INFINITE RICHES IN A LITTLE ROOM.
—*Christopher Marlowe.*

NEW AMERICANIZED

ENCYCLOPÆDIA BRITANNICA

REVISED AND AMENDED.

A DICTIONARY OF ARTS, SCIENCES AND LITERATURE

TO WHICH IS ADDED

BIOGRAPHIES OF LIVING SUBJECTS

96 Colored Maps and Numerous Illustrations.

EDITED BY
W. H. DEPUY, D.D., LL.D.
And a Corps of Eminent Writers.

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NEW AMERICANIZED

ENCYCLOPÆDIA BRITANNICA.

VOLUME II.

AST

ASTRONOMY is the science which deals with the distribution, motions, and characteristics of the heavenly bodies. Astronomy may probably be regarded as the most ancient of the sciences. Even the least civilized races must have recognized the regular vicissitudes of day and night (and, therefore, the diurnal course of the sun), while before long the variety and succession of the seasons would be noted, and their cause—the oblique annual motion of the same luminary—would be recognized. The moon in the sun's absence is so conspicuous and so useful that her motions, her various phases, and her regular disappearance and return after equal intervals of time, must have been watched in the earliest times with attention and interest. The occurrence of eclipses and other unusual phenomena would stimulate closer scrutiny. The spectacle of the starry heavens, seemingly unchangeable, save for the motions of a few wandering orbs along a certain zone of the star-sphere, early suggested an association between the fates of men and nations and these emblems of unchanging destiny on the one hand and of the changeful lot of mankind on the other.

But though mankind were probably first impelled by motives of mere curiosity to observe the courses of the stars, no great length of time could have elapsed ere they perceived that the regular and uniform revolutions of the heavens might be rendered subservient to their own wants and conveniences. By the help of the stars the shepherd, during the night, could count the hours, the traveler track his course through the uniform wastes of the desert, and the mariner guide his bark over the ocean; the husbandman, also, learned to regulate his labors by the appearance of certain constellations, which gave him warning of the approaching seasons. The indications derived from the simple observation of such phenomena were doubtless extremely vague; but as civilization advanced, the necessity of determining accurately the length of the solar year and of the lunar month, in order to regulate the calendar and the religious festivals, led to the accumulation and comparison of different observations, whereby errors were gradually diminished, and the foundations laid of a more perfect science. Astronomy thus presenting so many objects of curiosity and interest, and having so many practical uses, could not fail to be one of the sciences first cultivated by mankind. Its origin is, consequently, hid amidst the obscurity of remote ages, and is, in fact, coeval with the earliest development of the human intellect. The records or traditions of almost every ancient nation furnish some traces of attention to the state of the heavens, and of some rude attempts to discover the laws, the order, and the period of the most remarkable phenomena, such as eclipses of the sun and moon, the motions of the planets, and the heliacal risings of the principal stars and constellations. The Chaldeans and Egyptians, Chinese and Indians, Gauls and Peruvians, equally regard themselves as the founders of astronomy,—an honor, however, of which Josephus deprives them all, in order to ascribe it to the antediluvian patriarchs. The fables relating to the two columns of brick and marble which these sages are said to have erected, and on which they engraved the elements of their astronomy, to preserve them from the universal destruction by fire and water to which they are said to have learned from Adam the earth was doomed, are not worth the trouble of repetition; nor is there any better proof than the assertion of that credulous historian, of their acquaintance with the *annus magnus*, the astronomical cycle of 600 years, which brings back the sun and moon to the same points of the heavens so nearly, that its discovery implies a pretty correct knowledge of the solar and lunar motions.

According to the unanimous testimony of the Greek historians, the earliest traces of astronomical science are to be met with among the Chaldeans and Egyptians. The Egyptians were in ancient times the rivals of the Chaldeans in the cultivation of astronomy; and although they have left behind them still fewer monuments of their labors, they have obtained, through the exaggerated statements of the Greeks, even a greater reputation. The Greeks acknowledge themselves indebted to the Egyptians for their science and civilization; but regarding themselves likewise as descendants of that ancient people, they indulged their vain-glory in magnifying the accounts of the antiquity and knowledge of their supposed ancestors.

The Phœnicians are also generally enumerated among

the nations who cultivated astronomy at a very early period, though it does not appear, from any facts mentioned by ancient authors, that they devoted themselves specially to the observation of the heavens, or made any discoveries relative to the motions of the planets.

In China, astronomy has been cultivated from the remotest ages, and has always been considered a science indispensably necessary to the civil government of the state. The Chinese boast of a series of eclipses, recorded in the annals of the nation, extending over a period of 3,858 years, all of which, they affirm, were not only carefully observed, but were calculated and figured previous to their occurrence..

The astronomy of the Indians forms one of the most curious problems which the history of science presents, and one which, notwithstanding much discussion, still continues involved in great uncertainty.

The origin of astronomy in Greece, as in other early nations, ascends beyond the period of authentic history. The true foundations of Grecian science were laid by Thales, who was born at Miletus 640 years before our era. He formed a sect which has been distinguished by the title of the "Ionian School." Thales was succeeded by Anaximander, to whom also is attributed a knowledge of the sphere and of the zodiac. Anaximenes succeeded Anaximander in the Ionian school, and maintained nearly the same doctrines.

While the Ionian sect was so successfully employed in cultivating and propagating a knowledge of nature in Greece, another, still more celebrated, was founded in Italy by Pythagoras. Pythagoras is said to have acquired in Egypt the knowledge of the obliquity of the ecliptic, and of the identity of the morning and evening stars. What he chiefly deserves to be commemorated for in the history of astronomy, is his philosophical doctrine regarding the motion of the earth. He taught publicly that the earth is placed at the center of the universe; but among his chosen disciples he propagated the doctrine that the sun occupies the center of the planetary world, and that the earth is a planet revolving round the sun. This system, which still retains his name, being called the old or Pythagorean system of the universe, is that which was revived by Copernicus. Philolaus of Crotona, a disciple of Pythagoras, embraced the doctrine of his master with regard to the revolution of the earth about the sun. He supposed the sun to be a disk of glass which reflects the light of the universe. He made the lunar month consist of 29½ days, the lunar year of 354 days, and the solar year of 365½ days. Nicetas of Syracuse seems to have been the first who openly taught the Pythagorean system of the universe.

Although Plato can hardly be cited as an astronomer, yet the progress of the science was accelerated by means of the lights struck out by his penetrating genius. He seems to have had just notions of the causes of eclipses; and he imagined that the celestial bodies originally moved in straight lines, but that gravity altered their directions, and compelled them to move in curves. He proposed to astronomers the problem of representing the courses of the stars and planets by circular and regular motions. Geometry was assiduously cultivated in the school of Plato; and on this account he claims a distinguished place among the promoters of true astronomy.

Astronomy is also under some obligations to Aristotle. In a treatise which he composed on this science, he recorded a number of observations which he had made; and, among others, mentions an occultation of Mars by the moon, and another of a star in the constellation Gemini by the planet Jupiter. As such phenomena are of rare occurrence, their observation proves that he had paid considerable attention to the planetary motions.

The first astronomers of the Alexandrian school were Aristillus and Timocharis, who flourished under the first Ptolemy, about 300 years B. C. The chief object of their labors was the determination of the relative positions of the principal stars of the zodiac instead of merely announcing their risings and settings, as had been the practice of the Orientals and the ancient Greeks. The observations of these two astronomers conducted Hipparchus to the important discovery of the precession of the equinoxes, and served as the basis of the theory which Ptolemy, some centuries afterward, gave of that phenomenon.

About this time the science of astronomy was enriched by the discoveries of some of the distinguished geometricians whose labors have so greatly extended the glory of the Alexandrian school. Euclid, the celebrated author of the *Elements*, lived in the reign of the first Ptolemy. He composed a book on the sphere, which probably served as a model for future works of the same kind, and was the first who treated in a geometrical manner the phenomena of the different inclinations of the sphere.

Astronomy, which had as yet only consisted of a knowledge of isolated facts, acquired a systematic form, and almost a new existence, from the genius of Hipparchus, perhaps the greatest of all ancient philosophers in the sciences which are not purely speculative. This illustrious founder of astronomical science was born at Nicæa in Bithynia, and observed at Rhodes. After the death of Hipparchus nearly three centuries elapsed before any successor arose worthy of the name. During this long period astronomy made no essential advancement.

Ptolemy was born at Ptolemais in Egypt, and flourished at Alexandria about the 130th year of our era, under the reigns of Hadrian and Antoninus. This illustrious ornament of the Alexandrian school is entitled by his own discoveries to the high rank among astronomers which has universally been assigned to him; but the most signal service which he conferred on science was the collection and arrangement of the ancient observations. Ptolemy has been called The Prince of Astronomers,—a title which may perhaps be justified by the universal and long-continued prevalence of his system, but to which he has no claim from the number or value of his own observations. After a laborious and minute examination of the *Almagest*, Delambre doubts whether anything is contained in that great work, beyond the author's own statement, from which it can be decisively inferred that Ptolemy ever observed at all. He, indeed, frequently makes mention of observations made by himself; but his solar tables, rate of the precession, eclipses, determination of the moon's motion and parallax, and above all his catalogue of stars, render it impossible to doubt that the greater part of the results which he has given as observations are merely computed from the tables of Hipparchus.

The most celebrated of the Arabian astronomers was Albategni, or Muhammed Ben Geber Al-Batani, so-called from Batan, a city of Mesopotamia, where he was born about 850. He was a prince of Syria, and resided at Rakka in Mesopotamia, but many of his observations were made at Antioch. Having studied the *Syntaxis* of Ptolemy, and made himself acquainted with the methods practiced by the Greek astronomers, he began to observe, and soon found that the places assigned to many of the stars in Ptolemy's tables were considerably different from their actual situations, in consequence of the error which the latter had committed, with regard to the precession of the equinoxes.

Ulugh Begh, a Tartar prince, and grandson of the great Tamerlane, not only encouraged the study of astronomy, but was himself a diligent and successful observer. At Samarcand, the capital of his dominions, he established an academy of astronomers, and caused the most magnificent instruments to be constructed for their use. By means of a gnomon 180 feet in height, he determined the obliquity of the ecliptic to be 23° 30′ 20″, the precession of the equinoxes at 1° in 70 years, and obtained elements for the construction of tables which have been found to be scarcely inferior in accuracy to those of Tycho Brahe. The ancient astronomy had produced only one catalogue of the fixed stars,—that of Hipparchus. Ulugh Begh has the honor of having formed a second, after an interval of sixteen centuries. After the death of Ulugh Begh, astronomy received no farther accessions in the East. But the seeds of knowledge had now begun to take root in a more propitious soil, and Europe, destined to carry the development of the human energies to its fullest extent, began to awake from the lethargy in which it had continued during so many ages.

We come now to the period of the overthrow of the Ptolemaic system and the total renovation of the science of astronomy, which was due to the labors of Copernicus. The system which is associated with the name of Copernicus is now so familiar to every one, that it is almost unnecessary to describe it. The heaven, composed of stars perfectly at rest, occupies the remotest bounds of space, then the orbit of Saturn, next Jupiter, Mars, the Earth (accompanied by its moon), Venus, Mercury, and, lastly, the Sun immovable at the center. By this arrangement the stations and retrogradations of the planets became simple mathematical corollaries, following from the differences of the radii of their orbits and their unequal motions. The diurnal rotation of the earth explained more simply and rationally the apparent daily revolution of the heavens; and the precession of the equinoxes was referred to a small variation in the inclination of the earth's axis to the plane of the ecliptic. But the simplicity of the system, and its consequent probability, were the only arguments which Copernicus was able to bring forward in proof of its reality. The motion of the earth can, indeed, never be made an object of ocular demonstration; but after Richer's discovery of the diminution of gravity toward the equator, it was impossible to doubt longer of the existence of its rotary motion; and when Roemer had measured the velocity of light, and Bradley observed the phenomena of aberration, the evidences of its annual revolution were rendered equally convincing. For the events of his life see COPERNICUS.

Tycho Brahe stands next in chronological order on the roll of those who have contributed to the progress of astronomy. As an indefatigable and skillful observer, he is justly considered as far superior to any astronomer who had preceded him since the revival of the science in Europe. His ample fortune gave him the means of procuring the best instruments which the age could produce; and by his ingenuity and persevering application, he was admirably qualified to employ them to the best advantage. For an account of his life see BRAHE, TYCHO.

The great mass of accurate observations accumulated by Tycho furnished the materials out of which his disciple Kepler may be said to have constructed the edifice of the universe. The observations of the Danish astronomer had furnished the latter with the means of establishing with certainty the truth or inaccuracy of the various hypotheses which he successively imagined; and the diligence with which he labored in comparing and calculating these observations during twenty years, was finally rewarded by some of the most important discoveries which had yet been made in astronomy. (See Kepler's laws *supra*.)

Contemporary with Kepler was the illustrious Galileo whose discoveries, being of a more popular nature, and far more striking and intelligible to the generality of mankind, had a much greater immediate effect on the opinions of the age, and in hastening the revolution which was soon about to change the whole face of physics and astronomy. While residing at Venice, he heard it reported that Metius, a Dutch optician, had discovered a certain combination of lenses, by means of which distant objects were approximated to the sight. This vague and scanty intelligence sufficed to excite the curiosity of Galileo, who immediately set about inquiring into the means whereby such an effect could be produced. His researches were attended with prompt success, and on the following day he had a telescope which magnified about three times. It was formed by the combination of two lenses, a plano-convex and plano-concave, fitted in a leaden tube. In a second trial he obtained one which magnified seven or eight times; and subsequent essays enabled him to increase the magnifying power to thirty-two times. On directing his telescope to the moon, he perceived numerous inequalities on her surface, the diversified appearances of which led him to conclude almost with certainty that the moon is an opaque body similar to the earth, and reflecting the light of the sun unequally, in consequence of her superficial asperities. The planet Venus exhibited phases perfectly similar to those of the moon.

Science is indebted to Galileo for two other discoveries of a different kind, less brilliant perhaps, but of far greater importance than those which we have yet enumerated. These are the isochronism of the vibrations of the pendulum, and the law of the acceleration of falling bodies. His telescopic discoveries could not have remained long unknown; in fact, with the exception of those of the phases of Venus, and of the triple form of Saturn, they were all fiercely disputed, even during his own lifetime. It is now universally admitted that he was the first who discovered the satellites of Jupiter, and the spots of the sun; but the very circumstance of other claimants to these discoveries having arisen, proves that they were within the reach of ordinary observers. For an account of his eventful life see GALILEO.

While astronomy was making these rapid advances in the hands of Kepler and Galileo, an event occurred in Scotland which contributed, though less directly, no less powerfully, to the acceleration of its progress. This was the invention of logarithms by Lord Napier, baron of Merchiston. "An admirable artifice," says Laplace, "which by reducing to a few days the labor of many months, doubles the life of the astronomer, and spares him the errors and disgust inseparable from long calculations—an invention of which the human mind has the more reason to be proud, inasmuch as it was derived exclusively from its own resources."

Few individuals have rendered more important services to science than Huyghens. His improvement of the telescope and his application of the pendulum to clocks were valuable additions to the machiney of astronomical investigation. By means of his telescopes he discovered that the extraordinary appearance exhibited by Saturn was occasioned by a ring surrounding the body of the planet, and inclined to the ecliptic in an angle which he estimated at 21°. He lived to witness the discovery of four more satellites belonging to the same planet. (See HUYGHENS.)

The application of telescopes and micrometers to

graduated instruments forms an important epoch in the history of astronomy. The Royal Observatory of Paris was completed in 1670, and its direction intrusted to Dominic Cassini, who enriched astronomy with a great number of valuable observations and new discoveries. He determined the motions of Jupiter's satellites from observations of their eclipses, and constructed tables of them, which were found to be remarkably exact. He observed that the ring of Saturn is double, and discovered four of the satellites of that planet. He also determined the rotation of Jupiter and Mars, and made a number of observations on Venus with the same view. He observed the zodiacal light, and made a near approximation to the parallax of the sun. We also owe to him the first table of refractions calculated on correct principles, and a complete theory of the libration of the moon.

There is no period in the history of mankind so distinguished by great and important discoveries, or so remarkable for the rapid development of the human intellect, as the seventeenth century. We have already noticed the invention of the pendulum, and its application to regulate the motion of timekeepers; the invention of the telescope, bringing within the range of vision the phenomena of new worlds; of logarithms, by which computations are so much abridged; and of the mechanical contrivances for measuring minute angles in the heavens. The same century witnessed the application of algebra to geometry, the discovery of the laws of the planetary motions, the infinitesimal calculus, the acceleration of falling bodies, the sublime theory of central forces, and the great principle of gravitation which connects the celestial orbs, and regulates the motions which it had been the business of the astronomer to observe since the earliest ages of the world. The service which the discovery of these primary laws rendered to the progress of astronomy can scarcely be exaggerated.

By the discovery of the law of gravitation, Newton laid the foundations of physical astronomy; and by the consequences which he deduced from that law, he proceeded far in the erection of the superstructure. While physical astronomy was undergoing a complete revolution in the hands of Newton, the practical part was receiving great improvement from Flamsteed, the first astronomer royal, who conducted the Greenwich Observatory. This celebrated institution, from which so many important discoveries have emanated, was erected under the reign of Charles II, in 1675. Flamsteed was appointed to it in 1676, and continued with indefatigable zeal to discharge the duties of the office during the long period of thirty-three years.

Flamsteed was succeeded in the observatory by Halley, who held a prominent place among English astronomers. From early youth he applied himself with ardor to the study of mathematics and astronomy; and having procured a few instruments, he began to make observations, by which he was led to remark the inaccuracy of the tables of Jupiter and Saturn. In his nineteenth year he published a direct and geometrical method of finding the eccentricities and aphelia of the orbits of the planets, and in the year following he undertook a voyage to St. Helena, with a view to form a catalogue of the stars in the southern hemisphere. In 1720 Halley was appointed to succeed Flamsteed in the Royal Observatory.

The discoveries of Bradley, who succeeded Halley as astronomer royal, form a memorable epoch in the history of the science. It was reserved to him to give the theoretical explanation of a singular motion of the polar star which had been first observed by Picard, who had remarked that the inequality was annual, and amounted to about forty seconds, but had been unable to refer it to any law.

While England was witnessing the brilliant discoveries of Bradley, France produced a number of excellent astronomers, by whose successful labors every department of the science was signally promoted. Among these Lacaille is distinguished, both by his scientific zeal and the importance of his observations.

The question of the figure of the earth furnished ample materials for the practical as well as the speculative astronomer during the eighteenth century. The results of the measurement of the meridian by Cassini were at variance with the theories of Newton and Huyghens; and the Academy of Sciences resolved on making a decisive experiment by the actual measurement of the lengths of two degrees, one at the equator, and another at as high a latitude as could be reached. In the year 1735, three astronomers—Godin, Bouguer, and La Condamine—were commissioned by the French Government to accomplish the first of these objects in Peru; and the year following, Maupertuis, Clairaut, Camus, and Lemonnier went to Lapland to execute the second under the polar circle.

Maskelyne, the second English astronomer royal after Bradley, was appointed, in 1761, to observe the transit of Venus at the island of St. Helena. In the year 1765 he was appointed astronomer royal, and soon after recommended to the Board of Longitude the general adoption in the navy of the lunar method of finding the longitude, and proposed that tables for facilitating that method should be calculated and published in the *Nautical Almanac.*

Sir William Herschol, born in Hanover in 1738, has rendered his name immortal by the discovery of a new planet beyond the orbit of Saturn, and thereby doubling the ancient boundaries of the solar system. His observations on nebulæ and double stars opened up a new field of research, boundless in extent, and interesting by reason of the variety of the objects it presents to the attention of the observer. The extraordinary activity with which ne pursued his favorite occupation is attested by sixty-seven memoirs communicated by him from time to time to the Royal Society.

In the year 1764, the Academy of Sciences of Paris, which had so successfully promoted the great efforts that had already been made to perfect the theory of attraction, proposed for the subject of a prize the theory of the libration of the moon. Lagrange had the honor of carrying off the prize; but although he treated the subject in a manner altogether new, and with extraordinary analytical skill, he did not on this occasion arrive at a complete solution of the problem. In 1766 he obtained another prize for a theory of Jupiter's satellites. Of all the grand discoveries by which the name of Lagrange has been immortalized, the most remarkable is that of the invariability of the mean distances of the planets from the sun.

On account of the brilliant discoveries and important labors which we have just briefly noticed, Lagrange must be considered as one of the most successful of those illustrious men who have undertaken to perfect the theory of Newton, and pursue the principle of gravitation to its remotest consequences. But the value of his services to science is not limited to his discoveries in physical astronomy, great and numerous as these were. After Euler, he had contributed more than any other to increase the power and extend the applications of the calculus, and thereby to arm future inquirers with an instrument of greater efficiency, by means of which they may push their conquests into new and unexplored fields of discovery.

With the name of Lagrange is associated that of La-

place, their rival labors dividing the admiration of the scientific world during half a century. Like Newton and Lagrange, Laplace raised himself at an early age to the very highest rank in science. Before completing his twenty-fourth year he had signalized himself by the important discovery of the invariability of the mean distances of the planets from the sun, on an hypothesis restricted, indeed, but which, as we have already mentioned, was afterward generalized by Lagrange. About the same time he was admitted into the Academy of Sciences, and thenceforward devoted himself to the development of the laws which regulate the system of the world, and to the composition of a series of memoirs on the most important subjects connected with astronomy and analysis. His researches embraced the whole theory of gravitation, and he had the high honor of perfecting what had been left incomplete by his predecessors.

In the other departments of astronomy, also, numerous questions still remain to be discussed, the solution of which will occupy and reward the future labors of astronomers, and in which much progress has been made during the present century, by means of the powerful instruments now employed at the great observatories of every civilized country, and the improved methods of analysis brought to bear upon the results of observation. The curious phenomena of double and multiple stars, some of which are found to form connected systems of bodies revolving about one another, or a common center of motion—the variable stars—the proper motions of the stars—the translation of the solar system in space—the progressive condensation of nebulæ—are subjects still in a great measure new; for it is only of late years that observers have begun to direct the requisite attention toward them, or indeed have been in possession of instruments of sufficient power and delicacy to observe and measure the minute changes which take place beyond the boundaries of our own system. The discoveries in astronomy during the present century have been so brilliant and numerous, and the progress in every department is so rapid, and involves so many details, that it would be impossible to give here a detailed account of that progress.

PART II.—THEORETICAL ASTRONOMY.

When we look at the heavens on a clear night, we perceive a concave hemisphere on which are strewn multitudes of bright points. As we watch these hour after hour, we find that they are carried round precisely as though they were fixed on the interior surface of a spherical shell turning on a fixed axis. New groups are seen to rise above the eastern horizon, while those above the western horizon descend and finally disappear. Turning toward the south, we see that the groups of stars which pass above the horizon somewhat to the east of the south attain but a slight elevation when at their highest in the south, and then descending set as far to the west of the south point as they had risen to the east of it. Turning to the north, we see that there are groups of stars which remain visible the whole night, wheeling around a fixed point, and describing circles of greater or less magnitude according as they are at a greater or less distance from that point. Supposing our standpoint to be in or near London, the point thus remaining fixed is due north, and about 51½° above the horizon—therefore, about 38½° from the point directly overhead. If the heavens be observed night after night, similar phenomena are seen; and we recognize the uniformity of the motion of the (imaginary) star-sphere about its (imaginary) axis; for in any assigned interval, on any night in the year, the star-sphere turns by the same amount. It is soon found that the rate of turning is such that a complete rotation is effected in the course of about one day. But before many days have passed we find that this uniform turning motion does not correspond exactly to our common day. For though on several successive nights the stars may appear to be nearly in the same situation with respect to the horizon at any assigned hour, yet before long (or even in twenty-four hours if exact observation be made) it is found that the stars occupy the same position, *not* at the same hour on successive nights, but about four minutes earlier night after night. Thus, in the course of about fifteen days, the star-sphere has gained one hour's rotation; in about thirty days, two hours' rotation, and so on; until in the course of a year the star-sphere has gained a complete rotation, and the stars have the same apparent position at any assigned hour of the night as they had when the observations were commenced.

Limiting our attention for the present to the stars—though already, in speaking of the common day, we have in fact referred to the sun—the idea suggested by the observed phenomena is that the apparent star-sphere revolves around the earth precisely as it seems to do, turning about an axis, with a perfectly uniform motion, completing one rotation in twenty-four hours, less about four minutes. The natural steps for determining whether this really is the case, are—first, a series of careful observations at one fixed station; and, secondly, a study of the effects produced by change of station.

The altitude of the star, being in this case measured from the north, point N, is the supplement of the arc obtained by thus adding the north declination to the meridional altitude of the equator.

We see then that the declination of a star (or its north polar distance) determines the altitude of its culminating point. To determine the time at which the star culminates it is necessary that another co-ordinate should be known.

As we measure the declination from the equator, or in other words, determine the altitude of culmination by a reference to the equator, it is manifestly convenient to measure the time of a star's culmination by referring it to the time of culmination of some selected point on the equator. This is the course adopted by astronomers. The point selected for the purpose is one of the two points in which a great circle on the celestial sphere, called the ecliptic, cuts the equator. This point is called the first point of Aries, and is indicated by the sign T. At present it is only necessary to note that this point is in reality affected by a slow motion on the star-sphere, due to the fact that the axis on which the star-sphere apparently turns undergoes a slow change of position within the star-sphere itself, so that the equator is not really a fixed circle on the heavens. But for the purpose we have at present in view this slow change may be neglected; and we assume that the observer on earth has the equator as a fixed circle from which to measure the declination of stars, and that he also has a fixed point on the equator by which to time the culmination of each star. Knowing the declination of a star, he knows at what altitude it will culminate as viewed from the fixed station at which thus far we have supposed him to be placed. Let him now note the exact moment at which the first point of Aries culminates, and let him observe the precise interval in time between that moment and the moment when a star of known declination culminates; this interval is constant, and thereafter he will always know not only at what altitude that star will culminate, but at what time after the culmination of the point T. The interval in time between the culmination of T and the culmination of a given star is called the *right ascension* of the star. It may be measured, indeed, as an arc, viz.—

as the arc on the equator intercepted between T and that point in which a meridian circle through the star intersects the equator, the arc being measured in the direction opposite to that in which the star-sphere rotates. But the right ascension is more conveniently and now almost always measured in time.

The time measurement employed is the rotation of the star-sphere itself. The interval in time between the successive culminations of T is called a *sidereal day*. It is divided into 24 hours (numbered 0, 1, 2, 3 . . . to 24), each hour into 60 minutes, each minute into 60 seconds. If we have a clock showing 24 hours, and so rated as always to show 0 hour 0 min. 0 sec., when T is at its culmination, that clock will always show true sidereal time. Such a clock would gain nearly 4 min. a day as compared with an ordinary clock; but we need not at present dwell upon this point. Now the right ascension (or, as it is written, the R.A.) is indicated in sidereal time, and therefore corresponds to the time shown by the sidereal clock when that star is culminating. Thus, if a star's right ascension is 3 h. 2 m. 6 s., then when the sidereal clock shows time 3 h. 2 m. 6 s., that star is culminating. Whether it be day or night the astronomer knows this certainly, that is, if his sidereal clock is trustworthy.

It will be manifest that an observer at a fixed station, as we have thus far supposed our observer to be, requires to have the means of determining—(1) the moment at which a star culminates (or is on the meridian), and (2) the star's altitude when at its culmination. We have seen how the movement of the star-sphere determines the *cardinal points* of the horizon. Suppose now a telescope or pointer, so set as to turn upon a horizontal axis lying exactly east and west. We see that when the telescope is rotated on this axis, the line of sight, or the optical axis of the telescope, sweeps round in the plane of the meridian. It can be directed due south toward S, or to Æ (the culminating point of the celestial equator), or to *s*, a star on the meridian, or to the zenith Z, or to the pole P, or to the north point N—in fine, to any point on the celestial meridian. Now, if any contrivance be adopted to enable the observer to note the exact moment of sidereal time when a star crosses the middle of the field of view of such a telescope, then the right ascension of that star is known at once. Such an instrument, if devised simply or mainly for noting the moment of culmination, is called a *transit instrument*. If arranged with circles so that angles can be determined, the instrument is called a *transit circle*. An arrangement, now little used, in which a meridional circle bearing a telescope works against a fixed plane surface or wall (necessarily standing in a north-and-south position) is called a *mural circle*. The point to be specially noted in this plan is that, from observations of the star-sphere, we determine the cardinal points; and then the position of any star in the heavens can be determined by an instrument contrived so as to swing in the plane of the meridian. This done, a clock, carefully rated to show sidereal time, enables the astronomer at a fixed station to turn his transit instrument to the point of culmination of a star at the exact time when the star will culminate, and at the true place of such culmination.

But now let us suppose our observer to travel in a north-and-south direction, in order to determine what change, if any, will be produced by such voyage. The first effect noticed is that the pole of the heavens rises higher and higher above the northern horizon, as he travels farther and farther north, whereas the pole sinks lower and lower down toward the northern horizon the farther the observer travels toward the south. Close observation shows that the change of the pole's elevation is either exactly proportional to the observer's change of place in a north-and-south direction, or so nearly so that any discrepancy will require the closest and most exact scrutiny. The observer also notices that the stars retain their relative positions absolutely unaltered, but that new stars are seen in the south when he travels southward. This shows that the star-sphere is either truly a spherical enclosure—all the stars lying at the same distance—or else that the distances of the stars are so enormous that the displacement of the observer on the earth, even by several hundred miles, is as nothing by comparison. The uniform change in the pole's elevation cannot be explained, however, by merely supposing the stars very far away compared with terrestrial distances. It is manifest that we can only explain the observed facts by assuming that the course pursued by the supposed observer is not a straight line, but curved, and that it is curved uniformly, since the polar elevation changes uniformly when the observer travels at a uniform rate. It follows, therefore, that the path of the observer must be part of a circular arc. In other words, to an observer traveling uniformly along an arc toward the south, the angular elevation of the pole would diminish uniformly, as it is observed to do, *if* (1) the arc is circular, and (2) the pole of the heavens so far from the observer that lines drawn to it are appreciably parallel. Similarly the uniform increase of the polar elevation, to an observer traveling northward along the arc is explained.

Continuing this voyage southward, the observer finds the pole continues to sink, until at length the north pole of the heavens is on the horizon due north. All the phenomena of celestial rotation continue unchanged, except that toward the south many new stars have come into view. Moreover, the south pole of the heavens has now risen to the horizon, and lies due south. If the observer were now to retrace his course, he would, of course, find the north pole of the heavens rising uniformly again. But if instead of this he continue his journey southward, he finds the south pole of the heavens rising uniformly.

We see that journeys taken in a north-and-south direction lead to apparent changes of the dome of the heavens, only explicable on the assumption that the path traversed is a circular arc, or nearly so. It is clear also that the radius of this circular arc is determinable if the observer notes how much the elevation of the pole is changed for any given distance traversed by him in a north-and-south direction. Suppose for instance that in traveling he finds the elevation of the pole diminished by 7°, and that he has traveled about 480 miles, then (as already shown) he knows that ab=*ab*=change in polar elevation=an arc of 7° of the circumference of the circle along which he is traveling. Hence the whole circumference $= \frac{360}{7} \times 480$ miles $= 24{,}686$ miles; whence the diameter of the circle=(roughly) $24{,}686 \times \frac{7}{22} = 7855$ miles. This is not the true diameter of the earth's globe, being supposed to be the result of only a rough observation; but the method serves sufficiently to show how in very early times astronomers obtained a measure of the earth. For from whatever station the observer starts on north-and-south journeys, the same uniform elevation or depression of the visible pole as he travels toward or from it is observed; and the inference, therefore, is that the earth is a globe, since all the lines drawn on it in a north-and-south direction are circular arcs of equal radius. The points where the poles are both on the horizon, mark the

place of the *terrestrial equator;* and the points on the earth (which have never yet been reached), where the north and south celestial poles are respectively vertical, are the *terrestrial* or *geographical poles.*

Thus far we have considered only journeys made along a north-and-south course. Journeys pursued due east or due west, that is, always toward the point of the horizon which is 90° to the right or to the left of the north point, show equally that the observer is traveling on the surface of a globe, though they produce no apparent change either in the elevation of the pole or in the position of the points at which known stars rise, culminate, and set. We have seen that the observer who remains always at one station can determine the absolute time when any given star will culminate. Let us suppose that when journeying eastward or westward he can carry with him his sidereal time-measure, and that this continues throughout to show the true sidereal time of his original station. Then if he is traveling eastward he will find that any given star, instead of culminating at the time noted for that star as observed at his original station, will culminate earlier. The right ascension of the star will remain unchanged. On the contrary, if the observer travels westward from his original station, he finds that each star culminates later. Moreover, the observer finds that the amount of change in point of time corresponds to the distance he travels. Then the observer finds that the change in the time of a star's culmination corresponds exactly, to the length of arc traversed by him round the circle on the assumption that a complete circumference of this circle corresponds to 24 hours of sidereal time. This corresponds with the result of the former series of observations in showing that the earth is a globe, suspended, as it were, within the star-sphere; and that either the star-sphere turns uniformly around this terrestrial globe from east to west once in 24 sidereal hours, or else the terrestrial globe turns uniformly round its axis once in 24 sidereal hours from west to east.

The earth has now been shown to be a globe within the star-sphere, and whether the earth rotates within the star-sphere, or the star-sphere rotates round the earth, or both the earth and the star-sphere rotate, it is known that, *relatively to the earth*, the star-sphere rotates from east to west once in 24 sidereal hours. This rotation, whether apparent or real, takes place without any appreciable change in the relative position of the fixed stars. And the law of rotation having once been ascertained, it follows that the time of culmination of any star, and the position of the star at the time, are known, insomuch that a telescope or pointer can be directed to the place of the star at the moment of culmination with perfect exactness. Moreover, a star can be followed by an instrument properly devised, in such sort that a pointer shall continue directed upon the star all through the 24 sidereal hours.

We perceive, then, that if any celestial object is visible, whether by day or night, then by simply directing toward it a telescope we can ascertain in what part of the stellar heavens that celestial object lies. And if the object is moving upon the stellar heavens—or, in other words, it is other than one of these fixed stars with which we have hitherto been dealing—then by turning a telescope toward it from time to time we can determine its apparent path among the stars. So that in the case of the sun, which is never seen in company with the stars simply because his light, by illuminating our air, veils the stars from view, we can nevertheless ascertain exactly along what path on the star-sphere he seems to move, at what rate, and whether the rate is uniform or variable.

But before we examine the results of observations carried out for this purpose, it will be well to consider a circumstance affecting observations made in this manner. We refer to the refractive action of the earth's atmosphere, by which the apparent positions of the celestial bodies are to some degree affected. This is the proper place to mention the effects of refraction, because there can be little doubt that it was during observations of the sun that the refractive action of the atmosphere was first discovered. However, in explaining this action, reference will be made to the stars as heretofore, in order that the inquiry into the sun's apparent motions may be referred solely to the sphere of the fixed stars.

By a well-known optical law, a ray of light in passing obliquely from one medium to another of greater density is refracted or bent toward the normal to their common surface. We may regard our atmosphere as composed of an infinity of concentric spherical shells, whose densities increase the nearer they are to the earth's surface. When a ray of light from a star enters the atmosphere, therefore, it is inflected toward the earth, and the inflection is increased by every successive stratum of the atmosphere through which the light passes. The decrease of the density of the atmosphere, from the surface of the earth upward, follows the law of continuity, or takes place by insensible degrees; so that the luminous ray, in traversing the atmosphere, enters at every instant into a denser medium, and is therefore continually brought nearer and nearer to the vertical direction. Hence the true path of the ray is curvilinear, and concave toward the earth. This is equivalent to the supposition that the thickness of the different concentric strata of uniform density is infinitely small, and that the light, as it successively penetrates each, deviates from its former path by an infinitely small angle, which may be considered as the differential of the refraction, the total amount of which will therefore be obtained by integration. It is evident that the amount of the refraction is greater in proportion as the observed star is nearer to the horizon; for in this case the luminous rays strike the tangent planes of the atmospherical strata more obliquely, and have besides to traverse a greater extent of atmosphere before they arrive at the eye of the observer. On determining by experiment the refraction at every altitude from zero to 90°, tables of *Refraction* may be constructed, which will furnish the means of discovering the law of its diminution; but as such a process would be exceedingly tedious, and likewise apt to lead to erroneous results on account of the inevitable errors of observation, it is found more convenient to assume some hypothesis for a basis of calculation, and to verify the results which it leads to by comparing them with observation. In regard to media, which may be said to be permanent —such, for instance, as water and glass—the determination of the refraction is not attended with great difficulty; but the circumstances are greatly altered when we come to make experiments on the atmosphere. In this case the difficulty arises from the incessant changes which the atmosphere is undergoing relatively to its refractive power—changes which it is impossible for the observer fully to appreciate, inasmuch as he can only determine its physical state within a short distance of the earth, while that of the upper strata remains wholly unknown to him. The refractive power of the atmosphere is affected by its density and temperature. The effects of the humidity are insensible; for the most accurate experiments seem to prove that the watery vapors diminish the density of the air in the same ratio as their refractive power is greater. It is therefore only necessary, even in delicate experiments, to have regard

to the state of the barometer and thermometer at the time the observation is made.

It may be explained that the refraction of the rays of light in traversing the earth's atmosphere is the cause of *Twilight*, which sensibly lengthens the duration of the day, and prevents a sudden transition from light to darkness on the disappearance of the sun. When the sun is more than 33′ below the horizon, the refraction is not powerful enough to bring his rays sufficiently near the earth to reach our eyes; they pass over our heads, and are irregularly reflected by the molecules of the atmosphere. By this means a portion of the celestial vault is enlightened, while the sun is invisible. This illumination of the upper regions is called the twilight. It commences as soon as objects can be distinguished before sunrise, and terminates when they cease to be visible after the sun has set. The time, however, at which the twilight commences and terminates cannot be assigned with any degree of precision. It is generally supposed to be limited by the depression of the sun 18° below the horizon. Lacaille found the limit in the torrid zone to be between 16° and 17°. According to Lemonnier, it varies in France between 17° and 21°. The duration of the twilight will evidently be longer or shorter, according as the inclination of the sun's motion to the horizon is more or less oblique.

The apparent enlargement of the sun and moon near the horizon is an optical illusion, connected in some measure with the atmosphere, of which various explanations have been given since the time of Ptolemy. According to the ordinary laws of vision, the celestial bodies, particularly the moon, which is nearest to the earth, ought to appear largest in the meridian, because their distance is then less than when they are near the horizon; yet daily experience proves that the contrary takes place. The mean apparent diameter of the moon, at her greatest height, is 31′ in round numbers, but in the horizon she seems to the eye two or three times larger. The commonly received explanation of this phenomenon was first given by Descartes, and after him by Dr. Wallis, James Gregory, Malebranche, Huyghens, and others, and may be stated as follows:—The opinion which we form of the magnitude of a distant body does not depend exclusively on the visual angle under which it appears, but also on its distance; and we judge of the distance by a comparison with other bodies. When the moon is near the zenith there is no interposing object with which we can compare her, the matter of the atmosphere being scarcely visible. Deceived by the absence of intermediate objects, we suppose her to be very near. On the other hand we are used to observe a large extent of land lying between us and objects near the horizon, at the extremity of which the sky begins to appear; we therefore suppose the sky, with all the objects which are visible in it, to be at a great distance. The illusion is also greatly aided by the comparative feebleness of the light of the moon in the horizon, which renders us in a manner sensible of the interposition of the atmosphere. Hence the moon, though seen under nearly the same angle, alternately appears very large and very small. Desaguliers illustrated the doctrine of the horizontal moon by the supposition of our imagining the visible heavens to be only a small portion of a spherical surface, in which case the moon, at different altitudes, will appear to be at different distances, and will therefore seem to vary in magnitude.

Correction being made for refraction, the true position of the sun on the star-sphere can be ascertained day after day; and thus his apparent motions, as we have said, can be determined.

The result of such observations is to show that in a period of about 365 days the sun traverses a great circle of the star-sphere inclined to the equator. This period is called a *year*, and is familiar to all as the period in which the sun's varying positions, alternately north and south of the equator, bring about the circuit of the seasons. For we have already seen that a star to the north of the equator is above the horizon more than half the sidereal day, and at its meridian culmination has an altitude exceeding that of the south point of the equator. When the sun is north of the equator he has a daily arc like that of a star similarly placed, so that day lasts longer than night, and at mid-day the sun pours his heat more directly on the earth than if he were on the equator. In like manner it is shown that, when the sun is south of the equator, night lasts longer than day, and the sun at mid-day has a smaller altitude than if he were on the equator. The result of constant experience shows, that the sun's declination reaches its maximum on the south side of the equator about December 22, when it amounts to 23°.465. From this time it gradually diminishes till about March 21, when the sun reaches the plane of the equator. At this time the days and nights are of equal length all over the earth, and the instant of time at which the sun's center is in the equatorial plane is called the instant of the equinox. The sun then passes to the northern side of the equator, and his declination or meridional altitude continues to increase till about June 22, when he becomes stationary, and then again shapes his course toward the equator. His maximum declination on the north side of the equator is exactly equal to that on the south, amounting to 23°.465. The sun now continues to approach the equator till about September 24, when he again reaches that plane, and a second equinox succeeds. Continuing still to move in the same direction, he declines from the equator southward, till he reaches his former limit about December 22; and so on continually.

The two small circles of the sphere, parallel to the equator, which pass through the two points where the declination is greatest, are called the *Solstices* or the *Tropics;* that on the northern hemisphere is called the *Tropic of Cancer*, and the other is called the *Tropic of Capricorn.*

These two parallels, which mark the extreme limits of the sun's declination, are, as has just been stated, equally distant from the equator, with regard to which the variations of declination on either side are perfectly symmetrical and uniform.

The observations of the sun's right ascensions and meridional altitudes, which have been made daily during so great a number of years, and under so many different meridians, furnish complete proof that the projection of the sun's orbit is a great circle of the celestial sphere, and that the orbit itself is wholly confined to the same plane.

The great circle which the sun describes in virtue of his proper motion is called the *Ecliptic.* It has received this name from the circumstance that the moon, during eclipses, is either in the same plane or very near it. These phenomena can, in fact, only happen when the sun, earth and moon are nearly in the same straight line, and consequently, when the moon is in the same plane with the earth and the sun. The angle formed by the planes of the ecliptic and equator, which is measured by the arc of a circle of declination intercepted between the equator and tropic, is called the *Obliquity of the Ecliptic.* The two points in which the equator and ecliptic intersect each other are called the *Equinoctial Points;* they are also denominated the *Nodes of the Equator;* and the straight line conceived to join them is the *Line of the Equinoxes*, or the *Line of the*

Nodes. The node through which the sun passes on coming from the south to the north of the north of the equator is called the *Ascending Node*, the opposite node is the *Descending Node.* A straight line passing through the center of the earth, perpendicular to the plane of the ecliptic, is called the *Axis of the Ecliptic*, and the points in which its prolongation meets the sphere are called its *Poles*—these denominations being analogous to those of the axis and poles of the equator. The two small circles of the sphere which pass through the poles of the ecliptic, and are parallel to the equator, are called the *Polar Circles.*

The ecliptic has been divided by astronomers, from time immemorial, into twelve equal parts, called *Signs*, each of which consequently contains 30 degrees. The names by which they are characterized are as follows:—

North of the Equator.—Aries, Taurus, Gemini, Cancer, Leo, Virgo; South of the Equator.—Libra, Scorpio, Sagittarius, Capricornus, Aquarius, Pisces.

In each of these signs the ancients formed groups of stars, which they denominated the *Zodiacal constellations*, not confined to the ecliptic, but included within an imaginary belt, extending 9° on each side of it, to which they gave the name of *Zodiac (circle* or *zone of the animals).* The term *sign* is now employed only to denote an arc of 30°, and will probably soon be banished entirely from astronomical tables. It is now seldom used even for tables of the planets.

As the greater part of the celestial phenomena connected with the planetary system takes place either in the ecliptic or in planes not greatly inclined to it, it is found to be most convenient to refer the positions of the planets, and frequently those of the stars also, to that plane. The first point of Aries, which is the technical expression for the intersection of the ecliptic and equator, or the place of the sun at the vernal equinox, is assumed as the origin from which the degrees of the ecliptic, as well as of the equator, are counted from west to east, or in the direction of the sun's annual motion. The angular distance of the sun from this point is called his *Longitude*, and the longitude of a star is the arc intercepted on the ecliptic between the same point and a great circle passing through the star perpendicular to the ecliptic. The arc of this circle intercepted between the star and the ecliptic, or, which is the same thing, the complement of the star's distance from the pole of the ecliptic, is called the *Latitude* of the star; so that longitude and latitude bear the same relation to the ecliptic that right ascension and declination bear to the equator.

The sun's motion along the ecliptic is found not to be strictly uniform. In this place, let it suffice to notice that the sun is found to move more quickly in winter than in summer, the rate of motion changing from its maximum nearly in mid-winter to its minimum nearly in midsummer, and thence to its maximum again. But at no time does the motion differ greatly from its mean rate of very nearly 59′ in a sidereal day. If we call the mean rate 10,000, then the greatest and least rates of motion are represented by the members 10,336 and 9,664 respectively.

The direction in which the sun travels round the ecliptic, and in which longitude is measured, is from west to east, that is, it is contrary to the direction in which the star-sphere rotates.

Since the sun travels thus around the celestial sphere, it is manifest that the successive returns of the sun to the meridian cannot recur after the same interval of time as the successive returns of any given star. If on any day the sun's center when he is crossing the meridian has a particular position on the star-sphere, then when that point of the star-sphere next returns to the meridian—that is, one sidereal day later—the sun has traveled about 1° from that point, moving along the ecliptic in a direction opposed to that in which the star-sphere rotates. The star-sphere must, therefore, rotate a little further round before the sun will be on the meridian. As a convenient first approximation to the actual effects, let us make the supposition that the sun moves along the equator instead of the ecliptic, and that he moves exactly 1° in a sidereal day. In this case he would be exactly 1° from the meridian when the point he had occupied on the meridian the day before had reached the meridian. The point on the star-sphere would have completed the full circuit of 360° of rotation while the sun had completed only 359°, and his diurnal motion being therefore only $=\frac{359}{360}$ of the star-sphere's, it follows that the solar day (or the interval between the sun's successive returns to the meridian) would be greater than the sidereal day in the ratio of 360 : 359. Therefore, the solar day being divided into 24x60 minutes, the sidereal day would manifestly be 4 min. shorter.

But as the sun moves in a circle inclined more than 23° to the equator, and as the sun's motion is slightly variable, and the mean rate less than 1° per sidereal day, these relations are not exactly presented.

Let us, as a next approximation, suppose the sun to move uniformly round the equator once in the course of a year of 365¼ days, and determine the length of a solar day on this assumption. It is clear that whatever the sun's daily retardation may be, he loses one complete circuit of the heavens in a year of 365¼ solar days. In other words, while the sun has been carried round 365¼ times by the diurnal rotation, the star-sphere has been carried round 366¼ times. Therefore, on our assumption

$$365\tfrac{1}{4} \text{ solar days} = 366\tfrac{1}{4} \text{ sidereal days}$$

$$\text{and a sidereal day} = \frac{365\tfrac{1}{4}}{366\tfrac{1}{4}} \text{ solar day}$$

$$= 23 \text{ h. } 56 \text{ m. } 4 \text{ s., approximately.}$$

This, in fact, indicates roughly the manner in which the mean solar day is connected with the sidereal day. It is only necessary in the above process to substitute the true length of the year for the value 365¼ days—meaning by the year, the year of seasons, measured by the successive returns of the sun to the equator as he crosses that circle with northward motion.

As the sun moves at a varying rate, it is manifest that the actual solar day measured by the successive returns of the sun to the meridian could not be constant in value, even if the sun moved round the equator. For the excess of a solar day over the sidereal day is caused by the motion of the sun on the star-sphere, and will be therefore greater or less according as the sun's motion on the star-sphere is greater or less. The actual solar day, therefore, exceeding the constant sidereal day by a variable quantity, must necessarily be itself variable. It is greater than the mean in December and January, when the sun is moving at a rate greater than his mean rate, and less in June and July when he moves at a less rate. And it is clear that if at the end of December the moment of the real sun passing the meridian were taken as the beginning of the mean solar day of twenty-four hours, then the next passage of the meridian by the actual sun would occur after the twenty-four hours of mean solar time had elapsed. Day after day the sun would come to the meridian at a later and later hour of mean solar time, until toward the end of March, when, the sun's rate having acquired its mean value, the actual sun would not lag any farther behind. From this time he would gain, until toward the end of June he would come to the meridian at noon of mean solar

time. In the remaining half year he would be in advance, that is, he would cross the meridian before noon of mean solar time. Toward the end of September he would have made his greatest advance compared with mean time, and in the remaining quarter of the year he would gradually lose more and more of that gain, until at the end of December he would again cross the meridian at noon of mean solar time.

But besides this cause of variation in the length of the true solar day, there is another depending on the inclination of the sun's apparent path on the heavens to the celestial equator. To conceive the effect of this cause, it is necessary to have regard to the motion of the sun with reference to the equator. The sun describes every day a small arc of the ecliptic. Through the extremities of this arc suppose two meridians to pass; the arc of the equator, which they intercept, is the sun's motion for that day referred to the equator, and the time which that arc takes to pass the meridian is equal to the excess of the astronomical day over the sidereal. But it is obvious that at the equinoxes the arc of the equator is smaller than the corresponding arc of the ecliptic, in the proportion of the cosine of the obliquity of the ecliptic; at the solstices, on the contrary, it is greater in the proportion of the secant of the same obliquity. The astronomical day is diminished in the first case, and lengthened in the second.

To have a mean astronomical day independent of these causes of inequality, astronomers have supposed a second sun to move uniformly on the ecliptic, and to pass over the extremities of the axis of the sun's orbit at the same instant as the real sun. This removes the inequality arising from the inequality of the sun's motion. To remove the inequality arising from the obliquity of the ecliptic, conceive a third sun to pass through the equinoxes at the same instant with the second sun, and to move along the equator in such a manner that the angular distances of the two suns at the vernal equinox shall be always equal. The interval between two consecutive returns of this third sun to the meridian forms the *mean astronomical day*. *Mean time* is measured by the number of the returns of this third sun to the meridian; and *true time* is measured by the number of returns of the real sun to the meridian. The arc of the equator, intercepted between two meridian circles drawn through the centers of the true sun and the imaginary third sun, when reduced to time, is what is called the *Equation of Time*.

The inclination of the ecliptic to the equator results necessarily, as already mentioned, in a difference of seasons. When on the equator, the sun, like an equatorial star, is above the horizon during one-half of the day, and below the horizon during the other half. When he is north of the equator he is above the horizon for more than half the day, and reaches a higher altitude at noon than when on the equator. When south of the equator he is below the horizon for more than half the day, and does not reach so great an altitude at noon as when he is on the equator. As he is perceptibly the source of light and heat, it follows that when he is north of the equator we receive (in our northern latitudes) more light and heat than when he is on the equator, and so much the more as his northerly declination is greater; while, when he is south of the equator we receive less light and heat than when he is on the equator, and so much the less as his southerly declination is greater. These results are equally accounted for whether we regard the earth as fixed, and the sun as really traveling round the heavenly sphere on his inclined path, or whether we suppose the sun to be fixed, and the earth to travel around him on a correspondingly inclined path. Let us follow the earth round, noting how the sun would appear to move on the ecliptic, and also how the length of day would be affected by the varying position of the earth's axis with respect to the sun. When the earth is at the beginning of Libra, about March 20, the sun, as seen from the earth, appears at the beginning of Aries in the opposite part of the heavens, the north pole is just coming into light, and the sun is vertical to the equator, which, with all its parallels, is divided into two equal parts by the circle which forms the boundry between the dark and illuminated hemispheres, and therefore the days and nights are equal all over the earth. As the earth moves in the ecliptic, the north pole comes more and more into the light, and the days increase in length at all places north of the equator. When the earth comes to the beginning of Capricorn, the sun, as seen from the earth, appears at the beginning of Cancer about June 21; and the north pole of the earth inclines toward the sun, so as to bring into light all the north frigid zone, and more of each of the northern parallels of latitude in proportion as they are farther from the equator. As the earth advances from Capricorn towards Aries, and the sun appears to move from Cancer toward Libra, the north pole recedes from the light, which causes the days to decrease and the nights to increase in length till the earth comes to the beginning of Aries, and then they are equal as before—the boundary of light and darkness cutting the equator and all its parallels equally. The north pole then goes into the dark, and does not emerge till the earth has completed a semi-revolution of its orbit, or from September 22 till March 20. Similar changes occur, *mutatis mutandis*, in the southern hemisphere. For the purpose of actually picturing the relations of the various members of the solar system to his mind, the reader may conveniently use Sir J. Herschel's illustration, as follows:—Choose any well-leveled field. On it place a globe two feet in diameter to represent the sun; Mercury will be represented by a grain of mustard seed, on the circumference of a circle 164 feet in diameter for its orbit; Venus a pea, on a circle 284 feet in diameter; the earth a (somewhat larger) pea, on a circle of 430 feet; Mars a rather large pin's head, on a circle of 654 feet; the asteroids grains of sand, in orbits of from 1,000 to 1,200 feet; Jupiter a moderate-sized orange, on a circle of half a mile; Saturn a small orange on a circle of four-fifths of a mile; Uranus a full-sized cherry, on a circle more than one and a half miles; Neptune an extra-sized cherry, on a circle of two and a half miles in diameter.

We have seen that while the stars remain fixed, to all appearance, on the celestial concave, the sun circuits around a great circle of the star-sphere, moving always in one direction, and at a rate which, though variable in different parts of the circuit, does not vary largely, and is constant for each part of the ecliptic. Moreover, to ordinary observation, continued for periods of a few years, the sun's path in the heavens appears to remain always the same, and to bear the same relation to the poles and equator of the rotating star-sphere.

But we have now to consider bodies which neither remain fixed like the stars, nor move in a constant apparent path like the sun

The moon is the most noteworthy of these bodies, because of her apparent size and brightness, and also because of the remarkable changes of appearance which she presents according to her varying position with reference to the sun. When she is seen near him in the heavens, she appears always like a fine sickle of light, with the horns turned away from him. When she is in the path of the heavens directly opposite to the sun, she appears with a full orb. When she is exactly midway between the point occupied by the sun and that

opposite to him, she appears as a semicircle of light, with the convexity toward the sun; and in positions intermediate to these she appears with more or less of her circle illuminated, according as she is nearer to or further from the point directly opposite the sun. All this corresponds with what would happen if the moon were an opaque orb nearer to the earth than the sun, and illuminated by him.

Now, when the moon is watched, even for a few hours only, she is found to be traveling on the star-sphere in the same direction as the sun (and, like him, on a path inclined to the equator), but much more rapidly than the sun travels. It is impossible to watch the moon completely round the heavens, because she is found to pass close to the sun once in each circuit, and when very near to him cannot be seen. But while she is visible, she travels continuously in one direction, and when she reappears, after having been for a day or two lost in the sunlight, she is seen to have shifted her place as though, during that interval, she had traveled continuously onward.

The moon's circuit of the star-sphere is found to be completed in about twenty-seven and one-third solar days. But her circuit, considered with reference to the sun, occupies a longer interval. Thus, suppose we observe her when she is opposite to the sun, or "full." Then she is in the same (or very nearly the same) place among the stars about twenty-seven and one-third days later. But in the meantime the sun has advanced along the ecliptic about 27°, and the point now directly opposite the sun has, of course, advanced by the same amount. The moon has, therefore, to travel further on before she is again exactly opposite the sun. It is found that this happens rather more than two days later; or in other words, that the interval between successive full moons amounts to about twenty-nine and one-half days. This interval is called a *lunar month*, or *lunation;* the period during which the moon completes the circuit of the heavens being called a *sidereal month*. The lunation is also called a *synodical month*.

The path in which the moon travels is found to be inclined at an angle of about 5° 9′ to the ecliptic. But continued observation shows that the path, while retaining this inclination, shifts slowly in position—the points where it intersects the ecliptic gradually retrograding (on the whole) until, in the course of about eighteen and one-half years, they have made a complete circuit of the ecliptic. It is also found that the moon moves, like the sun, with variable velocity in her apparent course. The parts of her path, however, where she moves most and least rapidly are not fixed in position like the corresponding parts of the sun's apparent circuit, but advance, traveling round in 8.85 years.

It follows, from the varying position of the moon's apparent path with respect to the ecliptic, that her range north and south of the equator is variable. When she crosses the ecliptic, at or near the two points where the ecliptic crosses the equator, the inclination of her path to the ecliptic is either added to or substracted from the inclination of the ecliptic to the equator, so that her range in declination is, in one case, 23° 27′ + 5° 9′, or 28° 36′; and in the other, 23° 27′ − 5° 9′, or 18° 18′. When she crosses the ecliptic at or near the two points where the ecliptic is furthest from the equator, the inclination of her path to the equator is nearly the same as that of the ecliptic, the two paths—the ecliptic, or sun's path, and the apparent lunar path—crossing the equator at different points.

From the observed parallactic displacement of the moon it is manifest, apart from the lunar phases, that the moon's orbit relatively to the earth lies within the sun's. While observing the stars, which maintain apparently a constant position on the uniformly rotating star-sphere, the ancients early noted five bodies, which seem to travel among the stars like the sun and moon, but not always in one direction. To these bodies they gave the name of planets, or wanderers (a term which also included the sun and moon, so that there were seven in all). Three could be seen sometimes throughout the night, sometimes in the morning, sometimes in the evening. To these were given the names Saturn, Jupiter and Mars; and careful observation showed that these bodies, when visible all through the night, always travel among the stars in a direction contrary to that of the sun's yearly and the moon's monthly motion, but that this retrograde motion continues only for a certain length of time, being preceded and followed by an advancing motion, which is greater in amount than the retrograde motion, so that, on the whole, these bodies are carried round in the same direction as the sun and moon. But this peculiarity was noticed, that when any planet was at the outermost parts of the successive loops the planet was lost to view in the sun's rays, lying nearly in the same part of the sky, whereas, when a planet was at the innermost parts of the successive loops the planet was always opposite the sun. This exact agreement between the times when the planet and sun were in *conjunction* or in *opposition*, and the tracing out of the apparent planetary loops, should have suggested, it would seem, a connection between the sun and planets; for if the earth were the center of the sun's motion, and each of the three planets had its looped path wherein to travel around the earth, there could be imagined no reason why the planet's motion round its loops should synchronise with the sun's motion on his nearly circular path.

This view should have been confirmed by the apparent motions of two other planets, Venus and Mercury, which were found to remain always within a certain apparent distance from the sun, never being seen on the part of the sky opposite to him. Venus, the brighter, was observed to have the greater range on either side of the sun, moving from about 46° on the east of the sun, when she is seen as the Evening Star, to about the same distance on the west of the sun, when she is seen as the Morning Star; while Mercury's greatest range on either side of the sun is more variable, being sometimes as great as 27°, and at other times not greater than 18°. So far as the motion of these planets on the star-sphere could be traced they appeared to follow looped paths, somewhat like the outer planets; but the nearer and farther parts of the successive loops were *both* lost to view, the two planets being always too near the sun's place in the heavens to be visible when tracing those parts of their paths.

The five planets were found to travel always within a certain range on either side of the ecliptic, Venus, which has the greatest range, being sometimes as far as 9° north, or 9° south of the equator. A zone, or band, having the ecliptic for its central circle, and bounded by circles 9° north and south of the ecliptic, so as to be 18° wide, came thus to be regarded as a sort of celestial roadway, outside of which the planets were never seen. This zone was called the *zodiac*, and it was probably in connection with the planetary rather than the solar motions that the zodiacal constellations were originally formed.

Considering the observed relation between the motions of all the five planets and those of the sun, it is remarkable that any of the astronomers of old time should have regarded the earth as the common center of solar and planetary movement. It is true that, by supposing each planet to travel around a center which

itself traveled round the earth, the looped paths of the planets might be explained. Yet the synchronism between all the movements in these small circles and the sun's supposed motion round the earth, was left wholly unexplained by that theory.

Far more reasonable was the ancient Egyptian system, by some described as identical with, but in any case closely resembling in essentials, the system of Tycho Brahe. Here the earth is the center of the motions of the sun and moon, but all the planets circle around the sun, Venus and Mercury moving in orbits passing between the earth and sun, while Mars, Jupiter, and Saturn move in orbits passing outside the earth. All the observed movements, and all the peculiarities of the observed relations, were fully explained by this system. It is not too much to say that Tycho's system is not only fully equal to the Copernican in its fitness to explain the observed relations, but that, until the law of gravitation had been established, the arguments for the Tychonic system, modified so as to correspond to Kepler's discovery of the shapes of the different orbits, were almost equal in weight to those used by the disciples of Copernicus. The slight advantage of the Copernican system in point of simplicity was counterbalanced by the difficulty of accepting, in those days, the belief that the stars lie at so inconceivably vast a distance that the motion of the earth in an enormous orbit around the sun (for the sun was known even then to lie many millions of miles from us) produces no perceptible change in the appearance and rotation of the star-sphere. That the whole span of the earth's orbit was as a mere point compared with the distance of the stars, so that the earth on one side of the sun was, in effect, at the center of the star-sphere, while it was equally at the center when on the opposite side, or many millions of miles from its former position, was not unreasonably regarded by Tycho Brahe as scarcely credible.

Leaving the rotation of the star-sphere out of consideration, the apparent motions of the sun, the moon, and the five planets known to the ancients, are most naturally explained by regarding the sun as the center around which Mercury, Venus, the earth, Mars, Jupiter and Saturn revolve in that order as to distance, while the moon revolves round the earth. For though there are thus two centers of motion, yet only a small body traveling in a relatively small orbit is set revolving round the earth, now presented as a subordinate orb in the system; and the whole family, including the moon, are set revolving around the sun, for the moon accompanies the earth in her circuit. In the Tychonic system the sun, though presented as a subordinate orb, because traveling round the earth, was yet set as the center round which all the planets revolved. Either system was, however, altogether more reasonable than the Ptolemaic, in which all the planets were supposed to move around imaginary centers. It is hardly necessary to point out that the arrangement suggested by Copernicus explains the motions of the sun and moon as readily as the system which presents both these bodies as moving around the earth. Peculiarities in the motions of the earth and moon are indeed left unaccounted for by a simple theory of uniform circular motion around the sun and earth as centers; but so they were in the Ptolemaic system until eccentric and epicyclic movements were provided, and these were as admissible in the Copernican theory as in the Ptolemaic. But although the Copernican theory explains the general features of planetary motion, it could not, as originally advanced, explain those features which had rendered necessary the eccentrics and the subordinate epicycles of the Ptolemaic system. It was known to Copernicus that the earth does not move uniformly in a circle around the sun as center, but by an eccentric path with varying velocity. He might, therefore, reasonably assume that the other planets have paths similarly eccentric, and move with varying velocities. But he thought it necessary to explain the planetary motions by uniform motion in circles, using such contrivances to save appearances as the Ptolemaic system had rendered familiar to astronomers. Tycho Brahe, having completed a series of observations of Mars, the nearest planet moving on a manifestly eccentric orbit, Kepler tested the theory of Copernicus in order to ascertain whether any eclipse could account for the observed positions of the planet. Kepler was led at last to abandon the attempt to explain the motions of Mars by combining circular uniform motions. Passing to the ellipse, as the curve which Mars appeared to follow, and testing various empiric laws of motion in an elliptic orbit, he at length lighted upon the actual relation, presented in his first two laws as true for all the planets, though actually proved only in the case of Mars. The laws are these:—

1. *Every planet moves in an elliptical orbit, in one focus of which the sun is situated.*

2. *The line drawn from the sun to a planet, or the radius-vector of the planet, sweeps over equal areas in equal times.*

It remained now to discover if any law connected the periods in which the planets pursue their different paths. He did not at first try to connect the periods and the distances by any direct numerical relation, probably because he had recognized in the second law the probable existence of geometrical relations. But after many years of inquiry he arrived at the conclusion, that probably the required law connected the powers of the numbers representing the periods and the distances. It affords a strange evidence of the ponderous nature of Kepler's movements, that after this idea had occurred to him, ten weeks, instead of some ten minutes, elapsed before he had verified it. The law connecting the periods and distances—Kepler's third law—is this:—

3. *The squares of the numbers representing the periodic times of the planets vary as the cubes of the numbers representing their mean distances.*

The three laws of Kepler are approximately true for bodies circling around the same center. They do not apply to bodies circling around different centers. It was probably the recognition of this fact which first put astronomers on the track of the theory that the law depends on some force residing in the centers round which different bodies move. Newton certainly had given attention to this influence before he dealt with the moon's attraction earthward as a case of the action of terrestrial gravity. But, be that as it may, it is certain that so soon as the action of the earth's attraction on the moon had been demonstrated by him he extended the law of gravitation to all cases of motion around a central orb. It then became clear that the laws of Kepler are consequences of the general law of gravitation—the law, viz., that

Every particle of matter in the universe attracts every other particle with a force varying directly as the masses, and inversely as the square of the distances.

The proof of the law of gravitation divides itself into three distinct parts:—

First, The proof that the force acting on the moon is equal to the force of terrestrial gravity, reduced as the inverse squares of the distances of the moon and of a point on the earth's surface, from the center of the earth.

Secondly, The proof that a system of bodies circling around a central body like the sun, attracting them with a force inversely proportionate to their respective distances, would obey the laws of Kepler, or some modification of those laws, giving results according with the motions actually observed.

Thirdly, The proof that the mutual attractions of the several members of any system, and the attractions of members of one system on bodies belonging to another system (as, for instance, of the sun upon the moon regorded as a dependent of the earth), would result in such perturbations from the paths due to the attractions of the central body as are observed actually to take place.

The moon is, roughly, at a distance from the earth's center equal to 60 radii of the earth, and therefore the earth's moving force is less on her than on a body at the earth's surface as 1 to 3600. Now, regarding the moon's orbit as a circle, it is easily shown that, if at any moment the earth's attraction ceased to act, so that for the next second the moon moved on a tangent to her present course, her distance from the earth's center at the end of that second would be rather more than $\frac{1}{19}$th of an inch greater than at the beginning of the second. It follows that her fall toward the earth in a second on account of the earth's attraction amounts to rather less than $\frac{1}{19}$th of an inch. But the fall of a body near the earth's surface is about $16\frac{1}{10}$th feet, or nearly 193 inches per second, or nearly 193x19 times greater than the fall of the moon toward the earth per second; that is, about 3600 times greater. In other words, the moon is attracted toward the earth precisely as she would be if the force of gravity acting on bodies near her surface ruled her also, the law of variation of the force with distance being that of the inverse squares.

This relation which is true for elliptic orbits, is general for all systems, and gives the means of comparing the masses of different systems. But it is necessary to observe a modification which Kepler's third law and this extension of it have to undergo to make them strictly true (as regards, at least, the unperturbed motions of the planets). The masses of the planets, though very small, yet bear definite relations to the sun, and instead of considering each planet as swayed by the sun's mass, we must regard each as swayed by the sum of its own mass and the sun's, supposed to be gathered at the sun's center. Thus we must regard the planets as revolving around centers of different attractive energy; Jupiter round a center equal in mass to Jupiter and the sun; Saturn round a center equal in mass to Saturn and the sun, etc. Instead, then, of the ratio being constant for the solar system, we find that this ratio for any given planet is proportional to the sun's mass added to that planet's.

These laws suffice to enable us to deduce from the observed periods of the planets their true mean distances, velocities, etc., and from the observed period of the satellite of any planet, the ratio of the planet's mass to the sun's. The eccentricities of the planetary orbits are partly deduced from observation, and partly from the law of the equable description of areas. The inclinations of the orbits, and, of course, all elements relating to the planets' own globes, their dimensions, compression, inclination, rotation, and so on, are obtained by telescopic observation and measurement.

The sun, the central and ruling body of the planetary system, and the source of light and heat to our earth and all the members of that system, is a globe about 852,900 miles in diameter. So far as observation extends, his figure is perfectly spherical, no difference having been observed between his polar and spherical diameters. It has been well remarked, indeed, by Sir G. Airy, that if any observer could by ordinary modes of measurement satisfy himself that a real difference existed between the diameters, that observer would have proved the inexactness of his own work; for the absence of any measurable compression comes out as the result of comparisons between thousands of observations of the sun's limbs made at Greenwich and other leading observatories. The volume of the sun exceeds the earth's 1,252,700 times. His mean density is almost exactly one-fourth of the earth's, and his mass exceeds hers about 316,000 times. Gravity at the surface of the sun exceeds terrestrial gravity about 27.1 times, so that a body dropped from rest near the sun's surface would fall through 436 feet in the first second, and have acquired a velocity of 872 feet per second.

Viewed with the naked eye, the sun appears only as a luminous mass of intense and uniform brightness; but when examined with the telescope, his surface is frequently observed to be mottled over with a number of dark spots, of irregular and ill-defined forms, constantly varying in appearance, situation, and magnitude. These spots are occasionally of immense size, so as to be visible even without the aid of the telescope; and their number is frequently so great that they occupy a considerable portion of the sun's surface. Sir W. Herschel observed one in 1779, the diameter of which exceeded 50,000 miles, more than six times the diameter of the earth; and Scheiner affirms that he has seen no less than fifty on the sun's disk at once. Most of them have a deep black nucleus, surrounded by a fainter shade, or *umbra*, of which the inner part, nearest to the nucleus, is brighter than the exterior portion. The boundary between the nucleus and umbra is in general tolerably well defined; and beyond the umbra a stripe of light appears more vivid than the rest of the sun.

The discovery of the sun's spots has been attributed to Fabricius, Galileo, and Scheiner, and has been claimed for the English astronomer Harriot. Among these conflicting pretensions it is perhaps impossible to arrive at the truth; but the matter is of little importance; the discovery is one which followed inevitably that of the telescope, and an accidental priority of observation can hardly be considered as establishing any claim to merit.

The solar spots furnish an extensive subject of curious speculation. They are interesting on account of their establishing the fact of the rotation of the sun, and affording the means of determining its period.

Sir William Herschel, with a view to ascertain more accurately the nature of the sun, made frequent observations upon it from the year 1779 to the year 1794. He imagined the dark spots on the sun to be mountains, which, considering the great attraction exerted by the sun upon bodies placed at its surface, and the slow revolution it has upon its axis, he thought might be more than 300 miles high, and yet stand very firmly. He says that in August, 1792 he examined the sun with several powers from 90 to 500, when it evidently appeared that the dark spots are the opaque ground or body of the sun, and that the luminous part is an atmosphere, through which, when interrupted or broken, we obtain a view of the sun itself. Hence he concluded that the sun has a very extensive atmosphere, consisting of elastic fluids that are more or less lucid and transparent, and of which the lucid ones furnish us with light. This atmosphere, he thought, cannot be less than 1,843 nor more than 2,765 miles in height; and he supposed that the density of the luminous solar clouds needs not be much more than that of our aurora borealis, in order to produce the effects with which we are acquainted. The sun, then, if this hypothesis be admitted, "is similar to the other globes of the solar system with regard to its

solidity, its atmosphere, its surface diversified with mountains and valleys, its rotation on its axis, and the fall of heavy bodies on its surface; it therefore appears to be a very eminent, large, and lucid planet, the primary one in our system, disseminating its light and heat to all the bodies with which it is connected."

Herschel supposed that there are two regions or strata of solar clouds; that the inferior stratum is opaque, and probably not unlike our own atmosphere, while the superior is the repository of light, which it darts forth in vast quantities in all directions. The inferior clouds act as a curtain to screen the body of the sun from the intense brilliancy and heat of the superior regions, and, by reflecting back nearly one-half of the rays which they receive from the luminous clouds, contribute also greatly to increase the quantity of light which the latter send forth into space, and thereby perform an important function in the economy of the solar system. The luminous clouds prevent us in general from seeing the solid nucleus of the sun; but in order to account for the spots, he supposes an empyreal elastic gas to be constantly forming at the surface, which, carried upward by reason of its inferior density, forces its way through the planetary or lower clouds, and mixing itself with the gases which have their residence in the superior stratum, causes decomposition of the luminous matter, and gives rise to those appearances which he describes under the name of *corrugations*. Through the openings made by this accidental removal of the luminous clouds, the solid body of the sun becomes visible, which, not being lucid, gives the appearance of the dark spots or nuclei seen through the telescope. The length of time during which the spots continue visible renders it evident that the luminous matter of the sun cannot be of a liquid or gaseous nature; for, in either case, the vacuity made up by its accidental removal would instantly be filled up, and the uniformity of appearance invariably maintained.

But, perhaps, the most important of all the discoveries which have been made respecting the sun spots, are those which relate to the variation of these objects in number, and in the amount of solar area which they cover. We owe the initiation of observations on these points to Schwabe of Dessau. They were commenced in the year 1826, and continued without intermission, except in one case, during the astronomer's illness, for forty-six years. Before many years had elapsed, Schwabe discovered that the spots wax and wane in frequency in a period of about eleven years. At the time of spot-minimum the sun remains often for several days not only clear of spots, but with a singular smoothness of aspect, even the minute mottlings ordinarily seen on his surface either passing away for a time or becoming less conspicuous than usual. From such an epoch there is a gradual return to the spotted condition, and usually in four or five years the maximum of spot-frequency is reached; then there is a more gradual reduction, until, in rather more than eleven years on the average, the minimum is reached.

Among the most interesting discoveries in solar physics are those which have been effected by means of the spectroscopic analysis, not only as regards the constitution of the sun himself, but as to the nature of the solar spots and faculæ, as well as of the various objects which lie outside the sun's visible surface, and are only rendered discernible during the darkness of total solar eclipses.

The evidence of the spectroscope respecting the sun's constitution is too intimately associated with the history of spectroscopic analysis to be properly discussed at any length in this place. We propose, therefore, to present results, rather than to describe in detail the processes by which these results have been obtained, or the considerations on which must be based the interpretation of such results.

It has been shown, then, that the light of the sun comes from an orb glowing with intense *white* light—that is, light of all refrangibilities. Hence the sun is either liquid or solid, or if vaporous, then so greatly compressed that, in fact, the condition of its vapors is unlike that of any gases with which we are familiar. But inasmuch as the rainbow-tinted streak constituting the solar spectrum is crossed by a multitude of dark lines, it is seen that the glowing mass of the sun is surrounded by a complex vaporous envelope at a lower temperature. Nevertheless we are not to suppose that the vapors constituting the solar atmosphere are in any sense cool. In fact, we find from the position of the dark lines of the solar spectrum that the vapors of magnesium and sodium, of iron, copper, and other metals, exist in the true solar atmosphere, which implies an excessive intensity of heat. We know also that the vapors of the solar atmosphere, although less intensely hot than the glowing mass of the sun, are yet so hot as to be brightly luminous. It must not be supposed either that no other terrestrial elements exist in the sun, or that no other coincidences are recognizable. With each improvement in spectroscopic appliances fresh coincidences are determined. Moreover, it is certain that many elements existing in the sun may forever escape notice, simply because their vapors in the solar atmosphere may be either insufficient in quantity, or too low down to produce any recognizable effect.

The evidence given by the spectroscope respecting the solar spots confirms the theory that these are due to the existence of masses of relatively cool vapors at a lower level, and therefore relatively more compressed than the vapors elsewhere existing in the solar atmosphere. For the spectrum of the umbra of a spot differs chiefly from the spectrum of the solar photosphere in the greater strength and breadth of some of the dark lines.

Another very curious phenomenon connected with the sun is the faint nebulous aurora which accompanies him, known by the name of the *Zodiacal Light*. This phenomenon was first observed by Kepler, who described its appearance with sufficient accuracy, and supposed it to be the atmosphere of the sun. Dominic Cassini, however, to whom its discovery has been generally but erroneously attributed, was the first who observed it attentively, and gave it the name which it now bears. It is visible immediately before sunrise, or after sunset, in the place where the sun is about to appear, or where he has just quitted the horizon.

The general opinion respecting the zodiacal light at the present day is, that it forms the outer part of the solar corona, so that if the light of the sun could be for a time obliterated without rendering his appendages invisible, we could see the corona merging gradually into the faint glow of the zodiacal light.

Mercury and Venus.

Mercury is a small body, but emits a very bright white light, though he is seldom to be seen, always keeping near the sun.

Mercury is about 3,060 English miles in diameter, and his mean distance from the sun about thirty-five millions of miles. On account of his smallness and brilliancy, it is extremely difficult to find any spot on his disk so distinctly marked as to afford the means of determining his rotation. An attentive observation of the variation of the phases of Mercury led Schröter to infer that the planet revolves about its axis in a period of twenty-four hours five minutes thirty seconds. M. Harding discovered in 1801 an obscure streak on the southern hemisphere of the planet, the observations of

which, together with those of a spot discovered by Schröter, gave the same period of rotation. Schröter states that Mercury's form is spherical, exhibiting no sensible compression; that his equator is very considerably inclined to his orbit, and the differences of his days and seasons must consequently be very great; and that there are mountains on his surface which cast very long shadows, and of which the height bears a greater proportion to the diameter of the planet than those of the Earth, the Moon, or even of Venus. The height of Chimborazo is $\frac{1}{1017}$ of the radius of the earth; one of the mountains in the moon has been estimated at $\frac{1}{214}$ of her radius; the highest in Venus at $\frac{1}{144}$; and one in Mercury at $\frac{1}{126}$. But recent observations render it exceedingly doubtful how far Schröter's observations can be trusted. There are no observations to prove decisively whether Mercury is surrounded by an atmosphere.

Venus, the most beautiful object in the heavens, is about 7,510 English miles in diameter, and is placed at the distance of sixty-six millions of miles from the sun. Although the oscillations of this planet are considerably greater than those of Mercury, and she is seldom invisible, yet on account of the uniform brilliancy of her disk, it is extremely difficult to ascertain the period of her rotation. Dominic Cassini, after having long fruitlessly attempted to discover any object on her surface so well defined as to enable him to follow its motions, at length, in 1667, perceived a bright spot, distant from the southern horn a little more than a fourth part of the diameter of the disk, and near the eastern edge. By continuing his observations of this spot, Cassini concluded the rotation of Venus to be performed in about twenty-three hours; but he does not seem to have considered this conclusion as deserving of much confidence. In the year 1726 Bianchini, an Italian astronomer, made a number of similar observations for the same purpose, from which he inferred that the rotation of the planet is performed in twenty-four days eight hours. The younger Cassini has shown, however, that the observations of Bianchini, as well as those of his father, could be explained by a rotation of twenty-three hours and twenty-one or twenty-two minutes, whereas the rotation of twenty-four days eight hours cannot be reconciled with the appearances observed by the elder Cassini. The determination of Cassini was regarded by astronomers as the more probable of the two, particularly as Bianchini was not able to make his observations in a connected manner, because a neighboring building intercepted his view of the planet, and obliged him to transport his telescope to a different situation. The question of the rotation of Venus was again attacked by Schröter, who found it to be performed in twenty-three hours twenty-one minutes nineteen seconds. Each of the three observers found the inclination of the axis of rotation to the axis of the ecliptic to be about 75°. Much doubt, however, still exists with respect to the value of this element, which De Vico sets at little more than 50°.

Since the time of rotation of Mercury and Venus is nearly equal to that of the earth, the compression of these planets at the poles, which results from the centrifugal force, ought also to be nearly in the same proportion. But at the distance of the earth the compression must be imperceptible even in the case of Venus; for, supposing it to amount to $\frac{1}{300}$, the difference between the radius of her poles and that of her equator would only amount to a tenth of a second as seen from the earth.

During the transits of Venus over the sun's disk in 1761 and 1769 a sort of penumbral light was observed round the planet by several astronomers, which was occasioned, without doubt, by the refractive powers of her atmosphere. Wargentin remarked that the limb of Venus which had gone off the sun, showed itself with a faint light during almost the whole time of emersion. Bergman, who observed the transit of 1761 at Upsal, says that at the ingress the part which had not come upon the sun was visible, though dark, and was surrounded by a crescent of faint light; but this appearance was much more remarkable at the egress; for as soon as any part of the planet had disengaged itself from the sun's disk, that part was visible with a like crescent, but brighter. As more of the planet's disk disengaged itself from that of the sun, the part of the crescent farthest from the sun grew fainter, and vanished, until at last only the horns could be seen. The total immersion and emersion were not instantaneous; but as two drops of water, when about to separate, form a ligament between them, so there was a dark shade stretched out between Venus and the sun; and when this ligament broke, the planet seemed to have got about an eighth part of her diameter from the limb of the sun. The numerous accounts of the two transits which have been published abound with analogous observations, indicating the existence of an atmosphere of considerable height and density. During the transit of 1874 these appearances were so satisfactorily seen, that no doubt can remain as to their reality. Schröter calculated that the horizontal refraction of the atmosphere of Venus must amount to 37′ 34″, differing little from that of the terrestrial atmosphere. A twilight which he perceived on the cusps afforded him the data from which he deduced this conclusion, on which, however, very little reliance can be placed.

The atmosphere of Venus has been analysed with the spectroscope by Vogel, and the existence of aqueous vapor is regarded as demonstrated. On the occasion of the late transit (1874) Tacchini made spectroscopic observations, which seem more satisfactorily to establish the fact that there is water on Venus, than Vogel's observations.

Cassini and Montaigne imagined that they had observed a satellite accompanying Venus; but this appears to have been an optical illusion arising from the strong light of the planet reflected back from the convex surface of the eye upon the eye-glass of the telescope, and thence reflected a second time back to the eye. During the transits of Venus in 1761 and 1769, and in the transit of 1874, no trace of a satellite was seen; and there can be now no doubt whatever that Venice is without a satellite.

The Earth.

The earth is the third member of the solar system in order of distance from the sun. From what has been already shown, in determining the relative position of the earth and the celestial bodies seen in our skies, we know that the earth is a globe, rotating on her axis once in a day, and circling around the sun in an orbit of great extent once in a year.

It has been found by numerous and accurate experiments, that the lengths of arcs of 1° on the same meridian are greater in proportion as we advance nearer the pole. Hence, on account of the similarity of the isosceles triangles of which these arcs form the bases, their sides, or the terrestrial radii, must also be longer, and consequently the convexity of the earth is less toward the poles than at the equator. The surface of the earth is extremely irregular, even independently of the inequalities occasioned by mountains and cavities; yet it has been discovered that the meridional curves differ almost insensibly from ellipses; whence it is concluded that the figure of the earth is an ellipsoid of revolution about its shortest axis. In comparing the results of the

various measurements which have been made with the formulæ belonging to the dimensions of such a body, this conclusion has been fully verified; and the lengths of the arcs, the ellipticity, the distance of the pole from the equator, and, in short, all the elements of the spheroid, have been determined.

An arc of the meridian in India was measured by Col. Lampton in the early part of this century. But its value has been much increased by Col. Everest's extension of the arc. The arc of Lambton, extending from Punnæ (lat. 8° 9′ 35″) to Damargidą (lat. 18° 3′ 15″), was measured after the model of the English trigonometrical survey. From Damargida, where Lambton's arc terminated, another was measured by Col. Everest to Kaliana (lat. 29° 30′ 48″), a space of 797 miles, covering an arc of 11° 27′ 33″, the latest geodetical improvements being introduced. The whole extent of Lambton's and Col. Everest's operations includes a continuous arc of 21° 21′ (1,477 miles). The work was rivaled in extent by a vast operation executed in Russia and other northern countries of Europe, by which an arc of 25° 20′, extending from the banks of the Danube to the shores of the Arctic Sea, near the North Cape, was measured under the general superintendence and direction of W. Struve.

The arcs of India and of Russia include a space from lat. 8° to lat. 71°, with the exception of only about sixteen degrees, and are unquestionably the most important which exist for the determination of the earth's figure. When to them we add the French arc of 12° 22′ in a medium latitude, it will scarcely be necessary to take into account any other, at least for the northern hemisphere.

Capt. A. R. Clark, R. E., combining all the results obtained up to the year 1860, arrived at conclusions thus stated by Sir J. Herschel:—"The earth is not exactly an ellipsoid of revolution. The equator itself is slightly elliptic, the longer and shorter diameters being respectively 41,852,864, and 41,843,096 feet. The ellipticity of the equatorial circumference is therefore $\frac{1}{4\cdot 8\,3}$, and the excess of its longer over its shorter diameter about two miles. The vertices of the longer diameter are situated in longitude 14° 23′ E. and 194° 23′ E. of Greenwich, and of its shorter in 104° 23′ E. and 284° 23′ E. The polar axis of the earth is 41,707,-796 feet in length, and consequently the most elliptic meridian (that of longtitude 14° 23′ and 194° 23′) has for its ellipticity $\frac{1}{2\,8\,7\cdot 5}$, and the least (that of longitude 104° 23′ and 284° 23′) an ellipticity of $\frac{1}{3\,0\,8\cdot 3}$."

Gen. Schubert, using a method which Sir J. Herschel justly regards as less trustworthy, "makes the ellipticity of the equator $\frac{1}{8\,8\,8\,5}$, and places the verticles of the longer axis 26° 41′ to the eastward of Capt. Clark's. His polar axis, as deduced from each of the three great meridian arcs, the Russian, Indian, and French respectively, is 41,711,000 feet, 41,712,534 feet, and 41,697,-496 feet, the mean of which, giving to each a weight proportional to the length of the arc from which it is deduced, is 41,708,710 feet."

The figure and volume of the earth being thus determined, we require only to ascertain its mean density in order to know its mass. But this problem has not been solved, probably cannot be solved, with any very near approach to exactness.

It may be fairly assumed that the earth's mean destiny amounts to about 5·6 times the density of water, combining which with the known dimensions of the earth, we find that the earth's weight in tons may be roundly expressed by the number 6,000,000,000,000,000,000,000.

We have next to inquire into the rotation of the earth about its axis, and especially into the position of that axis.

The longitudes of the stars are measured on the ecliptic from the vernal equinox; and therefore, if the line of the equinoxes, which is the same as the line of the nodes, is invariable, the longitude of any star will always be the same, whatever interval of time may elapse between two observations of that longitude. But on comparing the actual state of the heavens with the observations recorded by ancient astronomers, it is perceived that the longitudes of all the stars are considerably increased. The phenomenon is to be explained by attributing to the equinoctial points a retrograde motion from east to west, in consequence of which the sun, whose motion is direct, arrives at them sooner than if they remained at rest; and therefore the equinoxes, and spring, autumn, and the other seasons happen before the sun has completed an entire circuit. On this account the motion has been denominated the *Precession of the Equinoxes*. As this motion is extremely slow, its exact amount can be discovered only by a comparison of observations separated from each other by long intervals of time. The comparison of modern observations with those of Hipparchus gives as its annual amount 50⅔″. The mean result of the observations of Tycho, compared with those of Lacaille, gives 50⅓″. On comparing modern observations with one another, we find 50″·06. Delambre, in his solar tables, supposes the annual precession to be equal to 50″·1. According to this estimate the equinoctial points go backward at the rate of 1° in 71·6 years nearly, and therefore, will make a complete revolution of the heavens in about 25,868 years.

If the sun and moon moved in the plane of the equator, there would evidently be no precession; and the effect of their action in producing it varies with their distance from that plane. Twice a year, therefore, the effect of the sun in causing precession is nothing; and twice a year, namely, at the solstices, it is a maximum. On this account the obliquity of the ecliptic is subject to a semi-annual variation; for the sun's force, which tends to produce a change in the obliquity, is variable, while the diurnal motion of the earth, which prevents the change from taking place, is constant. Hence the plane of the equator is subject to an irregular motion which is technically called the *Solar Nutation*. The existence of the solar nutation is, however, only a deduction from theory, for its amount is too small to be perceptible by observation; but a similar effect of the moon's action is sufficiently appreciable, and was, in fact, discovered by Bradley before theory had indicated its existence. Its period, however, is different, and depends on the time of the revolution of the moon's nodes, which is performed in eighteen years and about seven months. During this time the intersection of the lunar orbit with the ecliptic has receded through a complete circumference; and the inequality of the moon's action will consequently in the same time, have passed through all its different degrees. Bradley observed that the declinations of the stars continued to augment during the nine years, that they diminished during nine years following, and that the greatest change of declination amounted to 18″. He remarked further, that this motion was connected with an irregularity of the precession of the equinoxes, which followed exactly the same period; whence he concluded that the motion of the poles of the equator, occasioned by this vibration of its plane, was not confined to the solstitial colure. A series of observations on stars differently situated proved that all the phenomena could be explained on the hypothesis that the pole of the equator describes in eighteen years a small circle of 18″ diameter, contrary to the order of the signs; or that the axis of the earth, following the circumference of this circle, describes the

surface of a cone, the axis of which forms with its side an angle of 9″. This apparent vibratory motion is denominated the *Nutation of the Earth's Axis.*

While the shape of the earth's orbit and the position of its center (whose longitude=long. of perih. x 180°) thus undergo continual alteration, her mean distance from the sun remains appreciably constant. This we know from the length of the year, which certainly has not changed ten seconds in length since the time of the Chaldean determination of that element.

There are various ways of determining the sun's distance from the earth in terms of the earth's semidiameter. The distance of a planet from the sun may likewise be obtained if we can find the means of measuring its distance from the earth at any epoch, for the geocentric positions of the sun and the planet being known from the theory of their motions, the radius vector of the orbit, or planet's distance from the sun at that epoch, may be found by a simple trigonometrical computation. To determine the distance of a planet from the earth it might seem only necessary to determine its horizontal parallax; but in general the parallaxes of the planets are quantities by far too small to be directly observed.

The application of the transits of Venus to the determination of the sun's distance was first pointed out by Dr. Halley, when he announced the transit of 1761. The transit of Venus in 1769 was observed in many different parts of the world. The result of the whole of the observations led to the conclusion, that the parallax of the sun is included within the limits 8″·5 and 8″·7. The mean 8″·6 was adopted by Delambre and Lalande; and later the value 8″·5776 was deduced by Encke from a careful re-examination of all the observations made in 1761 and 1769. But several methods have been since applied to the determination of the solar parallax, with results which appear to agree in indicating a larger value for the parallax, or in other words, a smaller value for the sun's distance, than had been deduced from the transits of 1761 and 1769.

One of these depends on the moon's motions, and was first indicated by Laplace toward the close of the last century. Since the moon's distance from the earth, though small compared with the sun's, bears yet a measurable ratio thereto, it follows that there is not a perfect symmetry between the perturbations produced by the sun when the moon is passing from third to first quarter, and from first to third. The effect of this circumstance is recognizable in the lunar motions, which are affected by a minute variation arising from this cause, and called the *Parallactic Inequality.* It amounts at the maximum to about 2′; and as it depends on the proportion of the sun's distance to the moon's known distance, its amount supplies a means of determining the solar parallax. In 1854 Hansen announced, in a letter addressed to the astronomer royal, that this method, applied to his new tables of the lunar motions, gives a parallax of 8″·9159.

A second method depends on the fact, that the earth in reality revolves, in the course of a lunar month, around the common center of gravity of her own globe and the moon's. The diameter of the orbit thus circuited by the earth (in the same sense, at least, as the moon may be said to circuit in her monthly orbit) amounts to about 6,000 miles, and by the radius of this small orbit the earth is sometimes in advance of and sometimes behind her mean position in heliocentric longitude. The sun's geocentric longitude is affected to precisely the same degree as the earth's heliocentric longitude; and by determining the actual amount of the sun's displacement, we can ascertain what angle the mean diameter of the earth's monthly orbit subtends at the sun. Leverrier, by the careful study of a great number of observations of the sun made at the principal observatories in Europe, came to the conclusion that the solar parallax is 8″.95. But Mr. Stone of Greenwich detected a numerical error in Leverrier's computations, and when this is corrected, the value 8″.91 results. Prof. Newcomb of Washington has by the same method deduced the value 8″.84.

The Moon and its Motions.

The different appearances or phases of the moon were probably thefirst celestial phenomena observed with any degree of attention. The following definitions may conveniently be given in this place. When the moon passes the me-ridian at the same time with the sun, she is said to be in *Conjunction.* The two points of her orbit in which she is situated when in opposition and conjunction are called the *Syzygies;* those which are 90° distant from the sun are called the *Quadratures;* and the intermediate points between the syzygies and quadratures arecalled the *Octants.*

A slight attention to the lunar phases during a single revolution will be sufficient to prove that they are occasioned by the reflection of the sun's light from the opaque spherical surface of the moon. This fact, which was recognized in the earliest ages, can be made obvious by the help of a diagram. If the moon is an opaque body, we can only see that portion of her enlightened side which is toward the earth.

Since the parallax of the moon is subject to incessant variation, it is necessary to assume a certain mean value, about which the true and apparent values may be conceived to oscillate. This is called the constant of parallax. The best modern observations assign 57′ 2″.7 as the value of the lunar mean equatorial horizontal parallax, corresponding to a distance of 238,813 miles.

The *Ascending Node* of the lunar orbit is that point of the ecliptic through which the moon passes when she rises above the ecliptic toward the north pole. The *Descending Node* is the opposite point of the ecliptic, through which she passes when she descends below that plane toward the south. The position of the nodes is not fixed in the heavens. They move in a retrograde direction, or contrary to the order of the signs; and their motion is so rapid that its effects become very apparent after one or two revolutions.

The mean retrograde motion of the nodes is found, by the comparison of observations made at distant epochs, to amount to 19° 21′ 18″.3 in a mean solar year, and the time in which they make a tropical revolution is consequently 6793.391 mean solar days. The inclination of the lunar orbit is observed to vary between 5° 3′ aud 5° 13′. The mean inclination may be taken at 5° 8′.

The inclination of the lunar orbit to the plane of the terrestrial equator occasions considerable differences in the intervals between the moon's rising or setting on successive days, and gives rise to the phenomenon of the *Harvest Moon.*

The moon's orbit at any moment is an ellipse, having the earth at one of the foci; but this orbit is continually changing in form and position, but on the whole advancing at an average rate of 40⅔° per annum, so as to complete a sidereal revolution in 3232.575 mean solar days. These changes, like those which affect the inclination of the orbit and the position of the nodes, are due to the perturbing influence of the sun on the moon's motions relatively to the earth. The consideration of these perturbations, whether as affecting the figure and position of the moon's orbit, or her motions in that orbit, constitutes what is called the *Lunar Theory.*

Understanding by the term *month* the time which the moon employs to make an entire revolution relatively

to any given point, movable or fixed, we have as many different species of months as there are different motions with which that of the moon can be compared. For example, if we estimate her revolution relatively to the sun, the month will be the time which elapses between two consecutive conjunctions or oppositions. This is called the *synodic month*, *lunar month*, or *lunation*. If we consider her revolution as completed when she has gone through 360° of longitude counted from the movable equinox, we shall have the *tropical* or *periodic month*. The interval between two successive conjunctions with the same fixed star is the *sidereal month*. A revolution with regard to the apsides of her orbit, that is to say, the time in which she returns to her perigee or apogee, gives the *anomalistic month*. And, finally, the revolution with regard to the nodes is the *nodical month*.

The moon at all times presents very nearly the same face to the earth. It is proved by observation, that there are some variations in the apparent position of the spots on the lunar disk. Those which are situated very near the border of the disk alternately disappear and become visible, making stated periodical oscillations, which indicate a sort of vibratory motion of the lunar globe (apparent only), which is known by the appellation of the *Libration*.

The rotation of the moon is sensibly uniform, while the motion of revolution is variable. The apparent rotation occasioned by the revolution of the moon round the earth is, consequently, not exactly counterbalanced by the real rotation, which remains constantly the same. Hence the different points of the lunar globe must appear to turn about her center, sometimes in one direction, and sometimes in the contrary, and the same appearances be produced as would result from a small oscillation of the moon, in the plane of her orbit, about the radius vector drawn from her center to the earth. The spots near the eastern or western edge of her disk disappear according as her motion in her orbit is more or less rapid than her mean motion. This is called the *Libration in Longitude*. Its maximum value corresponds to a rotation through 7° 45′.

Further, the axis of rotation of the moon is not exactly perpendicular to the plane of her orbit; hence the two poles of rotation, and those parts of her surface which are near these poles, are alternately visible from the earth. This is called the *Libration in Latitude*. Its maximum value amounts to 6° 44′.

Again, the observer is not placed at the center of the earth, but at its surface. Thus in the course of a day the moon appears to oscillate about her radius vector because of the earth's rotation. This phenomenon constitutes what is called the *Diurnal Libration*, and is evidently the effect of the lunar parallax, and corresponds to it in amount, measured in minutes of arc. It therefore never exceeds 1° 1′ 28″.8.

The libration in latitude and the diurnal libration were discovered by Galileo soon after the invention of the telescope. It was Hevelius who discovered and first explained the libration in longitude..

The coincidence of the nodes of the lunar equator and orbit ranks among the most curious discoveries of modern astronomy. It was shown by Lagrange to be a necessary consequence of the attraction which the earth exercises on the lunar spheroid.

The various features of the moon's surface have been observed with great interest since the discovery of the telescope, and astronomers have been at much pains to determine their selenographic positions. On account of their number, it has been found necessary to distinguish them by particular names. Riccioli designated the most conspicuous of them by the names of astronomers and other eminent men. Hevelius gave them the names belonging to countries, islands, seas, and regions on the earth, without reference to situation or figure. The nomenclature of Riccioli is now universally followed. Delineations of the lunar disk have been given by Hevelius, in his *Selenographia*, by Cassini, Russell, Schröter, Lohrmann, and others.

That there are great inequalities on the surface of the moon is proved by looking at her through a telescope at any other time than when she is full; for then there is no regular line bounding the dark and illuminated parts, but the confines of these parts appear as it were toothed and cut with innumerable notches and breaks; and even in the dark part, near the borders of the enlightened surface, there are seen some small spaces illuminated by the sun's beams. It is impossible that this should be the case, unless these shining points were higher than the rest of the surface, so that the rays of the sun may illumine their summits before they reach their basis. Portions of considerable extent are also perceived on the lunar surface, which are never brilliant like the other parts, but remain constantly obscure. These are thought by some to be old sea-bottoms; they were formerly supposed to be seas, but this idea has been abandoned. Some of these cavities are upward of four English miles in depth, and forty in circumference at the orifice. An insulated mountain is frequently observed to rise in the center of these enormous pits or caverns, and they are surrounded by high annular ridges, the masses of which would fill the inclosed cavities. Herschel imagined that he even observed volcanoes in activity; but it is now known that he mistook for volcanic light the effects of earth-light reflected from those parts of the moon's surface which have the highest reflective capacity.

Eclipses.

Strictly speaking, the term eclipse extends to all cases in which one celestial body is wholly or partially obscured by another, either by direct intervention or by the interception of light illuminating the former, so that the term includes transits of inferior planets, the concealment of stars by the moon or by a planet, or the concealment of a satellite by its primary. But the term eclipse is for convenience limited to the three following orders of phenomena: (1) The total or partial concealment of the sun by the moon, called a *solar eclipse*. (2) The obscuration of the moon by the shadow of the earth, called a *lunar eclipse*. (3) The concealment of a satellite of a planet by the shadow of the primary, called *eclipses of satellites*, and distinguished from *occultations* in which the *disk* of the primary hides the satellite from view.

Solar and lunar eclipses can be considered together, so far as the general law of their sequence is concerned. From what has been already shown, it follows that, if the motions of the sun and moon could be watched continuously from the center of the earth, the moon would be seen to pass round the star-sphere once in each sidereal month on a path inclined about 5° 8′ to the ecliptic, while the sun would complete the circuit of the ecliptic once in a sidereal year; and the moon would pass the sun's place once in each synodical month. The place of conjunction of the sun and moon would clearly pass round the star-sphere, advancingly, making the complete circuit of the heavens once in each year on the average; and the same would happen with the place of conjunction of the moon and the point directly opposite the sun. Moreover, as the moon at these conjunctions would, of course, be on her own apparent orbit, and that orbit is inclined to the sun's, it is clear that, supposing the moon's orbit fixed, the conjunction of sun and moon during one-half of the year would

occur with the moon in the northern half of her apparent orbit, and those in the other half would occur with the moon in the southern half of her orbit. The same would be true of the conjunctions of the moon with the point opposite the sun, only, of course, the halves of the lunar orbit would be interchanged. At or near the time when the place of either conjunction was crossing from the northern to the southern side of the moon's orbit, or *vice versa*, the conjunction would occur with the moon so near to the ecliptic, that if the conjunction were one of sun and moon, she would hide the sun's disk wholly or partially, while, if the conjunction were one of the moon with that point opposite the sun toward which the earth's shadow is thrown, she would enter that shadow wholly or partially. In other words, at two seasons separated by six months there would be eclipses of the sun or moon, or both, whereas during the intervening months no eclipses would occur.

The number of eclipses which could occur in either eclipse-season would depend on the rate at which the points of successive conjunction approached and left the ecliptic, on the proximity necessary for the occurrence of an eclipse of either sort, and also on the manner in which the lunar node happened to be passed. For example, suppose that a conjunction of the sun and moon occurred when the moon was exactly at a node, so that a central eclipse of the sun occurred; then, half a synodical month before and half a synodical month after that conjunction, there would be a conjunction of the moon with the point opposite the sun, and the moon being only half a month's journey from her node, would be at a point of her orbit not far from the ecliptic. But the extent of the earth's shadow is such, that the moon would only be partially in the penumbra, and penumbral lunar eclipses are not considered by astronomers. There would therefore be only one eclipse in such an eclipse-season, viz., a central solar eclipse. Next, suppose that when the moon was at her node, she was exactly opposite the sun, then there would be a total lunar eclipse. Half a lunation later and earlier she would be in conjunction with the sun, and she would be at a point of her orbit not far from the ecliptic. In this case, although during half a month from nodal passage, the moon, supposed to be viewed from the earth's center, gets to a distance from the ecliptic exceeding the sum of her own and the sun's semidiameters, and therefore *so viewed* would pass clear of the sun, yet for the earth, regarded as a whole, she would not pass quite clear of the sun. In this case, then, there would be three eclipses, one lunar and total, the other two solar and partial. These results would be approximated to if the conjunction of sun and moon in the first case, or of moon and sun-shadow in the second case, occurred with the moon very near a node. But otherwise there would be an eclipse either solar or lunar a few days before her nodal passage, and another either lunar or solar a few days after her nodal passage, and no other eclipse of either sort in that eclipse-season.

All this corresponds to the actual conditions except in one respect. The lunar nodes retrograde, so as to meet the advancing conjunction-points of either kind; and thus, instead of a year being occupied in the complete circuit of the conjunctions, the actual interval has for its mean value the mean interval between the successive conjunctions of the sun with the rising node of the moon's orbit, or 346.607 days. Accordingly, the average interval between successive eclipse-seasons is 173.3 days instead of half a sidereal year.

Noting that eclipse-seasons last on the average about thirty-three days, and that three eclipse-seasons each having three eclipses cannot occur in succession, it is easy to determine the greatest and least number of eclipses which may occur in any single year. The average interval between successive eclipse-seasons is 173.3 days. Two such intervals amount together to 346.6 days, or fall short of a year by about nineteen days. Hence there cannot be three eclipse-seasons in a year; for each eclipse-season lasts on the average thirty-three days. But there may be two seasons, each containing three eclipses, followed by a season containing two eclipses, only one of which can occur in the portion of the eclipse-season falling within the same year. In this case there would be seven eclipses in the year. So also there would be seven if in the first season there were three, in the second two, and in the third three, for then the portion of the third falling within the year, being rather more than one-half, would comprise two eclipses. So also if the three successive seasons comprise severally two, three, and three eclipses.

There may then be as many as seven eclipses in a year, in which case at least four eclipses will be solar, and at least three of these partial, while of the lunar eclipses two at least will be total.

As regards the least possible number of eclipses, it is obvious that, as there must be two eclipse-seasons in the year, and at least one eclipse in each, we cannot have less than two eclipses in the course of a year. When there are only two, each eclipse is solar and central.

The Planet Mars.

After Venus, Mars is the planet whose orbit is nearest to the earth. His diameter is about 4,400 miles, and his volume about one-sixth of the earth's; his mass, however, is little more than one-ninth of hers, his density being estimated at only seven-tenths of the earth's. His mean distance from the sun is about 139,000,000 miles; but the eccentricity of his orbit amounting to 0.093262, his greatest and least distances differ considerably from this mean value, amounting to 152,304,000 and 126,318,000 miles respectively. It follows that his distance from the earth when in opposition varies largely—in opposition near his perihelion his distance is about 33,800,000 miles, whereas, when he is near aphelion, his opposition distance amounts to 61,800,000 miles. As he is also more brightly illuminated by the sun when in perihelion, it follows that he appears much brighter when in opposition at that part of his orbit.

In other words, the planet is nearly five times as bright at one of the favorable oppositions as at one of the unfavorable. The planet's synodical period being 779.936 days, or two years and about 49½ days, it follows that the place of opposition performs a complete circuit of the ecliptic in an average period of rather more than seven times the synodical period, so that the change in the place of opposition nearly corresponds to the earth's yearly motion. It is said that Fontana first noted the spots of Mars, and suspected the planet's rotation. But Fontana's credit is shaken by his alleged discovery of *seven* Jovian satellites. Cassini observed the spots at Bologna in 1666, and having continued his observations for a month, determined the planet's rotation-period as 24 h. 40 m. Cassini in 1670 again observed the planet, obtaining the same rotation-period as before. Maraldi in 1704 noted changes in the shape of the spots; but from some which underwent little change, he deduced the rotation-period 24 h. 39 m. In 1719, when Mars was exceedingly well placed for observation, Maraldi again carefully observed the planet, deducing from the observations of thirty-seven days a rotation-period identical with Cassini's.

Besides the dark spots, which have a somewhat greenish color, the rest of the disk being mostly ruddy, astronomers had noticed a portion of the disk around the south pole which was brightly white. The bright

appearance so remarkable about the poles of Mars was ascribed by Herschel to the reflection of light from mountains of ice and snow accumulated in those regions.

Asteriods.

On the first day of the present century a new planet was discovered, which, although in one sense seeming to fill up a gap in the solar system, was yet unlike any hitherto known member of the planetary family. Kepler and Titius, followed in later times by Bode, had adopted the view that a planet was wanting to complete the symmetry of the solar system, as indicated by a certain law of progression in the planetary distances. Toward the close of the last century, when Uranus had but lately been discovered and found to obey the law of distances, it was natural that the attention of astronomers should be directed to the strange gap in the series between Mars and Jupiter. So great was the confidence with which many now regarded the law, that the theory was advanced that a planet invisible to the naked eye was traveling within the seemingly vacant space; and through the exertions of Baron de Zach, an association of twenty-four astronomers was formed to search the zodiac for the unseen planet. Yet the discovery was not made by any member of this society. Wollaston had laid down a star in his catalogue where no star could be seen. Piazzi carefully examined the neighborhood, to determine whether some star really existing there had been misplaced by Wollaston. On January 1, 1801, he noted a small star in Taurus, which on January 3 had changed its place. He wrote to Oriani and Bode; but the planet, which was at its stationary point, following opposition, on January 12, had become invisible owing to its approach to the sun, before the letter reached them, and Piazzi himself fell ill soon after. But Gauss, the eminent mathematician, undertook to compute the new planet's orbit and motions from the observations made by Piazzi, and at length, after long searching, De Zach rediscovered the planet on December 3, 1801, Olbers independently discovering it on the following evening. Piazzi gave to the new planet the name Ceres. Besides differing from the other known planets in being so small as apparently to belong to a different order, Ceres was found to have an inclination (of more than 10½°) exceeding largely even that of Mercury. But these anomalous relations were soon found to be but the first indications of a discovery altogether more remarkable.

During his long and arduous search for Ceres, Dr. Olbers of Bremen had had occasion to examine with peculiar care the stars near her path. On March 28, 1802, he observed a star near Bode's stars 20 and 191 Virginis, where he felt sure that no star had existed during his former observations. After two hours it had moved very much as Ceres had done when he had first seen her almost in the same spot. Subsequent observations showed that this was a small planet (to which the name Pallas was given) traveling in an orbit having a mean distance of about 2.770 (earth's as 1), slightly exceeding, therefore, that of Ceres, but with an eccentricity of .248, considerably exceeding that of any known planet, and an inclination of 34° 39′, exceeding the sum of the inclinations of all the other planets together. The effect of this great inclination on the geocentric position of the planet is even more remarkable than the heliocentric range of more than 69° in latitude. For when Pallas is at her greatest heliocentric latitude, and near opposition, her geocentric latitude exceeds 42°. This is very different from Venus's range of less than 9° in geocentric latitude, which had been regarded as the maximum, and had led astronomers to assign to the zodiac a breadth of 18°. A zodiac to include the asteroids should be 90° in breadth, and would cover seven-tenths of the whole heavens.

While Harding of Lilienthal was charting the stars near the paths of Ceres and Pallas in the region thus indicated, he determined, on September 2, 1804, the position of a small star in Pisces, near 93 and 93 of Bode's catalogue. On September 4 the star was no longer in the same position. It was found to be a planet (to which the name Juno was given) traveling at a mean distance of 2.67 (considerably less than that deduced for Ceres and Pallas), in an orbit having eccentricity 0.257, and inclination 13° 1′. The effect of this great eccentricity is remarkable, as may be thus indicated—supposing the apsides of the orbit to correspond to the planet's solstices, then the summer of one hemisphere is only half as long as the winter of that hemisphere, or as the summer of the other.

Next Olbers, pursuing the same method, discovered Vesta, moving in an orbit having mean distance 2.373 (far less even than Juno's), eccentricity 0.0898, and inclination 7° 71′.

A long interval then elapsed without the discovery of any new members of this remarkable family. It was not until December 8, 1845, that the fifth was recognized. On that night M. Hencke, an amateur astronomer of Driessen, discovered the body since named Astræa. He communicated his discovery to Encke and Schumacher, who confirmed it by observations made with more powerful telescopes. M. Hencke also discovered the sixth planet, on July 1, 1847. Since that time not a year has passed without the discovery of one or more minor planets; and in some years as many as ten or twelve have been added.

Jupiter and Saturn.

Jupiter is the largest planet of the solar system. Indeed he surpasses the rest so greatly, that the combined mass of all of them together would barely exceed two-fifths of his. This superiority is deserving of more consideration than it has commonly received. If we are justified in regarding our moon or the asteroids as belonging to a different order of bodies from the earth, Venus, Mars, and Mercury, because so much less than them in mass, we may not unreasonably regard Jupiter as belonging to a different order, because so much exceeding in mass the planets which travel within the zone of asteroids. The earth exceeds the moon only eighty-one times in mass, but Jupiter exceeds the earth in mass more than 300 times.

Jupiter travels at a distance from the sun exceeding the earth's five and one-fifth times, or at a mean distance of 475,692,000 miles. The eccentricity of his orbit is considerable, amounting to 0.048239, so that his greatest and least distances amount respectively to 498,639,000 miles and 452,745,000 miles. When in opposition, and at his mean distance, his distance from the earth amounts to about 361,000,000 miles. His orbit is inclined about 1° 18′ 40.3″ to the eclipse. His sidereal revolution is completed in 4332.5°48 days, or 11 years 314.92 days; whence it is easily calculated that his synodical period, or the interval separating his mean returns to opposition, has a mean value of 398.867 days. His mean diameter is nearly 85,000 miles in length. His volume exceeds the earth's 1233.205 times, but his density is only about one-fourth of hers, and his mass does not exceed hers more than 301 times.

Although the actual order of discovery would lead us to speak of the satellites of Jupiter before considering the features of his globe, it will be for several reasons more convenient to describe these features first. Cassini was the first to discover that Jupiter's globe is surrounded by belts apparently belonging to his surface. The features of these belts, as described by Cassini, are

those which still continue to be recognized. Their number is variable; sometimes only one can be readily discerned, while at others the whole surface is covered by them. They are generally parallel to one another, but not always so. Their breadth is likewise variable, one belt having been observed to grow narrow, while another in its neighborhood has increased in breadth, as if one had partially flowed into the other; and in this case a part of an oblique belt is commonly recognized between them, as if forming the channel of communication. Sometimes the belts remain unchanged for months; at others, new belts have formed in an hour or two. Although his surface appears thus variable, yet at times spots have been visible for several weeks, whose motions have served to indicate the law of the planet's rotation.

In 1665 Cassini observed a spot near the large central belt of Jupiter. It moved more quickly when near the middle of the disk than when near the edge, and also appeared narrower when at the edge, showing that it belonged to the surface (that is, to what appears as the surface) of the planet. This principal or ancient spot, as it is called, is the largest and most permanent of any yet discovered. It appeared and vanished eight times between the years 1665 and 1708, then continuing invisible till 1713. The spot has been frequently observed since, sometimes remaining visible for two or three years in succession, at others being unseen for as long or longer.

The equator of Jupiter is inclined only 3° $5'$ $30''$ to the planet's orbit, so that there can be no appreciable seasonal changes. We should expect, therefore, a great calm to reign in the atmosphere of this planet, the more so that the sun's heat poured upon each square mile of it is (on the average) less than the 27th part of that received by each square mile of the earth's surface. Moreover, the seasons of Jupiter last nearly twelve times as long as ours, so that we should expect all changes in his atmosphere produced by solar action to take place with exceeding slowness.

Soon after the invention of the telescope, Galileo discovered that four small orbs or satellites circle around Jupiter. Galileo soon found that their orbits are nearly circular, and their motions nearly uniform. They revolve in planes inclined little to the plane of the ecliptic, so that as viewed from the earth they appear to traverse very narrow ellipses.

Saturn is the largest planet but one of the solar system, being surpassed in mass by Jupiter alone. His mass exceeds the combined mass of all the other planets (Jupiter excepted) nearly three fold. He is the sixth planet in order of distance from the sun, and was the remotest planet known to the ancients. He travels at a mean distance of 872,137,000 miles from the sun, his greatest distance being 920,973,000 miles, his least distance 823,301,000 miles. The eccentricity of his orbit is 0.055996, and the inclination 2° $29'$ $28''$ to the plane of the ecliptic. Saturn's mean sidereal period of revolution in his orbit is 29 years 167 days (see the *Elements*, p. 782); his mean synodical revolution, or the mean interval between his successive returns to opposition, is 378.090 days. The planet's mean diameter is about 70,000 miles, his polar diameter about 3,500 miles less, his equatorial diameter about 3,500 miles greater. In volume he exceeds the earth nearly 700 times, but in mass only about 90 times, his density being less than the earth's in the proportion of about 13 to 100. He rotates on his axis in about 10½ hours, the plane of his equator being inclined nearly 27° to the plane of his orbit.

This planet, in consequence of a luminous ring with which he is surrounded, is one of the most interesting objects in the heavens. This singular appendage was first noticed by Galileo, to whom the planet presented a *triple* appearance, as if a large orb were situated between two small bodies or *ansæ*. He observed that sometimes the ansæ were so enlarged as to present the appearance of a continuous ring; at other times they entirely disappeared, and Saturn appeared round like the rest of the planets. After a certain time they again became visible, and gradually increased in magnitude. These curious appearances were shown by Huyghens to be occasioned by an opaque, thin, circular ring surrounding the equator of Saturn, and at a considerable distance from the planet. Saturn moving in the plane of his orbit, carries the ring along with him, which, presenting itself to the earth under different inclinations, occasions all the phenomena which have been described.

Among the most remarkable discoveries of recent times with regard to the rings of Saturn is that of the *inner dusky or semi-transparent ring*, sufficiently obvious to any observer capable of using well a moderately good telescope, but which, previously to the year 1850, was only once mentioned by any astronomer. Dr. Galle of Berlin saw this ring with the Berlin refractor in 1838, but the attention of the scientific world was not generally drawn to it. The account of Galle's observations is accompanied by drawings exhibiting the trace of the dusky ring where it crosses the body of the planet. In the year 1850 the ring was recognized almost simultaneously by two observers, namely, by Prof. Bond of the Cambridge Observatory, U. S., and by Mr. Dawes. Since that time there has been no difficulty in seeing this appendage, though it requires a practiced eye and a good telescope. The opinion now generally entertained respecting the Saturnian ring-system is, that it is composed of multitudes of minute satellites, probably intermixed with vapor, traveling independently around the planet. On no other supposition, indeed, can the permanence of the ring-system be explained.

From observations of some obscure belts, and a very conspicuous spot on the surface of Saturn, Sir W. Herschel concluded that his rotation is performed in 10 hours 16 min. He also observed that the globe of Saturn appeared to be flattened at the equator as well as at the poles.

Saturn is surrounded by a system of eight satellites—the most extended as well as most numerous subordinate system within the sun's domain. The span of the orbit of the outermost satellite amounts to nearly four millions of miles. This satellite is probably larger than our moon, while Titan, the 6th satellite, is nearly as large as the planet Mercury.

Uranus and Neptune.

Uranus is the seventh primary planet in order of distance from the sun, and, with the exception of Neptune, the remotest. His mean distance from the sun exceeds the earth's more than nineteen times, and amounts to 1,753,869,000 miles. But the eccentricity of the orbit is considerable, amounting to 0.0466; consequently, the variation of the planet's distance is also great, his greatest distance amounting to 1,835,561,000 miles, his least to 1,672,177,000 miles. The sidereal revolution of Uranus is performed in 30,686 days, or 84 years 6½ days. His mean diameter is about 33,000 miles. The apparent diameter of the sun seen from Uranus is less than $\frac{1}{19}$th of the diameter of the sun as we see him, or is but about $1\frac{2}{3}'$; and the apparent surface of the sun is but about the 367th part of the apparent surface of the sun we see. Accordingly, the light and heat received by Uranus are less in the same proportion. It has been asserted that Uranus turns upon an axis in about 9½ hours, but the evidence on which this statement rests is slight and insufficient.

Uranus was discovered by Sir W. Herschel on March 13, 1781, while he was examining the small stars in the neighborhood of Geminorum. Being struck with the enormous magnitude of a star in this region, he suspected it to be a comet. He examined it with higher power, and found the disk enlarged, which would not be the case with a star. He therefore announced the discovery of a comet. But it was found to be moving in a nearly circular path, and was presently recognized as one of the principal planets of the solar system. Herschel gave it the name of Georgium Sidus, and foreign astronomers called it Herschel, but the name Uranus, suggested by Bode, of Berlin, is now universally adopted. In 1787 Herschel discovered that it was attended by two satellites, and he subsequently supposed that he had discovered four others; but there is great reason to believe that he had mistaken small stars near the planet for satellites. Two other satellites inferior to the rest have been discovered by Mr. W. Lassell, completing the series of four satellites.

Little of interest has rewarded the telescopic study of Uranus; nor has the spectroscope given any trustworthy evidence, though Secchi, Huggins, and Vogel recognize peculiarities distinguishing the spectrum of Uranus from that due to reflected sun-light.

The discovery of the planet Neptune ranks amongst the most brilliant of the scientific feats of the present century.

For many years the orbit of Uranus had been the occasion of great embarrassment to astronomers, from the impossibility of adequately reconciling the ancient and modern observations by any one set of elements, and from the rapid increase of the error from year to year. Bouvard early suggested that some planet exterior to Uranus caused these apparent irregularities. Among the astronomers who entered seriously upon the task of determining the position of such a disturbing planet two arrived at a successful solution of the problem, namely, Mr. Adams and M. Leverrier.

Almost immediately after the discovery of Neptune, it was found to be attended by one satellite. This discovery was made by Mr. Lassell in October, 1846. The orbit of the satellite is inclined to the ecliptic at an angle of about 29°.

Comets and Meteors.

The comets form a class of bodies belonging to the solar system, distinguished from the planets by their physical appearance and the great eccentricities of their orbits.

While the orbits of all the planets are confined within a narrow zone, or to planes not greatly inclined to the ecliptic, those of the comets are inclined in all possible angles. They have received the name of comets (*coma*, hair) from the *bearded* appearance which they frequently exhibit.

One of the most remarkable periodic comets with which we are acquainted is that known to astronomers as Halley's. Having perceived that the elements of the comet of 1682 were nearly the same as those of two comets which had respectively appeared in 1531 and 1607, he concluded that all the three orbits belonged to the same comet, of which the periodic time was about 76 years. After a rough estimate of the perturbations it must sustain from the attraction of the planets, Halley predicted its return for 1757—a bold prediction at that time, but justified by the event, for the comet again made its appearance as was expected, though it did not pass through its perihelion till the month of March, 1759, the attraction of Jupiter and Saturn having caused, as was computed by Clairaut previously to its return, a retardation of 618 days. This comet had been observed in 1066, and the accounts which have been preserved represent it as having then appeared to be four times the size of Venus, and to have shone with a light equal to a fourth of that of the moon. History is silent respecting it from that time till the year 1456, when it passed very near to the earth; its tail then extended over 60° of the heavens, and had the form of a saber. It returned to its perehelion in 1835, and the splendor of its appearance rendered it once more an object of universal interest; it was well observed in almost every observatory.

Another famous comet, whose periodic returns have been verified by observation, received the name of Encke, the astronomer who first recognized it as having been observed in previous revolutions. It returns to its perihelion in 1,208 days. Encke's comet, although its identity was not discovered till 1818, had been frequently observed, as in 1789, 1795 and 1805; and on these occasions it exhibited very different appearances, having been seen with and without a nucleus, and with and without a tail—circumstances which account for its having so long escaped being recognized as a regular attendant on the sun.

The appearances exhibited by comets are diversified, and sometimes remarkable. That which appeared in the year 134 B.C., at the birth of Mithridates, is said to have had a disk equal in magnitude to that of the sun. Ten years before this, one was seen which, according to Justin, occupied a fourth part of the sky (that is, extended over 45°), and surpassed the sun in splendor. Another, equally remarkable, appeared in the year 117 of our era; and in 479 there was one, of which the disk, according to Freret, was of such magnitude, that it might have occasioned the extraordinary eclipse of the sun which took place about that time. In 400 one was observed, which is said to have resembled a sword, and to have extended from the zenith to the horizon. That of 531 was of greater magnitude still, and its appearance more terrific. Those which appeared in 1066 and 1505 exhibited disks larger than that of the moon. It is, however, probable that these accounts were exaggerated; for since comets have been observed by astronomers, no instances have occurred in which their magnitudes and appearances have been so extraordinary. The most remarkable among those of which we possess accurate accounts appeared in the years 1456, 1618, 1680, 1744, 1759, 1769, 1807, 1811, 1841, 1858, 1861 and 1874.

It is only of late years that the study of meteors or falling stars has come to be regarded as belonging to astronomy. Even now the discovery of the connection of meteors and comets is so recent, and the aspect under which the new department of astronomy presents itself varies so continually as fresh relations are recognized, that it seems desirable to limit our remarks to the statement of a few broad facts. It has been shown, then, that meteors travel in systems round the sun, and that displays of falling stars occur when the earth passes through a meteor-system.

There are already recognized more than one hundred meteor-systems, known by the direction in which the corresponding falling stars encounter the earth.

The best-known meteor-systems are those which produce a shower on November 13-14 in certain years, and those which usually produce a display on August 10-11. The former have been called the Leonides, because the part of the stellar sphere whence the meteors appear to radiate is in the constellation Leo. The latter, for a like reason, appearing to radiate from Perseus. have been called the Perseides

The great multitude of stars visible even to the naked eye renders it impossible to distinguish each by a particular name; astronomers, accordingly, for the sake of

reference, have formed them into groups, known as *Constellations* or *Asterisms*. To these the early astronomers gave the names of men and animals and other objects from fancied resemblances or analogies, for the most part not easily traced. These denominations are preserved in modern catalogues, and the practice of delineating the object itself on celestial globes and charts has been only recently, if it has yet been altogether abandoned. The ancients distinguished some of the brightest stars in the different constellations by particular names; but to include others less conspicuous, it became necessary to adopt a different mode of proceeding. According to the usual method, first introduced by Bayer in his *Uranometria*, each of the stars in every constellation is marked by a letter of the Greek alphabet.

ASTURIAS, one of the ancient provinces of Spain, formerly (from 1388 downwards) conferred as a principality on the heir-apparent to the throne. By the new division of Spain in 1833, the province took the name of Oviedo, though not to the exclusion, in ordinary usage, of the older designation. It is bounded on the N. by the Bay of Biscay, on the S. by Leon, on the W. by Galicia, and on the E. by Santander, which is now incorporated with Old Castile. It consists of a portion of the northern slope of what is properly a part of the Pyrenean system, and is covered in all directions with offshoots from the main chain, by which it is almost completely shut in on all sides. Only a few of the passes across the mountains are practicable for carriages, and most of them are difficult even for horses. Along the coast there is a narrow strip of level ground, which consists largely of bare and moor-like reaches, covered with furze. The province, as might be supposed, is watered by numerous streams and rivers, which have hollowed out beautiful and picturesque valleys; but owing to the narrowness of the level tract, their courses are short, rapid, and subject to floods. The most important is the Nalon or Pravia, which receives the waters of the Caudal, the Trubia, and the Narcea, and has a course of 62 miles; after it rank the Navia and the Sella. Along the whole extent of the coast, a distance of 130 miles, there is not one good port. In that of Riba de Sella a large frigate may anchor, and Gijon will admit a vessel drawing 16 or 17 feet of water; but the entrance is in both cases difficult and dangerous. The climate of the district is generally mild, but overcharged with humidity, and in the higher regions the winters are protracted and severe. The broken character of the surface prevents anything like extensive agricultural industry, but abundant pasturage is found in the valleys. The wheat crop frequently fails. Rye succeeds better, and is often mixed with the maize which forms the principal food of all but the higher classes. Chestnuts — here, as elsewhere in Spain, an important article of diet — are very abundant on the hills, and the tree supplies valuable timber. Other timber-trees, such as oak and beech, are found in the mountains, along with various medicinal plants, such as hellebore, angelica, and valerian. Apples are abundant, and cider forms the common drink of the people; but little attention is paid to vines. The horses of Asturias are specially gentle and sure-footed, ranking among the best in Spain, and excelling those of Andalusia in strength, though surpassed by them in beauty. Wild deer, boars, and bears are not uncommon among the mountains; and the sea-coasts, as well as the streams, abound with fish of various kinds, including salmon and lampreys, which are sent to the markets of Madrid.

The capital of the province is Oviedo, and the other towns of importance are Gijon, Aviles, Llanes and Luarca.

ASUNCION, or ASSUMPTION, the capital of the Republic of Paraguay in South America. It is situated in the midst of a fertile territory on the eastern bank of the River Paraguay (here upwards of 600 yards in width), about 18 miles above the most northerly mouth of the Pilcomayo. It was one of the earlier Spanish settlements in this part of America, being founded in 1535 by Gonzalo de Mendoza and Juan de Salazar y Espinosa, and receiving its name of *Nuestra Señora de la Asuncion*, in honor of the festival of the Assumption. Originally a small fort, it soon became, from the convenience of its situation, a town of considerable importance, and in 1547 was erected into a bishopric. Formerly, while the Jesuits were masters of the country, it consisted of a rather irregular assemblage of one story houses, relieved by ecclesiastical buildings of varying pretension, from the cathedral downwards; but under the dictatorship of Francia, the streets were more symmetrically arranged, and a number of secular buildings erected. These were greatly increased under the rule of his successors, and Asuncion was brought into similarity with a European city of corresponding rank, having its government house, its president's palace, its arsenal, custom-house, barracks, military hospital, theater, and railway station. While the war between Paraguay and the neighboring states lasted, Asunçion suffered greatly, being taken and plundered in 1869 by the Brazilian forces, who had already bombarded it from the river. The population, Spanish for the most part in language, but of various races, was estimated, late in 1889, at 24,843, and carried on a somewhat extensive trade in Paraguay tea, or *Yerba Maté*, hides, tobacco, fruits, molasses, and rum.

ASYLUM, in *Greek Antiquities*, a temple enclosure, within which protection from bodily harm was afforded to all who sought it and could prove their danger. In a general sense, all Greek temples and altars were *asyla*, that is, it was a religious crime to remove by force any person or thing once under the protection of the deity. But it was only in the case of a small number of temples that this protecting right of a deity was recognised with common consent, and, apparently, these were among the oldest temples of Greece. Such, for example, was the temple of Athena Alea at Tegea in Arcadia, where King Pausanias II. spent the remainder of his days after the battle of Haliartus; or the temple of Ganymeda (Hebe) at Philus, where, it is said, persons who had escaped from prison hung up their chains in the sacred grove. Other instances are the sanctuaries of Poseidon at Calauria and Tænarum, of Athena at Chalcioecus at Sparta, and of Amphiarus at Oropus.

ASYLUM, a term now usually applied to homes for lunatics and idiots, deaf mutes and the blind. The word is used in some cases as a synonym for a refuge, for a sheltering place for orphans.

ASYMPTOTE (Gr. not coinciding), a line that continually approaches nearer and nearer to some curve, but only meets it at an infinite distance.

ATACAMA, a district of South America. (1.) The Chilian province has an area of about 38,000 square miles, with a population of 82,300. It is bounded S. by the province of Coquimbo, W. by the Pacific, and E. by the Argentine Republic. It is one of the richest copper and silver districts in the world, nearly 1000 mines being worked for the former metal, and about 250 for the latter. The silver ore was first discovered in 1832, by a shepherd, Juan Godoy, at a place which has since been occupied by a village that bears his name. The ores of lead and zinc are frequently found, and sulphur, alum, and salt are all of them abundant, the deposit of the last article alone covering about 50 square miles at the Laguna Salada. Gold likewise occurs in sufficient quantity to be mentioned in the list of exports

The capital of the province is Copiapo, with 13,380 inhabitants, and the population is principally clustered in the valleys of Copiapo and Huasco, and in the neighborhood of the various mines. Caldera is the principal port, and is connected with the capital and the eastern districts by the first railway constructed in South America. The value of the mineral exports through this and the adjacent ports was in 1889 estimated at 6,218,275 dollars. (2.) The Bolivian department has an area of about 70,000 square miles, with a population of about 18,000, which is rapidly increasing. It also owes its prosperity almost solely to its wealth in copper and silver. The mines of Caracoles, recently discovered, are said to be the most productive silver mines in the world. In other products it coincides with the Chilian province, with the addition, however, of meteoric iron, which has been found in remarkable masses. A large part of what is more especially designated the Desert of Atacamá is included in the department. It is not, as the name might suggest, a sandy, but for the most part a rocky and rugged, tract, with the merest patches and strips of vegetation. The capital of the department is Cobija, or, as it is officially called, Puerto de la Mar; but its prosperity is in some degree threatened by the rise of Mejillones, a seaport which has recently been connected by railway with the principal mining districts. See Phillippi, *Reise durch die Wüste Atacama*, Halle, 1860; Tchudi, *Reise durch die Andes*, a supplement to Petermann's *Mittheil.*, 1860; *Journ. Roy. Geog. Soc.* 1851, 1855.

ATAHUALLPA (*atahu*, Latin *virtus*, and *allpa*, sweet), called the last of the Incas, was the son of Huayna Capac, eleventh Inca of Peru, by the daughter of the conquered sovereign of Quito. His brother Huascar succeeded Huayna Capac; for, as Atahuallpa was not descended on both sides from the line of Incās, Peruvian law considered him illegitimate. He obtained, however, the kingdom of Quito, whether by stratagem or not is uncertain. A jealous feeling soon sprang up between him and Huascar, who insisted that Quito should be held as a dependent province of his empire. A civil war broke out between the brothers, and, though the details of it are not accurately known, it appears that just about the time when Pizarro was beginning to move inland from the town of San Miguel, Huascar had been defeated and thrown into prison, and Atahuallpa had become Inca. Pizarro set out in September, 1532, and made for Cassamarca, where the Inca was. Messengers passed frequently between them, and the Spaniards on their march were hospitably received by the inhabitants. On the 15th November, Pizarro entered Cassamarca, and sent his brother and Fernando de Soto to request an interview with the Inca. On the evening of the next day, Atahuallpa entered the great square of Cassamarca, accompanied by some five or six thousand men, who were either unarmed, or armed only with short clubs and slings concealed under their dresses. Pizarro's artillery and soldiers were planted in readiness in the streets opening off the square. The interview was carried on by the priest Vicente de Valverde, who addressed the Inca through an interpreter. He stated briefly and dogmatically the principal points of the Christian faith and the Roman Catholic policy, and concluded by calling upon Atahuallpa to become a Christian, obey the commands of the Pope, give up the administration of his kingdom, and pay tribute to Charles V., to whom had been granted the conquest of these lands. To this extraordinary harangue, which from its own nature and the faults of the interpreter must have been completely unintelligible, the Inca at first returned a very temperate answer. He pointed out what seemed to him certain difficulties in the Christian religion, and declined to accept as monarch of his dominions this Charles, of whom he knew nothing. He then took a Bible from the priest's hands, and, after looking at it, threw it violently from him, and began a more impassioned speech, in which he exposed the designs of the Spaniards, and upbraided them with the cruelties they had perpetrated. The priest retired, and Pizarro at once gave the signal for attack. The Spaniards rushed out suddenly, and the Peruvians, astonished and defenceless, were cut down in hundreds. Pizarro himself seized the Inca, and in endeavoring to preserve him alive, received, accidentally, on his hand the only wound inflicted that day on a Spaniard. Atahuallpa, thus treacherously captured, offered an enormous sum of money as a ransom, and fulfilled his engagement; but Pizarro still detained him, until the Spaniards should have arrived in sufficient numbers to secure the country. While in captivity, Atahuallpa gave secret orders for the assassination of his brother Huascar, and also endeavored to raise an army to expel the invaders. His plans were betrayed, and Pizarro at once brought him to trial. He was condemned to death, and, as being an idolater, to death by fire. Atahuallpa, however, professed himself a Christian, received baptism, and his sentence was then altered into death by strangulation. His body was afterwards burned, and the ashes conveyed to Quito. From the reports of the Spanish historians, it is impossible to gain an accurate idea of the character and abilities of the Peruvian monarch, and we have no other notices by which to test their account.

ATALANTA, in *Greek Legend*, (1) was connected with Arcadia, where, at her birth, she had been exposed on a hill, her father Jaison having expected a son. At first she was suckled by a she-bear, and then saved by huntsmen, among whom she grew up to be skilled with the bow, swift, and fond of the chase, like the virgin goddess Artemis. At the hunt of the Calydonian boar her arrows were the first to hit the monster, for which its head and hide were given her by Meleager. At the funeral games of Pelias, she wrestled with Peleus, and won. Melanion, with intense love, followed, fought, and toiled in her service, she despising love, and remaining true to Artemis long, but yielding at last. She was the mother of Parthenopæus. But there was (2) another Atalanta in Bœotian legends, who was to be obtained in marriage only by him who could outstrip her in a race, the consequence of failure being death. Hippomenes, before starting, had obtained from Aphrodite three golden apples, which at intervals in the race he dropped, and Atalanta, stopping to pick them up, fell behind. Both were happy at the result; but forgetting to thank the goddess for the apples, they were led by her to a religious crime, and for this were transformed into lions. Latterly the adventures of these two separate heroines were united and told as of one.

ATAXY, LOCOMOTOR (*a* priv., *τάξις* order—Synonyms, *Progressive locomotor ataxy*, *Tabes dorsalis*, *Posterior spinal sclerosis*), a disease of the nervous system, manifesting itself principally by disordered movements of the limbs in locomotion. This disorder is not, as was once supposed, a form of paralysis (there being no diminution of muscular strength), but is dependent on the loss of power of co-ordinating the muscles into harmonious action, which is essential to the proper performance of the voluntary movements of the body, and the maintenance of its equilibrium. Although the disease had been previously noticed both by Professor Romberg and Dr. R. B. Todd, it was first fully described and named by Dr. Duchenne in 1858. Its pathology has subsequently been investigated by Mr. Lockhart Clarke.

Locomotor ataxy usually begins insidiously, and advances slowly.

The pathelogical condition giving rise to locomotor ataxy is disease of a certain portion of the spiral cord, viz., the posterior columns and the posterior nerve roots. These undergo various transformations, which result in their ultimately becoming atrophied and indurated, When affecting, as this lesion most commonly does, the lower dorsal and lumbar regions of the cord, the ataxic symptoms are chiefly confined to the legs; but when it affects the cervical portion, the arms are involved. Occasionally the whole posterior columns of the cord are found diseased. The exciting causes of this malady are but ill understood. Exposure to cold and privation, intemperance, over exertion, and mental anxiety have been supposed to give rise to it.

ATBARA (Bahr-el-Aswad, or Black river), an important river of Eastern Africa. It rises in the mountains of Abyssinia, and unites with the Nile at El-Damer. During the rains it has an average depth of from thirty-five to forty feet.

ATCHAFALAYA (the Lost Water), a river of Louisiana, or secondary channel of the Mississippi, by which a portion of its water flows off from the main trunk into the Mexican Gulf. Its mouth is 120 miles west of the principal embouchure of the Mississippi.

ATCHISON, the county seat of Atchison county, Kan., is situated on the right bank of the Missouri river, equidistant from Leavenworth and St. Joseph. The railway facilities available are exceptionally complete and desirable, embracing the Atchison, Topeka and Santa Fé; Chicago, Rock Island and Pacific; Burlington and Missouri River; Kansas City, St. Joseph and Council Bluffs; Missouri Pacific; and Leavenworth Northern and Southern systems. The city also has communication with points on the Missouri and Mississippi rivers by steamers. Within the past ten years Atchison has grown rapidly in wealth and population, being to-day one of the most promising and enterprising cities of the West, and the railroad center of the State. It has thirteen churches, nine banks, three daily and three weekly papers, a court-house, high school, and five public school buildings, three colleges, a public library and an abbey conducted by the Society of St. Benedict, half-a-dozen large and well equipped hotels, an elegantly finished opera-house and a number of public halls, besides very many handsome private residences. A large iron railway and foot bridge spans the river opposite the city. The manufactures are numerous and varied, including carriages, furniture, hardware, oil, canned goods, lumber products, etc. The city is also the location of the machine and repair shops of the Burlington and Missouri River railroad. It is lighted by gas and electricity, enjoys street railway conveniences, and has a population (1890 census) of 14,222.

ATE, in *Greek Mythology*, a personification of criminal folly. She had misled even Zeus to take a hasty oath, when Heracles was born, for which, seeing his folly, he cast her by the hair out of Olympus, whither she did not again return. She fell, it was in later times said, on the hill where Troy was built.

ATELLA, an ancient city of Campania, about nine miles from Naples. In the second Punic war it sided with Hannibal, and, in consequence, its inhabitants were dispersed by the Romans, and their places supplied by the people of Nuceria. It is now after various fluctuations of fortune, a mere mass of ruins.

ATH, or AETH, a city of Belgium, in the province of Hainaut, situated on the river Dender, a navigable confluent of the Schelde, rather more than thirty miles by rail from Brussels. Population, 10,081.

ATHABASCA, or ATHAPESCOW, a river in the north-western territory of British North America, which flows into a lake of the same name. It rises in the Rocky Mountains, and has a long and tortuous course in a north-eastern direction, during which it receives the Lesser Slave River, the Red Deer, and several others. The lake is about 230 miles in length, with a breadth varying from 30 to 14 miles, lying in a direction almost E. and W. It communicates with Hudson's Bay on the one hand, and with the Polar Sea on the other.

ATHALIAH, the daughter of Ahab and wife of Jehoram, king of Judah, who, after the death of King Ahaziah, her son, caused all the male members of the royal house of Judah to be massacred, in order that she might usurp the throne. Among the victims were her own grandchildren, except the youngest, Joash, who was concealed in the temple by his aunt, Jehosheba, wife of the high priest, Jehoiada.

ATHANASIUS, ST., Bishop of Alexandria, and one of the most illustrious defenders of the Christian faith, was born at Alexandria about the year 297. Of his family, circumstances, or early education nothing can be said to be known, although a legendary story has been preserved by Rufinus of Aquileia as to the manner in which he came, while yet a boy, under the notice of his predecessor, Alexander. It seems certain that Alexander became his patron, took him as a youth into his house, and employed him as his secretary. This was probably about 313, and from this time Athanasius may be said to have been devoted to the Christian ministry. He was, no doubt, a student in the "Didascaleion," or famous "catechetical school" of Alexandria, which included amongst its already illustrious teachers the names of Clement and Origen. In the museum, the ancient seat of the Alexandrian university, he may have learned grammar, logic, and rhetoric. His mind was certainly well disciplined, and accustomed to discuss from an early period the chief questions both in philosopy and religion. The persecution under which the Alexandrian Church suffered at this time, and his intimacy with the great hermit Antony, of which he himself has told us, had all their effect upon his character, and served to nurture in him that undaunted fortitude and high spirit of faith by which he became distinguished. At the Council of Nicæa, in the year 325, he appears prominently in connection with the dispute. He attended the council, not as one of its members (who were properly only bishops or delegates of bishops), but merely as the attendant of Alexander. In this capacity, however, he was apparently allowed to take part in its discussions, for Theodoret (i. 26) states that "he contended earnestly for the apostolic doctrines, and was applauded by their champions, while he earned the hostility of their opponents. Within 'five months' after the return of Alexander to the scene of his episcopal labors he expired, and his friend and archdeacon was chosen to succeed him. He was elected 'in the sight and amidst the acclamations of the people.' He was now about 30 years of age, and is spoken of as remarkable both for his physical and mental characteristics."

The first few years of the episcopate of Athanasius were tranquil; but the storms in which the remainder of his life was passed soon began to gather around him. The Council of Nicæa had settled the creed of Christendom, but had by no means composed the divisions in the church which the Arian controversy had provoked. Arius himself still lived, and his friend Eusebius of Nicomedia rapidly regained influence over the emperor Constantine. The result of this was a demand made by the emperor that Arius should be re-admitted to communion. Athanasius stood firm, and refused to have any com-

munion with the advocates of a "heresy that was fighting against Christ." Constantine was baffled for the moment; but many accusers soon rose up against one who was known to be under the frown of imperial displeasure. The archbishop of Alexandria was charged with cruelty, even with sorcery and murder. It was reported that a Meletian bishop in the Thebaid, of the name of Arsenius, had been unlawfully put to death by him. He was easily able to clear himself of such charges, but the hatred of his enemies was not relaxed, and in the summer of 335 he was peremptorily ordered to appear at Tyre, where a council had been summoned to sit in judgment upon his conduct. He did not venture to disobey the imperial order, and a commission was appointed to inquire into an alleged instance of cruelty urged against him, notwithstanding the explanations which he had made. There appeared plainly a predetermination to condemn him, and he fled from Tyre to Constantinople to appeal to the emperor himself. "He resolved," says Gibbon, "to make a bold and dangerous experiment, whether the throne was inaccessible to the voice of truth." He presented himself suddenly with five of his suffragans before the emperor, while riding into his new capital. Refused at first a hearing, his perseverance was at length rewarded by the emperor's consent to his reasonable request — that his accusers should be brought face to face with him in the imperial presence. The leaders of the Tyrian council, amongst the most conspicuous of whom were the two Eusebii, were accordingly summoned to Constantinople, just after they had celebrated, at a great dedication festival at Jerusalem, the condemnation of Athanasius and the restoration of Arius to church communion. In confronting the former before Constantine they did not attempt to repeat the charge of cruelty, but found a more ready and effective weapon to their hands in a new charge of a political kind — that Athanasius had threatened to stop the Alexandrian corn-ships bound for Constantinople. Here, as in other matters, it is very difficult to understand how far there was any truth in the persistent accusations made against the prince-bishop of Alexandria. Probably there was in the very greatness of his character and the extent of his popular influence a certain species of dominance which lent a color of truth to some of the things said against him. On the present occasion his accusers succeeded in at once arousing the imperial jealousy; and the consequence was, that, notwithstanding his earnest denial of the act attributed to him, he was banished to Trier, or Treves, the capital of Gaul.

This was the first banishment of Athanasius, which lasted about two years and a half. It was only brought to a close by the death of Constantine, and the accession of Constantine II. as emperor of the West. It is recorded by himself that, on his return to Alexandria, "the people ran in crowds to see his face; the churches were full of rejoicing; thanksgivings were offered up everywhere; the ministers and clergy thought the day the happiest in their lives." But this period of happiness was destined to be short-lived. His position as patriarch of Alexandria placed him, not under his friend Constantine II., but under Constantius, another son of the elder Constantine, who had succeeded to the throne of the East. He in his turn fell, as his father had done, more and more under the influence of Nicomedian Eusebius, now transferred to the see of Constantinople. A second expulsion of Athanasius was accordingly resolved upon. The old charges against him were revived, with the addition of his having set at naught the decision of a council. It was further resolved on this occasion to put another bishop in his place. Accordingly, in the beginning of the year 340, a Cappadocian named Gregory, said to be an Arian, was installed by millitary force on the throne of the great defender of the faith, who, to save his followers from outrage, withdrew to a place of concealment. As soon as it was possible he repaired to Rome, to "lay his case before the church." He was declared innocent at a council held there in 342, and in another held at Sardica some years later. Julius, the bishop of Rome, warmly espoused his cause, and, generally, it may be said that the Western Church was Athanasian in its sympathies and its creed, while the majority of the Eastern bishops sided with the Eusebian party. This severance was clearly shown at the Council at Sardica, where the Orientals refused to meet with the representation of the Western Church, because the latter insisted on recognising the right of Athanasius and his friends to attend the council as regular bishops. The commonly received date of this council is 347, but the rediscovered *Festal Letters* of Athanasius have had the effect of throwing back this date for some years. It has been placed by some as early as the end of 343, by Mansi and others in the end of 344. The decision of the Council of Sardica, however, had no immediate effect in favor of Athanasius. Constantius continued for some time implacable, and the bold action of the Western bishops only incited the Arian party in Alexandria to fresh severities. Gradually, however, the excesses of the Arian party brought their own revenge, while the death of the intruded bishop Gregory, in the beginning of 345, opened up the way for a reconciliation betwixt the Eastern emperor and the banished prelate. The result was the restoration of Athanasius for the second time, amidst the enthusiastic demonstrations of the Alexandrian populace, which is represented by his panegyrist, Gregory Nazianzen, as streaming forth "like another Nile" to meet him in the distance as he approached the city. His restoration is supposed to have taken place, according to the more accurate chronology based upon the *Festal Letters*, in October 346.

For years at this time Athanasius held his ground in Alexandria. But the intrigues of the Arian or court party were soon renewed against him, and the feeble emperor, who had protested that he would never again listen to their accusations, was gradually stimulated to new hostilities. A large council was held at Milan in the spring of the year 355, and here, notwithstanding the vigorous opposition of a few faithful men amongst the Western bishops, a renewed condemnation of Athanasius was procured. This was followed up by the banishment of the faithful prelates, even of Hosius of Cordova, whose conciliatory character and intimate connection with the imperial family had not prevented him from addressing to Constantius a pathetic remonstrance against the tyranny of the Arian party. When his friends were thus scattered in exile, their great leader could not long escape; and on the night of the 8th of February 356, while he was engaged in service in the church of St. Thomas, a band of armed men burst into the sacred building. He has himself described the scene (*Apol. de fuga*, 24). Here for a time he maintained his composure, and desired the deacon to read the psalm, and the people to respond — "*For His mercy endureth for ever*;" and how, as the soldiers rushed forward with fierce shouts towards the altar, he at length made his escape in the crowd, and sought once more a place of safe retirement. The solitudes of Upper Egypt, where numerous monasteries and hermitages had been planted, appear to have been his chief shelter at this time. Here, protected from pursuit, he spent his time in literary labors in behalf of his cause; and to this period, accordingly, belong some of his most important writings, above all the great *Orations*,

or Discourses against the Arians, which furnish the best exposition of his theological position and principles.

For six years at this time Athanasius continued in exile, till the death of Constantius in November 361 opened once more the way for his return to his episcopate. Julian, the successor to the imperial throne, professed indifference to the contentions of the church, and granted permission to the bishops exiled in the late reign to return home. Amongst others, Athanasius took advantage of this permission, and seated himself once more upon his throne, amidst the jubilations of the people. He had begun his episcopal labors with renewed ardor, and summoned a council to Alexandria to decide various important questions, when an imperial mandate yet again drove him from his place of power. The faithful gathered around him weeping. "Be of good heart," he said, "it is but a cloud: it will soon pass." His forecast proved true; for within a few months Julian had closed his brief career of Pagan revival, and Anathasius "returned by night" to Alexandria. He received a letter from the new emperor, Jovian, praising his Christian fidelity, and encouraging him to resume his work. With the emperor he continued to maintain friendly relations, and even drew out for him a synodal letter embodying the Nicene Creed, which was graciously received. During the brief reign of this bluff soldier-prince, comparative quiet prevailed in the church. But the repose was of short duration. In the spring of 365, after the accession of Valens, troubles reappeared. An order was issued for the expulsion of all bishops who had been expelled by Constantius, and Athanasius was once more forced to take refuge in concealment from his persecutors. His concealment, however, only lasted for four months, when an order came for his return; and from this time (Feb. 366) he was left undisturbed to pursue his episcopal labors. Those labors were unceasing in refuting heretics, in building churches, in rebuking rapacious governors, in comforting faithful bishops, and in strengthening the orthodox everywhere, till at length, in the spring of 373, "in a good old age," he ceased from all his work. Having consecrated one of his presbyters his successor, he died quietly in his own house. His "many struggles," according to his panegyrists, won him "many a crown." He was gathered to his fathers, patriarchs, prophets, apostles, and martyrs, who had contended for the truth. Even those who fail to sympathise with the cause which Athanasius steadfastly maintained, cannot refuse their tribute of admiration to his magnanimous and heroic character. The cynic eloquence of Gibbon grows warm in recounting his adventurous career, and the language of Hooker breaks into stately fervor in celebrating his faith and fortitude. "The whole world against Athanasius, and Athanasius against it; half a hundred of years spent in doubtful trial which of the two in the end should prevail — the side which had all, or else the part which had no friends but God and death — the one a defender of his innocency, the other a finisher of all his troubles." If imperious in temper and inflexible in dogmatic determination, Athanasius had yet a great heart and intellect, enthusiastic in their devotion to Christ, and in work for the good of the church and of mankind.

His chief distinction as a theologian was his zealous advocacy of the essential divinity of Christ as co-equal in substance with the Father. This was the doctrine of the Homoousain, proclaimed by the Nicene Creed, and elaborately defended by his life and writings. Whether or not Athanasius first suggested the use of this expression, he was its greatest defender; and the catholic doctrine of the Trinity has ever since been more identified with his "immortal" name than with any other in the history of the church and of Christian theology. (For an exposition of the Athanasian Creed, see the article CREEDS.)

ATHEISM is the doctrine that there is no God. The word, which first appears in English literature in the latter part of the sixteenth century, is derived from Greek negative prefix *a*, and *Theos*, "God." The name atheist is said to have been first applied in Greek literature to one of the followers of the materialistic philosopher Democritus.

ATHELSTAN, or ÆTHELSTAN, son of King Edward the elder, and grandson of Alfred the Great, was born in 895. There has been much doubt with regard to his legitimacy, as his mother, Ecgwyn, is said to have been of humble origin; but these suspicions appear to rest on slight foundations. On the death of Edward in 925, Athelstan, who had been named by him as his successor, was elected king by the Mercians and West Saxons, and crowned at Kingston in Surrey. Anlaf, a Danish chief, or, according to some accounts, a son of Sihtric, with the king of Scotland, the Welsh, and the Danes of the north, invaded England. Athelstan, with his half brother Edmund, met and signally defeated the invaders in the battle of Brunanburh, celebrated in the "Brunanburh War-Song." In 940 or 941 Athelstan died at Gloucester.

ATHENA, in *Greek Mythology*, a goddess who, from being originally a personification of the clear, bright upper region of the sky, had, as early as the time of the epic poets, changed, or advanced, so as to embody under a divine form a conception of the clear insight of the human mind in its various functions. This upper air or ether seemed to be a distinct element in the universe. From it came the light of morning before sunrise and of evening after sunset, reminding us of the light which, in the Mosiac account of the Creation, existed before the sun and moon were placed in the sky. In the first stage of her character, in which, like the other deities of Olympus, she was directly identified with an element of nature and supposed to act as it acted, Athena bore the name of Pallas, and was thought of more in connection with the storms than with the serenity or light of the heavens. The obvious counterpart of a storm was a raging battle, and, accordingly, she became a goddess of war, armed with spear and helmet, and with the *ægis*, or storm-shield, of her father, resistless among men, hurling to the ground the giant Enceladus, and even superior in might to Ares himself, the god of war. The storm sweeps sorest round high citadels, where also the storms of war rage fiercest; and on such places was her favorite abode. But a storm is followed by serenity brighter than before, more enjoyable, and more exciting to activity of every kind; and then the goddess lays aside her armor to encourage and foster skill and industry. Her title is then Ergane. To her was ascribed the invention of spinning and weaving; of taming horses, bridling and yoking them to the war-chariot; of the flute, and in some way of the healing art. This is the second stage of her character, which the myth, agreeably to its principle, explains in a different fashion, when it says that she sprang into existence from the brain of the all-wise ruler of the world, Zeus, and that he had before swallowed his wife, Metis (intelligence). She must therefore have been in a measure a complement of him, created for the purpose of carrying out among men what was in his mind, but what yet he could not himself, as the supreme and impartial ruler, execute. As his substitute, she lent her aid to Heracles in all his hardships and adventures; to Theseus under similar circumstances; to the Greeks in their war against Troy; to Perseus in slaying the Gorgon Medusa, whose head she afterwards bore upon her *ægis*, from which she obtained the name of Gorgophone; and to the Argonatus on their expedition to Colchis.

She maintained always her character as a virgin, and, to express this, bore, at Athens in particular, the name of Parthenos. Her birth took place in Olympus, in presence of the other deities, Hephæstus aiding it, as it is coarsely said, by splitting open with his hatchet the skull of Zeus, a subject often represented on the ancient painted vases. This was also the subject of the sculptures in the front pediment of her greatest temple, the Parthenon at Athens. From the fact that in the other pediment the sculptures represented her contest with Poseidon for divine supremacy over Attica, it might perhaps seem that the first act of her existence was to claim this sovereignty. Foremost in her character always is her protection of high citadels, like that of Athens. Yet it was not for this, but for her causing an olive to grow on the bare rock of the Acropolis, that she was chosen rather than Poseidon, whose claim was that he had raised on the same rock a spring of brackish water. The olives of Attica were a source of great wealth, and the light supplied by their oil may have seemed not unlike the light of the ether. As the defender of citadels her title was Polias.

ATHENÆUM, a name originally applied to buildings dedicated to Athena (Minerva), was specially used as the designation of a temple in Athens, where poets and men of learning were accustomed to meet and read their productions. The academy for the promotion of learning which the Emperor Hadrian built at Rome, near the Forum, was also called the Athenæum. Poets and orators still met and discussed there, but regular courses of instruction were given by a staff of professors in rhetoric, jurisprudence, grammar, and philosophy. This species of university continued in high repute till the 5th century. The same name was afterwards applied to similar institutions in Lyons and Marseilles; and it has become a very general designation for literary clubs or academies. It has also been used as the title of literary periodicals, particularly of the journal of art criticism edited by the brothers Schlegel, and the two well-known modern papers published in London and Paris.

ATHENÆUS, a Greek rhetorician and grammarian, or man of letters, was a native of Naucratis, a town in Egypt, near the mouth of the Nile. Exceedingly little is known of his life, but from one or two references to known events which occur in his works it may be gathered that he flourished about the end of the 2d and the beginning of the 3d century A.D.

ATHENAGORAS, a Christian apologist, was a native of Athens, and lived during the 2d century A.D.

ATHENODORUS, surnamed CANANITES or SANDONUS, a Stoic philosopher, was born at Tarsus. He probably gave instruction to Augustus when he was at Apollonia; and on proceeding to the Roman courts, he was made tutor to Tiberius. The emperor esteemed him greatly for his proved virtue and probity. He was in the habit of giving his opinion very freely, and warned Augustus, whenever he found himself giving way to anger, to rehearse the twenty-four letters of the alphabet before saying or doing anything. Retiring late in life to his native town, he died there at the age of 82.

ATHENRY, a decayed town in Ireland, county of Galway, and province of Connaught, 14 miles E. of Galway.

ATHENS (*Ἀθῆναι*, ATHENÆ) was the name of as many as nine towns in various parts of the Grecian world, among which *Athenæ Diades*, in the N.W. of Eubœa, a town belonging to the Athenian confederation, is worthy of mention. But it was the capital of Attica which invested the name of Athens with an undying charm for the poet, the artist, the philosopher, the historian, for all time. Towards the south of the central plain of Attica, about 4½ miles from the harbor of Piræeus, and nearly 4 from the Bay of Phalerum. The survey of Pausanias, when compared with existing remains, and supplemented by the numerous incidental notices of ancient authors, enables us to form a more perfect conception of the topography of ancient Athens than of any other Greek city. Recent excavations have added greatly to our knowledge of it, and the literature of the subject is very extensive.

There seems little reason to doubt that the earliest settlement on Athenian soil was upon the cliff afterwards famous as the Acropolis. The earliest inhabitants appear to have been Pelasgians; and though it was the boast of the Athenians that they alone of all Greek states were indigenous, yet their town would from the first have received acessions from various parts of the continent, the peaceful poverty of Attica affording a welcome refuge in those early and unsettled times. The most accessible portion of the Acropolis is the western side, where it is joined by a neck of hill to the Areopagus. On this side there existed down to later times the remains of fortifications built by the earliest inhabitants, with nine doorways, one within the other. This fort protected the only entrance to the citadel, which was surrounded by a wall, and artificially levelled for the reception of buildings. Within this fortified enclosure stood the shrine of Athena Polias afterwards known as the Erechtheium,—and an altar of Zeus Polieus, where the strange sacrifices of the Dipolia were celebrated. A Prytaneium, containing the hearth-fire of the state, and serving as the residence of the king, would be another indispensable feature in the primitive town.

To the west of the Acropolis there extends from N. to S. a range of hills, the three most prominent heights of which are commonly known respectively as the Hill of the Nymphs, the Pnyx, and the Museium,— the Nymphs' Hill being separated from the Acropolis by the Areopagus, which intervenes between. Everywhere upon the slopes of the hills just mentioned traces have lately been discovered of ancient dwellings hewn out of the solid rock. But while all these rock-dwellings are exceedingly ancient, yet some appear less primitive than others; it is remarked that those which exist on the Areopagus and on the hill-sides nearest to the Acropolis are of a smaller and ruder type, those more distant from the citadel being somewhat more convenient in plan and extent. Legend declares the Athenians to have originally dwelt in rock-hewn caves, and it would seem that primitive Athens gradually extended itself from the Acropolis in this W. and S.W. direction. This quarter was afterwards known as the intramural deme of Melite, a name derived, perhaps from the balm which then grew there. As the population of the early town continued to increase, two more districts seem to have been incorporated — Collytus, extending from the east of Melite, between the Acropolis and Areopagus, and Cerameicus, or the "Potters' quarter" ("Tuileries"), which extended from the same two hills towards the north and north-west. The regions we have now described appear to have made up the Athens of Solonian times. The earliest historical event which illustrates Athenian topography is the rising of Cylon. The narratives of that event imply that the Acropolis was already fortified by the Enneapylum, that the Areopagus was already the seat of the court which bore its name (see AREOPAGUS), and that near the entrance of the citadel stood an altar of the Semnæ, or Furies, at which Cylon and his partisans were slain. This altar has been immortalised by Æschylus in the splendid conclusion of the *Eumenides*.

The reign of the Pisistratidæ was recognised by the ancients as marking an important era in Athenian topography. It was Pisistratus who laid the foundation for the great temple of Zeus Olympius upon the ancient site above mentioned. His magnificent design had an eventful history: left unfinished by its author, the Athenians, perhaps from dislike to the "tyrant," made no effort to complete it. At length, after receiving additions from various foreign princes, it was completed by Hadrian (*c.* 130 A.D.), and formed the grandest edifice in the region of the city which, in acknowledgment of the imperial munificence, was called Hadrianopolis. The Olympium was one of the largest temples in the world; but of its 124 Corinthian columns only 15 are now standing. The *Pythium*, or sanctuary of the Pythian Apollo, near the Olympium, was also ascribed to Pisistratus, whose grandson and namesake dedicated an altar within it (Thucyd., vi. 54). To Pisistratus was ascribed the founding of the *Lyceium*, or temple of Apollo Lyceius, which stood on the right bank of the Ilissus, a short distance from the city. The names both of Pericles and Lycurgus the orator are also associated with this building; yet it is not known who added the gymnasium close by, which afterwards became famous as the favorite haunt of Aristotle, and the birthplace of the Peripatetic philosophy. The yet more famous seat of the rival philosophy seems also to have owed something to the Pisistratidæ, for Hipparchus was said to have enclosed the *Academy* with a wall.

The revolution which expelled the Pisistratidæ (510 B.C.), and gave Athens a free government, left its mark upon the topography of the city. The old Pelasgic fortress, in which "the tyrants" had for a time held out, was now broken down, and the site occupied by its ruins was devoted by the Delphic oracle to eternal desolation. Only in the Peloponnesian war, when the country population was crowded within the city walls, do we read of this spot being occupied by dwellings. Another work which may probably be assigned to the age of Clisthenes is the first arrangement of the Pnyx, or place of public assembly.

A building of greater architectural importance and of equal interest belongs to this same period. Dramatic performances at Athens originally took place in wooden theatres extemporised for the occasion; but the fall of one of these led, in the year 500 B.C., to the erection of the marble theatre on a site already consecrated to Dionysus as the Lenæum, upon the S.E. slope of the Acropolis. We may be sure that the first stone theatre was comparatively simple in construction, consisting of an auditorium, with tiers of rock-hewn seats, and an *ὀρχήστρα*, or space for the chorus, while the stage itself and its furniture were of wood. The excavation of the Dionysiac theatre in 1862 has made every one familiar with the row of marble thrones for the various priests and officers of state, the elaborate masonry of the stage, the orchestra floor, and other features. But these and other interesting decorations of the theatre belong to a later age. It was under the administration of Lycurgus the orator (337 B.C.) that the building was first really completed; and many of the sculptures which have been lately brought to light belong to a restoration of the theatre in the 2d, or perhaps even the 3d, century A.D.

Enough has now been said of the condition of Athens before the Persian War. It was surrounded by a ring-wall of narrow circuit, some doubtful traces of which are supposed to remain. At its centre stood the Acropolis, already crowded with temples and sanctuaries, some upon the summit, some built at its foot, and others — like the famous grotto of Pan, on the N.W. slope — mere caves in its rocky sides.

The Persian invasion, which forced the Athenians to take refuge in their "wooden walls," and to leave their city at the mercy of the barbarians, marked an important epoch in the annals of Athenian building. Upon the retreat of Mardonius, the Athenians returned to Attica to find their city virtually in ruins. Its fortifications and public buildings had been destroyed or burnt, and the private dwellings had been wantonly defaced or ruined by neglect. Amid the enthusiasm of hope which followed upon the great deliverance of Greece, a natural impulse led the Athenians to rear their city more glorious from its ruins. Themistocles fanned their patriotism with the foresight of a statesman, and Athens rose again with marvellous rapidity. This haste, however, though creditable to their patriotism, and, indeed, necessary in order to forestall the jealous opposition of Sparta, was not without its evils. The houses were rebuilt on their old sites, and the lines of the old streets, narrow and irregular as they had been, were too readily followed. A similar haste marked the rebuilding of the city walls, a work in which men and women, old and young, took zealous part, not scrupling to dismantle any building or monument, private or public, which could supply materials for the building. But in rebuilding the walls Themistocles gave them a wider circuit, especially towards the N. and N.E. (Thucyd., i. 90, 93). At the same time he determined to construct new harbors, and to fortify the Piræeus, regarding the navy of Athens as her principal source of strength. It is doubtful whether the "Long Walls" formed a distinct portion of his designs; but he may certainly be regarded as the founder of the greatness of Athens, the works and embellishments carried out by Pericles being only a fulfilment of the far-sighted aims of Themistocles. Thucydides makes the circuit of the city wall to be 43 stades (about 5½ miles), exclusive of the unguarded space between walls; this is found to correspond accurately enough with the existing remains. Having completed the defences of the city proper, among which must be included the building of the north wall of the Acropolis, Themistocles proceeded to fortify the Piræeus.

Athens, like most of the old Greek towns, was built, for greater security, at a distance from the coast, and only when more settled times brought her greater prosperity was a harbor formed at the nearest bay of Phalerum, near the modern church of St. George. It is said that Themistocles would gladly have transported the Athenian population bodily from the upper city to the coast, there to form a great maritime state. Though this was impossible, yet he could strengthen Athens on the seaward side. The isthmus of Piræeus, though somewhat more distant than Phalerum, presented obvious advantages as a seaport.

If not a part of the original designs of Themistocles, it was at least a natural development of them, to carry the "Long Walls" from the newly-fortified Piræeus to the upper city, and thus combine them both into one grand system of fortification. The experiment of connecting a town by long walls with its port had been already tried between Megara and Nisæa, and it was now repeated on a grander scale under Cimon. It was Cimon who first set the example of providing the citizens with agreeable places for promenade (Plutarch, *Cimon*, xiii.), by planting the Agora with plane trees, and laying out the Academy with trees and walks. It is probable that some of the porticoes in the Agora were built by Cimon; at all events, the most beautiful one amongst them was reared by Pisianax, his brother-in-law, and the paintings with which Polygnotus, his sister's lover, adorned it (representing scenes from the military history of Athens, legendary and historical) made it ever famous. One more building, the most perfect existing relic of ancient

Athens, was also built by Cimon. The Theseium is a hexastyle Doric temple standing on an eminence due N. of the Areopagus, and is the first object which meets the eye of the tourist who approaches the city from the Piræeus. Having served in Byzantine times for a Christian church, it is now a museum of antiquities, and contains some of the choicest treasures discovered by recent excavations.

We have now brought this sketch of Athenian topography down to the most distinguished period of Athenian history and Athenian architecture — the era of Pericles. As the champion of Hellenic freedom against the Persians, as the head of the Ionic confederation, Athens had suddenly grown to be the foremost city in Greece. But when one by one the confederate states sank into the position of subject-allies; when the supremacy of Athens passed insensibly into a tyranny; when the contribution of ships and men was commuted in most cases for a money payment, and the funds of the confederation were transferred from the Apollonium at Delos to the Athenian Acropolis,—an enormous revenue became at the disposal of the Athenian Government. It is to their credit that so little of it found its way into private pockets. It was natural for the thoughts of a Greek, especially of an Athenian, to turn to the decoration of his city; it was politic that the central city of the Ionian confederacy should be adorned with a beauty equal to her prestige. The buildings connected with the name of Cimon had been chiefly for utility or defence; those of Pericles were mainly ornamental. The first edifice completed by him seems to have been the Odeium, on the E. of the Dionysiac theatre, to serve as a place for recitations by rhapsodists, and for musical performances. It was burnt by Aristion during Sulla's siege of Athens, but afterwards rebuilt. Mention has already been made of the building of the Long Walls and the laying out of the Piræeus by Pericles; but it was the Acropolis itself which witnessed the greatest splendors of his administration. Within its limited area arose buildings and statues, on which the genius of Phidias the sculptor, of Ictinus and Mnesicles the architects, were employed for years; while multitudes of artists and craftsmen of all kinds were busied in carrying out their grand designs. The spoils of the Persian War had already been consecrated under Cimon to the honor of the national goddess, in the erection of a colossal statue of Athena by Phidias between the entrance of the Acropolis and the Erechtheium; her warlike attitude gained her the title of *Προμαχος*, and the gleam of her helmet's plume and uplifted spear was hailed by the homeward seaman as he doubled Cape Sunium (Pausan., i. 28). But the national deity was to receive yet greater honors at the hand of Pericles. He proceeded to rear what has since been known as the Parthenon. It was completed in the year 438 B.C. It stood upon the highest platform of the Acropolis, so that the pavement of the peristyle of the Parthenon was on a level with the capitals of the columns of the east portico of the Propylæa. The temple was built entirely of white marble from the quarries of Mount Pentelicus. Ascending a flight of three steps, you passed through the great east entrance into the Pronaos, wherein was stored a large collection of sacred objects, chiefly of silver. From the Pronaos a massive door led into the *cella*, called Hecatompedos, because it measured in length 100 Attic feet. The treasure here bestowed consisted chiefly of chaplets and other objects of gold. The west portion of the cella was railed off, and formed the *Parthenon* proper, *i.e.*, the adytum occupied by the chryselephantine statue by Phidias of Athena Parthenos, —a work which yielded the pre-eminence only to one other statue by the same artist, viz., the Zeus at Olympia. In this adytum were stored a number of silver bowls and other articles employed at the Panathenaic festivals. The westernmost compartment at the rear of the cella was the Opisthodomus, which served as the national treasury; hither poured in the tribute of the Athenian allies. It is important to remember that the Parthenon was never intended as a temple of worship; for this purpose there already existed another temple, presently to be described as the Erechtheium, —standing upon the primeval site of that contest between Athena and Poseidon which established the claim of the goddess to the Attic citadel and soil. The Parthenon was simply designed to be the central point of the Panathenaic festival, and the storehouse for the sacred treasure. The entire temple should be regarded as one vast *ἀνάθημα* to the national deity, not as a place for her worship. Thus directly in front of her statue in the cella there stood an erection, which has been mistaken for an altar, but which is more probably to be regarded as the platform which the victorious competitors in the Panathenaic contests ascended to receive, as it were from the hand of the goddess, the golden chaplets and vases of olive oil that formed the prizes. This consideration lends significance to the decorations of the building, which were the work of Phidias. Within the outer portico, along the outside of the top of the wall of the building, ran a freize 3 feet 4 inches in height, and 520 feet in total length, on which were sculptured figures in low relief, representing the Panathenaic procession. Nearly all of these sculptures are in the British Museum, and the entire series has been recently made complete by casts from the other fragments, and arranged in the order of the original design. The marvellous beauty of these reliefs, which was heightened originally by color, has been long familiar to all the world from numerous illustrated descriptions. The processions of youths and maidens, of priests and magistrates, of oxen for sacrifice, of flute-players and singers, followed by the youthful chivalry of Athens on prancing steeds — is represented as wending its way from the west towards the eastern entrance. Outside of the building, on the N. and S. sides, the metopes between the Doric triglyphs were filled with sculptures representing scenes from the mythical history of Athens. But the glory of the Parthenon were the sculptures of the E. and W. pediments. Unhappily but a few figures remain, and none are wholly perfect, of the statues which formed these groups; and Pausanias appears to have thought it superfluous to give a minute description of objects so familiar to every connoisseur and traveller.

Opposite to the Parthenon, on the northern edge of the Acropolis, stands another remarkable temple, far smaller in size, and built in the most graceful forms of the Ionic order. The Erechtheium appears to be designed expressly to contrast with the severe sublimity of the Parthenon; and on the side which confronts those mighty Doric shafts, the columns of the smaller building are allowed to transform themselves into Canephori. The temple of Athena Polias, which contained the ancient wooden image of the Goddess, and formed the centre of her worship, suffered from fire in the Persian War (479 B.C.) A building so sacred would hardly have been allowed to remain for long in ruins; but it was reserved for Pericles to set about a complete restoration of it.

Among the many glories of the Acropolis, the Propylæa are described by Pausanias as being exceptionally magnificent (i. 22). They rivalled even the Parthenon, and were the most splendid of all the buildings of Pericles.

From the disastrous termination of the Peloponnesian war to the yet more fatal defeat at Chæroneia, the

architectural history of Athens is a blank, only interrupted by the restoration of the Long Walls and the rebuilding of the fortifications of Piræeus by Conon, both of which had been destroyed by Lysander. The financial genius of the orator Lycurgus, whose administration lasted from 338 to 325 B.C., replenished to some extent the exhausted resources of his country.

The Macedonian period again marks a new epoch in the history of Athenian topography. Hencefoward almost every embellishment Athens received was at the hands of the various foreign princes, whose tastes inclined them to patronise a city so rich in historical associations, and so ready to reward each new admirer with an equal tribute of servile adulation. But whatever decoration the city might owe to royal vanity or munificence, her connection with these foreign potentates brought her far more of injury than advantage. She became entangled in the wars, and usually found herself upon the losing side.

Upon the death of Alexander the Athenians claimed their liberty, but they at once had to submit to Antipater (322 B.C.), who placed a garrison in Munychia. It perhaps was he who defaced the ancient Pnyx; at all events, from this time forward the political oratory of Athens became silent for ever.

Under the rule of the Romans Athens enjoyed the privileges of a *libera civitas*, *i.e.*, no garrison was introduced into the town, no tribute was levied upon it, and the constitution was left unaltered. The Areopagus, indeed, under Roman influence, recovered some of its ancient power, and was made to take precedence of the more democratic assemblies of the Boule and Ecclesia. The revision also of the laws by Hadrian would, of course, introduce some changes. Yet it may surely be maintained that Athens under the Roman dominion was in a far better position than in the days before the taking of Corinth by Mummius, when she had been at the mercy of each successive Macedonian pretender. The Romans appear to have shown a remarkable respect for the feelings of the Athenian people. It would be superfluous here to recall the warm expressions of admiration which fall from Cicero and Horace when speaking of Athens. A visit to Athens was regarded by the educated Roman as a kind of pilgrimage. One great disaster Athens did indeed undergo at the hands of Rome; this was the siege and plunder of the city by Sulla in the Mithridatic War.

It is uncertain at what exact date the Horologium of Andronicus of Cyrrhus was erected, which is generally known as the Tower of the Winds. It is first mentioned by Varro, and is therefore older than 35 B.C., though certainly not earlier than the Roman conquest. This monument, so familiar to every scholar, is described by Virruvius (i. 6, 4) as an octagonal tower of marble. It stands at what anciently formed the eastern extremity of the Roman Agora, presently to be described. On each face, beneath the cornice, is sculptured the figure of the wind which blew from the corresponding quarter; on the top of the roof was a pedestal supporting a bronze triton (now destroyed), which was constructed to turn with the wind, and to point out the wind's quarter with a wand which he held in his hand. The sculptured figures of the winds are in good preservation, though of a declining period of art. They represent the four cardinal points and the intermediate quarters between these. Each has his emblems: Boreas, the north wind, blows his noisy conch; Notus, the rainy south wind, bears his water-jar; Zephyrus, the west wind, has his lap full of flowers, and so on. Under each figure are the remains of a sun-dial; and besides all these external features, the interior was constructed to form a water-clock, supplied with water from the spring at the Acropolis called Clepsydra. Thus in cloudy weather a substitute was provided for the dial and the sun.

The reign of Hadrian made literally a new era in the history of Athens. For Greece, and especially for Athens, this emperor entertained a passionate admiration. He condescended to hold the office of archon eponymus; in his honor a thirteenth tribe, Hadrianis, was instituted; and the emperor shared with Zeus the title of Olympius, and the honors of the newly-finished temple. While, however, many portions of the city bore witness to his munificence, it was in the south-eastern quarter that most of his new buildings arose, in the neighborhood of the Olympium. This suburb was accordingly styled Hadrianopolis, or New Athens, to distinguish it from the old city of Theseus and of Themistocles. The arch of Hadrian still stands in a fairly perfect state, and marks the boundary between the ancient town and the new suburb embellished by Hadrian. At the same time many of the older buildings underwent restoration at his command. Nor was his bounty shown in works of building alone. He ceded to the Athenians the island of Cephallenia, and bestowed upon them large presents of money, and an annual largess of corn.

The immediate successors of Hadrian were guided by his example. Antonius Pius completed an aqueduct which Hadrian had commenced for bringing water into the town from Cephisus. Marcus Aurelius visited Athens for the purpose of initiation at the Eleusinian mysteries.

A few words may suffice to describe the ultimate fate of Athens. In the reign of Valerian the northern barbarians first appeared in the north of Greece, where they laid seige to Thessalonica. This extraordinary apparition having alarmed all Greece, the Athenians restored their city wall, which Sulla had dismantled, and otherwise placed the town in a state of defence sufficient to secure it against a *coup-de-main*. But under Gallienus, the next emperor, Athens was beseiged, and the archonship abolished, upon which the strategos or general, who had previously acted as inspector of the Agora, became the chief magistrate. Under Claudius the city was taken, but recovered soon afterwards. Constantine the Great gloried in the title of General of Athens, which had been conferred upon him, and expressed high satisfaction on obtaining from the people the honor of a statue with an inscription, — a distinction which he acknowledged by sending to the city a yearly gratuity of grain. He also conferred on the governor of Attica and Athens the title of *Μέγας Δοῦξ*, or Grand Duke, which soon became hereditary; and his son Constans bestowed several islands on the city, in order to supply it with corn. In the time of Theodosius I., that is, towards the end of the 4th century, the Goths laid waste Thessaly and Epirus; but Theodorus, general of the Greeks, acted with so much prudence, that he saved the Greek cities from pillage and the inhabitants from captivity, a service which was most gratefully acknowledged. But this deliverance proved only temporary. The fatal period was now fast approaching, and, in a real barbarian, Athens was doomed to experience a conqueror yet more remorseless than Sulla. This was Alaric, king of the Goths, who, under the Emperors Arcadius and Honorius, overran both Italy and Greece, sacking, pillaging, and destroying. Never, indeed, did the fury even of barbarian conquest discharge itself in a fiercer or more desolating tempest. The Peloponnesian cities were overturned; Arcadia and Lacedæmon were both laid waste; the gulfs of Lepanto and Ægina were illuminated with the flames of Corinth, and the Athenian matrons were dragged in chains to satisfy the brutal desires of the barbarians. The invalu-

able treasures of antiquity were removed; stately and magnificent structures were reduced to heaps of ruin; and Athens, stripped of the monuments of her ancient splendor, was compared by Synesius, a writer of that age, to a victim of which the body had been consumed, and the skin only remained.

From the period of the Ottoman conquest, 1455, to the commencement of the insurrection in 1821, Athens was only known in history by two attempts, on the part of the Venetians, to expel the Turks and make themselves masters of the city. The first of these took place in 1464, only nine years after its capture by the Osmanlis, and proved an entire failure. But the second, which was undertaken in 1687, more than two centuries later, was crowned with a temporary and fatal success. In the month of September of that year, Count Königsmark, a Swede in the service of Venice, having disembarked at the Piræeus a force of 8000 foot and 870 horse, forming part of the armament under Francesco Morosini, afterwards doge, marched to Athens, and having summoned the citadel without effect, he erected a battery of heavy ordnance on the hill of the Pnyx, and placing two mortars near the Latin convent at the western foot of the Acropolis, bombarded it for several days. The fire of the cannon was chiefly directed against the Propylæa, and the modern defences below that edifice, whilst the mortars continued, without intermission, to throw shells into the citadel. The consequence was, that the beautiful little temple of Nike Apteros, the frieze of which is now at the British Museum, was completely destroyed by the breaching battery; and the Parthenon, besides being greatly injured by the bursting of the shells, was, towards the close of the attack, almost rent in pieces by the explosion of a powder magazine, which reduced the middle of the temple to a heap of ruins, threw down the whole of the wall at the eastern extremity, and precipitated to the ground every statue on the eastern pediment. The western extremity was fortunately less injured, and a part of the Opisthodomos was still left standing, together with some of the lateral columns of the peristyle adjoining to the cell. But the shock was nevertheless abundantly disastrous; and when the Turks afterwards regained possession of the citadel (from which, on this occasion, they were expelled), they did all in their power to complete the destruction which the Venetians had so vigorously begun, by defacing, mutilating, or burning for lime every fragment of the edifice within their reach.

In the course of the revolutionary war Athens sustained three sieges. The first was that by the Greeks in 1822. Having carried the town by storm, and driven the Turks into the citadel, they established a strict blockade of the fortress, which was continued until the advance of the Pasha with 4000 men induced them to abandon their enterprise, and fly, with the Athenians, to Salimis and Ægina. Two months afterwards, the Pasha having left Athens to the defence of 1500 men, the Greeks again ventured to attack the town, and succeeded in obliging the Turks to seek refuge in the citadel, which they forthwith determined to besiege; but, from ignorance and want of means, no progress whatever was made in the operation until they obtained possession of the well which supplied the garrison with water, when the Turks agreed to capitulate upon condition of being immediately embarked with their families and sent to Asia Minor.

With the liberation of Greece from the yoke of Turkey, begins the history of Modern Athens. Before the transfer of the capital from Nauplia by King Otho, who had been chosen to the throne of the new kingdom, Athens was a wretched village of a few hundred houses. Since that time it has enjoyed a prosperous growth. Modern Athens has been built chiefly on the Eastern and Northern sides of the Acropolis, while the ancient city lay chiefly on the Southern and Western sides, and in its public buildings and newer parks, it reminds one of the better-built German cities. Its present population is about 85,000, that of the Piræus being more than 30,000. It has a gymnasium on the German model, a school for the higher education of girls; several private schools of excellent character; a polytechnic school and a university, which numbers more than fifty professors in the various faculties, and about 1,400 students. A railway connects Athens with the Piræus; and street railroads run to outlying villages. Except in the back streets and remote corners, one would hardly think of Athens as at all an Oriental city. Its two chief business streets, "Hermes" and "Æolus," cross each other at right angles, and divide the city into four nearly equal parts. Of modern public buildings, the most noteworthy are the University, the Academy, which is built almost wholly of marble, and shows with beautiful effect the polychromatic decorations of the ancient Doric style, the Exposition Hall, and the Palace externally an ugly square building, but containing some spacious and handsome salons. Among the most recent erections are a magnificent building for the National Library and a fine theater. Both these structures, as well as the Academy and the Exposition Hall, are the gifts of wealthy Greeks, who reside mostly abroad and take this way of showing their interest in the prosperity of their native country. Athens has become a center of archæological interest and study. Aside from the monuments mentioned above, it has many remains of antiquity stored and exhibited in its three museums. At the Eastern end of the Acropolis, the Archæological Society of Athens has erected a low building in which are preserved the remains and fragments of ancient art, which had been exhumed on the Acropolis. The most noteworthy of these are several slabs of the Parthenon frieze; a few reliefs of the beautiful balustrade of the Temple of Wingless Victory; fragments of the frieze of the Erechtheum, and the fourteen archaic statues of divinities or priestesses found in 1886 west of the Erechtheum. The museum contained in the Polytechnicum embraces the Mycenæ collection made by Doctor Schliemann; a large number of figurines from Tanagra, Myrina and other places, and a collection of vases, illustrative of every period in the history of vase painting.

ATHÊNS, the name of several towns in the United States of America, the chief of which are the following: —(1.) The capital of a county of the same name in the S.E. of the state of Ohio, finely situated on the Hocking river. It is the seat of the Ohio University, and contains 3,000 people. (2.) The capital of Clark county, Georgia, on the W. bank of the Oconee River. It is the seat of the Georgia university, which was founded in 1801, and the central town of a large cotton-growing district. Population (1890), 8,627.

ATHERTON or CHOWBENT, a township in the parish of Leigh and hundred of West Derby, in Lancashire 200 miles from London. It is one of those places which have grown to wealth and populousness through the extension of the cotton trade. Besides its factories, it has collieries and ironworks. Population (1890), 9,000.

ATHIAS, JOSEPH, a celebrated rabbi and printer at Amsterdam, whose editions of the Hebrew Bible are noted for the general correctness of the text.

ATHLETÆ, among the Greeks and Romans, was the designation of persons who contended for prizes in the public games, exclusive of musical and other contests, where bodily strength was not called into play, though

here also the word was sometimes applied, and it was even extended to horses which had won a race, and again metaphorically, *e.g.*, to persons who had exerted themselves in good deeds. On the other hand, the term was restricted so as to exclude those, who, for mere exercise, without the incentive of a prize, practised in the daily gymnastic competitions. Yet it was not the value of the prizes themselves which led men to devote their lives to athletic exercises. That was at most very insignificant. But from the heroic legends of competitions for prizes, such as those at the obsequies of Patroclus, from the great antiquity of the four national games of Greece (the Olympian, Pythian, Nemean, and Isthmian, with the local Panathenæa at Athens), and from the high social position of the competitors in early times, there gradually became attached to victory in one of these games so much glory that the townsmen of a victor were ready to, and frequently did, erect a statue to him, receive him in triumph, and care for him for the rest of his life. Against specially trained athletes the better class of citizens refused to compete, and the lists of the public games being thus left practically open only to professionals, training became more a matter of system and study, particularly in regard to diet, which was rigorously prescribed for the athletes by a public functionary, styled the Aleiptes, who also had to salve their bodies when practising. At one time their principal food consisted of fresh cheese, dried figs, and wheaten bread. Afterward meat was introduced, generally beef or pork; but the bread and meat were taken separately, the former at breakfast, the latter at dinner. Except in wine, the quantity was unlimited, and the capacity of some of the heavy weights must have been, if such stories as those about Milo are true, enormous. Cases of death from apoplexy are not unknown among them. The Tarentine Iccus was an example of the strictest abstinence. Their instruction consisted, besides the ordinary gymnastic exercises of the palæstra, in carrying heavy loads, lifting weights, bending iron rods, striking at a suspended leather sack filed with sand or flour, taming bulls, &c. Boxers had to practice delving the ground, to strengthen their upper limbs. The competitions open to the athletes were in running, leaping, throwing the discus, wrestling, boxing, and the Pancratium, or combination of boxing and wrestling. Victory in this last was the highest achievement of an athelete, and was reserved only for men of extraordinary strength. The competitors were naked, having their bodies salved with oil. Boxers wore the *cæstus*, *i.e.*, straps of leather, round the wrists and forearms, with a piece of metal in the fist, which was sometimes employed with great barbarity. An athlete could begin his career as a boy in the contests set apart for boys. He could appear again as a youth against his equals, and though always unsuccessful, could go on competing till the age of 35, when he was debarred, it being assumed that after this period of life he could not improve. It sometimes happened that an athlete would agree to allow his rival to win; but for that and other cases of dishonesty a fine was imposed, and the money expended in erecting statues, with warning inscriptions. The most celebrated of the Greek athletes whose names have been handed down are Milo, Hipposthenes, Polydamas, Promachus, and Glaucus. Cyrene, famous in the time of Pindar for its athletes, appears to have still maintained its reputation to at least the time of Alexander the Great; for in the British Museum are to be seen six prize vases carried off from the games at Athens by natives of that district. These vases found in the tombs, probably, of the winners, are made of clay, and painted on one side with a representation of the contest in which they were won. and on the other side with a figure of Pallas Athena, with an inscription telling where they were gained, and in some cases adding the name of the eponymous magistrate of Athens, from which the exact year can be determined. Among the Romans, fond as they were of exhibitions of physical skill and strength, the profession of athletes was entirely an exotic, and was even under the empire with difficulty transplanted from Greece. The system and the athletes themselves were always purely Greek.

ATHLETIC SPORTS. Although this term is undoubtedly derived from the ancient, the derivation does not exactly indicate its present meaning, inasmuch as our modern athletes are distinctly defined to be amateurs, in contradistinction to professionals. In fact, the former pursue the agonistic art, and should be styled "agonistics," if we may be allowed to invent such a word, rather than athletes. How the pastime came to be thus named in Britain some thirty years ago it is hard to say. Till about 1860, all exercises wherein the feet played the principal part were rightly styled "pedestrianism." Up to that period all prizes, whether contended for by amateurs or professionals, were invariably in money. As the practice of the pastime, however, rapidly spread amongst the former, it was naturally found they were loth to compete on the same terms with, and for similar trophies as, the latter. Hence arose the modern definition of an amateur athlete, viz., "Any person who has never competed in an open competition, or for public money, or for admission money, or with professionals for a prize, public money, or admission money; nor has ever at any period of his life, taught, or assisted in the pursuit of athletic exercises as a means of livelihood; nor is a mechanic, artisan, or laborer." The moment this definition was brought into force a wide barrier arose between the two classes, and amateurs ceased to compete for money prizes amongst themselves, or against professionals, on any terms, unless they were willing to forfeit their status.

ATHLONE, a market-town and parliamentary borough of Ireland, lying partly in West Meath and partly in Roscommon, 76 miles west of Dublin. The river Shannon divides the town into two portions, which are connected by a handsome bridge, opened in 1844. The rapids of the Shannon at this point are avoided by means of a canal about a mile long, which renders the navigation of the river practicable for 71 miles above the town. Population (1890), 9,000.

ATHOL, a thriving town, situated in Worcester county, Mass., and the center of considerable commercial enterprise. Population (1890), 6,318.

ATHOR, ATHYR, HATHOR, the name of the Egyptian divinity corresponding to Aphrodite or Venus. Her name meant "the abode of Hor" or Horus, and she was the mother of that deity in some of his types, and as such a form of Isis, of whom she was a higher or celestial manifestation. Her name occurs as early as the 4th dynasty, when she is styled the mistress of the tree, or sycamore, *neha*, or the tree of the south. The solar deities Shu and Tefnut were her children. In certain legends she is mentioned as the seven cows of Athor, which appear in the Ritual or Book of the Dead. These cows, like the *Moiræ*, or fates of Greek mythology, appeared at the birth of legendary persons, and predicted the course and events of their lives. It is in this capacity that Athor is connected with Ptah, or the Egyptian Hephæstus, and is allied to Sekhet or Bast, called the wife or mistress of Ptah, the seven cows being the mystical companions of the Apis, the second life or incarnation of the god of Memphis. She was also represented under the attributes and with the titles of the goddess Nut, or the Egyptian Rhea. The cow of Athor wore on its head the solar disk. and hawk feather

plumes; like Amen Ra; and in this character as the great cow she has on some monuments her human head replaced by that of a cow wearing a disk, or the disk and plumes. This emblem also appears in her type at a later period, when her head is represented with long tresses curled into a spiral at the end, and the has the ears of a cow instead of human ears. Her head is then surmounted by a doorway or its cornice, emblem of the abode of the sun, which she represented. This is sometimes surmounted by the disk and horns. The third month of the Egyptian year was named Athor after her, and the fish *aten* or latus, a kind of carp, was sacred to her.

ATHOS is, strictly speaking, the terminal peak of the most eastern of the three peninsular promontories which stretch south from the coast of Turkey (*Macedonia*), like the prongs of a trident, into the Archipelago. The name is, however, frequently extended to the whole peninsula which was formerly known as Acte. The peak rises like a pyramid, with a steep summit of white marble, to a height of 6780 feet, and can be seen at sunset from the plain of Troy on the one hand, and on the other from the slopes of Olympus. The whole peninsula is remarkable for the beauty of its scenery, with rocky heights and richly-wooded flanks, ravines "embowered from the light," and glimpses of free outlook over the surrounding sea. The climate is for the most part healthy and pleasant, though the western side is perhaps too much exposed to the heats of summer; and Lucian assures us that in ancient times the inhabitants were famous for longevity. Several towns, such as Sane, Dium, Olophyxus, Cleonæ, are mentioned by Greek and Latin writers as existing in the Peninsula; but none of them seem to have attained any great importance, and the most remarkable event in the ancient history of Athos is the construction by Xerxes of a ship-canal across the isthmus between the outer sea and the Singitic gulf. Traces of this canal, which was regarded by Juvenal as a Greek myth, have been found almost right across the neck of land, and leave no doubt of the truth of the story. In more modern times the district of Athos has been famous for the number of hermits and monks that have found shelter in its retreats. No fewer than 935 churches, chapels, and oratories are said to exist, and many of the communities possess considerable wealth. It is believed that, with the exception of the dwellings of Pompeii, some buildings in Athos are the oldest specimens of domestic architecture in Europe; the shrines are in many cases richly decorated with goldsmith's work of great antiquity; the wealth of the monastic libraries in illuminated manuscripts has been long celebrated; and nowhere can the Byzantine school of painting be studied with equal advantage. The date of the oldest religious foundation in the peninsula is not clearly ascertained, and the traditional chronology of the monks themselves can hardly be trusted.

ATHY, a market-town of Ireland, county of Kildare, 34 miles S.W. of Dublin. It is a station on the Great Southern and Western Railway, and is intersected by the river Barrow, which is here crossed by a bridge of five arches. Population (1890) 48,000.

ATINA, a town of Naples, province of Terra di Lavoro, near the Melfa and 12 miles S. E. of Sora. It has a cathedral, convent, and hospital, and about 5000 inhabitants; but it is chiefly remarkable for its ancient remains, consisting of portions of its walls, the ruins of an extensive aqueduct, and numerous other structures, besides monuments and inscriptions. The city is of great antiquity, and was a place of importance down to the days of the Roman empire. It is remarkable now, as of old, for the exceptional coolness of its situation.

ATITLAN, a lake in the department of Solola, in Guatemala, 20 miles long, with an average breadth of 9 miles. It seems to occupy the crater of an extinct volcano, and its depth is reported to be very great.

ATLANTA, the capital of Georgia, is situated about seven miles southeast of the Chattahoochee river, at an elevation of 1,100 feet above the sea. It was laid out in 1845, and became a city in 1847. It is the seat of extensive manufacturing interests, there being 590 factories, with an invested capital of $14,500,000 and an annual product of $29,000,000. Eight large trunk lines of railroad center here. Atlanta contains the State capitol (cost $1,000,000), court-house, United States building, chamber of commerce, Confederate Home, many hospitals and asylums; sixteen schools, costing $320,000, and seventy-three churches, valued at $1,500,000. The city is lighted by gas and electricity, has twenty-five miles of main sewers, and new water-works taking an unlimited supply from the Chattahoochee river. There are fifty-five miles of electric, steam, dummy, and other street railroads; a fire department of fifty-five men, and a police force of 106 men. The city receipts in 1889 were $1,168,518; the expenditures $944,952. The assessed valuation is $75,000,000, and the tax levy is limited to one-half per cent. During the war Atlanta was the scene of extensive military operations. (See UNITED STATES, JOHNSTON, JOS. E., and SHERMAN, WM. T.) The census of 1890 shows a population of 67,515.

ATLANTIC, capital of Cass county, Iowa, eighty-two miles west by south of Des Moines. It has two banks, printing offices, graded schools, and six churches, and a population (1890) of 4,300.

ATLANTIC CITY, a watering place on the eastern coast of New Jersey, in Atlantic county. Population, 13,000, largely increased in the summer season.

ATLANTIC OCEAN. This designation, originally given to the sea that lies beyond the range of Atlas in North-western Africa, has come to be applied, with the extension of geographical knowledge, to the whole of that vast ocean which occupies the wide and deep trough that separates the New from the Old World. Its limits are variously defined; some geographers regarding it as extending from pole to pole, whilst others consider it as bounded at its northern and southern extremities by the Arctic and Antarctic circles respectively. As the peculiarity of the physical conditions of the Polar Seas renders it on every account more appropriate to describe them under a separate head (POLAR REGIONS), the Atlantic will be here treated as bounded at the north by the Arctic circle, which nearly corresponds with the natural closing-in of its basin by the approach of the coasts of Norway and Greenland with Iceland lying between them; while at the south, where the basin is at its widest, its only boundary is the Antarctic circle. The line which separates its southern extension from the Indian Ocean may be considered to be the meridian of Cape Agulhas, the southernmost point of the African continent; whilst the boundary between the South Atlantic and South Pacific would be formed in like manner by the meridian of Cape Horn. Although the Baltic and Mediterranean are commonly regarded as appendages to the Atlantic, yet their physical conditions are so peculiar as to require separate treatment.

Every physical geographer who has written upon the Atlantic has noticed the curious parallelism between its eastern and its western borders,—their salient and retiring angles corresponding very closely to each other. Thus, beginning at the north we see that the projection formed by the British Islands (which extends much further westwards at 100 fathoms below the surface than it does above the sea-level), answers to the wide entrance to Baffin's Bay; whilst, on the other hand, the projection of the American coast at Newfoundland answers to

the Bay of Biscay. Further south, the great rounded prominence of Northern Africa corresponds with the vast bay that stretches from Nova Scotia to St. Thomas; whilst the angular projection of South America towards the east corresponds with that receding portion of the mid-African coast-line which is known as the Gulf of Guinea.

This correspondence suggested to Humboldt the idea that the Atlantic basin was originally excavated by a very violent rush of water from the south, which, being repulsed by the mountain ranges of Brazil, was directed by them towards the coast of Africa, and formed the Gulf of Guinea; being there checked and turned to the west by the mountains of Upper Guinea, the stream excavated the Caribbean Sea and the Gulf of Mexico; and issuing thence, it ran between the mountains of North America and Western Europe, until it gradually diminished in velocity and force, and at length subsided. Another writer speaks of the basin of the Atlantic as an immense rift, made by some terrible force, which rent the surface-land asunder, but left the edges of the ravine to show by their form that they had once been connected. For neither of these speculations, however, is there the smallest foundation in fact. What has to be accounted for, indeed, in regard to either of the great areas at present covered by water, is not so much the excavation of its sea-bed, as its segregation from an ocean originally universal by the boundaries that now enclose it; in other words, not so much the depression of the bottom of its basin as the elevation of its sides. Not only is the proportion of the land-surface of the globe to its water surface scarcely more than one-third (being as 1 to 2.78), but the entire mass of the land which thus covers little more than one-fourth of the surface of the globe is quite insignificant in comparison with that of the water which covers the remaining three-fourths. For whilst the average elevation of the whole land is certainly less than one-fifth of a mile, giving from 9 to 10 millions of cubic miles as the total mass of land that rises above the sea-level, the average depth of the sea (so far as at present known) may be taken at about 2 miles, giving a total of nearly 290 millions of cubic miles of water, which is therefore about *thirty times* the mass of the land. From the computation of Keith Johnston, it appears that, "if we conceive an equalising line, which, passing around the globe, would leave a mass of the earth's crust above it, just sufficient to fill up the hollow which would be left below it, this line would then fall nearly a mile below the present level of the sea." This is tantamount to saying that, if the solid crust of the earth could be conceived to be smoothed down to one uniform level, its entire surface would be covered with water to the depth of about a mile. Hence it is obvious that as the elevation of that crust into land over certain areas must be accompanied by a corresponding depression of the sea-bed over other areas, such depression, augmenting in those areas the previous depth of the aqueous covering of the globe, would be quite sufficient to account for the existence of the great oceanic basins, without any excavating action. And a confirmation of this view is found in the fact, ascertained by recent surroundings, that the deepest local depressions of the sea-bed are met with in the neighborhood of islands that have been raised by volcanic agency. Further, as the quantity of solid matter that must have been removed (on Humboldt's hypothesis) in the excavation of the Atlantic valley must have been nearly four times as great as that which forms the whole known land of the globe, and as it is impossible to conceive of any mode in which such a mass can have been disposed of, we may dismiss that hypothesis as not only untenable in regard to the Atlantic basin, but as equally inapplicable to any other valley of similar width and depth.

The general direction of geological opinion, indeed, has of late been, on physical grounds, towards the high antiquity of the great oceanic basins, not exactly as at present bounded, but as areas of depression having the same relation as they have now to the areas of elevation which form the great continents. Thus Sir Charles Lyell was strongly impressed by the fact that the mean depth of the sea is not improbably fifteen times as great as the mean height of the land; and that the depressions of the sea-bottom to a depth of three miles or more extend over wide areas, whilst elevations of the land to similar height are confined to a few peaks and narrow ridges. Hence, he remarked, "while the effect of vertical movements equalling 1000 feet in both directions, upward and downward, is to cause a vast transposition of land and sea in those areas which are now continental, and adjoining to which there is much sea not exceeding 1000 feet in depth, movements of equal amount would have no tendency to produce a sensible alteration in the Atlantic or Pacific Oceans or to cause the oceanic and continental areas to change places. Depressions of 1000 feet would submerge large areas of the existing land; but fifteen times as much movement would be required to convert such land into an ocean of average depth, or to cause an ocean three miles deep to replace any one of the existing continents." And Professor Dana, who, more than any other geologist, has studied the structure of the existing continents and the succession of changes concerned in their elevation, has been led, by the consideration of the probable direction of the forces by which that elevation was effected, to conclude that the defining of the present continental and oceanic areas began with the commencement of the solidification of the earth's crust. "The continental areas are the areas of the least contraction, and the oceanic basins those of the greatest, the former having earliest had a solid crust. After the continental part was thus stiffened, and rendered comparatively unyielding, the oceanic part went on cooling, solidifying, and contracting throughout; consequently, it became depressed, with the sides of the depression somewhat abrupt. The formation of the oceanic basins and continental areas was thus due to 'unequal radial contraction.'" In the opinion of Professor Dana, there has never been any essential change in the relations of these great features. "It is hardly possible," he says, "to conceive of any conditions of the contracting forces that should have allowed of the continents and oceans in after time changing places, or of oceans, as deep nearly as existing oceans, being made where are now the continental areas; although it is a necessary incident to the system of things that the continental plateaus should have varied greatly in their outline and outer limits, and perhaps thousands of feet in the depths of some portions of the overlying seas, and also that the oceans should have varied in the extent of their lands." . . . "The early defining, even in Archæan times, of the final features of North America, and the conformity to one system visibly marked out in every event through the whole history — in the positions of its outlines and the formations of its rocks, in the character of its oscillations, and the course of the mountains from time to time raised — sustain the statement that the American continent is a regular growth. The same facts also make it evident that the oceanic areas between which the continent lies have been chief among the regions of the earth's crust that have used the pent-up force in the contracting sphere to carry forward the continental developments. If this was true of the North American continent, the same in principal was law for all continents."

Dimensions of the Atlantic.—The length of the At-

lantic basin, considered as extending from the Arctic to the Antarctic circle, is nearly 8000 geographical miles. The nearest approach of its boundaries is between Greenland and Norway, whose coasts are only about 800 miles apart. They thence recede from each other towards the south, as far as the parallel of 30° N. lat., where, between the peninsula of Florida and the western coast of Marocco, there is an interval of 70° of longitude, or about 3600 geographical miles. The channel then rapidly narrows as it passes southward, so that between Cape St. Roque in Brazil (5° S. lat.) and the coast of Sierra Leone (between 5° and 8° N. lat.) the African and American continents approach within 1500 miles of each other. The sudden eastward recession of the African coast as it approaches the equator, and the westward trend of the South American coast-line between Cape St. Roque and Cape Horn, widen out the South Atlantic basin to the same breadth as that of the North Atlantic in the parallel of 30° N., — the interval between the Cape of Good Hope and the estuary of La Plata, in the parallel of 35° S., being no less than 73½° of longitude, or about 3600 geographical miles.

The depth of the North Atlantic has been more carefully and systematically examined than that of any other oceanic basin; and the general contours of its undulating sea-bed may now be regarded as pretty well determined. The greatest depth determined by the recent "Challenger" soundings, which was that of a limited depression about a hundred miles to the north of St. Thomas, is 3875 fathoms, or about 4.4 miles. Except in the neighborhood of its coast-lines, and in certain shallower areas to be presently specified, the floor of the basin at its widest part seems to lie at a depth of from 2000 to 3000 fathoms, its slopes being extremely gradual. The central portion of the principal basin of the North Atlantic, however, is occupied by a plateau of irregular shape, of which a considerable part lies at a less depth than 2000 fathoms. Of this plateau the Azores may be regarded as the culmination; and that group being taken as its centre, it may be said to extend to the north as far as lat. 50°, and to the south-west as far as the tropic of Cancer. The northern extension of this plateau narrows out into a sort of isthmus, which connects it with the plateau that occupies a great part of the Atlantic basin to the north of 50° N. lat.; and it is across this isthmus, and along the bottom of the deep narrow valley on either side of it, that the telegraph cables are laid between Ireland and Newfoundland.

Generally speaking, the depths of these valleys increase pretty rapidly with the distance from the shore-line, so that the contour-lines of one and two miles follow the shore-lines pretty closely. But there are two localities in which shallow water extends to a much greater distance from land than it appears to do elsewhere. One of these lies in the neighborhood of the British Isles. For a distance of about 230 miles to the westward of Ireland there is a slope of only about 6 feet in a mile; but in the next 20 miles there is a fall of 9000 feet, after which there is little change of level for 1200 miles. Hence as the depth of the sea immediately surrounding the British Isles is nowhere 100 fathoms (so that an elevation of their whole area to that amount would unite these islands not only to each other but also to the continent of Europe), it is obvious that the platform on which they rest is really, although now submerged, a part of the land-mass of Europe. Another of these extensive shallows is that of which the Banks of Newfoundland form the highest part; and of the existence of this a probable explanation may be found in the accumulation of the rock-masses that are brought down by icebergs every summer from the coasts of Greenland and Labrador. For it is now generally admitted that these icebergs are really parts of glaciers, that were originally formed on the mountain-slopes of Greenland and Labrador, and then descended valleys which open out on their coasts, so as, on arriving at the mouths of these valleys, to detach themselves and float away, being borne southwards by the Polar Current to be presently described. Most Arctic icebergs of which a near view can be obtained are observed to have upon them a considerable number of pieces of rock, sometimes of a very considerable size; and these are of course deposited on the sea-bed when the icebergs melt (which they usually do on the borders of the Gulf Stream), thus forming a vast conglomerate bed, to which parallels are not improbably to be found in various geological epochs.

Geological Age of the Atlantic Basin. — Guided by the principle that great oceanic basins are to be considered rather as original marine areas that have been limited by the elevation of their boundaries, than as having been formed by the excavation of terrestrial areas, we have to inquire what evidence there is that the basin of the Atlantic has undergone any considerable change within a comparatively recent period.

As has been pointed out by Prof. Wyville Thomson, it is difficult to show that any oscillations have occurred in the north of Europe since the termination of the Secondary period, to a greater extent than from 4000 to 5000 feet, — this being the extreme vertical depth between the base of the Tertiaries and the highest point at which Tertiary or post-Tertiary shells are found on the slopes and ridges of mountains. Such oscillations, while considerably modifying the boundaries of the Atlantic, would not seriously affect the condition of the deeper parts of its sea-bed; and hence it may be concluded that the two deep valleys, one on the European side of the modern volcanic platform of the Azores, and the other on the American, each having a width of 600 or 700 miles, and an average depth of 15,000 feet, could neither have been formed by such oscillations, nor could, when once formed, have been converted into dry land. It will be presently shown that this idea of the existence of an Atlantic basin corresponding generally to that now existing, as far back as the later Secondary period, is strongly supported by the evidence recently obtained of the continuity of animal life on the Atlantic sea-bed from the Cretaceous epoch to the present time.

Important information as to the changes which the sea-bed of the Atlantic has undergone within the later geological periods, may be gathered from the structure of the islands which lift themselves above its surface. Along its eastern border, at no considerable distance from the coast of North Africa, there are three principal groups, — the Madeiras, Canaries, and Cape Verd, — all of which have an evidently volcanic origin, and rise up from the eastern slope of the basin, where it is progressively shallowing towards its continental shore-line. Further out, in mid-ocean, lies the group of the Azores, which also is volcanic, and rises from the plateau already spoken of; but between this area and the slope from which the Maderias and Canaries are based is a very deep channel, ranging downwards to at least 15,000 feet; and a like depth is also found between the Azores and the coast of Portugal. The structure of all these groups of islands gives obvious indications of their formation by separate igneous eruptions in a sea of great depth; and the earliest of these eruptions seems to have taken place in the later Miocene period. As soon as the first solid lavas raised their heads above water, and were thus exposed to the action of the waves, fragments were detached and rounded on the shore; and these being swept off, with the *débris* resulting from their attrition, formed deposits of various kinds upon the slope of the cone, in which corals, shells, &c., were imbedded. These

fossiliferous deposits have been subsequently elevated to heights from 1500 to 2000 feet above the level of the sea, showing a rise of the base of the craters; progressive additions have been made to their upper part by the piling up of basaltic and trachytic lavas. That this state of activity still continues is proved by the fact that in 1811 a new island was temporarily formed in the Azores group, off St. Michael, by the throwing-up of ashes, and the formation of a cone about 300 feet high, with a crater in the center. This island, to which the name Sabrina was given, was soon washed away by the waves. And only a few years since, another submarine eruption in this neighborhood was indicated by earthquakes, jets of steam and columns of smoke, and floating masses of scoriæ. All these considerations concur (as Sir Charles Lyell, *loc. cit.*, justly urges) to negative on geological grounds the hypothesis which has been advocated by some eminent naturalists, that the Azores, Madeiras, and Canaries are the last remaining fragments of a continuous area of land which once connected them with the west of Europe and North Africa.

Proceeding to the south of the equator, we meet with similar evidence of volcanic activity in the structure of the only two islands, Ascension and St. Helena, which lie near the line stretching from the Cape Verd group to the Cape of Good Hope; and these also arise from a plateau of considerably less depth than the circumjacent area whose eastern slope gradually shallows to the coast of South Africa. This plateau stretches in a north-westerly direction towards the equator, so as to meet it from 20° to 22° W. long.; and here indications of volcanic activity — earthquakes, troubled water, floating scoriæ, and columns of smoke — have been several times observed since the middle of the last century, betokening the probable formation of an island or an archipelago in that locality.

Nearly midway between the southern prolongations of the African and American continents, the solitary peak of Tristan da Cunha lifts itself above the ocean; this also is volcanic, and seems to rise from a broad base of general elevation, resembling the plateau of the North Atlantic.

The entire chain of the Greater and Lesser Antilles, which stretches from the delta of the Orinoco to the peninsula of Florida, and forms the eastern boundary of the Carribbean Sea, seems to have been in like manner elevated by volcanic action. That this elevation, like that of the groups of islands on the eastern side of the Atlantic, took place for the most part during the later Tertiary period, is shown by the occurrence of shells, corals, &c., of upper Miocene age, in the upraised sedimentary beds of several of the islands; while the presence of "fringing reefs" of coral around the shores of many of the West India islands is an indication that they lie in a area in which elevation is still proceeding. The channels by which they are separated are so deep as to render it very unlikely that there was ever a continuity of land between them; and the occasional recurrence of earthquakes and volcanic eruptions at different points of this "line of fire," shows that the plutonic action by which the islands were raised is still going on beneath.

The case is very different, however, in regard to the Bermuda group, which constitutes a singular exception to the general fact of the absence in the Atlantic of those coral islands that are so numerous in the Pacific. This group consists of about 300 islands, of which, however, only five are of any considerable size; and these rise from a shoal or platform of about 23 miles long by 13 miles broad, the channels between the islands being very shallow, while at a small distance from the edge of the shoal, the bottom rapidly deepens to 15,000 feet. The islands are entirely composed of upraised beds of coral, shells, &c. (the highest elevation being only about 180 feet above the sea-level); and the shoal itself appears to have the like structure throughout, no traces of any other rock than a limestone formed by the metamorphoses of coral being anywhere met with. Hence, as this insular platform proves to be the summit of a submarine column of 15,000 feet high, rising from a very small base, and as nothing we know of the structure of mountains—volcanic or other—would justify us in supposing that a column of such a height could be formed in any other way than by coral growth, the structure of the Bermuda group would seem to indicate a progressive subsidence of the bed of this part of the Atlantic during its formation, corresponding to that which (according to the well-known views of Mr. Darwin) is at present in progress over a large area of the Pacific. It is probable that this coral growth was determined in the first instance by the existence of a submarine mountain, of which the summit lay near the surface, or lifted itself above it; that as soon as this came to be submerged, the coral formation commenced; and that by its continued growth at the summit, at a rate equal to that of the subsidence of its base, the platform has been kept up to the sea-level. The slight elevation which has raised its highest portion above that level may not improbably have taken place in connection with the much larger recent elevations already referred to.

Thus, then, we have evidence of considerable recent local modifications in the level of the Atlantic sea-bed, without any such change as would affect its general character as an ocean basin; while all geological probability seems in favor of the remoteness of the principal depression of the Atlantic area, even if we do not regard it as dating back to the period when the surface of the globe was first undergoing solidification.

Currents of the Atlantic.—By the term "current" will be here meant that *sensible* movement of ocean water in particular directions which can be generally traced, directly or indirectly, to the action of wind upon its surface. A current thus directly impelled by wind is termed a "drift-current," whilst a current whose onward movement is sustained by the *vis a tergo* of a drift-current" is called a "stream-current." But there is another source of current-movement, which has been overlooked by most writers on this subject, namely, the indraught which necessarily takes place to keep up the level of any area from which the surface-water is constantly being drifted away. Such currents, which may be designated as "indraught" or "supply currents" complete the "horizontal circulation" that must necessarily take place in any oceanic area of which one part is subjected to the action of a wind almost constantly blowing in the same direction. Of such a circulation we have a very characteristic example in the South Atlantic, the principal currents of which we shall see to be very easily accounted for.

The initial movement of the current-system, alike of the North and of the South Atlantic, is given by the trade-winds, which are continually driving the water of the inter-tropical region from the African towards the American side of the basin, so as to produce what is known as the *Equatorial Current.* The position of the northern and southern boundaries of this current shifts, like the area of the trade winds, in accordance with the northward and southward declination of the sun;—a steady westward drift being generally met with to the north of the tropic of Cancer in the summer of the northern hemisphere, and to the south of the tropic of Capricorn in the summer of the southern, whilst in the winter of each hemisphere the border of the drift

lies within the tropic of that hemisphere. But as the *thermal* equator lies from two to three degrees to the north of the *geographical* equator, the entire zone of the trade-winds, and of the Equatorial Current propelled by them, is wider on the northern than on the southern side of the latter; and while the northerly trade often reaches 30° N. in July, and rarely extends south in January within 2° or 3° of the geographical equator, the southerly trade does not extend farther than 25° S. in January, and generally crosses the equator in July, even extending occasionally as far as 5° N. As between the northerly and southerly trades there is a region of "equatorial calms," so there is a corresponding interval between the northern and southern divisions of the Equatorial Current; and in this interval there is a counter-current (resembling the "back-water" often to be noticed in a stream that is flowing rapidly past some obstacle, such as a vessel at anchor, or a projecting river-bank), that runs eastwards, sometimes with considerable velocity, towards the Bight of Biafra, which may be considered the "head-water" of the Equatorial Current. From the recent observations of Capt. Nares in the "Challenger," it appears that the Equatorial Current, like other drift-currents, is very shallow, its depth being not much greater than 50 fathoms. He estimates its rate at the surface to be about 0.75 miles per hour, or 18 miles per day, whilst at 50 fathoms it only moves at about half that rate. Its surface temperature generally ranges between 75° and 80°; but the thermometer falls to 60° at a depth of little more than 100 fathoms,—the temperature of this belt of water, as will be hereafter shown, being kept down by the continual rising of polar water from below.

The Equatorial Current passes directly across the Atlantic towards the chain of the Antilles and the coast of South America; and as not only the whole of the northern division, but a considerable part of the southern, strikes the American coast-line to the north of the salient angle of Cape St. Roque (about 5° S. lat.), the portion of the current which is deflected into the northern hemisphere is much greater than that which is turned to the southward. It is a general fact, that where a current encounters any partial obstruction,—such as a coast-line meeting obliquely, a narrowing of its channel, the lateral pressure of another current, or even that of a mass of stationary water,—its velocity increases; and so the portion of the Equatorial Current that is pressed to the northward by the coast-line between Cape St. Roque and the mouth of the Orinoco (known in the first part of its course as the *Cape St. Roque Current*, and afterwards as the *Guiana Current*) acquires a greatly augmented rate, running ordinarily at the rate of from 30 to 50 miles, and occasionally at a rate of 80 miles, in the 24 hours. Entering the Caribbean Sea, it is reinforced by the portion of the Equatorial Current which flows in between the Lesser Antilles; and it then passes westwards along the northern coast of South America, until it is deflected northwards by the coast-line of Central America, and driven between the peninsula of Yucatan and the western extremity of Cuba into the Gulf of Mexico, at the rate of from 30 to 60 miles per day. A portion of it passes direct to the N.E. along the northern shore of Cuba; but by far the larger part sweeps round the gulf, following the course of its coast-line, and approaches the coast of Cuba from the N.W. as a broad deep stream of no great velocity, seldom running at more than 30 miles per day. The reunited current, being met by the Equatorial Current from the outside, which is pressing to the west along the north coast of Cuba and between the Bahama isles, is deflected northwards through the passage termed the Florida Channel, which is bounded on the one side by the southern extremity of the peninsula of Florida, and on the other by the coast of Cuba and the Bahamas. The rate of movement of the powerful current that flows through this channel, henceforth known as the *Gulf Stream*, is considerably augmented in its narrowest part, which is also its shallowest; but although its velocity sometimes reaches 4 (nautical) miles per hour, or even more, its *average* rate through the whole year may be confidently stated at not more than 2 miles per hour, or 48 miles per day.

The Gulf Stream current, however, does not by any means occupy the whole of the sectional area of the Florida Channel; for it is separated from the American coast by a band of cold water, which occupies about three-eighths of its total breadth of 40 miles, and which also dips under the outflowing current. The movement of the cold superficial band is perceptibly inwards, and that of the cold under-stratum is presumably so; and it is the opinion of the American surveyors that the depth of the warm outward current is not more than one-third of that of the channel through which it flows. It is probable that the rate of movement decreases from the surface downwards; but upon this point we have as yet no certain information. The meaning of the cold inflow will hereafter become apparent.

The course taken by the Gulf Stream in the first instance is nearly parallel to the line of the United States coast, from which it is everywhere separated by a band of cold water,—the boundary line between the two being so distinct as to be known as the "cold wall." It does not show for some time any great disposition to spread itself out laterally, though a division into alternate bands of warmer and colder water, the cause of which seems to lie in the contour of the bottom of the Florida Channel, becomes perceptible before it reaches Charleston, and is very marked off Cape Hatteras. The Stream there presents the form of a fan, its three warm bands spreading out over the Atlantic surface to an aggregate breadth of 167 miles, whilst two cold bands of an aggregate breadth of 52 miles are interposed between them. The innermost warm band is the one which exhibits the highest temperature and greatest rate of flow, its velocity being greatest where it is pressed on laterally by the Arctic Current, so that a rate of 4 miles per hour is occasionally observed. Capt. Nares estimates the depth of the Stream in this part of its course at about 100 fathoms, and its rate of flow in the line of most rapid movement at 3 miles per hour. The outermost band, on the other hand, graduates insensibly, both as to temperature and rate of movement, into the general surface-water of the Atlantic. It is when passing Sandy Hook that the Gulf Stream takes its decided turn eastwards,—this change in its direction being partly due to the eastward bend of the United States coast-line, and partly to the *excess of easterly momentum* which it brings from the lower latitude in which it issued from the Florida Channel. Its general rate of flow past Nantucket seems not to exceed 1 mile per hour, and to be frequently less; but several degrees to the eastward of this, the current has been found occasionally running at the rate of 4 miles an hour,—this acceleration being probably due to the lateral pressure of the *Arctic Current*, which, during the early months of the year, is driven southwards at the rate of 10 or 12 miles per day by the N. and N.W. winds then prevailing along the coast of Labrador, and which, turning westwards round the south of Newfoundland, keeps close to the coast of the United States (being left behind in the rotation of the earth, in consequence of its *deficiency* of easterly momentum), and follows it southwards, everywhere separating it from the Gulf Stream.

By the gradual thinning-out and expansion of the

Gulf Stream after passing the Banks of Newfoundland, by the progressive reduction of its rate of movement, and by the loss of that excess of temperature which previously distinguished it, as well as of its peculiar blue color (which probably depends on its holding in suspension the finest particles of the river-silt brought down by the Mississippi), this remarkable current so far loses all its special attributes, as to be no longer recognisable to the east of the meridian of 30° W. long.,—there degenerating into the general easterly drift of that region of the Atlantic which is kept up by the prevalence of westerly winds, sometimes called "anti-trades." When the Florida Current or true Gulf Stream can last be distinctly recognised, it forms a stratum not more than 50 fathoms in thickness; and it is there flowing *almost due east*, at a rate which would require about 100 days to bring it to the Land's End. The only valid evidence of the extension of any part of it to the western shores of Europe (the amelioration of their temperature being otherwise accounted for, while the transport of trunks of trees, drift-timber, fruits, shells, &c., to the Western Hebrides, the Orkney, Shetland, and Faroe islands, and the coast of Norway, may be fairly set down to the surface-drift sustained by the prevalence of S.W. winds) is afforded by the variable current known as *Rennell's*, which, flowing eastwards into the southern part of the Bay of Biscay, is deflected in a N.W. direction by the trend of its coast-line, so as to cross the British Channel towards the Sicilly Islands, whence it passes to the S.W. coast of Ireland, its strength mainly depending on the continued prevalence of the westerly anti-trades.

Of the whole mass of water, on the other hand, that is brought into the mid-Atlantic by the Gulf Stream, it may be stated with confidence that the larger proportion turns southward to the east of the Azores, and helps to form the *North African Current;* the other tributary of which may be considered as originating as far north as Cape Finisterre, under the influence of the northerly winds which prevail along the coast of Portugal. As this current flows past the entrance to the Strait of Gibraltar, a part of it, forming what is known as the *Gibraltar Current*, is drawn in to keep up the level of the Mediterranean, which would otherwise be reduced by the excess of evaporation from its surface; but the greater part keeps its course southwards along the Marocco coast, reinforcing the south-flowing extension of the Gulf Stream. On arriving at the border of the northerly trade, the North African Current divides into two parts,—the western division being at once carried into the course of the equatorial drift, whilst the eastern, which may be considered as essentially an indraught or supply current follows the African coast-line, and turns eastward into the Gulf of Guinea, forming the *Guinea Current*, which, coalescing with the eastward "back-water" already mentioned, flows pretty constantly, sometimes with considerable rapidity, towards the Bight of Biafra. There it meets the *South African Current*, which forms the other great feeder of the Equatorial Current; and the circulation thus completed may be considered as recommencing from the "head-water." The large area of comparatively still water which lies in the interior of this North Atlantic circulation is called the *Sargasso Sea*,—a corruption of the name (Mar de Sargaço) which it received from Columbus and the early Spanish navigators, on account of the quantity of sea-weed that floats on its surface. The boundaries of this area, which is of an irregularly elliptical shape, and nearly equals that of Continental Europe, are somewhat variable; but it may be considered to lie between the parallels of 20° and 35° N., and between the meridians of 30° and 60° W. Into it is collected a large proportion of the drift or wreck which floats about the North Atlantic.

Proceeding now to the South Atlantic, we meet with a circulation of the same kind, uncomplicated by any embaying of the Equatorial Current. The smaller division of this current which strikes the coast of South America to the south of Cape St. Roque flows along the coast of Brazil at the rate of from 12 to 20 miles a day, forming the *Brazil Current*, which, however, is separated from the land by an intervening band of lower temperature, that has, during the winter months, a distinct flow towards the equator. The Brazil Current can be traced southwards, by its temperature rather than by its movement, as far as the estuary of the La Plata, before reaching which, however, a great part of it takes an easterly direction, and crosses the Atlantic towards the Cape of Good Hope, forming what is known as the *Southern Connecting Current*. The easterly movement of this current seems to be partly due to the westerly anti-trades, and partly to the excess of easterly momentum which is retained by the Brazil Current in its southward course from Cape St. Roque; whilst it partly depends also on the junction of an Antarctic current that flows N.E. from Cape Horn, meeting the Brazil Current off the estuary of La Plata, just as the Arctic Current meets the Gulf Stream off Newfoundland,—dense fogs being produced, in the one case as in the other, through the precipitation of the vapor overlying the Equatorial Current, by the colder air that overlies the Polar. On meeting the coast of South Africa, the Southern Connecting Current turns northwards, and runs towards the Bight of Biafra, forming the *South African Current*, the movement of which is partly sustained by the southerly winds which prevail along that coast, but is partly attributable to the indraught set up to supply the efflux of the Equatorial Current. In its passage thither, however, the part of it most distant from the land is draughted westwards by the southern trade, forming the most southerly portion of the equatorial drift. Between this and the Southern Connecting Current is a central space, lying between the parallels of 20° and 30° S., and the meridians of 0° and 25° W., over which there are no regular currents; and to this the name Sargasso Sea is sometimes applied by analogy, although its surface has no covering of sea-weed.

Temperature of the Atlantic.—The distribution of surface temperature over the area of the Atlantic has now been made out with considerable accuracy; and it corresponds closely with what has been already stated as the course of the surface currents. There is, of course, a seasonal change, alike in its northern and in its southern division, this change being more and more marked as we recede from the equator. Following the course of the mean annual isotherms, however, we find that they cross the South Atlantic at nearly regular intervals, in an east and west direction, the principal departure from that direction being shown at their western end in the bend they take towards the south under the influence of the warm Brazil Current, and at their eastern in the still stronger bend they take towards the north under the influence of the cold South African Current, which reduces to about 75° the temperature of the southern equatorial that flows alongside the Guinea Current, whose temperature is 82°. In the North Atlantic, however, the influence of the movement of oceanic water on the surface-temperature is very much more marked. The annual isotherms, which cross the Sargasso Sea with nearly regular parallelism, and on the African side tend somewhat to the south, where they meet the colder water of the North African Current, show a strong northward bend on the American side,

along the early course of the Gulf Stream ; but as its excess of temperature above that of the Atlantic generally diminishes as we trace it towards the Banks of Newfoundland, this northward deflection progressively becomes less. The marked contrast in temperature which is often there exhibited between two contiguous bands of water,— a thermometer hanging from a ship's bow showing a temperature of 70°, whilst another hanging from the stern shows only 40°,— is due not so much to the elevation produced by the Gulf Stream as to the depression produced by the Arctic Current. This depression manifests itself in the southward bend given, on the American side; alike to the summer and the winter isotherms, beyond the summer isotherm of 70° and the winter isotherm of 60°, which may be considered as having nearly their normal position ; whilst the northward tendency of these same isotherms on the European side not less conspicuously indicates a flow of warm water towards the western coasts of the British Isles, Norway, and even Iceland and Spitzbergen. It has been customary to regard this flow as an extension of the Gulf Stream ; but if that term be limited (as it ought) to the current that issues from the Gulf of Mexico through the Florida Channel, the hypothesis is found to be untenable so soon as the thermal phenomena of that current are carefully examined. For, in the first place, the popular idea that the Gulf Stream retains it high temperature with little diminution during its passage first northwards and then eastwards is clearly disproved by observation.

From this it appears that, while the high surface-temperature with which the Gulf Stream leaves the Florida Channel is retained in summer with only 5° reduction as far as Nova Scotia, there is a reduction of 5° in winter during its northward passage to Cape Hatteras, and a further reduction of no less than 10° during its eastward passage from Cape Hatteras to Nova Scotia, making it a total reduction of 15°. In spring, again, there is a total reduction of 11°, and in autumn of 13°; and in both cases the reduction during the *eastward* flow under the parallel of 35° N. is greater than the reduction in the *northward* flow from 25° N. to 35° N. The explanation of this is plainly to be found in the fact that in the early part of the course of the Gulf Stream its superheated stratum is a thick one, so that when its superficial film is cooled down by a superincumbent atmosphere of lower temperature, it is replaced by the uprising of a deeper stratum having nearly its original temperature. But as the stream spreads out superficially, its superheated stratum becomes proportionally thinner, and will consequently be more and more rapidly cooled down by the superincumbent atmosphere. Even supposing, therefore, that it were not subjected to any special cooling influence, it appears certain that, as the rate of the current slackens and its depth diminishes, the cooling process must continue at an increased rate, so as to bring down the surface-temperature of the stream to the normal isotherm of the locality, long before it could reach the shores of Europe. But it has been shown that when it passes Newfoundland the Gulf Stream *is* subjected to a special cooling influence — that of the Labrador Current with its fleet of icebergs, which melt away when borne into it ; and this produces such an immediate reduction of its surface-temperature, that it thenceforth shows very little excess, although its sub-surface stratum still appears to be warmer than that of the ocean through which it flows.

But, further, the Gulf Stream, where it is last recognisable as a current, is flowing due east, and its southern portion turns first south-east and then south, whilst on the other hand, the course of the isothermal lines clearly shows that the flow of warm water which carries them northward spreads across the whole breadth of the Atlantic, from the British Isles to Labrador, even extending up to the west of north into Baffin's Bay. When we contrast this immense body of north-moving water with the thinned-out film of what is by comparison a mere rivulet, it becomes obvious (1) that its northward flow cannot be attributable to the *vis a tergo* of the Florida Current, whilst (2) its convection of heat to the Arctic Sea cannot be accounted for by any amount of excess of temperature that is limited to a small depth, since the temperature of such a stratum, moving north-east at a rate of (at most) 4 or 5 miles per day, must soon be brought down to that of the atmosphere above it.

Influenced by these considerations, several eminent hydrographers, both British and American, have been disposed to deny, not only that the temperature of the North Atlantic is modified in any considerable degree by the true Gulf Stream, but that any other agency than that of warm S.W. winds is concerned in producing the climatic amelioration popularly attributed to it. They maintained, in fact, that the surface-temperature of the North Atlantic and Arctic Seas *follows* that of the superincumbent air,— the atmospheric temperature not being in any degree raised by that of warmer water beneath. This doctrine, however, is found to be inconsistent with the results of careful comparisons recently instituted between marine and atmospheric temperatures along the western coasts of Scotland, the Orkney, Shetland, and Faroe Islands, and especially with those obtained along the western coast of Norway. For it is found that during the winter months there is a constant *excess* of sea-temperature above that of the air, averaging 6°.2 Fahr. along the western coast of Scotland and its islands, and rising to 14°.5 at Fruholm near the North Cape. And it is also a very significant fact (ascertained by the careful inquiries of Mr. Buchan), that while the *summer* isotherms cross the British Islands nearly east and west (the temperature diminishing pretty regularly from south to north), the *winter* isotherms traverse them nearly north and south (the temperature diminishing from west to east); whilst in Ireland the isotherms seem to envelope the islands in their folds, which increase in warmth from the centre of the island to its sea-board. So in Norway the isothermal lines run parallel with the coast-line, and this alike in summer and winter,— the temperature falling in winter, and rising in summer, with the increase of distance from the sea. Nothing could prove more conclusively than such facts as these (taken in connection with the absence of ice in the harbors of Norway, even as far north as Hammerfest, through the whole winter) the dependence of the mild winter climate of the north-western coasts of Europe upon the proximity of a sea which is warmer than the superincumbent atmosphere; and we have now to inquire how this great N.E. movement of a stratum of warm water sufficiently thick to retain a surface-temperature considerably higher than that of the air above it is to be accounted for.

The solution of the problem seems to be afforded by the doctrine of a *General Oceanic Circulation*, sustained by opposition of temperature only, which was first distinctly propounded in 1845 by Professor Lenz of St. Petersburg, on the basis of observations made by him during the second voyage of Kotzebue (1825–1828). Others had been previously led to surmise that "Polar Currents" flow along the floors of the great oceans, even as far as the equator, balancing the superficial counter-currents which are observable in the opposite direction. But Lenz was led to conclude that the

whole of the deeper portion of the great ocean-basins in communication with the polar areas is occupied by polar water, which is constantly, though slowly, flowing towards the equator; whilst conversely the whole upper stratum of equatorial water is as constantly, though slowly, flowing towards one or both of the poles. And he particularly dwelt on the existence of a belt of water under the equator, colder than that which lies either north or south of it, as an evidence that polar water is there continually rising from beneath towards the surface,— a phenomenon which, he considered, admits of no other explanation. He further adduced the low salinity of equatorial water (previously noticed by Humboldt, and confirmed by his own observations), compared with that of tropical water, as evidence that the equatorial water of the surface is derived from the polar underflow. And he attributed the maintenance of this circulation to the continually renewed disturbance of equilibrium between the polar and equatorial columns,— the greater lateral (because downward) pressure of the former causing a *bottom outflow* of polar water in the direction of the latter, whilst the reduction of level thus occasioned will produce a *surface indraught* from the warmer towards the colder areas.

The doctrine of Lenz, so far from meeting with the general acceptance to which it had a fair claim,— alike on theoretical grounds and from its accordance with the facts ascertained by careful observation,— seems to have been put aside and forgotten, a preference being given to the doctrine of the prevalence of a uniform deep-sea temperature of 39°, which was supposed to be established by the thermometric observations made in the voyages of D'Urville and Sir James Ross. No such precaution, was taken in these observations as to that which Lenz had recourse, to obviate the effects of the tremendous pressure (1 ton per square inch for every 800 fathoms of depth) to which deep-sea thermometers are exposed; and it is now certain that the temperatures at great depths recorded by D'Urville and Ross were several degrees too high.

It was in entire ignorance of the doctrine of Lenz, and under the influence of that of D'Urville and Ross, which had been stamped with the great weight of Sir John Herschel's weight of authority, that Dr. Carpenter commenced in 1868 (in concert with Professor Wyville Thomson) a course of inquiry into the thermal condition of the deep sea, which at once convinced him of the fallacy of the uniform 39° doctrine, and led him to conclusions essentially accordant with those of Lenz. For in the channel of from 500 to 600 fathoms' depth between the north of Scotland and the Faroe Islands, they found the deeper half to be occupied by a stratum of glacial water, whose temperature ranged downward from 32° to 29°.5; whilst the upper half was occupied by a stratum warmer than the normal temperature of the latitudes. This phenomenon was interpreted by Carpenter as indicating a deep glacial flow from N.E. to S.W., and a warm upper flow from S.W. to N.E.; and finding that to the west of this channel, on the border of the deep Atlantic basin, the excess of warmth extended to a depth of more than 500 fathoms, he came to the conclusion that the north-moving stratum which brought it could not be an extension of the true Gulf Stream, but must be urged on by some much more general force. A series of temperature-soundings taken along the west of Ireland, the Bay of Biscay, and the coast of Portugal, confirmed him in this view, by showing that the division between an upper warm stratum and a cold under-stratum exists in the North Atlantic at a depth of from 700 to 900 fathoms, the whole mass of water below this having either flowed into the basin of the polar area, or having had its temperature brought down from 39° to 36°.5 by mixture with the polar inflow. And this conclusion was confirmed by the result of temperature-soundings taken at corresponding depths and under the same parallels of latitude in the Mediterranean; for as they showed a uniform temperature of from 54° to 56°, from beneath the stratum of 100 fathoms that was superheated by direct insolation, to the very bottom, it became clear that depth *per se* could have no effect in reducing the bottom-temperature; and that the cause of the excess of temperature in the mass of water occupying the Mediterranean basin above that of Atlantic water at the same depths, lies in the seclusion of the former from the polar underflow which brings down the deep temperature of the latter. This conclusion having received marked confirmation from temperature soundings taken in the Eastern seas, was put forward by Carpenter as justifying the doctrine of a *vertical* oceanic circulation sustained by opposition of temperature only, quite independent of and distinct from the *horizontal* circulation produced by wind,— which doctrine he expressed in terms closely corresponding with those that had been used by Lenz. And the collection of data for the establishment or confutation of this doctrine was one of the objects of the "Challenger" expedition, which has already made, in the determination of the thermal stratification of the Atlantic between 38° N. lat. and 38° S. lat., what may fairly be characterised as the grandest single contribution ever yet made to terrestrial physics.

Distribution of Organic Life.— All that will be attempted under this head will be to indicate the general conditions that seem, from recent researches, to have the greatest influence on the distribution of plants and animals through this great oceanic basin.

The distribution of marine plants seems mainly determined by light, temperature, and depth,— a further influence being exerted by the character of the shores. The diminution of light in its passage through sea-water is so rapid, that the quantity which penetrates to a depth of 250 or 300 fathoms may be regarded as almost infinitesimal; and in conformity with this we find a very rapid diminution of Algal life below the depth of 100 fathoms. The upper stratum is occupied for the most part by the larger and coarser forms of the *Fucaceæ*, or olive-green sea-weeds, whilst the more delicate *Ceramiaceæ*, or red sea-weeds, frequent deeper waters; and, as it appears from experiments made in aquaria that the latter do not flourish in full light, but grow well in shadow, it may be concluded that their preference for a moderate depth is rather for reduced light and stillness than for depth *per se*. At a depth of 150 fathoms very few ordinary sea-weeds maintain their ground; and below this we seldom find any Algæ, save the Corallines and Nullipores consolidated by calcareous deposit. The distribution of particular types over different parts of the Atlantic area appears to be mainly regulated by temperature; and this would seem to be remarkably the case with the floating *Diatomaceæ*, which, though they form green bands in the surface-water of polar seas, have not been encountered in like abundance in the Atlantic, and do not contribute largely, by the subsidence of their siliceous *loricæ*, to the composition of its bottom-deposit. Although it is the habit of the larger Algæ to grow from a base of attachment (their roots serving no other purpose however, than that of anchorage), the enormous mass of Gulf-weed found in the Sargasso Sea seems quite independent of any such attachment. It was at one time supposed that this originally grew on the Bahama and Florida shores, and was torn thence by the powerful current of the Gulf Stream; but it seems certain that if such was its original source, the "Gulf-weed" now lives and propagates whilst freely

floating on the ocean-surface, having become adapted by various modifications to its present mode of existence.

The distribution of the animals that habitually live in that upper stratum of the ocean whose degree of warmth varies with the latitude, seems mainly determined by temperature. Thus the "right whale" of Arctic seas, and its representative in the Antarctic, seems never to enter the inter-tropical area, generally keeping away from even the temperate seas, whilst, on the other hand, the sperm whale ranges through the parts of the ocean where the "right-whales" are never seen.

The distribution of fishes seems generally to follow the same rule; as does also that of floating mollusks. Thus the little *Clio* (a Pteropod mollusk), which is a principal article of food of the "right whales" in polar seas, is rarely met with in the Atlantic, where, however, other pteropods, as *Hyalæa*, present themselves in abundance. On the other hand, the warmer parts of its area swarm with Salpa-chains, which are not frequent in higher latitudes; and the few representatives of the Nautiloid Cephalopods, that were so abundant in Cretaceous seas, are now restricted to tropical or sub-tropical areas. And the distribution of the mollusks, echinoderms, and corals, which habitually live on the bottom, seems to be determined, within certain limits at least, by temperature rather than by depth.

The bathymetrical range to which animal life of any higher type than the Rhizopodal might extend, was until recently quite unknown; but the researches initiated by Prof. Wyville Thompson and Dr. Carpenter, in 1868, and since prosecuted by the "Challenger" expedition, have fully established the existence of a varied and abundant fauna in ocean-depths ranging downwards to 2000 fathoms. And these researches have further established that the distribution of this fauna is mainly determined by the temperature of the sea-bed; so that whilst in the channel between the north of Scotland and the Faroes there were found at the same depths, and within a few miles of each other, two faunæ almost entirely distinct — one a boreal and the other a warmer-temperate — on sea-beds having respectively the temperatures of 30° and 43°, various types to which a low temperature is congenial are traceable continuously along the whole abyssal sea-bed that intervenes between those northern and southern polar areas within which they present themselves at or near the surface. And hence it becomes clear that, since glacial types are even now being embedded in the strata which are in process of formation beneath the equator, no inferences as to terrestrial climate can be drawn from the character of marine deposits.

One very remarkable feature which presents itself over a large proportion of the Atlantic basin is the abundance of the minute *Globigerinæ* and other Foraminifera, the accumulation of whose shells, and of their disintegrated remains, is giving rise to a calcareous deposit of unknown thickness, that corresponds in all essential particulars to Chalk. This deposit, in some parts of the North Atlantic, is replaced by an Arctic drift of fine sand, whilst in other parts there is a mixture of arenaceous and of calcareous components, such as is found in certain beds of the Cretaceous formation. Now on the surface of this deposit there have been found so many living types, especially belonging to the groups of Echinoderms, Corals, Siliceous Sponges, and Foraminifera, which closely correspond with types hitherto regarded as characteristic of the Cretaceous epoch, that the question naturally suggests itself whether the existing are not the lineal descendants of the fossil types,— the differences they present being not greater than may be fairly attributed to the prolonged action of differences of temperature, food, pressure, &c. And when these facts are taken in connection with those previously stated as to the probable remoteness of the period when (if ever) the present sea-bed of the Atlantic was dry land, the doctrine first put forth by Prof. Wyville Thomson, that there has been a continuous formation of Globigerina-mud on the bottom of the Atlantic from the Cretaceous epoch to the present time — or, in other words, that the formation of chalk on the sea-bed of the Atlantic did not cease with the elevation of the European area, but has been going on through the whole Tertiary period,— must be admitted as (to say the least) a not improbable hypothesis. That some considerable change took place at the conclusion of the Cretaceous epoch, by which the temperature of the upper stratum was lowered, so as to be no longer compatible with the existence of the fishes and chambered cephalopods characteristic of the Cretaceous fauna, may be fairly assumed from their disappearance; but this would not so much affect the deeper part of the basin, in which those lower types that seem more capable of adapting themselves to changes in external conditions would continue to hold their ground. That the like conditions had prevailed also through long previous geological periods, may be surmised from the persistence, over various parts of the Atlantic sea-bed, of the *Apiocrinite* type, which carries us back to the Oolitic formation, and of the *Pentacrinus* type, which has come down with very little alteration from the Liassic; whilst many existing *Terebratulidæ* do not differ more from Oolitic types that the latter differ among each other. Going back still further, we find in the persistence of certain Foraminiferal types from the Carboniferous limestone to the present time, and in the character of its deep-sea beds, a strong indication that they originated in a Foraminiferal deposit, representing in all essential particulars that which is now going on; while the persistence of the *Lingula* from the early Silurian strata to the present time suggests the question whether certain oceanic areas may not have remained in the condition of deep sea throughout the whole subsequent succession of geological changes.

ATLANTIS, ATALANTIS, or ATLANTICA, an island mentioned by Plato and other classical writers, concerning the real existence of which many disputes have been raised. In the *Timæus*, Critais relates how his grandfather Critais had been told by Solon some remarkable events in early Athenian history which he had learned from the Egyptian priests at Sais, whose records went much further back than the native accounts. "The most famous of all the Athenian exploits," Solon had been told, "was the overthrow of the island Atlantis. This was a continent lying over against the pillars of Hercules, in extent greater than Libya and Asia put together, and was the passage to other islands and to another continent, of which the Mediterranean Sea was only the harbor; and within the pillars the empire of Atlantis reached to Egypt and Tyrrhenia. This mighty power was arrayed against Egypt and Hellas and all the countries bordering on the Mediterranean. Then did your city bravely, and won renown over the whole earth, for at the peril of her own existence, and when the other Hellenes had deserted her, she repelled the invader, and of her own accord gave liberty to all the nations within the pillars. A little while afterwards there was a great earthquake, and your warrior race all sank into the earth; and the great island of Atlantis all disappeared into the sea. This is the explanation of the shallows which are found in that part of the Atlantic ocean." Such is the main substance of the principal account of the island furnished by the ancients,—an account which, if not entirely fictitious, belongs to the most nebulous region of history. The story may

embody some popular legend; and the legend may have rested on certain historical circumstances; but what these were it is (as the numerous theories advanced on the subjected may be held as proving) impossible now to determine.

ATLAS, in *Greek Mythology*, called sometimes a son of Japetus and the nymph Asia, or of Uranus and Gaia, and at other times traced to a different parentage, but always known as the being who supported on his shoulders the pillars on which the sky rested.

ATLAS, a mountain-chain of Northern Africa, between the great desert of the Sahara and the Mediterranean. The range has been but partially explored, and geographers differ as to its extent, some considering it to reach from Cape Ghir on the Atlantic to Cape Bon, the north-east point of Tunis, while others include under the name the whole mountain system between Cape Nun und the great Syrtis. In this latter sense it forms the mountain-land of the countries of Marocco, Algeria, Tunis, and Tripoli. It is composed of ranges and groups of mountains, enclosing well-watered and fertile valleys and plains, and having a general direction from W. to E. The highest peaks are supposed to attain an elevation of nearly 15,000 feet; and although none of them reach the height of perpetual snow, some of their loftiest summits are covered with snow during the greater part of the year. Mount Miltsin, 27 miles S.E. of the city of Marocco, was ascertained by Captain Washington to be 11,400 feet high. The greatest heights are in Marocco, from which point they appear to diminish in elevation as they extend towards the east.

ATMOSPHERE is the name applied to the invisible elastic envelope which surrounds the earth, the gaseous matter of which it is composed being usually distinguished by the name of air. Storms and weather generally, solar and terrestrial radiation, the disintegration of rocks, animal and vegetable life, twilight, and the propagation of sound, are some of the more striking phenomena which are either to a large extent or altogether dependent on the atmosphere. That air possesses weight may be shown by the simple experiment of taking a hollow globe filled with air and weighing it; then removing the contained air by means of an air-pump, and again weighing the globe, when it will be found to weigh less than at first. The difference of the two results is the weight of the air which has been removed. From Regnault's experiments, 100 cubic inches of dry air, or air containing no aqueous vapor, under a pressure of 30 English inches of mercury, and at a temperature of 60° Fahr., weigh 31.03529 grains; and since 100 cubic inches of distilled water at the same pressure and temperature weigh 25,252½ grains, it follows that air is 813.67 times lighter than water.

Air as an elastic fluid exerts pressure upon the earth or any substance on which it rests, the action of a boy's sucker and of a water-pump being familiar instances showing the pressure of the atmosphere. When air is removed from a water-pump, the water rises in the pump only to a certain height; for as soon as the water has risen to such a height that the weight of the column of water in the pump above the level of the surface of the water in the well just balances the pressure exerted by the atmosphere on the surface of the well, it ceases to rise. If the pressure of the atmosphere be increased, the water will rise higher in the pump; but if diminished, the level of the water will sink. The height to which the water rises within the pump thus varies with the pressure of the atmosphere, the height being generally about 34 feet. Since a given volume of mercury weighed *in vacuo* at a temperature of 62° Fahr. is 13.569 times heavier than the same volume of water it follows that a column of mercury will rise *in vacuo* to a height 13.569 times less than a column of water, or about 30 inches. If we suppose, then, the height of the mercurial column to be 30 inches, which is probably near the average height of the barometer at sea-level, and its base equal to a square inch, it will contain 30 cubic inches of mercury; and since one cubic inch of mercury contains 3426.7 grains, the weight of 30 cubic inches will be nearly 14.7304 lb. avoirdupois. Thus the pressure of the atmosphere is generally at sea-level equal to 14.7304 lb. on each square inch of the earth's surface. Sir John Herschel has calculated that the total weight of an atmosphere averaging 30 inches of pressure is about 11⅔ trillions of pounds; and that, making allowance for the space occupied by the land above the sea, the mass of such an atmosphere is about $\frac{1}{1\,200\,000}$ part of the earth itself. This enormous pressure is exerted on the human frame in common with all objects on the earth's surface, and it is calculated that a man of the ordinary size sustains a pressure of about 14 tons; but as the pressure is exerted equally in all directions, and permeates the whole body, no inconvenience arises in consequence of it.

A pressure agreeing approximately with the average atmospheric pressure at sea-level is often used as a unit of pressure. This unit is called *an atmosphere*, and is employed in measuring pressures in steam engines and boilers. The value of this unit which has been adopted, in the metrical system, is the pressure of 760 millimètres (29.922 Eng. inches) of the mercurial column at 0° C. (32° Fahr.) at Paris, which amounts in that latitude to 1.033 kilogrammes on the square centimètre. In the English system, *an atmosphere* is the pressure due to 29.905 inches of the mercurial column at 32° Fahr. at London, amounting there to nearly 13¾ lb. weight on the square inch. The latter atmosphere is thus 0.99968 of that of the metrical system.

As regards the distribution of atmospheric pressure over the globe, there was little beyond conjecture, drawn from theoretical considerations, and for the most part erroneous, till the publication in 1868 of Buchan's memoir "On the Mean Pressure of the Atmosphere and the Prevailing Winds over the Globe." By the monthly isobaric charts and copious tables which accompanied the memoir, this important physical problem was first approximately solved. Since then the British Admiralty has published charts showing the mean pressure of the atmosphere over the ocean. The more important general conclusions regarding the geographical distribution of atmospheric pressure are the following:—

There are two regions of high pressure, the one north and the other south of the equator, passing completely round the globe as broad belts of high pressure. They enclose between them the low pressure of tropical regions, through the centre of which runs a narrower belt of still lower pressure, towards which the north and south trades blow. The southern belt of high pressure lies nearly parallel to the equator, and is of nearly uniform breadth throughout; but the belt north of the equator has a very irregular outline, and great differences in its breadth and in its inclination to the equator,—these irregularities being due to the unequal distribution of land and water in the northern hemisphere. Taking a broad view of the subject, there are only three regions of low pressure,—one round each pole, bounded by or contained within the belts of high pressure just referred to, and the equatorial belt of low pressure. The most remarkable of these, in so far as is yet known, is the region of low pressure surrounding the south pole, which appears to remain pretty constant during the whole year. The depression round the north pole is divided into two distinct centres, at each of which there is a diminution of pressure greatly lower than the average

north polar depression. These two centres lie in the north of the Atlantic and Pacific Oceans, respectively. The distribution of pressure in the different months of the year differs widely from the annual average, particularly in January and July, the two extreme months. In January the highest pressures are over the continents of the northern hemisphere, — and the larger the continental mass the greater the pressure, — and the lowest pressures are over the northern portions of the Atlantic and Pacific, South America and South Africa, and the Antarctic Ocean. In the centre of Asia the mean pressure of the atmosphere in this month is fully 30.400 inches, whereas in the North Atlantic, round Iceland, it is only 29.340 inches, or upwards of an inch lower than in Central Asia.

In July, on the other hand, the mean pressure of Central Asia is only 29.468 inches, or nearly an inch lower than during January; or, putting this striking result in other words, about a thirteenth of the pressure of the atmosphere is removed from the region during the hottest months of the year as compared with the winter season. The lowest pressures of the northern hemisphere are now distributed over the continents, and the larger the continental mass the greater is the depression.

Over the ocean, if we accept the higher latitudes, atmospheric pressure is more regular throughout the year than over the land. In the ocean to westwards of each of the continents there occurs at all seasons an area of high pressure, from 0.10 inch to 0.30 inch higher than what prevails on the coast westward of which it lies. The distance of these spaces of high pressure is generally about 30° of longitude; and their longitudinal axes lie, roughly speaking, about the zones of the tropics. The maximum is reached during the winter months, and these areas of high pressure are most prominently marked west of those continents which have the greatest breadth in 30° lat.; and the steepest barometric gradients are on their eastern side. It is scarcely possible to over-estimate the importance of these regions of high and low mean pressures, from their intimate bearing on atmospheric physics, but more particularly from their vital connection with prevailing winds and the general circulation of the atmosphere. This relation will be apprehended when it is considered that winds are simply the flowing away of the air from regions where there is a surplus (regions of high pressure) to where there is a deficiency of air (regions of low pressure). Everywhere over the globe this transference takes place in strict accordance with Buys-Ballot's "Law of the Winds," which may be thus expressed: — The wind neither blows round the space of lowest pressure in circles returning on themselves, nor does it blow directly toward that space; but it takes a direction intermediate, approaching, however, more nearly to the direction and course of circular curves than of radii to a centre. More exactly, the angle is not right angle, but from 45° to 80°. Keeping this relation between wind and the distribution of pressure in mind, the isobaric lines give the proximate causes of the prevailing winds over the globe, and through these the prominent features of climates. As regards the ocean, the prevailing winds indicate the direction of the drift-currents and other surface-currents, and thereby the anomalous distribution of the temperature of the sea as seen in the Chili, Guinea, and other ocean currents, and the peculiarly marked climates of the coasts past which these currents flow, are explained; for observations have now proved that the prevailing winds and surface-currents of all oceans are all but absolutely coincident.

As regards the annual march of pressure through the months of the year, curves representing it for the different regions of the earth differ from each other in every conceivable way. It is only when the results are set down in their proper places on charts of the globe that the subject can be well understood. When thus dealt with, many of the results are characterised by great beauty and simplicity. Thus, of all influences which determine the barometric fluctuation through the months, the most important are the temperature, and through the temperature the humidity. Comparing, then, the average pressure in January with that in July, which two months give the greatest possible contrasts of temperature, the following is the broad result:—

Atmospheric pressure is more uniformly distributed over the globe in April and October than in any of the other months. In May and November, being the months immediately following, occur the great annual rise and fall of temperature; and since these rapid changes take place at very different rates, according to the relative distribution of land and water in each region, a comparison of the geographical distribution of May with that for the year brings out in strong relief the more prominent causes which influence climate, and some of the more striking results of these causes. This comparison shows a diminution of pressure in May over tropical and sub-tropical regions, including nearly the whole of Asia, the southern half of Europe, and the United States. An excess prevails over North America to the north of the Lakes, over Arctic America, Greenland, the British Isles, and to the north of a line passing through the English Channel in a north-easterly direction to the Arctic Sea. The excess in the southern hemisphere includes the southern half of South America and of Africa, the whole of Australia, and adjacent parts of the ocean. The influence of the land of the southern hemisphere, which in this month is colder than the surrounding seas, brings about an excess of pressure; on the other hand, the influence of land over those regions which are more immediately under the sun brings about a lower pressure, interesting examples of which occur in India, the Malayan Archipelago, and the Mediterranean, Black, and Caspian Seas. In many cases the lines of pressure follow more or less closely the contours of the coasts. Thus the diminution is greater over Italy and Turkey than over the Adriatic and Black Seas. The greatest diminution occurs in Central Asia, where it exceeds 0.200 inch, and the greatest excess round Iceland, where it exceeds 0.200 inch. It is to the position of Great Britian, with reference to the deficiency of pressure on the one hand and the excess on the other, that the general prevalence of east winds at this season is due. These easterly winds prevail over the whole of Northern Europe, as far south as a line drawn from Madrid and passing in a north-easterly direction through Geneva, Munich, &c. To the south of this line the diminution of pressure is less, and over this region the winds which are in excess are not easterly, but southerly. Crossing the Mediterranean, and advancing on Africa, we approach another region of lower pressure, towards which easterly and north-easterly winds again acquire the ascendency, as at Malta, Algeria, &c.

This, in many cases great, variation of the pressure in the different months of the year must be kept carefully in view in deducting heights of places from observations made by travellers of the pressure of atmosphere, by the barometer or the temperature of boiling water. In reducing the observations, it is necessary to assume a sea-level pressure if the place is at a considerable distance from any meteorological observatory. Previous to the publication of Buchan's *Mean Pressure of the Atmosphere*, it appears that a mean sea-level pressure of 29.92 or 30.00 inches was in such cases universally assumed. The mean pressure at Barnaul, Siberia, being

29.536 inches in July, 30.293 inches in January, and 29.954 inches for the year, it follows that, by the former method of calculating the heights, observations made in January to ascertain the height of Lake Balkash would make the lake 350 feet too high, and observations made in July would make it 330 feet too low,—the difference of the two observations, each set being supposed to be made under the most favorable circumstances, and with the greatest accuracy, being 680 feet. This illustration will serve to account for many of the discrepances met with in books regarding the heights of mountains and plateaus.

Of the periodical variations of atmospheric pressure, the most marked is the daily variation, which in tropical and sub-tropical regions is one of the most regular of recurring phenomena. In higher latitudes the diurnal oscillation is marked by the frequent fluctuations to which the pressure is subjected. If, however, hourly observations be regularly made for some time, the hourly oscillation will become apparent. The results show two maxima occurring from 9 to 11 A.M. and 9 to 11 P.M., and two minima occuring from 3 to 6 A.M. and 3 to 6 P.M.

Though the diurnal calometric oscillations are among the best-marked of meteorological phenomena, at least in tropical and sub-tropical regions, yet none of these phenomena, except perhaps the electrical, could be named respecting whose geographical distribution so little is really known, whether as regards the amount of variation, the hour of occurrence of the critical phases, or, particularly, the physical causes on which the observed differences depend. This arises chiefly from the want of a sufficient number of ascertained facts; and to remedy this deficiency observations have, in the preparation of this present article, been collected and calculated from upwards of 250 places in different parts of the globe, and the data set down on charts. The chief results of this inquiry are the following, attention being entirely confined to the chief of oscillation, viz., that occurring from the A. M. maximum to the P. M. minimum.

Since the two maxima of daily pressure occur when the temperature is about the mean of the day, and the two minima when it is at its highest and lowest respectively, there is thus suggested a connection between the daily barometric oscillations and the daily march of temperature; and similarly a connection with the daily march of the amount of vapor and humidity of the air. The view entertained by many of the causes of the daily oscillations may be thus stated:—The *forenoon maximum* is conceived to be due to the rapidly increasing temperature, and the rapid evaporation owing to the great dryness of the air at this time of the day, and to the increased elasticity of the lowermost stratum of air which results therefrom, until a steady ascending current has set in. As the day advances, the vapor becomes more equally diffused upwards through the air, an ascending current, more or less strong and steady, is set in motion, a diminution of elasticity follows, and the pressure falls to the *afternoon minimum*. From this point the temperature declines, a system of descending currents set in, and the air of the lowermost stratum approaches more nearly the point of saturation, and from the increased elasticity, the pressure rises to the *evening maximum*. As the deposition of dew proceeds, and the fall of temperature and consequent downward movement of the air are arrested, the elasticity is again diminished, and pressure falls to the *morning minimum*. Since the view propounded some years ago, that if the elastic force of vapor be subtracted from the whole pressure, what remains will show only one daily maximum and minimum, has not been confirmed by observation, it follows that the above explanation is quite insufficient to account for the phenomena; indeed, the view can be regarded in no other light than as a tentative hypothesis.

Singularly enough, Lamont and Broun, a few years ago, were led, independently of each other, to form an opinion that the daily barometric oscillations were due to the magneto-electric influence of the sun. It admits of no doubt, looking at the facts of the case so far as they have been disclosed, that the daily barometric oscillations originated with the sun, and that more than the sun's influence as exerted on the diurnal march of the temperature and humidity of the atmosphere is concerned in bringing them about. But from the facts adduced, it is equally certain that, be the originating cause what it may, its effects are enormously modified by the distribution of land and water over the globe, by the wind, and by the absolute and relative humidity of the atmosphere. The smallness of the amount of the summer oscillation from the forenoon maximum to the afternoon minimum over the North Atlantic as far south as lat. 30°, and its diminished amount, as far south at least as the equator, will no doubt play an important part in the unravelling of this difficulty.

One of the most important steps that could be taken would be an extensive series of observations from such countries as India, which offers such splendid contrasts of climate at all seasons, has a surface covered at one place with the richest vegetation, and at others with vast stretches of sandy deserts, and presents extensive plateaus and sharp ascending peaks—all which conditions are indispensable in collecting the data required for the solution of this vital problem of atmospheric physics.

The ancients thought that air was one of the four elements from which all things originated; this doctrine continued to prevail till 1774, when Priestly discovered oxygen gas, and showed it to be a constituent part of air. Nitrogen, the other constituent of air, first called *azote*, was discovered soon after, and the marked differences between these two gases could not fail to strike the most careless observer. It is remarkable that Scheele independently discovered both oxygen and nitrogen, and was the first to enunciate the opinion that air consists essentially of a mixture of these two gases. From experiments made by him to ascertain their relative volumes he concluded that the proportions are 27 volumes of oxygen and 73 volumes of nitrogen. It was left to Cavendish to show from 500 analyses that the relative proportions were practically constant, and that the proportion is 20,833 per cent. of oxygen. The results obtained by Cavendish, though not attended to for many years after they were published, have been shown by recent and more refined analyses to be wonderfully exact. The most recent analyses of specimens of air collected under circumstances which ensure that it is of average purity, give as a mean result the following:—

	Volume.
Oxygen.	20.96 per cent.
Nitrogen.	79.00 "
Carbonic acid.	0.04 "
	100.00

The circumstances under which these proportions vary, and the other gases and substances which are found in the air, will be afterwards adverted to. Besides these three constituents of air, there is a fourth, viz., the vapor of water, from which no air, even at the lowest temperature yet observed is wholly free, so that absolutely dry air does not exist in the free atmosphere. The dry air of the atmosphere—oxygen (inclusive of ozone) nitrogen and carbonic acid—is always a gas

and its quantity is constant from year to year; but the vapor of water does not always remain in the gaseous state, and the quantity present in the atmosphere is, by the processes of evaporation and condensation, varying every instant. Water evaporates at all temperatures, even the lowest, and rises into the air in the form of an invisible elastic gas called aqueous vapor. The elasticity of vapor varies with the temperature.

The relative humidity of the air may be regarded as the degree of approach to saturation. It is greatest near the surface of the earth during night, when the temperature, being at or near the daily minimum, approaches the dew-point; it is also great in the morning, when the sun's rays have evaporated the dew, and the vapor is as yet only diffused a little way upwards; and it is least during the greatest heat of the day.

Between the humidity, both absolute and relative, of the air and the temperature there is a vital and all-important connection. Observation shows that when the quantity of vapor in the air is great, and also when the relative humidity is high, temperature falls little during the night, even though the sky be perfectly clear; but when the quantity of vapor is small, or the relative humidity is low, temperature rapidly falls. On the other hand, during the day the temperature rises slowly, when the quantity of vapor is great, or relative humidity high, even though the sky be clear, but when the quantity of vapor is small, and humidity low, temperature rapidly rises. These facts are explained by the circumstance that perfectly dry air is diathermanous, that is, it allows radiant heat to pass through it without being sensibly warmed thereby. Add vapor to this air, and its diathermancy is diminished. The diathermancy is also reduced if the temperature approach nearer to the dew-point; in other words, if the relative humidity be increased. Hence, with an increase of vapor or with increased humidity, the effects of both solar and terrestrial radiation are much less felt on the surface of the earth—the vapor screen performing, in truth, one of the most important conservative functions of the atmosphere.

Since ascending currents fall in temperature as they ascend, through diminished pressure and consequent dilatation, they increase their relative humidity; and since descending currents increase in temperature, and consequently reduce their relative humidity, it follows that, over a region from which ascending currents rise, solar and terrestrial radiation is very considerably obstructed, but over a region upon which currents descend, radiation is much less obstructed. Most of our exceptionally hot summer and cold winter weather is to be explained in this way, on which occasions there is generally observed a high barometric pressure overspreading a comparatively limited region, on which a slow downward movement of the air proceeds.

Of the solar heat which reaches the surface of the globe, that part which falls on the land may be regarded as wholly absorbed by the thin superficial layer exposed to the heating rays; and since there is no mobility in the particles of the land, the heat can be communicated downwards only by conduction. On the other hand, the solar heat which falls on water is not, as in the case of land, arrested at the surface, but penetrates to a considerable depth, the heating effect being in the case of clear water appreciably felt at a depth of from 500 to 600 feet. Since the heat daily received by the ocean from the sun is diffused downwards through a very considerable depth, the surface of the ocean on which the atmosphere rests is much less heated during the day than is the surface of the land. Similarly it is also less cooled during the night by terrestrial radiation.

This points to a chief acting force on which the great movements of the atmosphere depend, viz., simultaneous local irregularities in the distribution of temperature in the atmosphere. The local expansion of the atmosphere by heat during the day is greatest over land, where the air is clear, dry, and comparatively calm, and least over the ocean, where the sky is clouded, and the air loaded with moisture. On the other hand, the local contraction by cold during night is greatest over land, where the air is clear, dry, and calm, or nearly so, and least over the ocean, where the air is clouded, and loaded with moisture. As familiar illustrations of atmospheric movements resulting from local expansions by heat and contractions by cold, we may refer to the land and sea breezes, and what depend upon exactly the same principle, the dry and rainy monsoons in different parts of the globe. But the illustration of the principle on the broadest scale is the system of atmospheric circulation known as the equatorial and polar currents of the atmosphere, which originate in the unequal heating by the sun of the equatorial, temperate, and polar regions.

The other principal motive force in atmospheric circulation depends on the aqueous vapor. The many ways in which this element acts as a motive force will be seen when it is considered that a large quantity of sensible heat disappears in the process of evaporation, and reappears in the process of condensation of the vapor into rain or cloud; that saturated air is specifically lighter than dry air; and that the absolute and relative amount of the vapor powerfully influences both solar and terrestrial radiation. The question to be carefully considered here is how in these ways the vapor produces local irregularities in the distribution of atmospheric pressure, thus giving rise to aerial movements which set in to restore the equilibrium which has thus been disturbed.

It is from these local irregularities—using the word local in a very wide sense—in the distribution of atmospheric pressure, whether the irregularities originate in the temperature or aqueous vapor, that all winds, from the lightest breeze to the most destructive hurricane, take their rise; for, as already stated, wind is merely the flowing away of the air from where there is a surplus of it to where there is a deficiency.

In examining weather charts embracing a considerable portion of the earth's surface, there are seen two different systems of pressure, changing their forms and positions on the globe from day to day—one set being systems of low pressure marked off by concentric isobarics enclosing pressures successively lower as the central space is approached, and the other set being systems of high pressure marked off by roughly concentric isobarics bounding pressures successively higher towards their centres. These two systems are essentially distinct from each other, and without some knowledge of them the circulation of the atmosphere cannot be understood.

Observations of the winds cannot be conducted, and the results discussed, on the supposition that the general movement of the winds felt on the earth's surface is horizontal, it being evident that the circulation of the atmosphere is effected largely through systems of ascending and descending currents. The only satisfactory way of discussing the winds, viewed especially in their climatic relations, is that recently proposed by Köppen of St. Petersburg, and applied by him with very fruitful results in investigating the weather of that place during 1872 and 1873. In attempting an explanation of these phenomena, we are met with several as yet insuperable obstacles:—(1.) An imperfect knowledge of the mode of formation and propagation of low-pressure systems; (2.) Imperfect knowledge of the relations of the formation of cloud and aqueous precipita

tion to barometric fluctuations; (3.) A want of information with reference to the merely mechanical effects of ascending, descending, and horizontal currents of air on the barometric pressure; in other words we do not know how far the barometric pressure is an indication of the mass of air in the column vertically over it, when that column is traversed by air-currents; (4.) An almost total absence of really good wind observations; and (5.) Deficient information in nearly everything that respects aqueous vapor — its relation to radiant heat, both solar and terrestrial; its mode of diffusion vertically and horizontally in the free atmosphere, especially from an evaporating surface; the influence which its condensation into cloud and rain exerts on aerial currents, — in regard to all which more satisfactory methods of observing this vital element, and discussing the results of observation, are greatly to be desired. There are here large important fields of inquiry awaiting experimental and observational physicists.

The law of the dilatation of gases, known as the "Law of Boyle" or "Law of Mariotte," is this: The volume occupied by a gas is in reverse ratio to the pressure under which it exists, if the temperature remains the same; or the density of a gas is proportioned to its pressure. Consequently, air under a pressure equal to that of two atmospheres will occupy only half the volume it occupied under the pressure of one atmosphere; under the pressure of three atmospheres, one-third of that volume, &c. By doubling the pressure we double the elasticity. If, however, the temperature be increased, and the air occupy the same space, the pressure will be increased; but if the pressure is to remain the same, the air must occupy a larger space. From Regnault's experiments, it is concluded that the co-efficient which denotes increase of elasticity for 1° Fahr. of air whose volume is constant equals .002036; and that the co-efficient which denotes increase of volume for 1° Fahr. of air whose elasticity is constant equals .002039.

These portions of the atmosphere in contact with the earth are pressed upon by all the air above them. The air at the top of a mountain is pressed upon by all the air above it, while all the portion below it, or lying between the top of the mountain and the surface of the sea, exerts no pressure whatever upon it. Thus the pressure of the atmosphere constantly diminishes with the height. If, then, the pressure of the atmosphere at two heights be observed, and if at the same time the mean temperature and humidity of the whole stratum of air lying between the two levels were known, the difference in height between the two places could be calculated. For the development of this principle, see BAROMETRIC MEASUREMENTS OF HEIGHTS.

The air thus diminishing in density as we ascend, if it consists of ultimate atoms, as is no doubt the case, it follows that the limit of the atmosphere will be reached at the height where the force of gravity downwards upon a single particle is equal to the resisting force arising from the repulsive force of the particles. It was long supposed, from the results of observations on the refraction of light, that the height of the atmosphere did not exceed 45 miles; but from the observations of luminous meteors, whose true character as cosmical bodies was established a few hundred years ago, it is inferred that the height of the atmosphere is at least 120 miles, and that, in an extremely attenuated form, it may even reach 200 miles.

Great differences have been observed by Dr. A. Smith between country rain and town rain: country rain is neutral; town rain, on the other hand, is acid, and corrodes metals, and even stones and bricks, destroying mortar rapidly, and readily spoiling many colors. Much information has been obtained regarding impurities in the air of towns and other places by examining the rain collected in different places. The air freest from impurities is that collected at the sea-coast and at considerable heights. Again, ammonia is found to diminish, while nitric acid increases, in ascending to, at least, habitable heights. As regards organic matter in the air, it corresponds to a considerable extent with the density of the population. As might have been supposed from the higher temperature, more nitric acid is contained in rain collected on the Continent than in the British Islands. This inquiry, which is only yet in its infancy, will doubtless continue to be vigorously prosecuted, particularly since we may hope thereby to arrive at the means of authoritatively defining the safe limits of the density of population, and the extent to which manufactures may be carried on within a given area. The influence of atmospheric impurities on the public health has received a good deal of attention.

The relation of weather to mortality is a very important inquiry, and though a good deal has been known regarding the question for some time, yet it has only recently been systematically inquired into. Considering the weather of the year as made up of several distinct climates differing from each other according to temperature and moisture and their relations to each other, it may be divided into six distinct climates, characterised respectively by cold, cold with dryness, dryness with heat, heat, heat with moisture, and cold with moisture. Each of these six periods has a peculiar influence in increasing or diminishing the mortality, and each has its own group of diseases which rise to the maximum, or fall to the minimum mortality, or are subject to a rapid increase or a rapid decrease. The mortality from all causes and at all ages shows a large excess above the average from the middle of November to the middle of April, from which it falls to the minimum in the end of May; it then slowly rises, and on the third week of July suddenly shoots up almost as high as the winter maximum of the year, at which it remains till the second week of August, falling thence as rapidly as it rose to a secondary minimum in October. Regarding the summer excess, which is so abrupt in its rise and fall, it is almost altogether due to the enormous increase of the mortality among mere infants under one year of age; and this increase is due not only to deaths at one age, but to deaths from one class of diseases, viz., bowel complaints. If the deaths from bowel complaints be deducted from the deaths from all causes, there remains an excess of deaths in the cold months, and a deficiency in the warm months. In other words, the curve of mortality is regulated by the large number of deaths from diseases of the respiratory organs.

ATMOSPHERIC RAILWAY, a railway in which the pressure of air is used directly or indirectly to propel carriages, as a substitute for steam. It was devised at a time when the principles of propulsion were not so well understood as they are now, and when the dangers and inconveniences attendant on the use of locomotives were very much exaggerated. It had been long known that small objects could be propelled for great distances through tubes by air pressure, but a Mr. Vallance, of Brighton, seems to have been the first to propose the application of this system to passenger traffic. He projected (about 1825) an atmospheric railway, consisting of a wooden tube about 6 feet 6 inches in diameter, with a carriage running inside it. A diaphragm fitting the tube, approximately air-tight, was attached to the carriage, and the air exhausted from the front of it by a stationary engine, so that the atmospheric pressure behind drove the carriage forward. Later inventors, commencing with Henry Pinkus (1835), for the most part kept the carriages altogether outside the tube, and

connected them by a bar with a piston working inside it, this piston being moved by atmospheric pressure in the way just mentioned. The tube was generally provided with a slot upon its upper side, closed by a continuous valve or its equivalent, and arrangements were made by which this valve should be opened to allow the passage of the driving bar without permitting great leakage of air. About 1840, Messrs. Clegg & Samuda made various experiments with an atmospheric tube constructed on this principle upon a portion of the West London Railway, near Wormwood Scrubs. The apparent success of these induced the Dublin and Kingstown Railway to adopt Clegg & Samuda's scheme upon an extension of their line from Kingstown to Dalkey, where it was in operation in 1844. Later on, the same system was adopted on a part of the South Devon line and in several other places, and during the years 1844–1846 the English and French patent records show a very large number of more or less practicable and ingenious schemes for the tubes, valves, and driving gear of atmospheric railways. The atmospheric system was nowhere permanently successful, but in all cases was eventually superseded by locomotives, the last atmospheric line being probably that at St. Germains, which was worked until 1862.

ATOM is a body which cannot be cut in two. The atomic theory is a theory of the constitution of bodies which asserts that they are made up of atoms. The opposite theory is that of the homogeneity and continuity of bodies, and asserts, at least in the case of bodies having no apparent organisation, such, for instance, as water, that as we can divide a drop of water into two parts which are each of them drops of water, so we have reason to believe that these smaller drops can be divided again, and the theory goes on to assert that there is nothing in the nature of things to hinder this process of division from being repeated over and over again, times without end. This is the doctrine of the infinite divisibility of bodies, and it is in direct contradiction with the theory of atoms.

The atomists assert that after a certain number of such divisions the parts would be no longer divisible, because each of them would be an atom. The advocates of the continuity of matter assert that the smallest conceivable body has parts, and that whatever has parts may be divided.

In ancient times Democritus was the founder of the atomic theory, while Anaxagoras propounded that of continuity, under the name of the doctrine of homœomeria, or of the similarity of the parts of a body to the whole. The arguments of the atomists, and their replies to the objections of Anaxagoras, are to be found in Lucretius.

In modern times the study of nature has brought to light many properties which appear to depend on the magnitude and motions of their ultimate constituents, and the question of the existence of atoms has once more become conspicuous among scientific inquiries.

We shall begin by stating the opposing doctrines of atoms and of continuity before giving an outline of the state of molecular science as it now exists. In the earliest times the most ancient philosophers whose speculations are known to us seem to have discussed the ideas of number and of continuous magnitude, of space and time, of matter and motion, with a native power of thought which has probably never been surpassed. Their actual knowledge, however, and their scientific experience were necessarily limited, because in their days the records of human thought were only beginning to accumulate. It is probable that the first exact notions of quantity were founded on the consideration of number. It is by the help of numbers that concrete quantities are practically measured and calculated. Now, number is discontinuous. We pass from one number to the next *per saltum*. The magnitudes, on the other hand, which we meet with in geometry, are essentially continuous. The attempt to apply numerical methods to the comparison of geometrical quantities led to the doctrine of incommensurables, and to that of the infinite divisibility of space. Meanwhile, the same considerations had not been applied to time, so that in the days of Zeno of Elea time was still regarded as made up of a finite number of "moments," while space was confessed to be divisible without limit. This was the state of opinion when the celebrated arguments against the possibility of motion, of which that of Achilles and the tortoise is a specimen, were propounded by Zeno, and such, apparently, continued to be the state of opinion till Aristotle pointed out that time is divisible without limit, in precisely the same sense that space is. And the slowness of the development of scientific ideas may be estimated from the fact that Bayle does not see any force in this statement of Aristotle, but continues to admire the paradox of Zeno. Thus the direction of true scientific progress was for many ages towards the recognition of the infinite divisibility of space and time.

It was easy to attempt to apply similar arguments to matter. If matter is extended and fills space, the same mental operation by which we recognise the divisibility of space may be applied, in imagination at least, to the matter which occupies space. From this point of view the atomic doctrine might be regarded as a relic of the old numerical way of conceiving magnitude, and the opposite doctrine of the infinite divisibility of matter might appear for a time the most scientific. The atomists, on the other hand, asserted very strongly the distinction between matter and space. The atoms, they said, do not fill up the universe; there are void spaces between them. If it were not so, Lucretius tells us, there could be no motion, for the atom which gives way first must have some empty place to move into.

The opposite school maintained then, as they have always done, that there is no vacuum—that every part of space is full of matter, that there is a universal plenum, and that all motion is like that of a fish in water, which yields in front of the fish because the fish leaves room for it behind.

Of the different forms of the atomic theory, that of Boscovich may be taken as an example of the purest monadism. According to Boscovich matter is made up of atoms. Each atom is an indivisible point, having position in space, capable of motion in a continuous path, and possessing a certain mass, whereby a certain amount of force is required to produce a given change of motion. Besides this the atom is endowed with potential force, that is to say, that any two atoms attract or repel each other with a force depending on their distance apart. The law of this force, for all distances greater than say the thousandth of an inch, is an attraction varying as the inverse square of the distance. For smaller distances the force is an attraction for one distance and a repulsion for another, according to some law not yet discovered. Boscovich himself, in order to obviate the possibility of two atoms ever being in the same place, asserts that the ultimate force is a repulsion which increases without limit as the distance diminishes without limit, so that two atoms can never coincide. But this seems an unwarrantable concession to the vulgar opinion that two bodies cannot co-exist in the same place. This opinion is deduced from our experience of the behavior of bodies of sensible size, but we have no experimental evidence that two atoms may not sometimes coincide. For instance, if oxygen and hydrogen combine to form

water, we have no experimental evidence that the molecule of oxygen is not in the very same place with the two molecules of hydrogen. Many persons cannot get rid of the opinion that all matter is extended in length, breadth, and depth. This is a prejudice of the same kind with the last, arising from our experience of bodies consisting of immense multitudes of atoms. The system of atoms, according to Boscovich, occupies a certain region of space in virtue of the forces acting between the component atoms of the system and any other atoms when brought near them. No other system of atoms can occupy the same region of space at the same time, because, before it could do so, the mutual action of the atoms would have caused a repulsion between the two systems insuperable by any force which we can command. Thus, a number of soldiers with firearms may occupy an extensive region to the exclusion of the enemy's armies, though the space filled by their bodies is but small. In this way Boscovich explained the apparent extension of bodies consisting of atoms, each of which is devoid of extension. According to Boscovich's theory, all action between bodies is action at a distance. There is no such thing in nature as actual contact between two bodies. When two bodies are said in ordinary language to be in contact, all that is meant is that they are so near together that the repulsion between the nearest pairs of atoms belonging to the two bodies is very great.

Thus, in Boscovich's theory, the atom has continuity of existence in time and space. At any instant of time it is at some point of space, and it is never in more than one place at a time. It passes from one place to another along a continuous path. It has a definite mass which cannot be increased or diminished. Atoms are endowed with the power of acting on one another by attraction or repulsion, the amount of the force depending on the distance between them. On the other hand, the atom itself has no parts or dimensions. In its geometrical aspect it is a mere geometrical point. It has no extension in space. It has not the so-called property of Impenetrability, for two atoms may exist in the same place. This we may regard as one extreme of the various opinions about the constitution of bodies.

The opposite extreme, that of Anaxagoras — the theory that bodies apparently homogeneous and continuous are so in reality — is, in its extreme form, a theory incapable of development. To explain the properties of any substance by this theory is impossible. We can only admit the observed properties of such substance as ultimate facts. There is a certain stage, however, of scientific progress in which a method corresponding to this theory is of service. In hydrostatics, for instance, we define a fluid by means of one of its known properties, and from this definition we make the system of deductions which constitute the science of hydrostatics. In this way the science of hydrostatics may be built upon on experimental basis without any consideration of the constitution of a fluid as to whether it is molecular or continuous. In like manner, after the French mathematicians had attempted, with more or less ingenuity, to construct a theory of elastic solids from the hypothesis that they consist of atoms in equilibrium under the action of their mutual forces, Stokes and others showed that all the results of this hypothesis, so far at least as they agreed with facts, might be deduced from the postulate that elastic bodies exist, and from the hypothesis that the smallest portions into which we can divide them are sensibly homogeneous. In this way the principle of continuity, which is the basis of the method of Fluxions and the whole of modern mathematics, may be applied to the analysis of problems connected with material bodies by assuming them. for the purpose of this analysis, to be homogeneous. All that is required to make the result applicable to the real case is that the smallest portions of the substance of which we take any notice shall be sensibly of the same kind. Thus, if a railway contractor has to make a tunnel through a hill of gravel, and if one cubic yard of the gravel is so like another cubic yard that for the purposes of the contract they may be taken as equivalent, then, in estimating the work required to remove the gravel from the tunnel, he may, without fear of error, make his calculations as if the gravel were a continuous substance. But if a worm has to make his way through the gravel, it makes the greatest possible difference to him whether he tries to push right against a piece of gravel, or directs his course through one of the intervals between the pieces; to him, therefore, the gravel is by no means a homogeneous and continuous substance.

In the same way, a theory that some particular substance, say water, is homogeneous and continuous may be a good working theory up to a certain point, but may fail when we come to deal with quantities so minute or so attenuated that their heterogeneity of structure comes into prominence. Whether this heterogeneity of structure is or is not consistent with homogeneity and continuity of substance is another question.

The extreme form of the doctrine of continuity is that stated by Descartes, who maintains that the whole universe is equally full of matter, and that this matter is all of one kind, having no essential property besides that of extension. All the properties which we perceive in matter he reduces to its parts being movable among one another, and so capable of all the varieties which we can perceive to follow from the motion of its parts. Descarte's own attempts to deduce the different qualities and actions of bodies in this way are not of much value. More than a century was required to invent methods of investigating the conditions of the motion of systems of bodies such as Descartes imagined. But the hydrodynamical discovery of Helmholtz that a vortex in a perfect liquid possesses certain permanent characteristics, has been applied by Sir W. Thomson to form a theory of vortex atoms in a homogeneous, incompressible, and frictionless liquid, to which we shall return at the proper time.

Outline of Modern Molecular Science, and in Particular of the Molecular Theory of Gases.

We begin by assuming that bodies are made up of parts, each of which is capable of motion, and that these parts act on each other in a manner consistent with the principle of the conservation of energy. In making these assumptions, we are justified by the facts that bodies may be divided into smaller parts, and that all bodies with which we are acquainted are conservative systems, which would not be the case unless their parts were also conservative systems.

We may also assume that these small parts are in motion. This is the most general assumption we can make, for it includes, as a particular case, the theory that the small parts are at rest. The phenomena of the diffusion of gases and liquids through each other show that there may be a motion of the small parts of a body which is not perceptible to us.

We make no assumption with respect to the nature of the small parts—whether they are all of one magnitude. We do not even assume them to have extension and figure. Each of them must be measured by its mass, and any two of them must, like visible bodies, have the power of acting on one another when they come near enough to do so. The properties of the

body, or medium, are determined by the configuration and motion of its small parts.

The effect of the direct action of the molecules on each other depends on the number of pairs of molecules which at a given instant are near enough to act on one another. The number of such pairs is proportional to the square of the number of molecules in unit of volume, that is, to the square of the density of the gas. Hence, as long as the medium is so rare that the encounter between two molecules is not affected by the presence of others, the deviation from Boyle's law will be proportional to the square of the density. If the action between the molecules is on the whole repulsive, the pressure will be greater than that given by Boyle's law. If it is, on the whole, attractive, the pressure will be less than that given by Boyle's law. It appears, by the experiments of Regnault and others, that the pressure does deviate from Boyle's law when the density of the gas is increased. In the case of carbonic acid and other gases which are easily liquefied, this deviation is very great. In all cases, however, except that of hydrogen, the pressure is less than that given by Boyle's law, showing that the virial is on the whole due to *attractive* forces between the molecules.

Another kind of evidence as to the nature of the action between the molecules is furnished by an experiment made by Dr. Joule. Of two vessels, one was exhausted and the other filled with a gas at a pressure of 20 atmospheres; and both were placed side by side in a vessel of water, which was constantly stirred. The temperature of the whole was observed. Then a communication was opened between the vessels, the compressed gas expanded to twice its volume, and the work of expansion, which at first produced a strong current in the gas, was soon converted into heat by the internal friction of the gas. When all was again at rest, and the temperature uniform, the temperature was again noted. In Dr. Joule's first experiments the observed temperature was the same as before. In a series of experiments, conducted by Dr. Joule and Sir W. Thomson on a different plan, by which the thermal effect of free expansion can be more accurately measured, a slight cooling effect was observed in all the gases examined except hydrogen. Since the temperature depends on the velocity of agitation of the molecules, it appears that when a gas expands without doing external work the velocity of agitation is not much affected, but that in most cases it is slightly diminished. Now if the molecules during their mutual separation act on each other their velocity will increase or diminish according as the force is repulsive or attractive. It appears from the experiments on the free expansion of gases, that the force between the molecules is small, but on the whole attractive. Having thus justified the hypothesis that a gas consists of molecules in motion, which act on each other only when they come very close together during an encounter, but which during the intervals between their encounters which constitute the greater part of their existence, are describing free paths, and are not acted on by any molecular force, we proceed to investigate the motion of such a system.

The mathematical investigation of the properties of such a system of molecules in motion is the foundation of molecular science. Clausius was the first to express the relation between the density of the gas, the length of the free paths of its molecules, and the distance at which they encounter each other. He assumed, however, at least in his earlier investigations, that the velocities of all the molecules are equal. The mode in which the velocities are distributed was first investigated by the present writer, who showed that in the moving system the velocities of the molecules range from zero to infinity, but that the number of molecules whose velocities lie within given limits can be expressed by a formula identical with that which expresses in the theory of errors the number of errors of observation lying within corresponding limits.

The mean kinetic energy of a molecule, however, has a definite value, which is easily expressed in terms of the quantities which enter into the expression for the distribution of velocities. The most important result of this investigation is that when several kinds of molecules are in motion and acting on one another, the mean kinetic energy of a molecule is the same whatever be its mass, the molecules of greater mass having smaller mean velocities. Now, when gases are mixed their temperatures become equal. Hence we conclude that the physical condition which determines that the temperature of two gases shall be the same is that the mean kinetic energies of agitation of the individual molecules of the two gases are equal. This is of great importance in the theory of heat, though we are not yet able to establish any like result for bodies in the liquid or solid state.

Our definition of a molecule is purely dynamical. A molecule is that minute portion of a substance which moves about as a whole, so that its parts, if it has any, do not part company during the motion of agitation of the gas. The result of the kinetic theory, therefore, is to give us information about the relative masses of molecules considered as moving bodies. The consistency of this information with the deductions of chemists from the phenomena of combination, greatly strengthens the evidence in favor of the actual existence and motion of gaseous molecules.

Another confirmation of the theory of molecules is derived from the experiments of Dulong and Petit on the specific heat of gases, from which they deduced the law which bears their name, and which asserts that the specific heats of equal weights of gases are inversely as their combining weights, or, in other words, that the capacities for heat of the chemical equivalents of different gases are equal.

The determination of the molecular volume of a gas is subject as yet to considerable uncertainty. The most obvious method is that of compressing the gas till it assumes the liquid form. It seems probable, from the great resistance of liquids to compression, that their molecules are at about the same distance from each other as that at which two molecules of the same substance in the gaseous form act on each other during an encounter. If this is the case, the molecular volume of a gas is somewhat less than the volume of the liquid into which it would be condensed by pressure, or, in other words, the density of the molecules is somewhat greater than that of the liquid.

The first numerical estimate of the diameter of a molecule was that made by Loschmidt in 1865 from the mean path and the molecular volume. Independently of him and of each other, Mr. Stoney, in 1868, and Sir W. Thomson, in 1870, published results of a similar kind—those of Thomson being deduced not only in this way, but from considerations derived from the thickness of soap bubbles, and from the electric action between zinc and copper.

The diameter and the mass of a molecule, as estimated by these methods, are, of course, very small, but by no means infinitely so. About two millions of molecules of hydrogen in a row would occupy a millimetre, and about two hundred million million million of them would weigh a milligramme. These numbers must be considered as exceedingly rough guesses; they must be corrected by more extensive and accurate experiments as science advances; but the main result, which appears to be well established, is that the determination of the

mass of a molecule is a legitimate object of scientific research, and that this mass is by no means immeasurably small.

Loschmidt illustrates these molecular measurements by a comparison with the smallest magnitudes visible by means of a microscope. Nobert, he tells us, can draw 4000 lines in the breadth of a millimetre. The intervals between these lines can be observed with a good microscope. A cube, whose side is the 4000th of a millimetre, may be taken as the *minimum visible* for observers of the present day. Such a cube would contain from 60 to 100 million molecules of oxygen or of nitrogen; but since the molecules of organised substances contain on an average about 50 of the most elementary atoms, we may assume that the smallest organised particle visible under the microscope contains about two million molecules of organic matter. At least half of every living organism consists of water, so that the smallest living being visible under the microscope does not contain more than about a million organic molecules. Some exceedingly simple organism may be supposed built up of not more than a million similar molecules. It is impossible, however, to conceive so small a number sufficient to form a being furnished with a whole system of specialised organs.

Thus molecular science sets us face to face with physiological theories. It forbids the physiologist from imagining that structural details of infinitely small dimensions can furnish an explanation of the infinite variety which exists in the properties and functions of the most minute organisms.

A microscopic germ is, we know, capable of development into a highly organised animal. Another germ, equally microscopic, becomes, when developed, an animal of a totally different kind. Do all the differences, infinite in number, which distinguish the one animal from the other, arise each from some difference in the structure of the respective germs? Even if we admit this as possible, we shall be called upon by the advocates of Pangenesis to admit still greater marvels. For the microscopic germ, according to this theory, is no mere individual, but a representative body, containing members collected from every rank of the longdrawn ramification of the ancestral tree, the number of these members being amply sufficient not only to furnish the hereditary characteristics of every organ of the body and every habit of the animal from birth to death, but also to afford a stock of latent gemmules to be passed on in an inactive state from germ to germ, till at last the ancestral peculiarity which it represents is revived in some remote descendant.

Some of the exponents of this theory of heredity have attempted to elude the difficulty of placing a whole world of wonders within a body so small and so devoid of visible structure as a germ, by using the phrase structureless germs. Now, one material system can differ from another only in the configuration and motion which it has at a given instant. To explain differences of function and development of a germ without assuming differences of structure is, therefore, to admit that the properties of a germ are not those of a purely material system.

The evidence as to the nature and motion of molecules, with which we have hitherto been occupied, has been derived from experiments upon gaseous media, the smallest sensible portion of which contains millions of millions of molecules. The constancy and uniformity of the properties of the gaseous medium is the direct result of the inconceivable irregularity of the motion of agitation of its molecules. Any cause which could introduce regularity into the motion of agitation, and marshal the molecules into order and method in their evolutions, might check or even reverse that tendency to diffusion of matter, motion, and energy, which is one of the most invariable phenomena of nature, and to which Thomson has given the name of the dissipation of energy.

Thus, when a sound-wave is passing through a mass of air, this motion is of a certain definite type, and if left to itself the whole motion is passed on to other masses of air, and the sound-wave passes on, leaving the air behind it at rest. Heat, on the other hand, never passes out of a hot body, except to enter a colder body, so that the energy of sound-waves, or any other form of energy which is propagated so as to pass wholly out of one portion of the medium and into another, cannot be called heat.

We have now to turn our attention to a class of molecular motions, which are as remarkable for their regularity as the motion of agitation is for its irregularity.

It has been found, by means of the spectroscope, that the light emitted by incandescent substances is different according to their state of condensation. When they are in an extremely rarefied condition the spectrum of their light consists of a set of sharply-defined bright lines. As the substance approaches a denser condition the spectrum tends to become continuous, either by the lines becoming broader and less defined, or by new lines and bands appearing between them, till the spectrum at length loses all its characteristics and becomes identical with that of solid bodies when raised to the same temperature.

Hence the vibrating systems, which are the source of the emitted light, must be vibrating in a different manner in these two cases. When the spectrum consists of a number of bright lines, the motion of the system must be compounded of a corresponding number of types of harmonic vibration.

In order that a bright line may be sharply defined, the vibratory motion which produces it must be kept up in a perfectly regular manner for some hundreds or thousands of vibrations. If the motion of each of the vibrating bodies is kept up only during a small number of vibrations, then, however regular may be the vibrations of each body while it lasts, the resultant disturbance of the luminiferous medium, when analysed by the prism, will be found to contain, besides the part due to the regular vibrations, other motions, depending on the starting and stopping of each particular vibrating body, which will become manifest as a diffused luminosity scattered over the whole length of the spectrum. A spectrum of bright lines, therefore, indicates that the vibrating bodies when set in motion are allowed to vibrate in accordance with the conditions of their internal structure for some time before they are again interfered with by external forces.

It appears, therefore, from spectroscopic evidence that each molecule of a rarefied gas is, during the greater part of its existence, at such a distance from all other molecules that it executes its vibrations in an undisturbed and regular manner. This is the same conclusion to which we were led by considerations of another kind at p. 626.

We may therefore regard the bright lines in the spectrum of a gas as the result of the vibrations executed by the molecules while describing their free paths. When two molecules separate from one another after an encounter, each of them is in a state of vibration, arising from the unequal action on different parts of the same molecule during the encounter. Hence, though the centre of mass of the molecule describing its free path moves with uniform velocity, the parts of the molecule have a vibratory motion with respect to the

centre of mass of the whole molecule, and it is the disturbance of the luminiferous medium communicated to it by the vibrating molecules which constitutes the emitted light.

We may compare the vibrating molecule to a bell. When struck, the bell is set in motion. This motion is compounded of harmonic vibrations of many different periods, each of which acts on the air, producing notes of as many different pitches. As the bell communicates its motion to the air, these vibrations necessarily decay, some of them faster than others, so that the sound contains fewer and fewer notes, till at last it is reduced to the fundamental note of the bell. If we suppose that there are a great many bells precisely similar to each other, and that they are struck, first one and then another, in a perfectly irregular manner, yet so that, on an average, as many bells are struck in one second of time as in another, and also in such a way that, on an average, any one bell is not again struck till it has ceased to vibrate, then the audible result will appear a continuous sound, composed of the sound emitted by bells in all states of vibration, from the clang of the actual stroke to to the final hum of the dying fundamental tone.

But now let the number of bells be reduced while the same number of strokes are given in a second. Each bell will now be struck before it has ceased to vibrate, so that in the resulting sound there will be less of the fundamental tone and more of the original clang, till at last, when the peal is reduced to one bell, on which innumerable hammers are continually plying their strokes all out of time, the sound will become a mere noise, in which no musical note can be distinguished.

In the case of a gas we have an immense number of molecules, each of which is set in vibration when it encounters another molecule, and continues to vibrate as it describes its free path. The molecule is a material system, the parts of which are connected in some definite way, and from the fact that the bright lines of the emitted light have always the same wave-lengths, we learn that the vibrations corresponding to these lines are always executed in the same periodic time, and therefore the force tending to restore any part of the molecule to its position of equilibrium in the molecule must be proportional to its displacement relative to that position.

From the mathematical theory of the motion of such a system, it appears that the whole motion may be analysed into the following parts, which may be considered each independently of the others : — In the first place, the centre of mass of the system moves with uniform velocity in a straight line. This velocity may have any value. In the second place, there may be a motion of rotation, the angular momentum of the system about its centre of mass remaining during the free path constant in magnitude and direction. This angular momentum may have any value whatever, and its axis may have any direction. In the third place, the remainder of the motion is made up of a number of component motions, each of which is an harmonic vibration of a given type. In each type of vibration the periodic time of vibration is determined by the nature of the system, and is invariable for the same system. The relative amount of motion in different parts of the system is also determinate for each type, but the absolute amount of motion and the phase of the vibration of each type are determined by the particular circumstances of the last encounter, and may vary in any manner from one encounter to another.

The values of the periodic times of the different types of vibration are given by the roots of a certain equation, the form of which depends on the nature of the connections of the system. In certain exceptionally simple cases, as, for instance, in that of a uniform string stretched between two fixed points, the roots of the equation are connected by simple arithmetical relations, and if the internal structure of a molecule had an analogous kind of simplicity, we might expect to find in the spectrum of the molecule a series of bright lines, whose wave-lengths are in simple arithmetical ratios.

But if we suppose the molecule to be constituted according to some different type, as, for instance, if it is an elastic sphere, or if it consists of a finite number of atoms kept in their places by attractive and repulsive forces, the roots of the equation will not be connected with each other by any simple relations, but each may be made to vary independently of the others by a suitable change of the connections of the system. Hence, we have no right to expect any definite numerical relations among the wave-lengths of the bright lines of a gas.

The bright lines of the spectrum of an incandescent gas are therefore due to the harmonic vibrations of the molecules of the gas during their free paths. The only effect of the motion of the centre of mass of the molecule is to alter the time of vibration of the light as received by a stationary observer. When the molecule is coming towards the observer, each successive impulse will have a shorter distance to travel before it reaches his eye, and therefore the impulses will appear to succeed each other more rapidly than if the molecule were at rest, and the contrary will be the case if the molecule is receding from the observer. The bright line corresponding to the vibration will therefore be shifted in the spectrum towards the blue end when the molecule is approaching, and towards the red end when it is receding from the observer. By observations of the displacement of certain lines in the spectrum, Dr. Huggins and others have measured the rate of approach or of recession of certain stars with respect to the earth, and Mr. Lockyer has determined the rate of motion of tornadoes in the sun. But Lord Rayleigh has pointed out that according to the dynamical theory of gases the molecules are moving hither and thither with so great velocity that, however narrow and sharply-defined any bright line due to a single moleclue may be, the displacement of the line towards the blue by the approaching molecules, and towards the red by the receding molecules, will produce a certain amount of widening and blurring of the line in the spectrum, so that there is a limit to the sharpness of definition of the lines of a gas. The widening of the lines due to this cause will be in proportion to the velocity of agitation of the molecules. It will be greatest for the molecules of smallest mass, as those of hydrogen, and it will increase with the temperature. Hence the measurement of the breadth of the hydrogen lines, such as C or F in the spectrum of the solar prominences, may furnish evidence that the temperature of the sun cannot exceed a certain value.

We must now leave these speculations about the nature of molecules and contemplate the material universe as made up of molecules. Every molecule, so far as we know, belongs to one of a definite number of species. The list of chemical elements may be taken as representing the known species which have been examined in the laboratories. Several of these have been discovered by means of the spectroscope, and more may yet remain to be discovered in the same way. The spectroscope has also been applied to analyse the light of the sun, the brighter stars and some of the nebulæ and comets, and has shown that the character of the light emitted by these bodies is similar in some cases to that emitted by terrestrial molecules, and in others to light from which the molecules have obsorbed certain rays. In this way a considerable number of

coincidences have been traced between the systems of lines belonging to particular terrestrial substances and corresponding lines in the spectra of the heavenly bodies.

The value of the evidence furnished by such coincidences may be estimated by considering the degree of accuracy with which one such coincidence may be observed. The interval between the two lines which form Fraunhofer's line D is about the five hundredth part of the interval between B and G on Kirchoff's scale. A discordance between the positions of two lines amounting to the tenth part of this interval, that is to say, the five thousanth part of the length of the bright part of the spectrum, would be very perceptible in a spectroscope of moderate power.

If we adopt the theory of Boscovich, and assert that the primitive atom is a mere centre of force, having a certain definite mass, we may get over the difficulty about the equality of the mass of all atoms by laying it down as a doctrine which cannot be disproved by experiment, that mass is not a quantity capable of continuous increase or diminution, but that it is in its own nature discontinuous, like number, the atom being the unit, and all masses being multiples of that unit. We have no evidence that it is possible for the ratio of two masses to be an incommensurable quantity, for the incommensurable quantities in geometry are supposed to be traced out in a continuous medium. If matter is atomic, and therefore discontinuous, it is unfitted for the construction of perfect geometrical models, but in other respects it may fulfil its functions.

But even if we adopt a theory which makes the equality of the mass of different atoms a result depending on the nature of mass rather than on any quantitative adjustment, the correspondence of the periods of vibration of actual molecules is a fact of a different order.

We know that radiations exist having periods of vibration of every value between those corresponding to the limits of the visible spectrum, and probably far beyond these limits on both sides. The most powerful spectroscope can detect no gap or discontinuity in the spectrum of the light emitted by incandescent lime.

The period of vibration of a luminous particle is therefore a quantity which in itself is capable of assuming any one of a series of values, which, if not mathematically continuous, is such that consecutive observed values differ from each other by less than the ten thousandth part of either. There is, therefore, nothing in the nature of time itself to prevent the period of vibration of a molecule from assuming any one of many thousand different observable values. That which determines the period of any particular kind of vibration is the relation which subsists between the corresponding type of displacement and the force of restitution thereby called into play, a relation involving constants of space and time as well as of mass.

It is the equality of these space- and time-constants for all molecules of the same kind which we have next to consider. We have seen that the very different circumstances in which different molecules of the same kind have been placed have not, even in the course of many ages, produced any appreciable difference in the values of these constants. If, then, the various processes of nature to which these molecules have been subjected since the world began have not been able in all that time to produce any appreciable difference between the constants of one molecule and those of another, we are forced to conclude that it is not to the operation of any of these processes that the uniformity of the constants is due.

The formation of the molecule is therefore an event not belonging to that order of nature under which we live. It is an operation of a kind which is not, so far as we are aware, going on on earth or in the sun or the stars, either now or since these bodies began to be formed. It must be referred to the epoch, not of the formation of the earth or of the solar system, but of the establishment of the existing order of nature, and till not only these worlds and systems, but the very order of nature itself is dissolved, we have no reason to expect the occurrence of any operation of a similar kind.

In the present state of science, therefore, we have strong reasons for believing that in a molecule, or if not in a molecule, in one of its component atoms, we have something which has existed either from eternity or at least from times anterior to the existing order of nature. But besides this atom, there are immense numbers of other atoms of the same kind, and the constants of each of these atoms are incapable of adjustment by any process now in action. Each is physically independent of all the others.

Whether or not the conception of a multitude of beings existing from all eternity is in itself self-contradictory, the conception becomes palpably absurd when we attribute a relation of quantitative equality to all these beings. We are then forced to look beyond them to some common cause or common origin to explain why this singular relation of equality exists, rather than any one of the infinite number of possible relations of inequality.

Science is incompetent to reason upon the creation of matter itself out of nothing. We have reached the utmost limit of our thinking faculties when we have admitted that, because matter cannot be eternal and self-existent, it must have been created. It is only when we contemplate not matter in itself, but the form in which it actually exists, that our minds find something on which it can lay hold.

The matter, as such, should have certain fundamental properties, that it should have a continuous existence in space and time, that all action should be between two portions of matter, and so on, are truths which may, for aught we know, be of the kind which metaphysicians call necessary. We may use our knowledge of such truths for purposes of deduction, but we have no data for speculating on their origin.

But the equality of the consants of the molecules is a fact of a very different order. It arises from a particular distribution of matter, a *collocation*, to use the expression of Dr. Chalmers, of things which we have no difficulty in imagining to have been arranged otherwise. But many of the ordinary instances of collocation are adjustments of constants, which are not only arbitrary in their own nature, but in which variations actually occur; and when it is pointed out that these adjustments are beneficial to living beings, and are therefore instances of benevolent design, it is replied that those variations which are not conducive to the growth and multiplication of living beings tend to their destruction, and to the removal thereby of the evidence of any adjustment not beneficial.

The constitution of an atom, however, is such as to render it, so far as we can judge, independent of all the dangers arising from the struggle for existence. Plausible reasons may, no doubt, be assigned for believing that if the constants had varied from atom to atom through any sensible range, the bodies formed by aggregates of such atoms would not have been so well fitted for the construction of the world as the bodies which actually exist. But as we have no experience of bodies formed of such variable atoms this must remain a bare conjecture.

Atoms have been compared by Sir J. Herschel to manufactured articles, on account of their uniformity. The uniformity of manufactured articles may be traced to very different motives on the part of the manufacturer. In certain cases it is found to be less expensive as regards trouble, as well as cost, to make a great many objects exactly alike than to adapt each to its special requirements. Thus, shoes for soldiers are made in large numbers without any designed adaptation to the feet of particular men. In another class of cases the uniformity is intentional, and is designed to make the manufactured article more valuable. Thus, Whitworth's bolts are made in a certain number of sizes, so that if one bolt is lost, another may be got at once, and accurately fitted to its place. The identity of the arrangement of the words in the different copies of a document or book is a matter of great practical importance, and it is more perfectly secured by the process of printing than by that of manuscript copying.

In a third class not a part only but the whole of the value of the object arises from its exact conformity to a given standard. Weights and measures belong to this class, and the existence of many well-adjusted material standards of weight and measure in any country furnishes evidence of the existence of a system of law regulating the transactions of the inhabitants, and enjoining in all professed measures a conformity to the national standard.

There are thus three kinds of usefulness in manufactured articles—cheapness, serviceableness, and quantitative accuracy. Which of these was present to the mind of Sir J. Herschel we cannot now positively affirm, but it was at least as likely to have been the last as the first, though it seems more probable that he meant to assert that a number of exactly similar things cannot be each of them eternal and self-existent, and must therefore have been made, and that he used the phrase "manufactured article" to suggest the idea of their being made in great numbers.

ATOOI, one of the larger Sandwich Islands, in the South Pacific Ocean. Towards the N.E. and N.W. the country is rugged and broken, but to the southward it is more level. The hills rise from the sea with a gentle acclivity, and, at a little distance back, are covered with wood; the central peaks attain an elevation of 7000 feet. The chief ports are Waimea and Hanalei. The island was one of the stations chosen for the observation of the transit of Venus in 1874. It is nearly 40 miles in length, and contains about 10,000 inhabitants.

ATRATO, a river of Colombia, South America, which, after a course of 250 miles, almost due N., for the most part through a low and swampy region, falls into the Gulf of Uraba or Darien. The gold and platinum mines of Choco were on some of its affluents, and its sands are still auriferous. The river has attracted considerable attention in connection with schemes for the construction of a ship-canal across the isthmus. It is navigable for small vessels for about 140 miles.

ATREK or ATTRUCK, a river which rises in the mountains of Khorasan, and flows W. along the borders of Persia and the Russian possessions, till it falls in the south-eastern corner of the Caspian, a short distance to the N. of Ashurada.

ATREUS, in *Greek Legend*, a son of Pelops, had, with his brother Thyestes, settled in Mycenæ, where he succeeded Eurystheus in the sovereignty, in which he was secured by the possession of a lamb or ram with a golden fleece. His wife Aërope, a daughter of Minos, bribed by Thyestes, assisted the latter to carry off the ram. But Zeus, in the interest of Atreus, wrought a miracle, causing the sun which before had risen in the west to rise in the east. Thyestes was driven from Mycenæ, but returned to his brother begging to be forgiven. Atreus, appearing to welcome him, invited him to a banquet to eat of his own son, whom he had slain. From this crime followed the ills which befel Agamemnon, the son of Atreus.

ATRI or ATRIA, the ancient *Hadria*, a town of Naples, in the province of Abruzzo Ulteriore I., situated on a steep mountain 5 miles from the Adriatic, and 18 miles S.E. of Teramo. Remains of the ancient city have been discovered to the S. of the present site, consisting of the ruins of a theatre and baths, with pavements, and vases of Greek manufacture.

ATRIUM, the principal apartment in a Roman house, was entered through the *ostium* or *janua*, which opened off the *vestibulum*, a clear space between the middle of the house and the street, formed by the projection of the two sides. It was generally quadrangular in shape, and was roofed all over, with the exception of a square opening, called *compluvium*, towards which the roofs sloped, and by which the rain-water was conducted down to a basin (*impluvium*) fixed in the floor. In the early periods of Roman civilisation, the atrium was the common public apartment, and was used for the reception of visitors and clients, and for ordinary domestic purposes, as cooking and dining. In it were placed the ancestral pictures, the marriage-couch, the hearth, and generally a small altar. Here, too, were kept the looms at which the mistress of the house sat and span with her maid-servants. At a somewhat later period, and among the wealthy, separate apartments were built for kitchens and dining-rooms, and the atrium was kept as a general reception room for clients and visitors.

ATRIUM, in *Ecclesiastical Antiquities*, denotes an open place or court before a church. It consisted of a large area or square plat of ground, surrounded with a portico or cloister, situated between the porch or vestibule and the body of the church. In the centre was placed a fountain, wherein the worshippers washed their hands before entering church. In the atrium those who were not suffered to advance farther, and more particularly the first class of penitents, stood to solicit the prayers of the faithful as they went into the church. It was also used as a burying-ground, at first only for distinguished persons, but afterwards for all believers.

ATROPHY, a term in medicine used to describe a a state of wasting due to some interference with the function of healthy nutrition. In the living organism there are ever at work changes involving the waste of its component tissues, which render necessary, in order to the preservation of life, the proper assimilation of nutritive material. It is also essential for the maintenance of health that a due relation exist between these processes of waste and repair, so that the one may not be in excess of the other. When the appropriation of nutriment exceeds the waste, hypertrophy or increase in bulk of the tissues takes place. (See HYPERTROPHY.) When, on the other hand, the supply of nutritive matter is suspended or diminished, or when the power of assimilation is impaired, atrophy or wasting is the result. Thus the whole body becomes atrophied in many diseases; and in old age every part of the frame, with the single exception of the heart, undergoes atrophic change. Atrophy may, however, affect single organs or parts of the body, irrespective of the general state of nutrition, and this may be brought about in a variety of ways. One of the most frequently observed of such instances is atrophy from disuse, or cessation of function. Thus, when a limb is deprived of the natural power of motion, either by paralysis or by painful joint disease, the condition of exercise essential to its nutrition being no longer fulfilled, atrophy of all its textures

ooner or later takes place. The brain in imbeciles is frequently observed to be shriveled, and in many cases of blindness there is atrophy of the optic nerve and optic tract. This form of atrophy is likewise well exemplified in the case of those organs and structures of the body which subserve important ends during fœtal life, but which, ceasing to be necessary after birth, undergo a sort of natural atrophy, such as the thymus gland, and certain vessels specially concerned in the fœtal circulation. The uterus after parturition undergoes a certain amount of atrophy, and the ovaries, after the child-bearing period, become shrunken. Atrophy of a part may also be caused by interruption to its normal blood supply, as in the case of the ligature or obstruction of an artery. Again, long standing disease, by affecting the nutrition of an organ and by inducing the deposit of morbid products, may result in atrophy, as frequently happens in affections of the liver and kidneys. Parts that are subjected to continuous pressure are liable to become atrophied, as is sometimes seen in internal organs which have been pressed upon by tumors or other morbid growths, and is well illustrated in the case of the feet of Chinese ladies, which are prevented from growing by persistent compression exercised from birth.

ATROPIA, or ATROPINE, $C_{17}H_{23}NO_3$, is an alkaloid existing in all parts of the deadly night-shade (*Atropa belladonna*). The seed of the thorn-apple (*Datura stramonium*) also contains an alkaloid, deturine, which long was believed to be identical with atropia. Recent researches seem to indicate that it is, however, only isomeric, and that it is only half as poisonous as atropia. A solution of sulphate of atropia in water dropped into the eye is now generally preferred to belladonna lotions or ointments for eye diseases.

ATROPOS, the eldest of the three Moirai, Parcæ, or Fates. Her name, the Unalterable, indicates the part generally played by her, viz., that of rendering the decisions of her sisters irreversible or immutable.

ATTACHE (Fr.), one attached to or connected with another, as a part of his suite of attendants. The term is specifically applied to young diplomatists on the staff of an ambassador.

ATTACHMENT, in *Law*, is a process from a court of record, awarded by the court at its discretion, on a bare suggestion, or on its own knowledge, and is properly grantable in cases of contempt. It differs from arrest, in that he who arrests a man carries him to a person of higher power to be forthwith disposed of; but he that attaches keeps the party attached, and presents him in court at the day assigned, as appears by the words of the writ. Another difference is, that arrest is only upon the body of a man, whereas an attachment is often upon his goods. It is distinguished from distress in not extending to lands, as the latter does; nor does a distress touch the body as an attachment does. Every court of record has power to fine and imprison for contempt of its authority. Attachment being merely a process to bring the defendant before the court, is not necessary in cases of contempt in the presence of the court itself.

ATTACHMENT OF DEBTS.— It was suggested by the common law commissioners in 1853 that a remedy analogous to that of Foreign Attachment might be made available to creditors, after judgment, against debts due to their debtors. Accordingly, the Common Law Procedure Act, 1854, enacted that any creditor, having obtained judgment in the superior courts, should have an order that the judgment debtor might be examined as to any debts due and owing to him before a master of the court. On affidavit that the judgment was still unsatisfied, and that any other person within the jurisdiction was indebted to the judgment debtor, the judge was empowered to attach all debts due from such third person to the judgment debtor.

In the United States attachment may be defined as the taking into the custody of the law the person or property of one who is already before the court, or of one whom it is sought to bring before the court; also a writ for this purpose. To some extent it is of the nature of a criminal process. In some States attachments are distinguished as foreign and domestic—the former issued against a non-resident having property within the jurisdiction of the State, the latter against a resident in the State, jurisdiction over the person or property being necessary for an attachment. An attachment issued under a State law which has not been adopted by Congress, or by a rule of court, cannot be sustained in a United States court. Money due to a seaman for wages is not attachable in the hands of a purser, the purser being a distributing agent for the government, and in no sense the debtor of the seaman.

ATTAINDER, in the *Law of England*, was the immediate and inseparable consequence from the common law upon the sentence of death. When it was clear beyond all dispute that the criminal was no longer fit to live, he was called *attaint*, *attinctus*, stained or blackened, and could not be a witness in any court. This attainder took place after judgment of death, or upon such circumstances as were equivalent to judgment of death, such as judgment of outlawry on a capital crime, pronounced for absconding from justice. Conviction without judgment was not followed by attainder. The consequences of attainder were Forfeitures. On attainder for treason, the criminal forfeited to the Crown his lands, rights of entry on lands, and any interest he might have in lands for his own life or a term of years. For murder, the offender forfeited to the Crown the profit of his freeholds during life, and in the case of lands held in fee-simple, the lands themselves for a year and a day; subject to this, the lands escheated to the lord of the fee. These forfeitures related back to the time of the offence committed. Forfeitures of goods and chattels ensued not only on attainder, but on conviction for a felony of any kind, or on flight from justice, and had no relation backwards to the time of the offence committed. Provision is made for the due administration of convicts' estates in the interests of themselves and their families. Forfeiture consequent on outlawry is exempted from the provisions of the Act.

ATTALIA, an ancient city of Pamphylia, named from Attalus II, king of Pergamus.

ATTAR, or OTTO, of ROSES, a well-known perfume of great strength, is an essential oil of roses, prepared chiefly in Hindustan and Persia. See OILS and PERFUMERY.

ATTENTION, in *Psychology* may be defined as the concentration of consciousness, or the direction of mental energy upon a definite object or objects.

ATTERBOM, PETER DANIEL AMADEUS, a Swedish poet, was born in Ostergöthland in 1790, studied in the University of Upsala from 1805 to 1815, became Professor of Philosophy there in 1828, and died in 1855. He was the leader in the great romantic movement which revolutionised Swedish literature.

ATTERBURY, FRANCIS, a man who holds a conspicuous place in the political, ecclesiastical, and literary history of England, was born in the year 1662, at Middleton in Buckinghamshire, a parish of which his father was rector. Francis was educated at Westminster School, and carried thence to Christ Church a stock of learning, which, though really scanty, he through life exhibited with such judicious ostentation that superficial observers believed his attainments to be immense. In

1687 he distinguished himself among many able men who wrote in defence of the Church of England, then persecuted by James II., and calumniated by apostates who had for lucre quitted her communion. Among these apostates none was more active or malignant than Obadiah Walker, who was master of University College, and who had set up there, under the royal patronage, a press for printing tracts against the established religion. In one of these tracts, written apparently by Walker himself, many aspersions were thrown on Martin Luther. Atterbury undertook to defend the great Saxon Reformer, and performed the task in a manner singularly characteristic. Whoever examines his reply to Walker will be struck by the contrast between the feebleness of those parts which are argumentative and defensive, and the vigor of those parts which are rhetorical and aggressive.

ATTICA, the most famous district of ancient Greece, is a triangular piece of ground projecting in a south-easterly direction into the Ægean Sea, the base line being formed by the continuous chain of Mounts Cithæron and Parnes, the apex by the promontory of Sunium. It is washed on two sides by the sea, and this feature seems to have given rise to the name. The coast is broken up into numerous small bights and harbors, which, however, are with few exceptions exposed to the south wind; the irregularity of the outline accounts for its great length in comparison of the superficial area of the country. The surface of Attica, as of the rest of Greece, is very mountainous, and between the mountain chains lie several plains of no great size, open on one side to the sea. On the west its natural boundary is the Corinthian Gulf, so that it would include the district of Megaris; and, as a matter of fact, before the Dorian invasion, which resulted in the foundation of Megara, the whole of this country was politically one, being in the hands of the Ionian race.

The central position of Attica in Greece was one main cause of its historical importance.

The mountains of Attica, which form its most characteristic feature, are to be regarded as a continuation of that chain which, starting from Mount Tymphrestus at the southern extremity of Pindus, passes through Phocis and Bœotia under the well-known names of Parnassus and Helicon; from this proceeds the range which, as Cithæron in its western and Parnes in its eastern portion, separates Attica from Bœotia, throwing off spurs southward towards the Saronic Gulf in Ægaleos and Hymettus, which bound the plain of Athens.

The soil is light and thin, and requires very careful agriculture to develop its produce. This feature belongs not only to the rocky mountain sides, but to some extent also to the maratime plains, and had considerable influence on the development of the inhabitants, both by enforcing industrious habits, and in leading them at an early period to take to the sea. Still, the level ground was sufficiently fertile to form a marked contrast to the rest of the district, and this fact is represented in the mythical genealogy of the early kings, which embodies several geographical features.

But whatever drawbacks the people of Attica experienced in respect of the soil were more than compensated by the fineness of the climate. In this point they enjoyed a great advantage over their neighbors the Bœotians; and while at the present day travellers speak of the excessive heat in summer and cold in winter which they have experienced in Bœotia, Attica has always been famous for its mildness.

When we turn to the vegetation of Attica, the olive first calls for our attention. This tree, we learn from Herodotus, was thought at one time to have been found in that country only; and the enthusiastic praises of Sophocles teach us that it was the land in which it flourished best. So great was the esteem in which it was held, that in the early legend of the struggle between the gods of sea and land, Poseidon and Athena, for the patronage of the country, the sea-god is represented as having to retire vanquished before the giver of the olive; and at a later period the evidences of this contention were found in an ancient olive tree in the Acropolis, together with three holes in the rock, said to have been made by the trident of Poseidon, and to be connected with a salt well hard by. The fig also found its favorite home in this country, for Demeter was said to have bestowed it as a gift on the Eleusinian Phytalus, *i.e.*, "the gardener."

Having thus noticed the general features of the country, let us proceed to examine it somewhat more in detail. It has been already mentioned that the base line is formed by the chain of Cithæron and Parnes, running from west to east; and that from this transverse chains run southward, dividing Attica into a succession of plains. The westernmost of these, which is separated from the innermost bay of the Corinthian Gulf, called the Mare Alcyonium, by an offshoot of Cithæron, and is bounded on the east by a ridge which ends towards the Saronic Gulf in a striking two-horned peak called Kerata, is the plain of Megara. It is only for geographical purposes that we include this district under Attica, for both the Dorian race of the inhabitants, and its dangerous proximity to Athens, caused it to be at perpetual feud with that city; but its position as an outpost for the Peloponnesians, together with the fact of its having once been Ionian soil, sufficiently explains the bitter hostility of the Athenians towards the Megarians. The great importance of Megara arose from its commanding all the passes into the Peloponnese. These were three in number: one along the shores of the Corinthian Gulf, which, owing to the nature of the ground, makes a long detour; the other two starting from Megara, and passing, the one by a lofty though gradual route over the ridge of Geraneia, the other along the Saronic Gulf, under the dangerous precipices of the Scironian rocks. The town of Megara, which was built on and between two low hills rising out of the plain rather more than a mile from the sea, had the command of both gulfs by means of its two ports—that of Pegæ on the Corinthian, and that of Nicæa on the Saronic.

To the east of the plain of Megara lies that of Eleusis, bounded on the one side by the chain of Kerata, and on the other by that of Ægaleos, through a depression in which was the line of the sacred way, where the torchlight processions from Athens used to descend to the coast, the "brightly-gleaming shores." Here a deep bay runs into the land, opposite to which, and separated from it by a strait, which forms a succession of graceful curves, was the rocky island of Salamis, at all times an important possession to the Athenians on account of its proximity to their city. The scene of the battle of Salamis was the narrowest part of this channel, where the island approaches the extremity of Ægaleos. The eastern portion of this plain was called the Thriasian plain, and the city of Eleusis was situated in the recesses of the bay. The coast-line of this part, between the sanctuary of Poseidon at the isthmus, which was originally Ionian, and Athens, is the principal scene of the achievements of Theseus, a hero who holds the same relation to the Ionians of Greece proper as Hercules does to the Greeks at large, viz., that of being the great author of improvements in the country.

Next in order to the plain of Eleusis came that of Athens, which is the most extensive of all, reaching from the foot of Parnes to the sea, and bounded on the

west by Ægaleos, and on the east by Hymettus. Its most conspicuous feature is the broad line of dark green along its western side, formed by the olive-groves of Colonus and the gardens of the Academus, which owe their fertility to the waters of the Cephisus, by which they are irrigated. This river is fed by copious sources on the side of Mount Parnes, and thus, unlike the other rivers of Attica, has a constant supply of water; but it does not reach the sea, nor did it apparently in classical times, having been diverted, then as now, into the neighboring plantations; for this is what Sophocles means when he speaks of "the sleepless fountains of Cephisus, which stray forth from their channels." The position of Colonus itself is marked by two bare knolls of light-colored earth, which caused the poet in the same chorus to apply the epithet "white" to that place. On the opposite side of the plain runs the other river, the Ilissus, which rises from a beautiful fountain in Mount Hymettus, and skirts the eastern extremity of the city of Athens; but this, notwithstanding its celebrity, is a mere brook which stands in pools a great part of the year, and in summer is completely dry. The situation of Athens relatively to the surrounding objects is singularly harmonious; for, while it forms a central point, so as to be the eye of the plain, and while the altar-rock of the Acropolis and the hills by which it is surrounded are conspicuous from every point of view, there is no such exactness in its position as to give formality, since it is nearer to the sea than to Parnes, and nearer to Hymettus than to Ægaleos. The most striking summit in the neighborhood of the city is that of Lycabettus, now Mount St. George, on the north-eastern side; and the variety is still further increased by the continuation of the ridge which it forms for some distance northwards through the plain. Three roads lead to Athens from the Bœotian frontier over the intervening mountain barrier — the easternmost over Parnes, from Delium and Oropus by Deceleia, which was the usual route of the invading Lacedæmonians during the Peloponnesian War; the westernmost over Cithæron, by the pass of Dryoscephalæ, or the "Oak-heads;" leading from Thebes by Platæa to Eleusis, and so to Athens, which we hear of in connection with the battle of Platæa, and with the escape of the Platæans at the time of the siege of that city in the Peloponnesian War; the third, midway between the two, by the pass of Phyle, near the summit of which, on a rugged height overlooking the Athenian plain, is the fort occupied by Thrasybulus in the days of the Thirty tyrants.

It still remains to mention the most famous spot of ground in Attica, the little plain of Marathon, which lays in the north-east corner, encircled on three sides by Parnes and Pentilicus, while the fourth faces the sea and the opposite coast of Eubœa. It was on the mountain slopes that the Greeks were stationed, while the Persians with their ships occupied the coast; and on the two sides the marshes may still be traced by which the movements of the invader's host were impeded The mound, which at once attracts the eye in the centre of the level plain, is probably the burial-place of the Athenians who fell in the battle. The bay in front is sheltered by Eubœa, and is still more protected from the north by a projecting tongue of land, called Cynosura. The mountains in the neighborhood were the seat of one of the political parties in Attica, the Diacrii or Hyperacrii, who, being poor mountaineers, and having nothing to lose, were the principal advocates of change; while, on the other hand, the Pedieis, or inhabitants of the plains, being wealthy landholders, formed the strong conservative element and the Parali, or occupants of the sea-coast, representing the mercantile interest, held an intermediate position between the two.

Of the condition of Attica in mediæval and modern times little need be said, for it has followed for the most part the fortunes of Athens. The population, however, has undergone a great change, independently of the large admixture of Slavonic blood that has effected the Greeks of the mainland generally, by the immigration of Albanian colonists, who now occupy a great part of the country.

ATTICA, a city of New York, situated in the northern part of Wyoming county, is on the Erie and the New York Central railways, thirty-one miles east of Buffalo and forty-three miles southwest of Rochester. Among the industries are flour mills, carriage shops and tanneries. The population is 5,000.

ATTICUS, Titus Pomponius, the friend of Cicero, was one of the most distinguished men during the period of the decline and fall of the Roman republic. His life gives an admirable picture of the classical man of culture, who, withdrawing from the stir of political affairs, devoted himself to literary and artistic pursuits. He was born at Rome 109 B.C., and was thus three years older than Cicero, along with whom he and the younger Marius were educated. He did not marry till he was 53 years of age, and his only child became the wife of Vipsanius Agrippa, the distinguished minister of Augustus. His large fortune was increased on the death of his uncle, L. Cæcilius, who bequeathed to him the greater part of his property. He formed a large library at Athens, and kept a staff of slaves engaged in making copies of valuable works. He probably derived considerable profits from the sale of these books. In 32 B.C., he was seized with an illness believed to be incurable. He resolved not to protract a painful and hopeless struggle, and died after five days of voluntary starvation.

ATTICUS HERODES, Tiberius Claudius, a very wealthy citizen of Athens, was born about 104 A.D. His grandfather's estates had been confiscated for treachery, but the fortunes of the family had been restored by the discovery in his father's house of an enormous sum of money, which the Emperor Nerva permitted them to retain. This great wealth Herodes afterwards increased by his marriage. He received a careful education under the most distinguished masters of the time, and specially devoted himself to the study of oratory, to excel in which seems to have been the ruling motive of his life. While very young he delivered a speech before one of the emperors; but it was so ill received that he was with difficulty restrained from throwing himself into the Danube. He ultimately attained to great celebrity as a speaker and as a teacher of rhetoric. Among his pupils were Marcus Aurelius and Lucius Verus. He was highly esteemed by the Antonines, particularly by Aurelius, and received many marks of favor, among others the archonship at Athens and the consulate at Rome. Atticus is principally celebrated, however, for the vast sums he expended on public purposes. He withdrew from Athens, and resided at his villa near Marathon, where he died about 180 A.D. None of his writings are extant.

ATTILA, or Etzel, the famous leader of the Huns, surnamed the "Fear of the World," or the "Scourge of God," was born probably about 406 A.D. His father Mundzuk, king of the Huns, was succeeded by his brothers Octar and Rhuas; and on the death of Rhuas, in 434, Attila and his brother Bleda together ascended the throne. They ruled not only over the Huns, but over nearly all the tribes north of the Danube and the Black Sea; under their banners fought Ostrogoths, Gepidæ, Alani, Heruli, and many other Teutonic peoples. Their dominions are said to have extended from the Rhine to the frontiers of China. Attila was

superstitiously reverenced by his countrymen; he was said to possess the iron sword of the war-god, Mars, and he proclaimed himself to be the man-child born at Engaddi, who was destined to rule over the whole world. In 441 and 442 the brothers ravaged Thrace and Illyria, defeated the troops of the Eastern Empire in three great battles, and penetrated as far as Thermopylæ. Peace was made on the Romans agreeing to pay a heavy tribute. About this time Attila contrived to make away with his brother Bleda, and thus secured undivided supremacy. In 445 and the following years, he again directed his attacks against the Eastern Empire, and laid waste the whole country round Constantinople. Nowhere did he meet with resistance save from the brave little town of Azimus. The empire seemed about to succumb, when Theodosius entered into negotiations and made terms with his conqueror. While matters were being arranged, a plot was laid to assassinate Attilla, in which the emperor was implicated. The conspiracy was discovered, and the barbarian upbraided the Christian monarch with his want of honor and manly courage. . Theodosius died soon after, and his successor, Marcian, returned a firm refusal to Attila's demands for tribute. War seemed inevitable; but at this time the attention of the Hun was drawn to the Western Empire. It is said that the Princess Honoria, sister of Valentinian, tired of her life of enforced celibacy, sent her ring and an offer of her hand to Attila, who upon this grounded his claim to a part of the empire. It is probable, however, that he merely used this as a pretext, and that his real designs were more comprehensive. He evidently thought it a favorable opportunity for taking advantage of the enmity between the Romans and the Visigoths; and to this plan he was also induced by the proposals of Genseric, king of the Vandals, who offered to unite with him against his rival, Theodoric, king of the Visigoths. In 451 Attila assembled his forces, it is said 700,000 strong, led them through the centre of Germany, probably by Franconia, and crossed the Rhine, at what place cannot be determined. He defeated the Burgundians, and pushed on through the heart of Gaul, until his centre was checked by the valiant resistance offered by Orleans. Meanwhile, Theodoric and Aëtius, the Roman general, had collected and united their forces, and marching with all speed, arrived in time to raise the siege of Orleans. Attila retreated to a position in the plain of Chalons, and there concentrated his forces for a great engagement. A tremendous battle ensued—one of the most gigantic as well as most important contests recorded in history. The Romans, who formed one wing, were driven back, and although they kept together, and at nightfall retired to the camp of the Visigoths, Aëtius had given up the day as lost. The Visigoths, who were on the other wing, had also been repulsed, and were discouraged by the fall of their leader Theodoric. But the fortune of the day was changed by the impetuous bravery of Thorismund, Theodoric's son, who, burning to avenge his father's fall, led on the infuriated Visigoths, and drove Attila back to his camp. He even penetrated into the fortifications, but was wounded and thrown from his horse, and his followers with difficulty carried him off. Next day, Attila remained in camp in expectation of an attack, and having thrown all his baggage into a gigantic pile in the centre of the camp to be burned in case of defeat, resolved to sell his life dearly. But no attack was made; for Thorismund was persuaded by Aëtius to march to Toulouse in order to obtain his father's kingdom. Attila was thus enabled to retire in perfect security. Next year he poured his forces through the defiles of the Alps, and laid waste the whole north of Italy. Rome itself seemed likely to fall before the invader, when his course was arrested by an embassy headed by Pope Leo. Attila at once withdrew from Italy, but the motive which led him to act thus is not known. At the time his retreat was ascribed to the miraculous interposition of Providence, Peter and Paul having appeared in the camp of the Huns along with the embassy; the whole matter is, on the whole, rather obscure. Attila died in the year 453, from the bursting of a blood vessel, and his empire broke up immediately after his death.

ATTLEBOROUGH, a town of Bristol county, Mass., thirty-one miles southwest of Boston. It has good railroad connections, and contains national banks, newspaper offices, several churches, and a system of graded schools. The town is the seat of several important industries, the chief of which is the manufacture of jewelry and electro-plate. There are also manufactories of cotton, woolen and knit goods, and of boots and shoes. The township contains a large village known as North Attleborough, where similar industries are carried on. Attleborough has a population (1890) of 7,575.

ATTOCK, a town and fort of British India, in the Panjáb, situated on the eastern bank of the Indus. The place is both of political and commercial importance.

ATTORNEY, in *English Law*, signifies, in its widest sense, any substitute or agent appointed to act in "the turn, stead, or place of another." The term is now commonly confined to a class of qualified agents who undertake the conduct of legal proceedings for their clients. By the common law the actual presence of the parties to a suit was considered indispensable, but the privilege of appearing by attorney was conceded in certain cases by special dispensation, until the statute of Merton and subsequent enactments made it competent for both parties in all judicial proceedings to appear by attorney. Solicitors appear to have been at first distinguished from attorneys, as not having the attorney's power to bind their principals, but latterly the distinction has been between attorneys as the agents formally appointed in actions at law, and solicitors who take care of proceedings in Parliament, Chancery, Privy Council, &c. In practice, however, and in ordinary language, the terms are synonymous.

In the United States, legal counsel, of whatever nature, whether in criminal or civil procedure, is styled an attorney — comprehending at once the functions of the English solicitor, attorney, counsel and barrister—no distinction being made, the practising *lawyer* combining in his person all legal attributes of these professions.

ATTORNEY-GENERAL, the chief law officer appointed to manage all the legal affairs and suits in which the government is interested.

ATTRACTION. That the different parts of a material system influence each other's motions is a matter of daily observation. In some cases we cannot discover any material connection extending from the one body to the other. We call these cases of action at a distance, to distinguish them from those in which we can trace a continuous material bond of union between the bodies. The mutual action between two bodies is called stress. When the mutual action tends to bring the bodies nearer, or to prevent them from separating, it is called tension or attraction. When it tends to separate the bodies, or to prevent them from approaching, it is called pressure or repulsion. The names tension and pressure are used when the action is seen to take place through a medium. Attraction and repulsion are reserved for cases of action at a distance. The configuration of a material system can always be defined in terms of the mutual distances of the parts of the system. Any change of configuration

must alter one or more of these distances. Hence the force which produces or resists such a change may be resolved into attractions or repulsions between those parts of the system whose distance is altered.

There has been a great deal of speculation as to the cause of such forces, one of them, namely, the pressure between bodies in contact, being supposed to be more easily conceived than any other kind of stress. Many attempts have therefore been made to resolve cases of apparent attraction and repulsion at a distance into cases of pressure. At one time the possibility of attraction at a distance was supposed to be refuted by asserting that a body cannot act where it is not, and that therefore all action between different portions of matter must be by direct contact. To this it was replied that we have no evidence that real contact ever takes place between two bodies, and that, in fact, when bodies are pressed against each other and in apparent contact, we may sometimes actually measure the distance between them, as when one piece of glass is laid on another, in which case a considerable pressure must be applied to bring the surfaces near enough to show the black spot of Newton's rings, which indicates a distance of about a ten thousandth of a millimetre. If, in order to get rid of the idea of action at a distance, we imagine a material medium through which the action is transmitted, all that we have done is to substitute for a single action at a great distance a series of actions at smaller distances between the parts of the medium, so that we cannot even thus get rid of action at a distance.

The study of the mutual action between the parts of a material system has, in modern times, been greatly simplified by the introduction of the idea of the energy of the system. The energy of the system is measured by the amount of work which it can do in overcoming external resistances. It depends on the present configuration and motion of the system, and not on the manner in which the system has acquired that configuration and motion. A complete knowledge of the manner in which the energy of the system depends on its configuration and motion, is sufficient to determine all the forces acting between the parts of the system. For instance, if the system consists of two bodies, and if the energy depends on the distance between them, then if the energy increases when the distance increases, there must be attraction between the bodies, and if the energy diminishes when the distance increases, there must be repulsion between them.

Newton, in his *Principia*, deduces from the observed motions of the heavenly bodies the fact that they attract one another according to a definite law. This he gives as a result of strict dynamical reasoning, and by it he shows how not only the more conspicuous phenomena, but all the apparent irregularities of the celestial motions are the calculable results of a single principle. In his *Principia* he confines himself to the demonstration and development of this great step in the science of the mutual action of bodies. He says nothing there about the means by which bodies gravitate towards each other. But his mind did not rest at this point. We know that he did not believe in the direct action of bodies at a distance. And we also know that he sought for the mechanism of gravitation in the properties of an ætherial medium diffused over the universe.

In his *Optical Queries*, indeed, he shows that if the pressure of this medium is less in the neighborhood of dense bodies than at great distances from them, dense bodies will be drawn towards each other, and that if the diminution of pressure is inversely as the distance from the dense body the law will be that of gravitation. The next step, as he points out, is to account for this inequality of pressure in the medium; and as he was not able to do this, he left the explanation of the cause of gravity as a problem to succeeding ages. As regards gravitation the progress made towards the solution of the problem since the time of Newton has been almost imperceptible. Faraday showed that the transmission of electric and magnetic forces is accompanied by phenomena occurring in every part of the intervening medium. He traced the lines of force through the medium; and he ascribed to them a tendency to shorten themselves and to separate from their neighbors, thus introducing the idea of stress in the medium in a different form from that suggested by Newton; for, whereas Newton's stress was a hydrostatic pressure in every direction, Faraday's is a tension along the lines of force, combined with a pressure in all normal directions. By showing that the plane of polarisation of a ray of light passing through a transparent medium in the direction of the magnetic force is made to rotate, Faraday not only demonstrated the action of magnetism on light, but by using light to reveal the state of magnetisation of the medium, he "illuminated," to use his own phrase, "the lines of magnetic force."

From this phenomenon Thomson afterwards proved, by strict dynamical reasoning, that the transmission of magnetic force is associated with a rotatory motion of the small parts of the medium. He showed, at the same time, how the centrifugal force due to this motion would account for magnetic attraction.

It is remarkable that of the three hypotheses, which go some way towards a physical explanation of gravitation, every one involves a constant expenditure of work. That of the generation or absorption of fluid requires, not only constant expenditure of work in emitting fluid under pressure, but actual creation and destruction of matter. That of waves requires some agent in a remote part of the universe capable of generating the waves.

According to such hypotheses we must regard the processes of nature not as illustrations of the great principle of the conservation of energy, but as instances in which, by a nice adjustment of powerful agencies not subject to this principle, an apparent conservation of energy is maintained. Hence, we are forced to conclude that the explanation of the cause of gravitation is not to be found in any of these hypotheses.

ATTWOOD, THOMAS, musical composer, was born in London in 1767, and died in 1838.

ATWOOD, GEORGE, an author celebrated for the accuracy of his mathematical and mechanical investigations, and considered particularly happy in the clearness of his explanations, and the elegance of his experimental illustrations, was born in the early part of the year 1746, and died in 1807.

ATYS, ATTIS, or ATTES, in the *Phrygian and Lydian Mythology*, a youth beloved for his beauty by the goddess Rhea, there called Agdistis. Like Adonis, he was the personification of the changes in nature, from the beauty of spring and summer to the severity and darkness of winter. The story, as told at Pessinus, the centre of the worship of the goddess, was that she had borne to Zeus a being both male and female; that the gods displeased, had transformed this being into a tree, from the fruit of which the daughter of the river-god Sangarius bore a boy, who grew up among herdsmen marvellous in his beauty so as to win the love of Agdistis. This was Atys, and he was about to be married to the king's daughter of Pessinus, when the goddess appeared among the guests, terrified them, and caused Atys to run to the woods, where he maimed himself and was transformed into a pine tree; from his blood sprang violets.

AUBAGNE, a town of France, in the department of Bouches-du-Rhône, with a population of 7408, who

carry on the manufacture of wine, pottery, leather, coarse cloth, &c.

AUBE, a department of France bounded on the N. by the department of Marne, N. W. by Seine-et-Marne, W. by Yonne, S. by Cote-d'Or, and E. by Haute-Marne. It consists of a portion of Champagne and Vallage, with a small part of Burgundy, and has an area of 2317 square miles. Its general inclination from S. E. to N. W. presents little variety of surface, the only elevations being a double line of hills along the course of the Seine, never exceeding 1150 feet in height. The department belongs to the Seine basin, and is watered by that river and its tributaries, the Ource, the Sarce, the Melda, and the Aube, &c. The climate is comparatively mild, but damp. Among the celebrated men connected with Aube are Villehardouin, Pope Urban IV., Mignard, Danton, Beugnot, and Ulbach. The capital is Troyes, and the arrondissements are Troyes, Arcis-sur-Aube, Nogent-sur-Seine, Bar-sur-Aube, and Bar-sur-Seine. Population in 1890, 260,000.

AUBENAS, a town of France, department of Ardèche, near the river of that name, 14 miles S. W. of Privas. It is beautifully situated on the slope of a hill, but its streets generally are crooked and narrow. Population 7694.

AUBER, Daniel François Esprit, musical composer, the chief representative of the French school, was the son of a Paris printseller. He was born at Caen, in Normandy, on the 29th January 1782, while his mother was on a visit to that town. Destined by his father to the pursuits of trade, he was allowed, nevertheless, to indulge his fondness for music, and learnt to play at an early age on several instruments, his first teacher being the Tyrolean composer, Ladurner. Sent at the age of twenty to London to complete his business training, he returned after the rupture of the peace of Amiens. He had already attempted musical composition, and at this period produced several *concertos pour basse*; in the manner of the violoncellist, Lamare, in whose name they were published. The praise given to his concerto for the violin, which was played at the Conservatoire by Mazas, encouraged him to undertake the resetting of the old comic opera, *Julie*. Conscious by this time of the need of regular study of his chosen art, he placed himself under the severe training of Cherubini, by which the special qualities of the young composer were admirably developed. In 1813 he made his *début* in an opera in one act, the *Séjour Militaire*, the unfavorable reception of which put an end for some years to his attempts as composer. But the failure in business and death of his father, in 1819, compelled him once more to turn to music, and to make that which had been his pastime the serious employment of his life. He produced another opera, the *Testament et les Billets-doux*, which was no better received than the former. But he persevered, and the next year was rewarded by the complete success of his *Bergère Châtelaine*, an opera in three acts. This was the first in a long series of brilliant successes, terminating only in the eighty-sixth year of his age. In 1822 began his long association with M. Scribe, who shared with him as librettist the success and growing popularity of his compositions. The opera *Leicester*, in which they first worked together (1823), is remarkable also as showing the first evidences of the influence of Rossini on Auber's style. This style was, however, distinctly original, and was easily recognisable. A phrase of Auber, said his friend Théodore Gautier, is not the phrase of any one else. His characteristics are lightness and facility, sparkling vivacity, grace and elegance, clear and piquant melodiousness,—these marking him out as a true son of France, and making him her darling singer. Depth of thought, elevation of sentiment, intensity of passion, inspiration which grasps the sublime and the infinite,—these are not in Auber.

Devoted by preference to the comic opera, as the most fitting field for his talents, he ventured on more than one occasion to pass into the field of grand opera, and in his *La Muette de Portici*, familiary known as *Masaniello*, he achieved his greatest musical triumph. Produced at Paris in 1828, it rapidly became a European favorite, and its overture, songs, and choruses were everywhere heard. The duet, *Amour sacré de la patrie* was welcomed like a new *Marseillaise;* sung by Nourrit at Brussels in 1830, it became the signal for the revolution which broke out there. Among his other works, about fifty in all, the more important are—*Fra Diavolo* (1830), *Lestocq* (1834), *L'Ambassadrice* (1836), *Le Domino Noir* (1837), *Le Lac des Fées* (1839), *Les Diamants de la Couronne* (1841), *Haydée* (1847), *Marco Spada* (1853), and *La Fiancée du roi de Garbe* (1864). Official and other dignitaries testified the public appreciation of Auber's works. In 1829 he was elected member of the Institute, in 1830 he was named director of the court concerts, and in 1842 he succeeded Cherubini as director of the Conservatoire. He was also a member of the Legion of Honor from 1825, and attained the rank of commander in 1847. One of Auber's latest compositions was a march, written for the opening of the International Exhibition in London in 1862. His fascinating manners, his witty sayings, and his ever ready kindness and beneficence won for him a secure place in the respect and love of his fellow-citizens. He remained in his old home during the German siege of Paris, 1870-71, but the miseries of the Communist war which followed sickened his heart, and he at last refused to touch his beloved instrument, or to take food. He died May 13, 1871.

AUBIN, a town of France, in the department of Aveyron and arrondissement of Villefranche, principally remarkable for its extensive mines of coal, sulphur, and alum. It also carries on an active trade in sheep, iron goods, &c.

The name Aubin, or St. Aubin, is one of the most frequent in France, being borne by upwards of fifty villages from the Pyrenees to Jersey.

AUBURN, the capital of Cayuga county, in the state of New York, on the railway between Albany and Buffalo, 174 miles W. of the former. The irregularity of the surface on which the city is built has prevented the complete carrying out of the rectangular arrangement of streets, which is so much in favor in the United States, but the thoroughfares are wide and lined with trees, and the houses for the most part well built. The principal public buildings are in Genesee Street. The most remarkable of the institutions is the state prison, founded in 1816, which is conducted on the "silent system," and usually contains upwards of 1000 prisoners, who are employed each in the work to which he has been trained. Population, 30,000.

AUBURN, the county seat of Androscoggin County, Me. It is a place of some importance as a commercial centre. Pop. 10,000.

AUBUSSON, a town of France, situated in a picturesque valley on the banks of the Creuse, in the department to which that river gives its name. Population 3,000.

AUCH, the ancient *Climberrum* or *Augusta Auscorum*, one of the most ancient cities of France, capital of the department of Gers. In Cæsar's time this was the chief town of the Ausci. In the 8th century it became the capital of Gascony; and when that district was divided into countships, was the capital of Armagnac.

AUCHTERARDER, a town and parish of Scotland, county of Perth, 15 miles W.S.W. of Perth.

AUCHTERMUCHTY, a royal burgh and parish of Scotland, county of Fife, 8 miles W.S.W. of Cupar.

The town is irregularly built on an elevated site, and is divided by the Leverspool, a rapid streamlet which runs down its center. The manufacture of linen is carried on. The population of the burgh in 1891 was 1,600.

AUCKLAND, the northern provincial district of New Zealand, includes fully a half of North Island, and is about 400 miles long by 200 wide at its greatest breadth. The bays of its coast-line afford safe harborage, and its rivers serve as highways for the produce of the interior, There are three almost natural divisions of this district: North Peninsula, East Coast and the Waikato Country—the latter two, which had been mainly in the hands of the natives, have lately been opened up for European settlements. The land is chiefly of two kinds—a light volcanic loam, and a stiff yellow clay. For the most part it is broken, with low ranges of hills and broad shallow valleys covered to a great extent with dense forests. It is less suited for grazing than for agricultural purposes. Gold, copper, tin, iron, coal, and other minerals exist in Auckland, which is also very rich in timber, the most important tree being the Kauri pine. The fossil gum of ancient forests of this pine is dug up in large quantities, and exported. Much New Zealand flax is grown and manufactured. About 200 miles of railway give connection with the agricultural districts. The annual value of the exports, including wool, Kauri gum, timber, flax, and gold, average $5,000,000; the imports are double that amount. The value of the gold exported from 1857 to 1890 was over $33,000,000. The climate is pleasant and healthy, and owing to sea-breezes, the summer heat is not so great as in other parts of Australasia in the same latitude. Ferns grow in perfection, upwards of 130 species being found. Volcanic action has deeply left its mark on the surface of Auckland; there is still an active volcano near the city of Auckland; and the warm lake and geyser scenery of the region, about ninety miles Southeast from Auckland, below the Bay of Plenty, is considered by travelers the most remarkable in the world. The "Hot Lake" district covers an area about 120 miles long, by ten to fifteen miles wide, and includes hot springs, cisterns of hot water, and mud volcanoes. A sanatorium for bathing purposes exists near Lake Taupo and at Ohinenutu on Rotoma. The other lakes are Tarawera, Rotoiti and Rotomahana. The wonderful pink and white terraces near Tarawera Lake were destroyed by a volcanic eruption in 1886. The white terrace, which had the appearance of a crystal staircase, glittering and stainless, as of ice, was produced by deposits of silica from the boiling springs; the pink terrace, its companion, was flushed with a pale rose color, believed to have been caused by the presence of oxide of iron. Auckland was the scene of the labors of Bishops Selwyn and Patteson. The population in 1875 was 79,104; 1881, 99,451; 1889, 150,000.

For a descriptive account of a large part of the province, the reader is referred to Dr. Hochstetter's valuable works, especially to his *New Zealand*, 1863. A very graphic sketch of some of the natural curiosities is furnished by Anthony Trollope in his *Australia and New Zealand*, vol. ii.

AUCKLAND, the capital of the above province, is finely situated on an isthmus in the N.W. peninsula, on the S. shore of the Waitemata harbor, which is formed by an inlet of the Hauraki Gulf. Lat. 36° 51′ S., long. 174° 50′. On the other side of the isthmus lies the harbor and town of Manukau, which serves as a supplementary port to the city. Auckland was founded in 1840 by Governor Hobson, and became a burgh in 1851. It was till 1865 the seat of government, which is now situated at Wellington. The city has a fine appearance, especially from the harbor, and is surrounded by a number of flourishing suburban villages, with several of which it is connected by railway. Pop. 59,000.

AUCKLAND ISLANDS, a group discovered in 1806 by Captain Briscoe, of the English whaler "Ocean," about 180 miles S. of New Zealand. The islands, of volcanic origin, are very fertile, and are covered with forest.

AUCKLAND, WILLIAM EDEN, BARON, an eminent diplomatist and politician, third son of Sir Robert Eden, Bart., of West Auckland, was born in 1744. He was educated at Eton and Oxford, and adopted the profession of the law. At the age of twenty-seven he resigned his practice at the bar, and engaged in political life as under-secretary to Lord Suffolk. By the favor of the duke of Marlborough, he obtained a seat for Woodstock, and soon gave proof of his ability in the House. He attached himself to Lord North's party, and after serving under Lord Carlisle on the unsuccessful commission to the colonists in America, acted as secretary to that nobleman, when he held the post of viceroy in Ireland. During this time he had obtained the offices of director and auditor of Greenwich Hospital, which probably yielded him an income sufficient for carrying on his political career. In 1783 he took a leading part in negotiating the remarkable coalition between North and Fox, and was rewarded by being made vice-treasurer of Ireland. In 1784 he opposed Pitt's proposal for commercial reciprocity with Ireland, but in so doing contrived to separate himself to some extent from his own party, and shortly after accepted from Pitt the office of plenipotentiary at Paris. Here he successfully negotiated the important commercial treaty with France; and after his appointment as embassador to Spain, he rendered valuable service in settling the dispute between the British and French Governments with regard to the affairs of Holland. In 1789 he was made an Irish peer, with the title of Baron Auckland, and in 1793 he was raised to the British peerage as Baron Auckland, of West Auckland, Durham.

AUCKLAND, GEORGE EDEN, EARL OF, Governor-General of India, born 20th August 1784, was the second son of the foregoing. He died January 1, 1849.

AUCTION, a mode of selling property by offering it to the highest bidder in a public competition. It is the duty of an auctioneer to sell for the best price he can obtain, and his authority cannot be delegated to another unless by special permission of his employer. The auctioneer's name must be exhibited on some conspicuous place during the sale. Sales by auction usually take place under certain conditions, which it is the duty of the auctioneer to read to the bidders before the sale begins. To complete a sale by auction there must be a *bidding* by, or on behalf of, a person capable of making a contract, and an *acceptance* thereof by the auctioneer, and until the bidding is accepted both vendor and bidder are free, and may retract if they choose.

AUDÆUS, or AUDIUS, a reformer of the 4th century, by birth a Mesopotamian. He suffered much persecution from the Syrian clergy for his fearless censure of their irregular lives, and was expelled from the church. He was afterwards banished into Scythia, where he gained many followers and established the monastic system. He died there at an advanced age, about 370 A.D.

AUDE, a southern department of France, forming part of the old province of Languedoc, bounded on the E. by the Mediterranean, N. by the departments of Hérault and Tarn, N.W. by Upper Garonne, W. by

Ariége and south by that of the Eastern Pyrenees. Area, 2,341 square miles. Population, 352,160.

AUDEBERT, JEAN BAPTISTE, a distinguished French naturalist and artiste, was born at Rochefort in 1759 and died 1800.

AUDITOR, a person appointed to examine the accounts kept by the financial officers of the government, public corporations, or private persons, and to certify as to their accuracy.

AUDOUIN, JEAN VICTOR, a distinguished French entomologist, was born at Paris, April 27, 1797. He began the study of law, but was diverted from it by his strong predilection for natural history. He became eminent as an anatomist and died 1841.

AUDRAN, the name of a family of French artists and engravers, who for several generations were distinguished in the same line. The first who devoted himself to the art of engraving was Claude Audran, born 1592, and the last was Benoit, Claud's great-grandson, who died in 1712. The two most distinguished members of the family were Gerard, or Girard Audran, born 1640, and Jean Audran, born 1657, and died in 1767.

AUDUBON, JOHN JAMES, a well-known naturalist, was born in 1781, in Louisiana, where his parents, who were French Protestants, had taken up their residence while it was still a Spanish colony. They afterwards settled in Pennsylvania. From his early years he had a passion for observing the habits and appearances of birds, and attempting delineations of them from nature. At the age of fifteen he was sent to Paris, and remained there about two years, when, among other studies, he took some lessons in the drawing-school of David. On returning to America his father established him in a plantation in Pennsylvania, and he soon after married. But nothing could damp his ardor for natural history. For fifteen years he annually explored the depths of the primeval forests of America in long and hazardous expeditions, far from his family and his home. In these excursions he acquired the facility of making those spirited drawings of birds that give such value to his magnificent work, *The Birds of America*. At that period he had not dreamed of any publication of his labors; as he informs us, "it was not the desire of fame that prompted to those long exiles; it was simply the enjoyment of nature." He afterwards removed with his family to the village of Henderson on the banks of the Ohio, where he continued his researches in natural history for several years, and at length set out for Philadelphia with a portfolio containing 200 sheets filled with colored delineations of about 1,000 birds. Business obliged him to quit Philadelphia unexpectedly for some weeks, and he deposited his portfolio in the warehouse of a friend; but to his intense dismay and mortification, he found, on his return, that these precious fruits of his wanderings and his labors had been totally destroyed by rats. The shock threw him into a fever of several weeks' duration, that well-nigh proved fatal. But his native energy returned with returning health; and he resumed his gun and his game-bag, his pencils and his drawing-book, and plunged again into the recesses of the backwoods. In about three years he had again filled his portfolio, and then rejoined his family, who had in the meantime gone to Louisiana. After a short sojourn there he set out for the Old World, to exhibit to the ornithologists of Europe the riches of America in that department of natural history.

In 1826 Audubon arrived at Liverpool, where the merits of his spirited delineations of American birds were immediately recognized. An exhibition of them to the public in the galleries of the Royal Institution of that town was so successful that it was repeated at Manchester and at Edinburgh, where they were no less admired. When he proposed to publish a work on the birds of America, several naturalists advised him to issue the work in large quarto, as the most useful size for the lovers of natural history, and the most likely to afford him a sufficient number of subscribers to remunerate his labors. At first he yielded to this advice, and acknowledged its soundness; but finally he decided that his work should eclipse every other ornithological publication. Every bird was to be delineated of the size of life, and to each species a whole page was to be devoted; consequently the largest *elephant folio* paper was to receive the impressions. This necessarily increased the expense of the work so much as to put it beyond the reach of most scientific naturalists—which accounts for the small number of persons who for a considerable time, could be reckoned among his supporters in the gigantic undertaking. The exceptionally high character of the work, however, gradually became known; and a sufficient number of subscribers was at length obtained in Great Britain and America, during the ten or twelve years that the work was going through the press, to indemnify him for the great cost of the publication—leaving him, however, a very inadequate compensation for his extraordinary industry and skill. The first volume was published at New York in the end of the year 1830, the second in 1834, the third in 1837, and the fourth and last in 1839. The whole consists of 445 colored plates containing 1,055 figures of birds the size of life. It is certainly the most magnificent work of the kind ever given to the world, and is well characterized by Cuvier, "C'est le plus magnifique monument que l'Art ait encore élevé à la Nature."

During the preparation and publication of his great work Audubon made several excursions from Great Britain. In the summer of 1828 he visited Paris, where he made the acquaintance of Cuvier, Humboldt, and other celebrated naturalists, and received from them every mark of honor and esteem. The following winter he passed in London. In April of 1830 he revisited the United States of America, and again explored the forests of the central and southern federal territories. In the following year he returned to London and Edinburgh, but the August of 1831 found him again in New York. The succeeding winter and spring he spent in Florida and South Carolina; and in the summer of 1832 he set out for the Northern States, with an intention of studying the annual migrations of birds, particularly of the passenger pigeon, of which he has given a striking description; but his career was arrested at Boston by a severe attack of cholera, which detained him there till the middle of August. After that he explored the coasts, lakes, rivers and mountains of North America, from Labrador and Canada to Florida, during a series of laborious journeys, that occupied him for three years. From Charleston, accompanied by his wife and family, he took his third departure for Britain. During his earlier residence in Edinburgh he had begun to publish his *American Ornithological Biography*, which at length filled five large octavo volumes. The first was issued by Adam Black in 1831; the last appeared in 1839. This book is admirable for the vivid pictures it presents of the habits of the birds, and the adventures of the naturalist. The descriptions are characteristically accurate and interesting. In 1839 Audubon returned to America, and shortly afterward commenced the publication of his two last works, *The Quadrupeds of America* and a *Biography of American Quadrupeds*. The latter was issued in 1850. On January 27, 1851, Audubon died at New York.

AUGEIAS (Αὐγείας, Αὐγεας, *cf.* ἡλίου αὐγή), in *Greek Legend*, a son of Helios, the sun. He was a prince of Elis, and, consistently with his being a descendant of the sun-god, had an immense wealth of herds, including twelve bulls sacred to Helios, and white as swans. He lived beside the stream Menios (Μήν = moon); and his daughter Agamede was, like Medeia and Circe, skilled in witchcraft, and connected with the moon goddess. The task of Hercules was to clear out all his stalls in one day, and without help. This he did by making an opening in the wall and turning the stream through them. Augeias had promised him a tenth of the herd, but refused this, alleging that Hercules had acted only in the service of Eurystheus.

AUGEREAU, Pierre François Charles, Duke of Castiglione, was the son of obscure parents, and born in 1757. After serving for a short period in the armies of France, he entered the Neapolitan service, and for some time supported himself by teaching fencing at Naples. In 1792 he joined the Republican army that watched the movements of Spain. He rose rapidly to the rank of brigadier-general, and commanded a division in the army of Italy. Here he distinguished himself in numerous engagements by his energy, skill, and vigorous rapidity of action. To him were due in great measure the brilliant victories of Millesimo, Dego, and Castiglione, and he led the decisive charges at the bloody combats of Lodi and Arcola. In 1797 he took part with Barras and the Directory, and was an active agent in the revolution of the 18th of Fructidor; but his jealousy of his former comrade, Bonaparte, prevented their intimacy; and he was one of the general officers not privy to the noted revolution of the 18th of Brumaire (Nov. 9) 1799. He received, however, the command of the army of Holland and the Lower Rhine, but was superseded in 1801. From that time he lived in retirement, till 1804, when he was made a marshal of the French empire, and in the following year he was appointed to the command of the expedition against the Vorarlberg, which he quickly subdued. He also distinguished himself greatly in the battles of Jena and Eylau. In 1809–10 he commanded the French in Catalonia, and tarnished his laurels by his great cruelty to the Spaniards, but he was again more honorably conspicuous in the campaign of 1813, especially in the terrible battle of Leipsic. In 1814 he had the command of a reserve army at Lyons, and might have made a diversion in favor of Napoleon, but he preferred to submit, and retained a command under the Bourbons. In the following year he at first refused to join Napoleon on his escape from Elba, and when he would afterwards have accepted a command his services were declined. He also failed to obtain military office under the new dynasty, and, after having had the painful task of being one of the commission on the trial of Ney, he returned to his estates, where he died of dropsy in 1816.

AUGSBURG, a celebrated city of Germany, capital of the circle of Swabia and Neuburg in Bavaria, the principal seat of the commerce of South Germany, and of commercial transactions with the south of Europe. It derives its name from the Roman Emperor Augustus, who, on the conquest of Rhætia by Drusus, established a Roman colony named *Augusta Vindelicorum* (about 14 B.C.). In the 5th century it was sacked by the Huns, and afterwards came under the power of the Frankish kings. It was almost entirely destroyed in the war of Charlemagne against Thassilon, duke of Bavaria, and after the dissolution and division of that empire, it fell into the hands of the dukes of Swabia. After this it rose rapidly into importance as a manufacturing and commercial town, and its merchant princes, the Fuggers and Welsers, rivalled the Medici of Florence; but the alterations produced in the currents of trade by the discoveries of the 15th and 16th centuries occasioned a great decline. In 1276 it was raised to the rank of a free imperial city, which it retained with many changes in its internal constitution, till 1806, when it was annexed to the kingdom of Bavaria. Meanwhile, it was the scene of numerous events of historical importance. It was besieged and taken by Gustavus Adolphus in 1632, and in 1635 it surrendered to the imperial forces; in 1703 it was bombarded by the electoral prince of Bavaria, and forced to pay a contribution of 400,000 dollars; and in the war of 1803 it suffered severely. Its most memorable conventions are those which gave birth to the Augsburg confession (1530) and to the Augsburg alliance (1686).

The city is pleasantly situated in an extensive and fertile plain, between the rivers Wertach and Lech, 36 miles W.N.W. of Munich, lat. 48° 21′ 44″ N., long. 10° 54′ 42″ E. Its fortifications were dismantled in 1703, and have since been converted into public promenades. Maximilian street is remarkable for its breadth and architectural magnificence. One of its most interesting edifices is the Fugger House, of which the entire front is painted in fresco. Among the public buildings of Augsburg most worthy of notice is the town-hall, said to be one of the finest in Germany, built by Elias Holl in 1616–20. One of its rooms, called the "Golden Hall," from the profusion of its gilding, is 113 feet long, 59 broad, and 53 high. The palace of the bishops, where the memorable Confession of Faith was presented to Charles V., is now used for Government offices. The cathedral dates in its oldest portions from the 10th century. There are also various churches and chapels, a school of arts, a polytechnic institution, a picture gallery in the former monastery of St. Catherine, a museum, observatory, botanical gardens, an exchange, gymnasium, deaf-mute institution, orphan asylum, public library, several remarkable fountains dating from the 16th century, etc. The "Fuggerei," built in 1519 by the brothers Fugger, consists of 106 small houses, let to indigent Roman Catholic citizens at a merely nominal rent. The manufactures of Augsburg are various and important, consisting of woolen, linen, cotton, and silk goods, watches, jewelry, and goldsmith work, mathematical instruments, machinery, leather, paper, chemical stuffs, types, etc. One of the best-known Continental newspapers is the *Allgemeine Zeitung* or *Augsburg Gazette*. Augsburg is an important railway junction. On the opposite side of the river, which is here crossed by a bridge, lies the little village of Lechhausen. Population in 1890, 68,500.

AUGSBURG CONFESSION. This document, compiled by Melanchthon in 1530, forms the doctrinal definition of the Lutheran faith. It consists of twenty-one articles, in which the belief of the signers is set forth in terse and dignified language. A supplementary Confession known as the *Apologia Confessionis Augustanæ* was also prepared by Melanchthon, and was published a year or two later. In 1536 Luther promulgated the "Articles of Smalkald," and forty years later still another "Confession" appeared. The documents are not all considered of equal authority, but taken as a whole they represent the confessional theology of Lutheranism. The two catechisms prepared by Luther are also accepted as standards of faith, and the collective documents are issued as a Concordia or *Liber Concordiæ*.

AUGURS, in *Roman Antiquities*, a college or board appointed to interpret, according to the books (*libri augurales*) in which the science of divination was laid

down, the *auspicia* or signs of approval or disapproval sent by Jupiter on the occasion of any public transaction. At first, it is said, there were only two augurs, one from each of the tribes Ramnes and Tities. Two more were added by Numa, and again other two for the third tribe of Luceres, that is six altogether. But in the year 300 B.C. it is certain that there were only four, to which number five plebeia places were added by the *lex Ogulnia*. Sulla increased the number to fifteen, at which it continued, with the exception that Cæsar appointed a sixteenth, and the emperors frequently added as *supra numerum* persons of distinction, or of their own family. An augur retained his office and sacred character for life. The college had the right of election of new members. The insignia of their office were the *lituus*, or crook, and the dress called *trabea*. The natural region to look to for signs of the will of Jupiter was the sky, where lightning and the flight of birds seemed directed by him as counsel to men. The latter, however, was the more difficult of interpretation, and upon it, therefore, mainly hinged the system of divination with which the augurs were occupied, and which is expressed in the terms *augurium* and *auspicium*. The presence of augurs was required only in observing signs in the sky, where their first duty was to mark out with the *lituus* a space or *templum* in the sky within which the omen must occur. Such observations being properly made only in the city of Rome, augurs are not found elsewhere. Signs of the will of the gods were of two kinds, either in answer to a request (*auspicia impetrativa*), or incidental. Of such signs there were five classes:—(1.) *Signs in the sky* (*cœlestia auspicia*), consisting chiefly of thunder and lighting, but not excluding fallen stars and other phenomena. Lightning from left to right was favorable, from right to left unfavorable; and this being a very direct and impressive token of the will of Jupiter, the observation of it was held to apply to all public transactions fixed for the day on which it occurred. Whether favorable or the reverse in its direction, the appearance of lightning was held as a voice of the god against business being done in the public assemblies. But since the person charged to take the auspices for a certain day was constitutionally subject to no other authority who could test the truth or falsehood of his statement that he had observed lightning, it happened that this became a favorite means of putting off meetings of the public assembly. Restrictions were, however, imposed on it in the latter times of the republic. When a new consul, prætor, or quæstor entered on his first day of office and prayed the gods for good omens, it was a matter of custom to report to him that lightning from the left had been seen. (2.) *Signs from birds*, with reference to the direction of their flight, and also to their singing or uttering other sounds. In matters of ordinary life on which divine counsel was prayed for, it was usual to have recourse to this form of divination. For public affairs it was, by the time of Cicero, superseded by the fictitious observation of lightning. (3.) *Feeding of birds*, which consisted in observing whether a bird,—usually a fowl,—on grain being thrown before it, let fall a particle from its mouth. If it did so, the will of the gods was in favor of the enterprise in question. The simplicity of this ceremony recommended it for very general use, particularly in the army when on service. The fowls were kept in cages by a servant, styled *pullarius*. In imperial times are mentioned the *decuriales pullarii*. (4.) *Signs from animals*, *i.e.*, observation of the course of, or sounds uttered by, quadrupeds and serpents within a fixed space, corresponding to the observations of the flight of birds, but much less frequently employed. It had gone out of use by the time of Cicero. (5.) *Warnings*, consisting of all unusual phenomena, but chiefly such as boded ill. Being accidental in their occurrence, they belonged to the *auguria oblativa*, and their interpretation was not a matter for the augurs, unless occurring in the course of some public transaction, in which case they formed a divine veto against it. Otherwise, references were made for an interpretation to the Pontifices in olden times, afterwards frequently to the Sibylline books, or the Etruscan haruspices, when the incident was not already provided for by a rule, as, for example, that it was unlucky for a person leaving his house to meet a raven, that the sudden death of a person from epilepsy at a public meeting was a sign to break up the assembly, not to mention other instances of adverse omens. A Roman, however, did not necessarily regard a warning as binding unless it was clearly apprehended. Not only could an accidental oversight render it useless, but to some extent measures could be taken to prevent any warning being noticed.

AUGUST, originally *Sextilis*, as being the sixth month in the pre-Julian Roman year, received its present name from the Emperor Augustus. The preceding month, *Quintilis*, had been called July after the great Julius Cæsar, and the senate thought to propitiate the emperor by conferring a similar honor upon him. August was selected, not as being the natal month of Augustus, but because in it his greatest good fortune had happened to him.

AUGUSTA, the capital of the State of Maine, and seat of justice, is situated on the Kennebec River (in Kennebec county), 43 miles from its mouth, in lat. 44° 19′ N., long. 69° 50′ W. The city lies mainly on the right bank of the Kennebec River, which is here crossed by a bridge 520 feet long. The business portion of the city was destroyed by fire in 1865, but has since been rebuilt. Its principal public buildings are the State house, State insane asylum, and United States' arsenal. It has several banks, daily and weekly newspapers, and numerous churches. The population of Augusta, in the census of 1890, was 10,521

AUGUSTA, a city of Georgia, in the United States of America, the capital of the county of Richmond. It is situated in a beautiful plain, on the Savannah River, 231 miles from its mouth, and has extensive railway communication. Like other American cities it is spacious and regular in its plan, Greene Street, for example, being 168 feet in width, with a row of trees extending along each side. The principal buildings are the city hall, a Masonic hall, an Oddfellows' hall, the Richmond academy, the Georgia medical college, the opera-house, and an orphan asylum. Besides these, the city possesses an arsenal, water-works, a number of banks, newspaper offices, extensive cotton factories and flour mills, several foundries, two tobacco factories, &c. Water-power is abundantly supplied from the river by the Augusta canal, which was constructed in 1845. Augusta was an important place during the revolutionary war, and continued to flourish amazingly till the opening of the Georgia railway. A temporary decline then took place, owing to the change in the methods of traffic; but a new current of prosperity speedily set in, which still continues. Population in 1890, 33,150.

AUGUSTAN HISTORY is the title bestowed upon a collection of the biographies of the Roman emperors, from Hadrian to Carinus, written under Diocletian and Constantine, and usually regarded as the composition of six authors,—Ælius, Spartianus, Julius Capitolinus, Ælius Lamprididius, Vulcatius Gallicanus, Trebellius Pollio, and Flavius Vopiscus. Upon investigation, however, there appears good reason for reducing those writers to four. The distribution of the respective

biographies among them, according to the arrangement of the MSS., is supported by no extraneous authority, and depends upon no intelligible principle.

No biographical particulars are recorded respecting any of these writers. From their acquaintance with Latin and Greek literature they must have been men of letters by profession, and very probably secretaries or librarians to persons of distinction. They appear particularly versed in law. Spartianus's reference to himself as "Diocletian's own" seems to indicate that he was a domestic in the imperial household. They address their patrons with deference, acknowledging their own deficiencies, and seem painfully conscious of the profession of literature having fallen upon evil days.

AUGUSTI, JOHN CHRISTIAN WILLIAM, a distinguished German theologian, was born at Eschenberga, near Gotha, 1772, and died in 1841.

AUGUSTINE (AURELIUS AUGUSTINUS), one of the four great fathers of the Latin Church, and admittedly the greatest of the four, more profound than Ambrose, his spiritual father, more original and systematic than Jerome, his contemporary and correspondent, and intellectually far more distinguished than Gregory the Great, the last of the series. The theological position and influence of Augustine may be said to be unrivalled. No single name has ever exercised such power over the Christian church, and no one mind ever made such an impression upon Christian thought.

Aurelius Augustinus was born at Tagaste (Tajelt), a town of Numidia, on the 13th of November 354 A.D. His father, Patricius, was a burgess of this town, and was still a pagan at the time of his son's birth. His mother, Monica, was not only a Christian, but a woman of the most elevated, tender, and devoted piety, whose patient prayerfulness for both her husband and son (at length crowned with success in both cases), and whose affectionate and beautiful enthusiasm have passed into a touching type of womanly saintliness for all ages. She early instructed her son in the faith and love of Jesus Christ, and for a time her instruction seems to have impressed his youthful mind. Falling ill he wished to be baptised; but when the danger was passed, the rite was deferred, and, notwithstanding all his mother's admonitions and prayers, he grew up without any profession of Christian piety, or any devotion to Christian principles. Inheriting from his father a vehement and sensual disposition, he early gave way to the unbridled impulses of passion, and, while still a mere youth, formed a connection, common enough at the time, but at variance with the principles of Christian morality. As the result of the connection he became the father of a son, whom he named Adeodatus in a fit of pious emotion, and to whom he was passionately attached.

In the midst of all his youthful pleasures Augustine was an earnest student. His father, observing the early development of his talents, formed the ambition of training him to the brilliant and lucrative career of a rhetorician, and he seems to have spared no expense to equip him for the career. The youth studied not only at his native town, but at Maduara and Carthage, and especially devoted himself to the Latin poets — many traces of his love for which are to be found in his writings. His acquaintance with Greek literature was much more limited, and, indeed, it has been doubted whether he could use, in the original, either the Hebrew or Greek Scriptures. Apparently, he was in the habit of using translations of Plato; but, on the other hand, Greek words frequently occur in his writings, correctly rendered and discriminated; and he speaks in one of his epistles to Marcellinus of referring to the Greek Psalter and finding, in reference to certain difficulties, that it agreed with the Vulgate.

While a student at Carthage he was particularly attracted by the theatre, the spectacles at which were of unusual magnificence. To his enthusiastic and sensuous spirit they were irresistible, and the extent to which he seems to have yielded to the fascination is sufficient proof of his active alienation from Christianity at this period.

Cicero's *Hortensius*, which he read in his nineteenth year, first awakened in Augustine's mind the spirit of speculation. He engaged restlessly in philosophical studies, and passed from one phase of thought to another, unable to find satisfaction in any. Manichæism first enthralled him. Its doctrine of two principles, one of good and one of evil, seemed to answer to the wild confusion of his own heart, and the conflict of higher and lower impulses which raged within him. It seemed to solve the mysteries which perplexed him in his own experience and in the world. He became a member of the sect, and entered into the class of *auditors*. His ambition was to be received among the number of the *Elect*, and so get to the heart of what he believed to be their higher knowledge. But falling in with Faustus, a distinguished Manichæan bishop and disputant, and entering into discussion with him, he was greatly disappointed. The system lost its attraction for him; he gradually became disgusted, and abandoned it. But before this he had left Carthage, shocked with the licence of the students, and had betaken himself for a time to Rome in the pursuit of his profession. There he also became dissatisfied, and accepted an invitation to proceed to Milan, where the people were in search of a teacher of rhetoric. He travelled thither at the public expense, and was welcomed by friends who already seem to have recognised his distinction.

At Milan the conflict of his mind in search of truth still continued. He was now in his thirtieth year, and for eleven years he had been seeking for mental rest, unable to find it. "To-morrow," he said to himself, "I shall find it: it will appear manifestly, and I shall grasp it" (*Confess.*, vi. 18). But it still eluded his grasp, and he sunk back again into despondency. The way, however, was being prepared for his conversion. Ambrose was bishop of Milan, and, although he had a weak voice, was noted for his eloquence. Augustine was attracted by his reputation, and went to hear the famous Christian preacher in order, as he himself relates "to see whether his eloquence answered what was reported of it. I hung on his words attentively," he adds, "but of the matter I was but an unconcerned and contemptuous hearer." He confesses his delight so far: "The bishop's eloquence was more full of knowledge, yet in manner less pleasurable and soothing, than that of Faustus." He wished an opportunity of conversation with him, but this was not easily found. Ambrose had no leisure for philosophic discussion. He was accessible to all who sought him, but never for a moment free from study or the cares of duty. "Augustine used to enter, as all persons might, without being announced; but after staying for a while, afraid of interrupting him, he departed again." He continued, however, to hear Ambrose preach, and gradually the gospel of divine truth and grace was received into his heart. First Plato and then St. Paul opened his mind to higher thoughts, and at length certain words of the latter were driven home with irresistible force to his conscience. He was busy with his friend Alypius in studying the Pauline epistles. His struggle of mind became intolerable; the thought of divine purity fighting in his heart with the love of the world and of the flesh. He burst into an incontrollable flood of tears and rushed out into his garden, flinging himself under a fig tree that he might allow his tears to have full vent, and pour out his heart to

God. Suddenly he seemed to hear a voice calling upon him to consult the divine oracle, "Take up and read, take up and read." He left off weeping, rose up, and sought the volume where Alypius was sitting, and opening it read in silence the following passage: "Not in rioting and drunkenness, not in chambering and wantonness, not in strife and envying. But put ye on the Lord Jesus Christ, and make not provision for the flesh to fulfil the lusts thereof." He adds, "I had neither desire nor need to read further. As I finished the sentence, as though the light of peace had been poured into my heart, all the shadows of doubt dispersed. Thus hast Thou converted me to Thee, so as no longer to seek either for wife or other hope of the world, standing fast in that rule of faith in which Thou so many years before hadst revealed me to my mother."

Augustine went back to Rome for a short period and then returned to his native city, where he took up his abode in retirement, forming, with some friends who joined him in devotion, a small religious community, which looked to him as its head. They had all things in common, as in the early church, and fasting and prayer, Scripture reading and almsgiving, formed their regular occupations. Their mode of life was not formally monastic according to any special rule, but the experience of this time of seclusion was, no doubt, the basis of that monastic system which Augustine afterwards sketched, and which derived from him its name.

Henceforth Augustine's life is filled up with his ecclesiastical labors, and is more marked by the series of his numerous writings and the great controversies in which they engaged him than by anything else. Already he had distinguished himself as an author. He had written several philosophical treatises; he had combated the scepticism of the Academy; he had treated of the "Blessed Life" and of the "Immortality of the Soul;" he had defended the church against the Manichæans, whose doctrines he had formerly professed.

But the time was one of almost universal ecclesiastical and intellectual excitement; and so powerful a mental activity as his was naturally drawn forth in all directions. Following his writings against the Manichæans come those against the Donatists. This controversy was one which strongly interested him, involving as it did the whole question of the constitution of the church and the idea of catholic order, to which the circumstances of the age gave special prominence. The Donatist schism sprang out of the Diocletian persecutions in the beginning of the century. A party in the Church of Carthage, fired with fanatical zeal on behalf of those who had distinguished themselves by resistance to the imperial mandates and courted martyrdom, resented deeply the appointment of a bishop of moderate opinions, whose consecration had been performed, they alleged, by a *traditor*. They set up, in consequence, a bishop of their own, of the name of Majorinus, succeeded in 315 by Donatus. The party made great pretensions to purity of discipline, and rapidly rose in popular favor, notwithstanding a decision given against them both by the bishop of Rome and by the Emperor Contantine, to whom they personally appealed. Augustine was strongly moved by the lawlessness of the party, and launched forth a series of writings against them, the most important of which survive, though some are lost.

The third controversy in which Augustine engaged was the most important, and the most intimately associated with his distinctive greatness as a theologian. As may be supposed, from the conflicts through which he had passed, the bishop of Hippo was intensely interested in what may be called the anthropological aspects of the great Christian idea of redemption. He had himself been brought out of darkness into "marvellous light," only by entering into the depths of his own soul, and finding, after many struggles, that there was no power but divine grace, as revealed in the life and death of the Son of God, which could bring rest to human weariness, or pardon and peace for human guilt. He had found human nature in his own case too weak and sinful to find any good for itself. In God alone he had found good. This deep sense of human sinfulness colored all his theology, and gave to it at once its depth — its profound and sympathetic adaptation to all who feel the reality of sin — and that tinge of darkness and exaggeration which as surely have repelled others. When the expression Augustinianism is used, it points especially to those opinions of the great teacher which were evoked in the Pelagian controversy, to which he devoted the most mature and powerful period of his life. His opponents in this controversy were Pelagius, from whom it derives its name, and Cœlestius and Julianus, pupils of the former. Pelagius was a British monk. Augustine calls him Brito; and Jerome points to his Scottish descent, in such terms, however, as to leave it uncertain whether he was a native of Scotland or Ireland. He was a man of blameless character, devoted to the reformation of society, full of enthusiasm, and that confidence in the natural impulses of humanity which often accompanies philanthropic enthusiasm. Travelling to Rome about the beginning of the 5th century, he took up his abode for a time there, and soon made himself conspicuous by his activity and opinions. His pupil Cœlestius carried out the views of his master with a more outspoken logic, and was at length arraigned before the bishop of Carthage for the following, amongst other, heretical opinions: — (1.) That Adam's sin was purely personal, and affected none but himself; (2.) That each man, consequently, is born with powers as incorrupt as those of Adam, and only falls into sin under the force of temptation and evil example; (3.) That children who die in infancy, being untainted by sin, are saved without baptism. Views such as these were obviously in conflict with the whole course of Augustine's experience, as well as with his interpretation of the catholic doctrine of the church. And when his attention was drawn to them by the trial and excommunication of Cœlestius, he undertook their refutation, first of all, in three books on *Forgiveness of Sins and Baptism*, addressed to his friend Marcellinus, in which he vindicated the necessity of the baptism of infants because of original sin and the grace of God by which we are justified. This was in 412. In the same year he addressed a further treatise to the same person, "My beloved son Marcellinus," on *The Spirit and the Letter*. Three years later he composed two further treatises on *Nature and Grace*, and the relation of the *Human to the Divine Righteousness*. The controversy was continued during many years in no fewer than fifteen treatises. Upon no subject did Augustine bestow more of his intellectual strength, and in relation to no other have his views so deeply and permanently affected the course of Christian thought. Even those who most usually agree with his theological stand-point will hardly deny that, while he did much in these writings to vindicate divine truth and to expound the true relations of the divine and human, he also, here as elsewhere, was hurried into extreme expressions as to the absoluteness of divine grace and the extent of human corruption. Like his great disciple in a later age — Luther — Augustine was prone to emphasise the side of truth which he had most realised in his own experience, and, in contradistinction to the Pelagian exaltation of human nature, to depreciate its capabilities beyond measure. There are few thoughtful minds who would not concede the deeper truthfulness of Augustine's

spiritual and theological analysis, in comparison with that of his opponent, as well as its great consistency with Scripture; but there are also few who would now be disposed to identify themselves with the dogmatism of the orthodox bishop any more than with the dogmatism of the heretical monk. And on one particular point, which more or less runs through all the controversy—the salvation of infants—the Christian consciousness, in its later and higher growth, may be said to have pronounced itself decisively on the side of the monk rather than of the bishop.

The character of Augustine, both as a man and a theologian, has been briefly indicated in the course of our sketch. Little remains to be added without entering into discussions too extended for our space. None can deny the greatness of Augustine's soul—his enthusiasm, his unceasing search after truth, his affectionateness, his ardor, his self-devotion. And even those who may doubt the soundness or value of some of his dogmatic conclusions, cannot hesitate to acknowledge the depth of his spiritual convictions, and the strength, solidity, and penetration with which he handled the most difficult questions, and wrought all the elements of his experience and of his profound Scriptural knowledge into a great system of Christian thought.

AUGUSTINE, or AUSTIN, ST., the first archbishop of Canterbury, was originally a monk in the Benedictine convent of St. Andrew at Rome, and was educated under the famous Gregory, afterwards Pope Gregory I., by whom he was sent to Britain with forty monks of the same order, to carry out the favorite project of converting the English to Christianity. Having sent interpreters to explain their mission to King Ethelbert, whose queen, Bertha, was a Christian, they received from him permission to preach and to make converts. He treated them with great favor, held a public conference with them, and assigned them a residence at Durovernum, now Canterbury. His own conversion to the Christian faith, which took place shortly afterwards, had a powerful influence with his subjects, who joined the new church in great numbers. Augustine passed the remainder of his life principally at Canterbury, where he died, probably in 607, on the 26th May.

AUGUSTINIANS, a monastic order of the Roman Catholic Church, claiming to have received its rule from St. Augustine.

AUGUSTOVO, a city in Russian Poland, in the government of Suvalki, situated on the river Netta, near a lake, which abounds in fish. Population, 14,018.

AUGUSTULUS, ROMULUS, the last emperor of the western half of the old Roman Empire. He was defeated in 476 A. D. and was pensioned by his conquerer, Odoacer.

AUGUSTUS AND THE AUGUSTAN AGE. The name of Augustus was the title of honor given by the Romans to the Emperor Caius Julius Cæsar Octavius, or, as he was originally designated, Caius Octavius. The era of Augustus formed an illustrious epoch in Roman history, and was distinguished for its splendid attainments in arts and arms, and more especially in literature. The Romans in later times looked back to the age of Augustus with great complacency, as the most prosperous and the most distinguished in their annals. The name of the "Augustan Age" has been specially applied to it in modern times, and the same title has been given, with more or less justice, to certain epochs in modern history as the highest compliment to their glory. The reign of Louis XIV., is called the Augustan age of France; the reign of Anne, the Augustan age of England.

Caius Octavius was the son of a noble Roman of the same name, of the plebian order. The father had married Atia, the daughter of Julia, sister to the great C. Julius Cæsar, who was accordingly great-uncle to the young Octavius. Cæsar, the dictator, having no son of his own, took an interest in this youth, caused him to be enrolled among the Patricians, and bred him with a view to the highest honors of the republic. Already, in his eighteenth year, he had chosen him for his "master of the horse," but this was a merely nominal distinction. The young man was sent to carry on his education at the camp at Apollonia in Illyricum, and there, at the age of nineteen, he heard of his great kinsman's assassination (44 B.C.). He had already become a favorite with the soldiers, who offered to escort him to Rome, and follow his fortunes. But this he declined, and crossed over alone to Italy. On landing he learned that Cæsar had made him his heir and adopted him into the Julian gens, whereby he acquired the designation of C. Julius Cæsar Octavius. The inheritance was a perilous one; his mother and others would have dissuaded him from accepting it, but he, confident in his abilities, declared at once that he would undertake its obligations, and discharge the sums bequeathed by the dictator to the Roman people. M. Antonius had possessed himself of Cæsar's papers and effects, and made light of his young nephew's pretensions. The liberators paid him little regard, and dispersed to their respective provinces. Cicero, much charmed at the attitude of Antonius, hoped to make use of him, and flattered him to the utmost, with the expectation, however, of getting rid of him as soon as he had served his purpose. Octavianus conducted himself with consummate adroitness, making use of all competitors for power, but assisting none. Considerable forces attached themselves to him. The senate when it armed the consuls against Antonius, called upon him for assistance; and he took part in the campaign in which Antonius was defeated at Mutina, but both the consuls, Hirtius and Pansa, slain. The soldiers of Octavianus demanded the consulship for him, and the senate, though now much alarmed, could not prevent his election. He now effected a junction with Antonius, who quickly overthrew the power of the republican party in their stronghold, the Cisalpine provinces, with the death of Decimus Brutus, the ablest of the liberators. Thereupon Octavianus and Antonius, taking Lepidus into union with them, met on the river Rhenus near Bononia, and proclaimed themselves a triumvirate for the reconstitution of the commonwealth. They divided the western provinces among them, the east being held for the republic by M. Brutus and Cassius. They drew up a list of proscribed citizens, entered Rome together, and caused the assassination of three hundred senators and two thousand knights. They further confiscated the territories of many cities throughout Italy, and divided them among their soldiers. Cicero was murdered at the demand of Antonius. The remnant of the republican party took refuge either with Brutus and Cassius in the East, or with Sextus Pompeius, who had made himself master of the seas.

Octavianus and Antonius crossed the Adriatic 42 B.C. to reduce the last defenders of the republic. Brutus and Cassius were defeated, and fell at the battle of Philippi. War soon broke out between the victors, the chief incident of which was the siege and capture by famine of Perusia, and the alleged sacrifice of three hundred of its defenders by the young Cæsar at the altar of his uncle. But peace was again made between them. Antonius married Octavia, his rival's sister, and took for himself the eastern half of the empire, leaving the west to Cæsar. Lepidus was reduced to the single province of Africa. Meanwhile Sextus Pompeius made himself formidable by cutting off the supplies of

grain from Rome. The triumvirs were obliged to concede to him the islands in the western Mediterranean. But Octavianus could not allow the capital to be kept in alarm for its daily sustenance. He picked a quarrel with Sextus, and when his colleagues failed to support him, undertook to attack him alone. Antonius, indeed, came at last to his aid, in return for military assistance in the campaign he meditated in the East. But Octavianus was well served by the commander of his fleet, M. Vipsanius Agrippa. Sextus was completely routed, and driven into Asia, where he perished soon afterwards. Lepidus was an object of contempt to all parties, and Octavianus and Antonius remained to fight for supreme power.

The alliance of Antonius with Cleopatra, queen of Egypt, alienated the Romans from him. They now gladly accepted the heir of Cæsar as the true successor of the most illustrious of their heroes. It was felt almost universally that the empire required a single head, and that repose could only be assured by the sovereignty of the chief of its armies. The battle of Actium, followed by the death of Antonius, 31 B.C., raised the victor to universal empire. Nevertheless, Octavianus did not hasten to assume his position. He first regulated the affairs of Egypt, which he annexed to the Roman dominions, then lingered for a time in Greece, and entered upon a fifth consulship at Samos, 29 B.C. On his return to Rome he distributed the vast sums he had accumulated among the people and the soldiers, while he soothed the pride of the nobles by maintaining unchanged the outward show of republican government. Of his personal history from this period there remains little to be said. He continued to reside almost constantly at Rome and in the neighborhood, making one expedition into Spain, 27 B.C., and a journey through Greece in 21, on which occasion he advanced into Syria, and received back the standards taken by the Parthians from Crassus. In 16 B.C. he went to Gaul to regulate the affairs of that province, an expedition which he repeated 9 B.C. But from thenceforth he intrusted the defence of the position to his lieutenants, and more especially to the young princes of his own family. The empire continued to enjoy profound internal tranquillity. More than one plot was formed against the head of the state by some of the discontented nobility, but these were discovered and disconcerted; and when it was evident that they met with no favor from the people generally, he could afford to treat them with a signal clemency, which seems to have secured him from any further attempts. The serenity and placability which he displayed in his latter years form a marked contrast to the jealousy and ferocity at an earlier period; and the character of the Emperor Augustus Cæsar has been a problem to historians in consequence. The life of the emperor was prolonged to the year 14 A.D. He died at Nola in his seventy-fifth year, after holding supreme power in the state for nearly half a century.

During the years which had intervened between his accepting the inheritance of Cæsar, and his attaining to Cæsar's undivided sovereignty, the young aspirant had been meditating how to secure the retention of his power. At first, excited by fears for his own personal safety, and urged by the examples of party leaders around him, and of others who had gone before him, he plunged into a career of wholesale bloodshed, and cut off without scruple every public man from whose principles or whose passions he might have cause of apprehension. A large proportion, perhaps, of the senators and nobles had perished in the proscriptions and bloody wars of the triumvirate. Still it could not be expected that the germs of republican sentiment would ever be wholly eradicated. The sense of patriotism and the sense of interest would not fail to raise up enemies to the sovereign ruler of the Roman commonwealth. The conquerer's first object was to protect himself by force of arms, his next to soothe the passions of the class from whose resentment he had most cause of fear, and after that to raise up another class in direct sympathy with himself to balance the power which the first must necessarily attain in a well-ordered government. It was to the attainment of these three objects that Octavius directed his organisation of the commonwealth.

The powers of the imperator or commander of the Roman army ceased on his return to the city. He then became once more a plain citizen. If war again arose he must seek his reappointment to command with the usual forms. Cæsar had not trusted his countrymen so far. He had claimed from them the title of imperator in perpetuity. With this title prefixed to his name, he continued to be still the commander of the legions, whether in the city or in the provinces. With this power his successor dared not dispense. On his arrival at Rome from the East he at once required the senate to accord it to him, as to his uncle before him; but he pretended only to ask it for a limited period of five years. At the expiration of that term, however, he assumed it again and again, though each time for ten years only, but never actually relinquished it to the end of his career. He thus received authority to command the whole force of the state in chief, and the officers who acted under him became simply his lieutenants. If they gained victories, the honors of the triumph were reserved for the imperator "under whose auspices" they were reputed to have served. It followed that all the provinces on the frontiers, or in which armies were maintained, were placed under the emperor's direct authority, while it was only the central and peaceful portions of the empire that were handed over to the government of the senate. The imperial provinces were administered by the legati Cæsaris, the senatorial by proconsuls.

The person of the emperor was thus secured as far as the power of the sword could secure it. But he was anxious that the source of his power should not be too apparent. The second Cæsar wished to maintain the appearance at least of government by the constitutional powers of the republic. The senate had once been practically the ruling power, as far as it was not actually controlled by the masters of the legions. He would not degrade it in its own estimation, or in the estimation of the people, any further, at least, than might be necessary for his main object. He caused himself to be appointed censor, not for one but for five years, in order to give him full time to revise the list of senators, to supply the fearful gaps in the ranks of the old nobility, and to expel such members, and many they were, who seemed unworthy, from their foreign extraction, their low birth, their scanty means, or their bad character, to have a place in that august assembly. The irregularities of the epoch which he hoped now to close had filled its benches with personages who degraded the order in the eyes of genuine citizens. The nobles and good citizens generally hailed this revision with deep satisfaction. It accorded with the national taste as well as with historical traditions. From the individual resentments it provoked, it was an act of some personal danger to the censor; but the danger was more than repaid by the popularity attending upon it, which was enhanced to the utmost by the liberality with which provision was made for raising some of the poor but honorable members of the order to the standard of property now to be required of them.

The emperor placed himself at the head of this reconstituted body, by assuming the office and title of *Princeps Senatus*. The office was indeed little more than nom-

inal; it gave the right of proposing measures and of speaking first in the highest legislative assembly of the state, and having been borne in earlier times by some of the most distinguished of Roman patriots, it carried with it the respect and affection of the people. The titular precedence it gave was all the more valuable, inasmuch as it might be conceded without a blush by the sturdiest republican in the senate. But it was the consul who possessed practically the chief authority in the assembly. Octavianus had been already five times consul, and he shrank from seizing in perpetuity an office which, according to Roman ideas, differed in nothing from royalty, except that it was elective, and that it was limited to the tenure of a single year. Yet he could hardly afford to yield it to the citizen whom the people might at any time elect to thwart or to rival him. What should he do? He took what was certainly a bold step. It was a manifest innovation upon the forms of the free state when he required from the citizens the perpetual "potestas," or power of the consulship, at the same moment that he resigned the office itself, and suffered consuls to be annually elected to sit, one on each side of him, in the senate. The potestas which was thus conceded to him rendered him the head of the state, both in its legislative and executive departments. When he quitted the city he carried with him into the provinces a proconsular authority, and became to all intents and purposes king for life of the Romans and of their subjects. Even in the senatorial provinces he was now recognised as supreme; and thus it was that in him were centred all the great political functions which had been hitherto divided by the great assembly of the Roman magnates.

But the emperor did not limit his views to becoming the chief of the nobles. It was the part of a wary statesman to associate himself not less intimately with the opposite faction, which, under the name of the plebeians, had aimed at securing co-ordinate power with the patricians. The original meaning of these designations had indeed long been lost. The plebeians could boast many families as eminent both for honors and possessions as their haughty rivals. Step by step they had won an equal share with them in political privileges. But the class which still bore the title of plebeian was much more widely extended, and embraced the great mass of the knights and men of business in the city, and also of the citizens settled throughout the provinces. This large class had for more than a century contended with the nobles for the perquisites of office, and their mutual rivalry had armed Sulla against Marius and Cæsar against Pompeius. The heir of Cæsar inherited the favor of the plebeians, and was bound to requite it by distinguised patronage. The plebeians were still the electors to the tribunate, and still regarded the tribunes as their protectors against the encroachments of the patricians represented by the senate. The tribunes had proved themselves most useful allies to Cæsar, and might yet again array themselves in support of the faithful inheritor of his principles. The emperor proposed to balance the consular potestas by assuming at the same time a tribunician potestas also. He thus endowed himself with the authority of the tribune for life, and assured the commons of the city and empire that he could at any time exercise the formidable veto upon the proceedings of the consuls which had served them so well, even down to recent times. Thus did he become emperor indeed,—the sovereign both of the nobles and the people in the city, as well as the commander of the army in the field and in the provinces.

There remained yet another sovereign authority in the state, namely, that which the chief pontiff exercised over the affairs of religion. However much the religious sentiment had been weakened throughout the Roman world, there was yet enough superstition left among the citizens to confer great and sometimes overwhelming influence upon the legitimate interpreter of divine things to the nation. The senate had exercised this power with great effect, as long as the appointment to the chief pontificate rested with the patrician curiæ. Of late years, however, this important dignity had been thrown open to the commons also. Octavianus was well pleased to accept it on the nomination of the whole people combined. He allowed, indeed, his former colleague Lepidus to retain it unmolested during his lifetime, but upon his death he assumed himself the exalted position which he might hesitate to intrust to any other. With this last addition to his prerogatives the emperor might well be contented. The name of king he had from the first utterly repudiated. The office of dictator approached too near to that of a king to be acceptable to a ruler, who studied to confine himself within the limits of the republican constitution. Yet there still lacked some general appellative which might reflect in a single world the full dignity and power resulting from the combination of so many honors and prerogatives. The emperor proposed at first, it is said, to assume the name of *Romulus;* but Romulus had been a king; and further, Romulus had been destroyed, according to the tradition, by the senate, just as Cæsar had been in later times. Such associations were ominous. At last he fixed upon the epithet *Augustus*, a name which no man had borne before, and which, on the contrary, had been applied to things the most noble, most venerable, and most sacred. The rites of the gods were called *august;* their temples were *august.* The word itself was derived from the holy *auguries;* it was connected in meaning with the abstract term *authority*, and with all that increases and flourishes upon earth. The use of this glorious title could not fail to smooth the way to the general acceptance of the divine character of the mortal who was deemed worthy to bear it. The senate had just decreed the divinity of the defunct Cæsar; the courtiers were beginning now to insinuate that his successor, while yet alive, enjoyed an effluence from deity; the poets were even suggesting that altars should be raised to him; and in the provinces, among the subjects of the states at least, temples to his divinity were actually rising, and the *cult* of Augustus was beginning to assume a name, a ritual, and a priesthood.

Augustus, as we may now call him, viewed all this with secret satisfaction. It was one of his first objects, indeed, to restore the outward show at least of reverence for divine things, and re-establish the old Roman religion on its firm political basis. It was easy to rebuild, or cause to be rebuilt, the fallen or dilapidated temples of the national gods. The nobles paid their court to their master by seconding his efforts in this direction. The Pantheon, the temple of all the gods, if such was its original destination, remains still as a monument of his minister Agrippa's munificence; but Virgil would assure us that not less than three hundred "grand" temples were erected throughout the city. Perhaps, indeed, these were mostly the sacella or chapels of the Lares, which are placed at the corners of the streets. Augustus took the sentiment of the people at a favorable moment. They were thoroughly sickened by the miseries of the civil wars; they were ashamed of the crimes for which the whole nation were more or less responsible; they were eager to rush into any scheme of expiation and reparation that should be offered to them, and lend their hands to the material work of restoring at least the outward semblance of penitence for sin, and thankfulness for the mercy vouchsafed them. There can be no doubt that the conscience of

the nation was awakened to a sense of the divine retribution under which they had suffered, but which had been at last averted under the blessed influence of the ruler whom they had at last chosen. The Romans had not lost their belief in a divine Providence, which oppressed them with anxiety and terror, however little they connected it with a sense of moral duty.

The spirit of materialistic philosophy had, however, been rife among them, and during the past century the anti-religious dogmas of Epicurus had sapped the belief of the educated and literary classes. The patrician youth of Rome had been trained in the schools of Greece, and especially at Athens, or had been placed under the teaching of Greek instructors at home; and of the three contending schools, the Stoics, the Epicureans, and the Academics, the second was that which had carried off far the greater number of disciples. The men of books or of speculative character might be generally Academics, and claim Cicero as their noblest leader; the men of imagination and deep religious fervor might follow, with Cato and Brutus, the teaching of the Stoics; but the practical men, the men of arts and arms and business, if they adhered to any school of thought at all, were almost all, like Cæsar himself and his associates generally, addicted to the easy precepts and still laxer morality of Epicurus. This philosophy was noted for its utter denial of Providence and, for all practical objects, of divinity altogether. None of these rival systems, whatever degrees of right sense and reason they might embrace respectively, could sanction any real belief in the still current mythology of the national worship, which was assailed and derided on all sides. Nevertheless, such was the pertinacious adherence of the Roman people to their ancient forms, especially where they had any connection with their national polity, that the outward ritual of their religion was still maintained, though a mere shadow of its former substance. Statesmen, indeed, had invented a formula for reconciling their actual unbelief with their outward profession. Varro had said, and the dictum was favorably accepted, that the ancient beliefs were to be upheld as a matter of public policy. Such, no doubt, was the principle on which Augustus, who was himself neither a believer nor a philosopher, but a politician only, proceeded, when he assumed the part of a restorer of the national religion. He touched, with great sagacity, a chord which vibrated to the heart of the people, who firmly believed that the destinies of the city were bound up with the due observance of the ancient rites, and statesmen looked on with decorous acquiescence at shows and ceremonies to which they attached no significance whatever.

The world "composes its countenance to the expression assumed by the king." Such was the aphorism of the man of the world, and in this particular Augustus was a king indeed.. The Romans rushed forward in the course he marked out for them. His word dictated the fashions of the day, not in sentiment only, but in many particulars of external conduct. He was anxious to restore the dignity of the Roman citizen, as one of the conquering race which ruled its subjects as much by the prestige of its character as by its arms, and he resented all relaxation from the strait-laced discipline of the ancients, even to the petty matters of their dress and deportment. He marked his sovereign displeasure at the degenerate Romans who indulged in the loose habiliments of Greece. "Are these," he exclaimed, in the language of Virgil, "the rulers of the world, the nation of the gown?" And in order to keep up the high distinction of Roman citizenship at a period when provincials from all sides were crowding into it, he reversed, in this single instance, the policy of Cæsar, and was very sparing in granting admission to the Roman franchise. He was, indeed, extremely careful in striking a balance between the tendency of the age to a general fusion of castes and privileges and the ancient spirit of exclusion, in which he thought the strength of the republic still really reposed. The policy of Augustus was one, on the whole, of cautious and moderate reaction. He made an effort to stay the process of disintegration, which he found so rife throughout the vital forces of the empire. The lawlessness of his own usurpation did indeed combine with the gross selfishness of his personal character to sap the moral principles of society, and render its ultimate dissolution inevitable; but he made a vigorous effort to stem the tide, and succeeded in giving the Roman world a period of rest in the downward path which it was generally pursuing.

AUGUSTUS II. (also, and more accurately, designated FREDERICK AUGUSTUS I.), Elector of Saxony and King of Poland, second son of John George III. of Saxony, was born at Dresden, 12th May 1670. His personal beauty was remarkable, and from his great physical strength he received the surname of The Strong, by which he is commonly distinguished. He was very carefully educated, and spent several years travelling in Europe, visiting most of the courts, and taking part in some campaigns against the French. In 1694 he succeeded his elder brother as elector of Saxony, and shortly after, having entered into alliance with Austria, was appointed to the chief command of the imperial forces against the Turks. In 1697, after having suffered a defeat at Olasch, he resigned this office, and proceeding to Vienna, entered into negotiations with regard to the throne of Poland, left vacant by the death of John Sobieski in 1696. As a preliminary step in his candidature, Augustus renounced the Protestant faith, and proclaimed himself a Catholic. Among his rivals the most formidable was the French prince of Conti. Both expended enormous sums in buying over the Polish nobles, and both claimed to be elected at the general diet. Conti, however, was not on the spot, and Augustus, marching into Poland with his Saxon forces, gained possession of the kingdom. Scarcely was he settled on the throne, when he entered into alliance with Russia and Denmark against the young king of Sweden, and with his Saxon troops (for the Poles would not unite with him) invaded Livonia. In the campaigns which followed (1700–1704), he was completely worsted by the extraordinary military genius of his opponent, the celebrated Charles XII. of Sweden; he was driven from Poland, and Stanislaus Leszczinski was crowned in his place. The Swedes, following up their victories, invaded Saxony, and in 1706, at Altranstädt, Augustus was compelled to make peace, to repay the expenses of the Swedish army, to acknowledge Stanislaus as king of Poland, and to congratulate him on his accession. After these reverses he spent some time as a volunteer in the Netherlands, but the defeat of Charles at Pultowa (1709) again raised his hopes. He at once declared the Altranstädt treaty null and void, and having received promises of assistance from Russia, entered Poland, drove out Stanislaus, and was a second time proclaimed king. During the following years he continued to carry on the war with Sweden, while at the same time his kingdom was distracted by the jealousy with which the Poles regarded the Saxon troops who were compelled to leave Poland in 1717. In 1718 Charles XII. was killed at Fredericshall, and from that time the reign of Augustus was marked by no important event. His court became celebrated as the most extravagant and luxurious in Europe, and he himself as the most dissolute and magnificent of princes. His lavish expenditure, though it enriched his capital

with treasures of art, impoverished both Poland and Saxony, and laid the foundations for the future misfortunes of those countries. He died 1st February 1733, from mortification of an old wound. Of his numerous natural children, the most famous was the distinguished general, Maurice of Saxony.

AUGUSTUS III., or FREDERICK AUGUSTUS II., Elector of Saxony and King of Poland, only legitimate son of Augustus the Strong, was born at Dresden, 7th October 1696. He was brought up in the Protestant faith, but in 1712, while on his travels, he entered the Church of Rome, though his change of opinion was not publicly known till 1717. In 1733 he succeeded his father as elector of Saxony, and put forward claims to the kingdom of Poland. The Polish nobles, however, had become dissatisfied with foreign rule, and endeavored to reinstate Stanislaus Leszczinski, whose daughter was married to Louis XV. of France. Russia and Austria, probably bribed, but certainly dreading French influence in Poland, supported Augustus, who was elected, though in an informal manner, and by their aid established himself in the kingdom. On the death of Charles of Austria in 1740, Saxony at first joined the league against Maria Theresa, but jealousy of the Prussian successes in the first campaign caused Augustus to unite with the empress when the war broke out a second time in 1744. His forces were completely defeated by Frederick, and Saxony was overrun and pillaged by the Prussian troops. Eleven years later Augustus joined the alliance against Frederick, which gave rise to the Seven Years' War. He was again unfortunate; the whole Saxon army was surrounded and compelled to surrender at Pirna in 1756, and during the remainder of the war Saxony and Poland were the seats of operations, and suffered severely. Augustus died 5th October 1763, surviving only by a few months the peace of Hubertsburg. During his reign considerable additions were made to the collections of art treasures formed by his father, and Dresden began to be celebrated throughout Europe for its china and pictures.

AUK, a name common to several species of sea-fowl belonging, with one exception, to the family *Alcidæ*. Of these, special interest attaches to the Great Auk, or Gare-fowl (*Alca impennis*), from the circumstance that there is no authentic record of its having been taken, or even seen alive, for more than a quarter of a century. In the autumn of 1821 Dr. Fleming, while on a cruise through the Hebrides, observed and described one which had been taken alive in the sea off St. Kilda and put on board the yacht. With a rope attached to one of its legs, this specimen was occasionally allowed to disport itself in its native element, where it astonished every one by the rapidity with which it swam under water. On one of these occasions it got loose from its bonds, and was soon beyond reach of pursuit. Another specimen had been observed a few years before off Papa Westra, one of the Orkney Islands, but in spite of the exertions of a crew of a six-oared boat, continued for several hours, the auk could not be overtaken. This specimen, however, was afterwards secured, and is now in the British Museum.

AULIC COUNCIL (from the Latin *aula*, a hall, in German, *Reichshofrath*), one of the two supreme courts of the old Germanic empire, the other being the imperial chamber (*Reichskammergericht*). It was called into existence in 1501 by the Emperor Maximilian, and was by him intended to counterbalance the influence of the imperial chamber, which he had been compelled to form by the states six years before. The Aulic Council had in many respects equal power with the chamber; from its decisions there was no appeal, and under its special jurisdiction were included the consideration of the imperial reserved rights, fees, and privileges, the settlement of disputes as to precedence among the several states, and the arrangement of matters relating to the Italian possessions of the empire. All questions of law could be submitted either to this council or to the chamber. At the dissolution of the old Germanic imperial system in 1806, the Aulic Council in its former signification came to an end, though an Austrian court bearing the same title still continued to sit in Vienna.

AULIS, a town in Bœotia, supposed to have been situated on a rocky peninsula between two bays, about three miles S. of Chalcis. During the Trojan war it was the rendezvous of the Greek fleet, and has obtained celebrity as the scene of the sacrifice of Iphigenia.

AUMALE, formerly ALBEMARLE, from the Latin *Alba Maria*, a town of France, in the department of Seine Inférieure, on the banks of the Bresle, 35 miles N.E. of Rouen.

AUNGERVYLE, RICHARD, commonly known by the name of *Richard de Bury*, was born in 1281, at Bury St. Edmund's in Suffolk, and educated at the university of Oxford. He entered the order of Benedictine monks, but was shortly afterwards appointed tutor to the prince of Wales. On the accession of his pupil to the throne as Edward III., he was promoted to various offices of dignity, and was finally made bishop of Durham, as well as lord high-chancellor and treasurer of England.

AURAY, a small town of France, situated on the slope of a hill near the mouth of the river of the same name, in the department of Morbihan, 10 miles W. of Vannes.

AURELIANUS, CÆLIUS, a celebrated Latin physician, born probably at Sicca in Numidia, but regarding whose life scarcely anything is known. The writings of Aurelianus, which are composed from the point of view of the methodical school, show considerable practical skill in the diagnosis of ordinary and even of exceptional diseases.

AURELIUS ANTONINUS, MARCUS, the noblest of all pagans, the crown and flower of Stoicism, was born at Rome 121 A.D., the date of his birth being variously stated as the 21st and the 26th of April. His original name was Marcus Annius Verus. His father Annius Verus, died while he was prætor; his mother who survived her husband, was Domitia Calvilla or Lucilla. The noble qualities of the child attracted the attention of the Emperor Hadrian, who, playing upon the name Verus, said that it should be changed to Verissimus. When Marcus reached the age of seventeen, Hadrian adopted, as his successor, Titus Antoninus Pius (who had married Annia Galeria Faustina, the sister of Annius Verus, and was consequently the uncle of Marcus), on condition that he in turn adopted both his nephew and Lucius Ceionius Commodus, the son of Ælius Cæsar, whom Hadrian, being childless, had originally intended as his successor, but who had died before him. It is generally believed that, had Marcus been old enough, Hadrian would have adopted him directly.

After the death of Hadrian, and the accession of Antoninus Pius to the throne, it became at once apparent that a distinguished future was in store for Marcus. He had been, at the age of fifteen, betrothed to the sister of Commodus; the engagement was broken off by the new emperor, and he was instead betrothed to Faustina, the daughter of the latter. In 139 A.D. the title of Cæsar was conferred upon him, and he dropped the name of Verus. The full name he then bore was Marcus Ælius Aurelius Antoninus, Ælius coming from Hadrian's family, and Aurelius being the original name of Antoninus Pius. He is generally known as Marcus Aurelius or Marcus

Aurelius Antoninus. In 140 A.D., he was made consul, and entered fully upon public life.

The education of Aurelius in his youth was so minute, and has been so detailed by himself, that it ought not to be passed over without notice. He never attended any of the Roman public schools, and this he makes a matter for self-congratulation. He was trained by tutors, in whom, particularly in Rusticus, he appears to have been very fortunate, and to whom he showed gratitude when he reached the throne by raising them to the highest dignities of the state. But, at the early age of eleven, he entered upon another course of study, in which he may be said to have continued more or less till the end of his life. He became acquainted with Diognetus the Stoic, was fascinated by the philosophy he taught, assumed the dress of his sect, and ultimately abandoned rhetoric and poetry for philosophy and law, having among his teachers of the one Sextus of Chæronea, and of the other L. Volusianus Marcianus, a distinguished jurist. He went thoroughly and heartily into the practice as well as the theory of Stoicism, and lived so abstemious and laborious a life, that he injured his health. It was from his Stoical teachers that he learned so many admirable lessons,—to work hard, to deny himself, to avoid listening to slander, to endure misfortunes, never to deviate from his purpose, to be grave without affectation, delicate in correcting others, "not frequently to say to any one, nor to write in a letter, that I have no leisure," nor continually to excuse the neglect of ordinary duties by alleging urgent occupations. Through all his Stoical training, Aurelius preserved the natural sweetness of his nature, so that he emerged from it the most lovable as well as the saintliest of Pagans.

Antoninus Pius reigned from 138 to 161 A.D., and the concord between him and his destined heir was so complete, that it is recorded that during these twenty-three years Marcus never slept oftener than twice away from the house of Pius.

Antoninus Pius died of fever, 161 A.D., at his villa of Lorium at the age of seventy-five. As his end approached, he summoned his friends and the leading men of Rome to his bedside, and recommended to them Marcus, who was then forty years of age, as his successor, without mentioning the name of Commodus, his other adopted son, commonly called Lucius Verus.

The early part of the reign of Aurelius was clouded by various national misfortunes: an inundation of the Tiber swept away a large part of Rome, destroying fields, drowning cattle, and ultimately causing a famine; then came earthquakes, fires, and plagues of insects; and finally, the unruly and warlike Parthians resumed hostilities, and under their king, Vologeses, defeated a Roman army and devastated Syria. Verus, originally a man of considerable physical courage and even mental ability, went to oppose the Parthians, but, having escaped from the control of his colleague in the purple, he gave himself up entirely to sensual excesses, and the Roman cause in Armenia would have been lost, and the empire itself, perhaps, imperilled, had Verus not had under him able generals, the chief of whom was Avidius Cassius. By them the Roman prestige was vindicated, and the Parthian war brought to a conclusion in 165, the two emperors having a triumph for their victory in the year following. Verus and his army brought with them from the East a terrible pestilence, which spread through the whole empire, and added greatly to the horrors of the time. The people of Rome seem to have been completely unnerved by the universal distress, and to have thought that the last days of the empire had come. Nor were their fears without cause. The Parthians had at the best been beaten, not subdued, the Britons threatened revolt, while signs appeared that various tribes beyond the Alps intended to break into Italy. Indeed, the bulk of the reign of Aurelius was spent in efforts to ward off from the empire the attacks of the barbarians. To allay the terrors of the Romans, he went himself to the wars with Verus, his headquarters being Carnuntum on the Danube. Ultimately, the Marcomanni, the fiercest of the tribes that inhabited the country between Illyria and the sources of the Danube, sued for peace in 168.

Aurelius was thenceforth undisputed master of the Roman empire, during one of the most troubled periods of its history.

Peace was not long allowed the emperor. The year after the death of his partner, two of the German tribes, the Quadi and the Marcomanni, renewed hostilities with Rome, and, for three years, Aurelius resided almost constantly at Carnuntum, that he might effectually watch them. In the end, the Marcomanni were driven out of Pannonia, and were almost destroyed in their retreat across the Danube. In 174 Aurelius gained a decisive victory over the Quadi, to which a superstitious interest is attached, and which is commemorated by one of the sculptures on the Column of Antonine. The story is that the Roman army had been entangled in a defile, from which they were unable to extricate themselves, while at the same time they suffered intensely from thirst. In this extremity a sudden storm gave them abundance of rain, while the hail and thunder which accompanied the rain confounded their enemies, and enabled the Romans to gain an easy and complete victory. This triumph was universally considered at the time, and for long afterwards, to have been a miracle, and bore the title of "The Miracle of the Thundering Legion."

Even after this Aurelius was not allowed to rest. From Rome, to which he had returned, he marched to Germany to carry on the war against the tribes which harassed the empire. There the alarming news reached him that Avidius Cassius, the brave and experienced commander of the Roman troops in Asia, had revolted and proclaimed himself emperor. But the rebellion did not last long. Cassius had only enjoyed his self-conferred honor for three months, when he was assassinated, and his head was brought to Marcus. With characteristic magnanimity, Marcus did not thank the assassins for what they had done; on the contrary, he begged the senate to pardon all the family of Cassius, and to allow his life to be the only one forfeited on account of the civil war. This was agreed to, and it must be considered as a proof of the wisdom of Aurelius's clemency, that he had little or no trouble in pacifying the provinces which had been the scene of rebellion. He treated them all with forbearance, and it is said that when he arrived in Syria, and the correspondence of Cassius was brought him, he burnt it without reading it. During this journey of pacification his wife Faustina, who had borne him eleven children, died.

The one blemish in the life of Aurelius is his hostility to Christianity, which is the more remarkable that his morality comes nearer than any other heathen system to that of the New Testament. Attempts have been made to show that he was not responsible for the atrocities with which his reign is credited, but the evidence of Justin, of Athenagoras, of Apollinaris, and above all, of Melito, bishop of Sardis, and of the Church of Smyrna, is overwhelmingly to the effect that not only were there severe persecutions of Christians, in which men like Polycarp and Justin perished, but that the foundation of these persecutions was certain rescripts or constitutions issued by Aurelius as supplementary to the milder decrees of his predecessors Hadrian and Antoninus Pius.

In explanation, however, if not in extenuation, of the attitude of Aurelius towards Christianity, several circumstances should be taken into consideration. In the first place, it is evident that he knew little of the Christians, and absolutely nothing of Christian ethics. In his *Meditations* he makes only one reference to the adherents of the new creed, and that of the most contemptuous character, showing that he confounded them all with certain fanatics of their number, whom even Clemens of Alexandria compares, on account of their thirst for martyrdom, to the Indian gymnosophists. How far this ignorance was culpable it is impossible at so remote a date to say. Further, it should be noted, in regard to the rescripts upon which the persecutions were founded, that, although they were in the name of the emperor, they may not have proceeded directly from him. There is no evidence that he was an active persecutor, except a passage in Orosius to the effect that there were persecutions of the Christians in Asia and Gallia "under the orders of Marcus;" and it should not be kept out of consideration that he was to some extent a constitutional monarch, and had to pay deference both to the *consulta* of the senate and the precedents of previous emperors. At the time there was a great popular outcry against the Christians on social and political, even more than on religious, grounds; and Aurelius may have been as much at the mercy of intriguers or fanatics when he gave his sanction to the butcheries of Christians in Asia Minor, as William III. was at the mercy of Stair and Breadalbane, the real authors of the massacre of Glencoe.

The book which contains the philosophy of Aurelius is known by the title of his *Reflections*, or his *Meditations*, although that is not the name which he gave to it himself, and of the genuineness of the authorship no doubts are now entertained. It is believed that the emperor also wrote an autobiography, which has perished with other treasures of antiquity. The *Meditations* were written, it is evident, as occasion offered,—in the midst of public business, and even on the eve of battles on which the fate of the empire depended,—hence their fragmentary appearance, but hence also much of their practical value and even of their charm. It is believed by many critics that they were intended for the guidance in life of Aurelius's son, Commodus. If so, history records how lamentably they failed in accomplishing their immediate effect, for Commodus proved one of the greatest sensualists, buffoons, and tyrants that disgraced even the Roman purple. But they have been considered as one of the most precious of the legacies of antiquity,—as, in fact, the best reflections on practical morality. They have been recognised as among the most effectual stimuli to strugglers in life, of whatever class and in whatever position, in the field of speculation as in that of action.

Antoninus died as he had lived, a Stoic philosopher. After the death of his wife, Faustina, he visited Lower Egypt, Greece and Italy. In 177 he was called to Germany to suppress a rebellion, and he died, it is believed, near Vienna, on March 17, 180.

AUREOLA, AUREOLE, the radiance or luminous cloud which, in paintings of sacred personages, is represented as surrounding the whole figure. In the earliest periods of Christian art this splendor was confined to the figures of the persons of the Godhead, but it was afterwards extended to the Virgin Mary and to several of the saints. The aureola, when enveloping the whole body, is generally oval or elliptical in form, but is occasionally circular or quatrefoil. When it is merely a luminous disk round the head, it is called specifically a *nimbus*, while the combination of nimbus and aureole is called a *glory*.

AURICH, a town of Prussia, in the province of Hanover, with a population of 5,399.

AURICULA, a genus, and AURICULIDÆ, a family, of Gasteropod Mollusca (Lat. *auricula*, a little ear). Some inhabit fresh water marshes, while others prefer the vicinity of salt water. They generally belong to warm climates, and some of them attain a large size. *Auricula midæ*, a native of the East Indies, is known to shell-collectors by the name of Midas' ear.

AURICULA (*Primula auricula*), a congener of the Primrose, much cultivated in flower gardens. It was highly esteemed by the Romans, and has, at least since the seventeenth century, received particular attention from the florists of England and Holland. A fine dust appears on the flowers and adds much to their beauty. Hence the name in Scotland of "Dusty Miller."

AURIFABER (the Latinized form of the name GOLDSCHMIDT), JOHANNES, a Lutheran divine, celebrated as the friend of Luther and as one of the editors of his works, was born in 1519 in the county of Mansfeldt, and died in 1575.

AURIFABER, JOHANNES, a Lutheran divine, born in Breslau in 1517. He was educated at Wittenberg, and was there specially attracted to Melanchthon, with whom he ever afterward remained on terms of close friendship. He died 19th October, 1568.

AURILLAC, the capital of the department of Cantal, France, situated on the right bank of the Jourdanne, which is here crossed by a handsome bridge. It contains tribunals of primary instance and commerce, a communal college, societies of agriculture, arts, and commerce, a public library, and a museum. Population (1889), 13,860.

AUROCHS is properly the German name of the extinct species of wild ox, called by Cæsar, *Urus*. Recently the name has been erroneously used for the Bison, still found in Lithuania.

AURORA, the Roman personification of the dawn of day, corresponding to the Greek goddess Eos (*q. v.*)

AURORA POLARIS, AURORA BOREALIS and AUSTRALIS, POLAR LIGHT, NORTHERN LIGHTS, or STREAMERS, an electrical meteor, appearing most frequently in high latitudes, in the form of luminous clouds, arches, and rays, of which the latter sometimes meet at a point near the zenith, and form what is called a *boreal crown*. The arches are sometimes single; sometimes several concentric ones are seen, and they are usually nearly stationary, or move slowly southward. The rays rise perpendicularly from the arches, but are sometimes seen detached, or when the arch is below the horizon.

The only thing resembling a distinct history of this phenomenon is that which has been given by Dr. Halley, in the *Philosophical Transactions*, No. 347. The first account he gives, taken from a book entitled *A Description of Meteors*, by W. F., D.D., reprinted at London in 1654, describes the appearance of what is called by him *burning spears*, which were seen at London on the 30th January 1560. The next appearance, according to the testimony of Stow, was on the 7th October 1564. In 1574 also, according to Camden and Stowe, an aurora borealis was observed two nights successively, viz., on the 14th and 15th of November, having much the same appearances as that described by Dr. Halley in 1716. Again, an aurora was twice seen in Brabant, in the year 1575, viz., on the 13th of February and 28th of September. Both appearances were described by Cornelius Gemm, professor of medicine at Louvain, who compares them to spears, fortified cities, and armies fighting in the air. Michael Mæstlin, tutor to Kepler, states that at Backnang in Würtemberg these phenomena, which he styles *chasmata*, were

seen by himself no less than seven times in 1580. In 1581 they again appeared in great splendor in April and September, and in a less degree in some other months of the same year. In September 1621, a similar phenomenon was observed all over France, and described by Gassendi, who gave it the name of *aurora borealis;* yet neither this, nor any similar appearance posterior to 1574, is described by English writers till the year 1707. From 1621 to 1707, indeed, there is no mention made of an aurora borealis having been seen at all; and, considering the number of astronomers who during that period were continually scanning the heavens, it might almost be supposed that nothing of the kind really made its appearance until after an interval of eighty-six years. A small one was seen in November 1707; and during that and the following year the same appearances were repeated five times. The next on record is that mentioned by Dr. Halley in March 1716, which from its brilliancy attracted universal attention, and was considered by the common people as marking the introduction of a foreign race of princes. Since that time these meteors have been much more frequent, and most of our readers must have seen the brilliant displays within the last few years which have been visible over the northern zone.

One singular phenomenon which seems to be connected with the aurora is that of a dark bank of cloud below the arches, and usually just above the northern horizon. Although this appears decidedly darker than the uncovered portion of the sky, it is of so thin a character that stars can be seen through it, as well as through the auroral arches and rays, with but little diminution of brightness. It is, however, quite possible that this cloud is only the somewhat misty open sky near the horizon, which appears darker by contrast with the bright arch above it.

It has been repeatedly affirmed that cracking, hissing, or whizzing sounds have been heard proceeding from the polar lights, and the natives of high latitudes are almost unanimous in alleging that this is sometimes the case.

Numerous observers have attested the occasional visibility of aurora by daylight. In the *Transactions of the Royal Irish Academy*, 1788, Dr. H. Ussher notices that aurora makes the stars "flutter" very much in the telescope, and states that, having noticed this effect strongly one day at 11 A.M., he examined the sky, and saw an auroral corona with rays to the horizon. Others have seen aurora which could not be distinguished from clouds, till the further development of the display made their real nature evident. Dr. Richardson thinks he has observed a polarity in the masses of cloud belonging to a certain kind of cirro-stratus approaching to cirrus, by which their long diameters, having all the same direction, were made to cross the magnetic meridian nearly at right angles. But the apparent convergence of such masses of cloud towards the opposite points of the horizon, which have been so frequently noticed by meteorologists, is an optical deception, produced when they are situated in a plane parallel to that on which the observer stands. These circumstances, says Dr. Richardson, are here noticed, because if it shall hereafter be proved that the aurora depends upon the existence of certain clouds, its apparent polarity may, perhaps, with more propriety, be ascribed to the clouds themselves which emit the light; or, in other words, the clouds may assume their peculiar arrangement through the operation of one cause (magnetism, for example), while the emission of light may be produced by another, namely, a change in their internal constitution, perhaps connected with a motion of the electrical fluid. D. Low states that he has witnessed as complete a display of auroral motions in the cirrus cloud as he ever beheld in a midnight sky. He thinks that all clouds are subject to magnetic or diamagnetic polarisation, and states that when the lines converge towards the magnetic pole, fine weather follows; when they are at right angles to this position, wet and stormy. The aurora appears in these latitudes usually to occur at a height much greater than that of ordinary clouds. Dr. Richardson's observations seem to show, however, that, in the Arctic regions, the aurora is occasionally seated in a region of the atmosphere below a kind of cloud which is known to possess no great altitude, namely, that modification of cirro-stratus which, descending low in the atmosphere, produces a hazy sheet of cloud over head, or a fog bank in the horizon. Indeed, Dr. Richardson is inclined to infer that the aurora borealis is constantly accompanied by, or immediately precedes, the formation of one or other of the forms of cirro-stratus. On the 13th of November and 18th December 1826, at Fort Enterprise, its connection with a cloud intermediate between cirrus and cirro-stratus is mentioned; but the most vivid coruscations of the aurora were observed when there were only a few thin attenuated shoots of cirro-stratus floating in the air, or when that cloud was so rare that its existence was only known by the production of a halo round the moon. The natives of the Arctic regions of North America pretend to foretell wind by the rapidity of the motions of the aurora; and they say that when it spreads over the sky in a uniform sheet of light, it is followed by fine weather, and that the changes thus indicated are more or less speedy, according as the appearance of the meteor is early or late in the evening,—an opinion not improbable, when it is recollected that certain kinds of cirro-stratus are also regarded by meteorologists are sure indications of rain and wind. Dr. Richardson frequently observed the lower surface of nebulous masses illuminated by polar lights,—a fact illustrative of the comparatively low situation of these auroræ. Biot, also, in the island of Uist, observed many auroræ that could not be higher than the region of clouds. Sir John Franklin in like manner observed low auroræ. "The important fact," says he, "of the existence of the aurora at a less elevation than that of dense clouds was evinced on two or three occasions this night (13th February 1821, at Fort Enterprise), and particularly at 11 hours 50 min., when a brilliant mass of light, variegated with the prismatic colors, passed between a uniform steady dense cloud and the earth, and in its progress completely concealed that portion of the cloud which the stream of light covered, until the coruscation had passed over it, when the cloud appeared as before." Captain Parry, as stated in his third voyage, observed auroræ near to the earth's surface. It is said while Lieutenants Scherer and Ross and Captain Parry were admiring the extreme beauty of a polar light, they all simultaneously uttered an exclamation of surprise at seeing a bright ray of the aurora shoot suddenly downward from the general mass of light, and between them and the land, which was only 3000 yards distant. The ray or beam of the polar light thus passed within a distance of 3000 yards, or less than 2 miles, of them. Further, Mr. Farquharson observed in Aberdeenshire an aurora borealis not more than 4000 feet above the level of the sea. Fitzroy believed that aurora in northern latitudes indicates and accompanies stormy weather at a distance, and that straining and cracking of the ice may cause the hissing and whizzing sounds.

M. Silbermann notes facts which strongly confirm the connection of aurora with some form of cirrus cloud. He says (of the aurora of 15th April 1869),—"At 11 hours 16 min. the phenomenon disappeared in a singular

fashion. It appeared as if the columns of the aurora were still visible, but the stars were hidden, and it soon became obvious that fan-like cirrus clouds, with their point of divergence in the north, had taken the place of the aurora. Between 1 and 2 in the morning these clouds had passed the zenith, and let fall a very fine rain. On stretching out the back of the hand one felt a pricking of cold, and now and then there were minute scintillations in the nearest strata of air, like a hail of tiny crystals of ice, which afterwards turned to a rain of larger and larger drops. At 4 o'clock in the morning the cirrus of the false aurora was still visible, but deformed towards the top, and presenting a flaky aspect. One interesting point is, that the cirrus never appeared to replace the aurora either from the right or the left, but to substitute itself for it, like the slow changes of a dioramic view." "I had previously observed a fall of small ice crystals on the 30th April 1865. At 6 P.M. Paris seemed enveloped in a cirrus of vertical fibres, recalling those of amianthus, and more or less wavy. It was a rain of little sparkling prisms. At the same time I heard a rustling or crepitation, and on extending my hand I felt a pricking sensation of cold, and distinguished the crystals which fell and melted immediately."

In a later memoir he remarks that many storm-clouds throw out tufts of cirri from their tops, which extend over a great portion of the sky, and resolve themselves into a very fine and cold drizzle, which frequently degenerates into a warmer and more abundant rain. Usually the fibres are more or less sinuous, but in much rarer cases they become perfectly rectilinear, and surround the cloud like a glory, and occasionally shine with a sort of phosphorescence. As an illustration he quotes his observations on the night of the 6th September 1865: — "A stormy cloud was observed about 11 P.M. in the N.N.W., and lightning was distinctly visible in the dark cumulous mass. Around this mass extended *glories* of a phosphorescent whiteness, which melted away into the darkness of the starry sky. Round the cloud was a single and uninterrupted corona, and outside this, two fainter coronæ broken by rifts which corresponded with each other. After the cloud had sunk below the horizon the *glories* were still visible. The light could not have been due to the moon or any foreign cause. The rays showed great mobility, and a sort of vibration intermediate between that of the aurora and the 'brush discharge' of the electric machine."

A still more curious fact is mentioned by Sabine, who, during his magnetic survey, anchored some days at Loch Scavaig in Skye. This loch is surrounded by high and bare mountains, one of which was nearly always enveloped in a cloud, resulting from the vapors which almost constant west winds brought from the Atlantic. This cloud at nights was permanently self-luminous, and Sabine frequently saw rays similar to those of the aurora. He entirely repudiates the idea that the rays could be due to auroræ beyond the mountain, and is sure that these phenomena, whatever their nature, were produced in the cloud itself.

Silbermann asserts that auroræ are preceded by the same general phenomena as thunderstorms, and concludes that everything had happened as if the auroræ of 1859 and 1869 had been storm-clouds, which, instead of bursting in thunder, had been drawn into the upper parts of the atmosphere, and their vapor being crystallised in tiny prisms by the intense cold, the electricity had become luminous in flowing over these icy particles. This view is very strongly supported by the observation of Professor Piazzi Smyth that the monthly frequency of aurora varies inversely with that of thunderstorms. It must, however, be remembered that the observed frequency of auroræ is much affected in Scotland by the continuous twilight during the summer months. If there be this connection between thunder-clouds and auroræ, it is not improbable that the "dark segment" is sometimes a real cloud or mist, situated at a height where the density of the air is too great for luminous discharge; and in several cases Silbermann has seen auroral rays rise from small clouds, which gradually melted entirely away, or left a small non-luminous nucleus when their electricity was discharged.

If, as would certainly be the case in a mist, any portion of the auroral light is reflected, whether it be its own or derived from some other body, it should be polarised; but so far polariscope observations are deficient, and give no certain information. It is difficult to separate the proper polarisation of the aurora from the mere atmospheric polarisation of the sky. Mr. Ranyard, who appears to have used a double-imaged prism and Savart during the great aurora of Feb. 4, 1872, and also to have made some observations on that of Nov. 11, 1871, did not detect polarisation. On the other hand, Prof. Stephen Alexander, in his report on his expedition to Labrador, found strong polarisation with a Savart, and, singularly enough, thought it strongest in the dark parts of the aurora. The observations were made in lat. about 60°, in the beginning of July, and near midnight, but he does not state whether there was twilight or any trace of air polarisation at the time, nor does he give the plane of polarisation.

With regard to the height of auroræ, Sir W. R. Grove states that he saw an aurora some years ago at Chester in which the rays came between him and the houses; and Mr. Ladd observed a similar case in which the lighthouse at Margate was visible through a ray. The evidence, however, appears strong that aurora is usually at a very great height. Dalton calculated the height of an auroral arch, which was seen as far north as Edinburgh, and as far south as Doncaster, and at most intermediate places, from its apparent altitude, as measured by its position in relation to the stars seen from Kendal and Warrington, 83 miles apart. The resulting height was about 100 miles, and the position slightly south of Kendal. An observation at Jedburgh confirmed this, but some taken at Edinburgh placed it above Carlisle at a height of 150 miles. Dalton, however, considered the former reckoning the more trustworthy. Backhouse has made many calculations, and considers the average height of auroræ ranges from 50 to 100 miles, and numerous other observers have calculated similar heights. All these observations, however, are liable to the objection, that different observers may really have seen different arches, of which, as has been remarked, there are often several concentric ones. It is not likely that this was really the case in most instances, but it has, no doubt, sometimes occurred, and may account for the heights of 500 to 1000 miles calculated by early observers.

Early observers, and especially Mr. Canton, conjectured that the aurora was an electric discharge in the rarefied upper atmosphere, and the resemblance between it and the phenomena exhibited by discharges in an air-pump vacuum confirmed the idea. Recent spectroscopic observations have thrown some little doubt on this conclusion, or at least have shown that there is still a mystery left unexplained. When the light of any flowing gas is analysed by the prism, it is found to consist of a series of colored lines and bands, of which the number and position are dependent on the nature of the gas, and which is called its spectrum. The light of the aurora gives a spectrum usually consisting of a single line in the greenish yellow, which does not coincide with a

principal line of any known substance,—a spectrum totally different from those of the gases of the atmosphere. Besides this line there is occasionally visible a sharp line in the red, and several fainter and more refrangible bands.

To give some idea of the extent of magnetic perturbations, we may mention that during the aurora of 13th May 1869, the declination at Greenwich varied 1° 25′, while the vertical force experienced for four successive maxima, and the greatest oscillation amounted to 0.04 of its total mean value. The horizontal force at the same time only varied 0.014 of its mean value. During the aurora of the 15th April of the same year the declination at Stonyhurst varied 2° 23′ 14″ in nine minutes.

The electric currents produced at such times in telegraph wires, though transient, are often very powerful. Loomis mentions cases where wires had been ignited, brilliant flashes produced, and combustible materials kindled by their discharge. It often happens that the ordinary signals are completely interrupted during their continuance.

In addition to the resemblance between the auroral phenomena and those of electric discharges in rarefied gases, we have seen that auroral displays are accompanied by marked disturbances both in the direction and force of terrestrial magnetism. This fact is in itself almost proof of their electrical character, and, taken in conjunction with the strong "earth-currents" which are at such times produced in lines of telegraph, and with the manifest polarisation of the arches and rays with regard to the magnetic meridian, may be considered as conclusive that the aurora is some sort of electric discharge. There are still some points with regard to the origin of this electricity which are unexplained, and it is uncertain whether the magnetic disturbance causes the electrical phenomena, or *vice versa*. It has been shown by Prof. Plücker that when an electric discharge takes place through rarefied gas in the field of a magnet, it is concentrated in the magnetic curves, which are the only paths in which it can move without being disturbed by the magnet. This is well shown in De la Rive's well-known experiment, in which an electromagnet is set in action, the discharge, which had before filled the egg, is concentrated into a defined band of light, which rotates steadily round the magnet,—the direction of its rotation being changed by reversal either of the current or of the polarity of the magnet. If we suppose that the aurora is an electric discharge passing from one magnetic pole to the other, and following the terrestrial magnetic curves, we shall find that the theory agrees with observed facts even in its lesser details. In these latitudes the magnetic curves are sensibly straight and parallel, and are inclined S.E. at an angle of about 70° from the perpendicular, and, by the well-known laws of perspective, will appear to converge towards this point, as, in fact, the auroral streamers do. The streamers should move from east to west, or from west to east, according as the discharge is from north to south, or *vice versa*, and, in fact, they are in constant motion. Professor Loomis gives a catalogue of forty-six cases of such movement, of which thirty-one were from E. to W. and only fifteen in the opposite direction; and as part of these apparent motions are due to a real motion from N. to S., he concludes that the actual motion of the streamers is from about N.N.E. to S.S.W. This would make the north pole the negative electrode, which is most likely usually the case. Prof. Loomis has shown that during auroral displays electrical currents traverse the earth's surface in the same general direction, though subject to great variation in intensity and even to reversal. Waves of magnetic disturbance are also propagated in the same direction.

With regard to the arches it is evident that they are generally circles concentric to the magnetic poles, and it is very probable that they are analogous to the striæ often seen in discharges in rarefied gases. Gassiot describes an experiment with his great Grove's battery of 400 cells, in which the exhausted receiver was placed between the poles of the large electro-magnet of the Royal Institution:—"On now exciting the magnet with a battery of ten cells, effulgent strata were drawn out from the positive pole, and passed along the under or upper surface of the receiver according to the direction of the current. On making the circuit of the magnet and breaking it immediately, the luminous strata rushed from the positive, and then retreated, cloud following cloud with a deliberate motion, and appearing as if swallowed up by the positive electrode." This, as Mr. Marsh remarks, bears a very considerable resemblance to the conduct of the auroral arches, which almost invariably drift slowly southward; and we cannot do better than sum up his theory in his own words—"The foregoing considerations seem to render it probable that the aurora is essentially an electric discharge between the magnet poles of the earth leaving the immediate vicinity of the north magnetic pole in the form of clouds of electrified matter, which float southward through the atmosphere at a height of 40 miles or more from the earth, sometimes to a distance of more than 30° from the pole; that whilst they are thus moving forward, with a comparatively slow and steady motion, or sometimes even remaining almost stationary for a long time, bright streams of electricity are from time to time suddenly shot out from them in a nearly vertical direction, that is to say, in the magnetic curves corresponding to the points from which they originate; that these curves, ascending to a great height beyond the atmosphere, then bending more and more southward and downward until they finally reach corresponding points in the southern magnetic hemisphere, are the pathways by which the electric currents pass to their destination; and that for several hundred miles from the earth these curves are thus 'traced through space and illuminated with bright electric light;' and further, that the magnetism of the earth also causes these luminous currents and the electrified matter composing the arch to revolve round the magnetic pole of the earth, giving them the motion from east to west, or from west to east, which the components of the arch are observed to have."

The principal difficulties and deficiencies of this hypothesis, which was first suggested by De la Rive, are that it makes no attempt to account for the origin of such an electrical discharge, and that it is difficult to understand how an electric current can traverse vast spaces of the almost perfect vacuum which must exist at the distance from the earth (many hundreds of miles) which is attained by the magnetic curves, since, in the best vacuums of our Sprengel pumps, discharge will not take place even across the interval of a few centimetres. It is not, however, certain that the stellar space is an insulator, and it is possible, moreover, that the auroral currents do not follow the magnetic curves through their whole course, since electric discharge is always in the path of least resistance, and this is modified not only by the magnetic forces, but by atmospheric density, and it is possible that on attaining a certain height the current may proceed horizontally on a stratum of least resistance. It need create no surprise that the discharge is generally invisible in the intermediate zone of low latitudes, since this is well accounted for not only by the large surface over which it is spread at great heights, but because this part of its course it at right angles to the line of sight, while in higher latitudes we look at the streamers almost "end-on," and thus have before our eyes a very great depth of luminous gases. It is common enough,

too, in discharges in rarefied gases to see the two poles surrounded by luminous auræ, while the intermediate space is almost or quite dark, or consists of luminous disks or striæ separated by dark spaces. It seems probable that this "glow" discharge in rarefied gases is really a sort of electrical convection, which is propagated comparatively slowly, and from particle to particle; and that the striæ are surfaces at which the difference of potential of the moving molecules is so great as to cause discharge between them, while in the intermediate dark spaces the electric force is carried mechanically and silently by the particles moving in regular currents under the repulsive and attractive forces of electrification. On this hypothesis the auroral discharge becomes comprehensible, since we have only to suppose that the electricity is carried mechanically, as it were, through the vacuous spaces, which, if they contain no matter to conduct electricity, can contain none to impede the motion of the molecules. It is, moreover, by no means certain that the bright rays indicate actual currents. They may simply consist of matter rendered luminous in the arches, and projected by magnetic or electrical repulsion in the curves of magnetic force, since Varley shows that when a glow discharge in a vacuum tube is brought within the field of a powerful magnet, the magnetic curves are illuminated beyond the electrodes between which the discharge is taking place as well as within the path of the current; and also that this illumination is caused by moving particles of matter, since it deflected a balance plate of tale on which it was caused to impinge. It has also been shown that in electrical discharges in air at ordinary pressures, while the spark itself was unaffected by the magnet, it was surrounded by a luminous cloud or aura, which was drawn into the magnetic curves, and which might also be separated from the spark by blowing upon it. It is evident, therefore, that any mechanical force may separate the luminous particles from the electric discharge which produces them.

With regard to the geographical distribution of aurora, Prof. Loomis laid down a series of zones of equal auroral frequency, and in Petermann's *Mittheilungen* for October 1874, Prof. Fritz has given a chart embodying the results of his extensive researches on the same subject. He finds, like Prof. Loomis, that the frequency of auroral display does not continue to increase to the pole, but reaches a maximum in a zone which, for the northern hemisphere, passes through the Faroe Islands, reaches its most southern point, about 57°, nearly south of Greenland, passes over Nain on the Labrador coast, then tends northwards, across Hudson's Bay (60° N. lat.), and through great Bear Lake, and leaves the American continent slightly south of Point Barrow. It then skirts the northern coast of Asia, reaching its most northerly point, about 76° N., near Cape Taimyr, passing through the north of Nova Zembla, and skirting the N.W. coast of Norway. Not only are auroral displays less frequent in Iceland and Greenland than further south, but it is found that while south of this zone auroræ appear usually to the north of the observer, north of it they are generally to the south, and within it, north or south indifferently. South of this lie other zones approximately parallel to it, and of constantly diminishing frequency. That in which the average yearly number of auroræ is 100 passes through the Drontheim, the Orkneys, and the Hebrides, and reaches the American coast just north of Newfoundland. South of this the frequency diminishes rather rapidly. At Edinburgh the annual average is 30, at York 10, in Normandy 5; while at Gibraltar the average is about 1 in ten years.

These curves, which Prof. Fritz calls *isochasmen*, are nearly normal to the magnetic meridians, and bear a close relation to the curves of equal magnetic inclination, especially with those laid down by Hansteen in 1730, while they noticeably diverge in some places from those of Sabine of 1840. They also approximate to the isobaric curves of Schouw, and Prof. Fritz remarks that the curves of greater frequency tend towards the region of lowest atmospheric pressure. It is not unlikely that there may be such a connection, since Prof. Airy has showed a relation between barometric and magnetic disturbances.

It will be noticed that, eastward from England, the isochasmic curves tend rapidly northward, Archangel being only on the same auroral parallel as Newcastle. Prof. Fritz points out that they bear some relation to the limit of perpetual ice, tending most southward where, as in North America, the ice limit comes furthest south. He also endeavors to establish some connection between the periods of maximum of auroræ and those of the formation of ice, and considers ice as one of the most important local causes which influence their distribution. He quotes a curious fact mentioned by several Arctic voyagers, that aurora was most frequently seen when open water was in sight, and usually rather in the direction of the water than of the magnetic north. In this connection it may be well to remind our readers that the water of the Arctic regions is always warmer than the ice fields, and must cause upward currents of damp air. For the southern hemisphere there are not yet sufficient observations to make any determination of geographical distribution. The correspondence of sunspots and auroræ is here shown for 66 years.

Sun Spots.	Auroræ.	Sun Spots.	Auroræ.
1706	1707	1788	1788
1718	1721	1804	1804
1728	1728	1817	1816
1739	1738	1830	1830
1750	1749	1837	1839
1761	1760	1848	1848
1770	1769	1860	1860
1779	1779	1871	1872

Although no daily periodicity of the aurora can be affirmed, there are two well-marked annual maxima in March and October, of which the latter is the greater, and two minima — the greater in June and the less in January. In this respect the aurora differs from the sporadic meteors, which have a maximum in autumn and a minimum in spring. It also differs from meteors in the hours of its appearance, the former being most frequent before and the latter after midnight.

Although the electric hypothesis is the one generally accepted by scientific men, it is only fair to allude to one that has been recently proposed independently by Dr. Zehfuss. According to this view, the light of the aurora is caused by clouds of ferruginous meteoric dust, which is ignited by friction with the atmosphere. Groneman has shown that these might be arranged along the magnetic curves by action of the earth's magnetic force during their descent, and that their influence might produce the observed magnetic disturbances. The arches may be accounted for by the effects of perspective on columns suddenly terminated at a uniform height by increase of atmospheric density, while the correspondences with iron lines in its spectrum are sufficiently close to favor the idea. Ferruginous particles have been found in the dust of the polar regions, but whether they are derived from stellar space or from volcanic eruptions is uncertain. The yearly and eleven-yearly periodicity of auroræ tends to support the theory, but it is a formidable difficulty that, while shooting stars are more frequent in the morning, or on the face of the earth which is directed forwards in its orbit, the reverse is the

case with auroræ. Groneman meets this difficulty by supposing that in the first place the velocity may be too great to allow of arrangement by the earth's magnetic force, and that, consequently, only diffused light can be produced. He accounts for its unfrequency in equatorial regions by the weakness of the earth's magnetic force, and the fact that, when it does occur, the columns must be parallel to the earth's surface. Without pronouncing in favor of this hypothesis, it must be admitted that it furnishes a plausible explanation of the phenomenon, although we have no evidences that meteoric dust, even if it exists, would produce the observed spectrum, and, as has been already remarked, the iron coincidences are of little weight.

AURORA, a city of Kane county, Ill., on the Fox river, which affords magnificent water power. There are twenty-six large factories, with a capital stock of $6,100,000, and representing all branches of business. The city has eight public schools, twenty-three churches and a population (1890) of 19,634. It has ample railroad facilities, is lighted by gas and electricity, and has waterworks and a fire and police department. Assessed valuation $3,200,000. Aurora contains the car-shops of the Chicago, Burlington and Quincy railroad, which employ over 1,000 men. It has a fine city hall and other public buildings, and is the seat of a seminary.

AURORA, a city of Dearborn county, Ind., on the Ohio river. four miles from Lawrenceburg. It contains a national bank, breweries and distilleries, a nail factory, and several cooper shops, and has a population of 3,928.

AURUNGABĀD, or AURANGÁBÁD, a city of India, in the native state of Haidarábád, or the Nizám's dominions, 138 miles from Púna, 207 from Bombay *via* Púna, and 270 from Haidarábád. It was founded about the year 1620, under the name of Gurka, by Malik Ambar, an Abyssian, who had risen from the condition of a slave. It is now greatly fallen from its ancient grandeur.

AURUNGZÉBE, one of the greatest of the Moghul emperors of Hindustan, was the third son of Shah Jehan, and was born in October 1618. His original name, Mahomet, was changed by his father, with whom he was a favorite, into Aurungzebe, meaning ornament of the throne, and at a later time he assumed the additional titles of Mohi-eddin, reviver of religion, and Alam-gir, conqueror of the world. At a very early age, and throughout his whole life, he manifested profound religious feeling, perhaps instilled into him in the course of his education under some of the strictest Mahometan doctors. He was employed, while very young, in some of his father's expeditions into the country beyond the Indus, gave promise of considerable military talents, and was appointed to the command of an army directed against the Usbeks. In this campaign he was not completely successful, and soon after was transferred to the army engaged in the Deccan. Here he gained several victories, and in conjunction with the famous general, Meer Jumla, who had deserted from the king of Golconda, he seized and plundered the town of Haidarábád, which belonged to that monarch. His father's express orders prevented Aurungzebe from following up this success, and, not long after, the sudden and alarming illness of Shah Jehan turned his thoughts in another direction. Of Shah Jehan's four sons, the eldest, Dara, a brave and honorable prince, but disliked by the Mussulmans on account of his liberality of thought, had a natural right to the throne. Accordingly, on the illness of his father, he at once seized the reins of government and established himself at Dehli. The second son, Soojah, governor of Bengal, a dissolute and sensual prince, was dissatisfied, and raised an army to dispute the throne with Dara. The keen eye of Aurungzebe saw in this conjecture of events a favorable opportunity for realising his own ambitious schemes. His religious exercises and temperate habits gave him, in popular estimation, a great superiority over his brothers, but he was too politic to put forward his claims openly. He made overtures to his younger brother Murad, governor of Guzerat, representing that neither of their elder brothers was worthy of the kingdom, that he himself had no temporal ambition, and desired only to place a fit monarch on the throne, and then to devote himself to religious exercises and make the pilgrimage to Mecca. He therefore proposed to unite his forces to those of Murad, who would thus have no difficulty in making himself master of the empire while the two elder brothers were divided by their own strife. Murad was completely deceived by these crafty representations, and at once accepted the offer. Their united armies then moved northward. Meanwhile Shah Jehan had recovered, and though Dara resigned the crown he had seized, the other brothers professed not to believe in their father's recovery, and still pressed on. Soojah was defeated by Dara's son, but the imperial forces under Jesswunt Singh were completely routed by the united armies of Aurungzebe and Murad. Dara in person took the field against his brothers, but was defeated and compelled to fly. Aurungzebe then, by a clever stroke of policy, seized the person of his father, and threw him into confinement, in which he was kept the remaining eight years of his life. Murad was soon removed by assassination, and the way being thus cleared, Aurungzebe, with affected reluctance, ascended the throne in August 1658. He quickly freed himself from all other competitors for the imperial power. Dara, who again invaded Guzerat, was defeated and closely pursued, and was given up by the native chief with whom he had taken refuge. He was brought to Dehli, exhibited to the people, and assassinated. Soojah, who had been a second time defeated near Allahabad, was attacked by the imperial forces under Meer Jumla and Mahomet, Aurungzebe's eldest son, who, however, deserted and joined his uncle. Soojah was defeated and fled to Aracan, where he perished; Mahomet was captured, thrown into the fortress of Gwalior, and died after seven years' confinement. No similar contest disturbed Aurungzebe's long reign of forty-nine years, which has been celebrated, though with doubtful justice, as the most brilliant period in the history of Hindustan. His last years were embittered by remorse, by gloomy forebodings, and by constant suspicion, for he had always been in the habit of employing a system of espionage, and only then experienced its evil effects. He died, on the 21st February 1707 at Ahmadnagar, while engaged on an extensive but unfortunate expedition against the Mahrattas.

AUSCHWITZ, or OSWIECIM, a town in Galicia, Austria, on the right bank of the Sola, a tributary of the Wechsel, 33 miles W.S.W. of Cracow. Population, 4,000.

AUSCULTATION (*auscultare*, to listen), a term in medicine, applied to the method employed by physicians for determining, by the sense of hearing, the condition of certain internal organs. The ancient physicians appear to have practised a kind of auscultation, by which they were able to detect the presence of air or fluids in the cavities of the chest and abdomen. Still no general application of this method of investigation was resorted to, or was indeed possible, till the advance of the study of anatomy led to correct ideas regarding the locality, structure, and uses of the various organs of the body, and to the alterations produced in them by disease. In 1761 Auenbrugger of Vienna introduced the art of percussion in reference more especially to diseases of the chest. This consisted in tapping with the fingers the surface of the body, so as to elicit sounds by which the comparative resonance of the subjacent parts or organs

might be estimated. Auenbrugger's method attracted but little attention, till Corvisart, in 1808, demonstrated its great practical importance; and then its employment in the diagnosis of affections of the chest soon became general.

In 1819 the distinguished French physician, Laennac, introduced the method of auscultation by means of the stethoscope (στῆθος, the chest, and σκοπέω, I examine), with which his name stands permanently associated. For some time previously, physicians, more especially in the hospitals of Paris, had been in the habit of applying the ear over the region of the heart for the purpose of listening to the sounds of that organ, and it was in the employment of this method that Laennec conceived the idea that these sounds might be better conveyed through the medium of some solid body interposed between his ear and the patient's chest. He accordingly, by way of experiment, rolled up a quire of paper into the form of a cylinder and applied it in the manner just mentioned, when he found, as he states, that he was able to perceive the action of the heart more distinctly than he had ever been able to do by the immediate application of his ear. He thence inferred that not merely the heart's sounds, but also those of other organs of the chest might be brought within reach of the ear by some such instrument, and he, therefore, had constructed the wooden cylinder, or stethoscope, which bears his name. This consisted of a cylindrical piece of wood, about 12 inches long, with a narrow perforation from end to end, the extremity for applying to the chest having a movable piece of conical form fitting into the cylinder, which was withdrawn by the physician while listening to the sounds of respiration, the complete instrument being used for examining the sounds of the voice and those of the heart.

The whole subject of auscultation has been greatly elaborated since the time of Laennec, and while some of his opinions have been found to require modification, continued investigation only serves more clearly to demonstrate the value of this method of diagnosis, and to elicit fresh and more accurate results from its employment. Although much remains to be done in the way of the correct interpretation of the phenomena observed in auscultation, yet the facts already established are among the most important acquisitions in the whole domain of practical medicine.

AUSONIUS, Decimus Magnus, a Roman poet of the 4th century, was the son of an eminent physician, and born at Burdigala *(Bordeaux)* about 310 A.D. He was appointed consul by the Emperor Gratian in the year 379, after having filled other important offices; for besides the dignity of quæstor, to which he had been nominated by Valentinian, he was made præfect of Latium, of Libya, and of Gaul, after that prince's death. The time of his death is uncertain, but he was alive in 388, and probably survived till about 394.

AUSPICIA. See Augurs.

AUSSIG, Aussyenad, or Labem, a town of Austria, in Bohemia, situated in a mountainous district, at the confluence of the Bila and the Elbe. It carries on a large manufacturing trade. Population, 12,000.

AUSTEN, Jane, one of the most distinguished modern British novelists, was born December 16, 1775, at the parsonage of Steventon, in Hampshire, of which place her father was for many years rector. Her life was singularly tranquil and void of incident, so that but few facts are known concerning her from which an idea of her character can be formed. She was tall and attractive in person, and of an extremely kind and gentle disposition. Under her father's care she received a sound education, though she had few of the modern accomplishments. She had a fair acquaintance with English literature, her favorite authors being Richardson, Johnson, Cowper, and Crabbe; she knew French well and Italian slightly, had some taste for music, and was noted for her skill in needlework. In 1796 her first large work, *Pride and Prejudice*, was begun and completed in about ten months; *Sense and Sensibility* and *Northanger Abbey* were written soon after, during 1797 and 1798. Many years elapsed before these works were published. Miss Austen died July 18, 1817.

AUSTERLITZ, a small town of Moravia, 12 miles E. S. E. of Brünn, containing a magnificent palace belonging to the prince of Kaunitz-Rietberg, and a beautiful church. It has been rendered memorable by the great victory obtained in its vicinity, on the 2d of December, 1805, by the French under Napoleon, over the united forces of Austria and Russia. Pop., 3,450.

AUSTIN, John, one of the ablest English writers on jurisprudence, was born on the 3d or March, 1790. Austin wrote one or two pamphlets, but the chief work he published was his *Province of Jurisprudence Determined* (1832.) He died in 1859.

AUSTIN, Sarah Taylor, translator and miscellaneous writer, was born in 1793. She grew up a beautiful and cultivated woman, and in 1820 became the wife of John Austin, noticed above. Mrs. Austin is best known as a singularly skillful translator of German and French works. She died on August 8, 1867.

AUSTIN, Stephen F., founder of the State of Texas, was the son of Moses Austin, a pioneer in the same region, and in 1821 conducted a party of settlers to where the city of Austin now stands, thus carrying out a work his father had begun. In 1833 Austin went to the city of Mexico to secure the admission of his settlement into the Mexican Confederacy, and was imprisoned there till 1835. He died in December, 1836.

AUSTIN, the capital of Texas, is a city of 15,324 people, situated in Travis county, on the left bank of the Colorado river. Its chief attraction is the magnificent capitol building, erected at a cost of nearly $5,000,000. In addition to this Austin contains other public buildings, costing over $1,000,000. It has eight churches, a public library, first-class schools, gas and electric lights, street cars and electric railroads, a well-organized fire department and an efficient police service. The assessed valuation in 1890 was $9,000,000; city tax rate, $1 per $100; the fiscal receipts, $125,000. The city is an important shipping point for cotton.

AUSTRALASIA, one of the six great geographical divisions of the globe, is situated, as its name indicates, south of Asia. It comprises the island-continents of New Guinea, Australia, Tasmania, and New Zealand, and the conterminous archipelagoes of New Britannia, Solomon Islands, New Hebrides, Loyalty Islands, and New Caledonia, which will be treated of under special headings.

AUSTRALIA or New Holland, the largest island-continent of Australasia, measures 2500 miles in length from west to east, by 1950 miles in breath from north to south, and contains an area of about 3,000,000 square miles — nearly the same as that of the United States of America, exclusive of Alaska. It is surrounded on the west by the Indian Ocean, and on the east by the South Pacific. In the north it is separated from New Guinea by Torres Strait, which is 80 miles broad, and from the Eastern Archipelago by Arafura Sea; while on the south Bass Strait, 140 miles wide, separates it from Tasmania. The neighboring colony of New Zealand lies 1200 miles opposite its south-east coast.

Owing to its position at the antipodes of the civilized world, Australia has been longer a *terra incognita* than any other region of the same extent. Its

first discovery is involved in considerable doubt, from confusion of the names which were applied by the earlier navigators and geographers to the Australasian coasts.

The ancients were somehow impressed with the idea of a *Terra Australis* which was one day to be revealed. The Phœnician mariners had pushed through the outlet of the Red Sea to Eastern Africa, the Persian Gulf, and the coasts of India and Sumatra. But the geographer Ptolemy, in the 2d century, still conceived the Indian Ocean to be an inland sea, bounded on the south by an unknown land, which connected the *Chersonesus Aurea* (Malay Peninsula) with the promontory of *Prasum* in eastern Africa. This erroneous notion prevailed in mediæval Europe, although some travellers like Marco Polo heard rumors in China of large insular countries to the south-east.

The investigations of Mr. R. H. Major make it appear probable that the Australian mainland was known as "Great Java" to the Portuguese early in the 16th century; and the following passage in the *Descriptionis Ptolemaicæ Augmentum* of Cornelius Wytfliet, printed at Louvain in 1598, is perhaps the first distinct account that occurs of the country:—"The *Australis Terra* is the most southern of all lands, and is separated from New Guinea by a narrow strait. Its shores are hitherto but little known, since, after one voyage and another, that route has been deserted, and seldom is the country visited, unless when sailors are driven there by storms. The *Australis Terra* begins at one or two degrees from the equator, and is ascertained by some to be of so great an extent, that if it were thoroughly explored it would be regarded as a fifth part of the world."

It was in 1606 that Torres, with a ship commissioned by the Spanish Government of Peru, parted from his companion Quiros (after their discovery of Espiritu Santo and the New Hebrides), and sailed from east to west through the strait which bears his name; while in the same year the peninsula of Cape York was touched at by a vessel called the "Duyfhen" or "Dove" from the Dutch colony of Bantam in Java, but this was understood at the time to form a part of the neighboring island of New Guinea. The Dutch continued their attempts to explore the unknown land, sending out in 1616 the ship "Endraght," commanded by Dirk Hartog, which sailed along the west coast of Australia from lat. 26° 30′ to 23° S. This expedition left on an islet near Shark's Bay a record of its visit engraved on a tin plate, which was found there in 1801. The "Pera" and "Arnhem," Dutch vessels from Amboyna, in 1618 explored the Gulf of Carpentaria, giving to its westward peninsula, on the side opposite to Cape York, the name of Arnhem Land. The name of Carpentaria was also bestowed on this vast gulf in compliment to Peter Carpenter, then governor of the Dutch East India Company. In 1627 the "Guldene Zeepard," carrying Peter Nuyts to the embassy in Japan, sailed along the south coast from Cape Leeuwin, and sighted the whole shore of the Great Bight. But alike on the northern and southern sea-board, the aspect of New Holland, as it was then called, presented an uninviting appearance.

An important era of discovery began with Tasman's voyage of 1642. He, too, sailed from Batavia; but, first crossing the Indian Ocean to the Mauritus, he descended to the 44th parallel of S. lat., recrossing that ocean to the east. By taking this latter course he reached the island which now bears his name, but which he called Van Diemen's Land, after the Dutch governor of Batavia. In 1644 Tasman made another attempt, when he explored the northwest coast of Australia, from Arnhem Land to the 22d degree of latitude, approaching the locality of Dirk Hartog's discoveries of 1616. He seems to have landed at Cape Ford, near Victoria River, also in Roebuck Bay, and again near Dampier's Archipelago. But the hostile attitude of the natives, whom he denounced as a malicious and miserable race of savages, prevented his seeing much of the new country; and for half a century after this no fresh discoveries were made.

The English made their first appearance on the Australian coast in 1688, when the north-western shores were visited by the famous buccaneer Captain William Dampier, who spent five weeks ashore near Roebuck Bay. A few years later (1697) the Dutch organised another expedition under Vlamingh, who, first touching at Swan River on the west coast, sailed northward to Shark's Bay, where Hartog had been in 1616. Dampier, two years later, visited the same place, not now as a roving adventurer, but with a commission from the English Admiralty to pursue his Australian researches. This enterprising navigator, in the narrative of his voyages, gives an account of the trees, birds, and reptiles he observed, and of his encounters with the natives. But he found nothing to invite a long stay. There was yet another Dutch exploring squadron on that coast in 1705, but the results were of little importance.

It was Captain Cook, in his voyages from 1769 to 1777, who communicated the most important discoveries, and first opened to European enterprise and settlement the Australian coasts. In command of the bark "Endeavour," 370 tons burden, and carrying 85 persons, amongst whom were Sir Joseph Banks and Dr. Solander, returning from the Royal Society's expedition to observe the transit of Venus, Cook visited both New Zealand and New South Wales. He came upon the Australian mainland in April 1770, at a point named after Lieutenant Hicks, who first sighted it, on the shore of Gipps' Land, Victoria, S. lat. 38°, E. long. 148° 53′. From this point, in a coasting voyage not without peril when entangled in the barrier reefs of coral, the little vessel made its way up the whole length of the eastern side of Australia, rounding Cape York, and crossing Torres Strait to New Guinea. In his second expedition of Australasian discovery, which was sent out in 1773, Cook's ship, the "Resolute," started in company with the "Adventure," commanded by Captain Furneaux. The two vessels separated, and Cook went to New Zealand, while Furneaux examined some parts of Tasmania and Bass Strait. The third voyage of Cook brought him, in 1777, both to Tasmania and to New Zealand.

Next to Cook, twenty or thirty years after his time, the names of Bass and Flinders are justly honored for continuing the work of maritime discovery he had so well begun. To their courageous and persevering efforts, begun at their private risk, is due the correct determination of the shape both of Tasmania and the neighboring continent. The French admiral Entrecasteaux, in 1792, had made a careful examination of the inlets at the south of Tasmania, and in his opinion the opening between Tasmania and Australia was only a deep bay. It was Bass who discovered it to be a broad strait, with numerous small islands. Captain Flinders survived his friend Bass, having been associated with him in 1798 in this and other useful adventures. Flinders afterwards made a complete survey in detail of all the Australian coasts, except the west and northwest. He was captured, however, by the French during the war, and detained a prisoner in Mauritius for seven years.

The shores of what is now the province of Victoria were explored in 1800 by Captain Grant, and in 1802 by Lieutenant Murray, when the spacious land-locked bay

Longitude East from Greenwich.

British

United States & Dutch

French & Spanish

Portuguese

Native Possessions

Eastern Portion of POLYNESIA.

of Port Phillip was discovered. New South Wales had already been colonised, and the town of Sydney founded at Port Jackson in 1788. West Australia had long remained neglected, but in 1837, after the settlement at Swan River, a series of coast surveys was commenced in H.M.S. "Beagle." These were continued from 1839 to 1843 by Mr. Stokes, and furnished an exact knowledge of the western, north-western, and northern shores, including four large rivers.

Inland Exploration.—The geographical position of the Australian continent had now been sufficiently determined, and what remained for discovery was sought, not as hitherto by coasting along its shores and bays, but by striking into the vast tract of *terra incognita* that occupied the interior. The colony of New South Wales had been founded in 1788, but for twenty-five years its settlers were acquainted only with a strip of country 50 miles wide, between the Blue Mountains and the sea-coast, for they scarcely ever ventured far inland from the inlets of Port Jackson and Botany Bay. Mr. Bass, indeed, once while waiting for his vessel, made an attempt to cross the Blue Mountains, and succeeded in discovering the River Grove, a tributary of the Hawkesbury, but did not proceed further. An expedition was also conducted by Governor Hunter along the Nepean River west of the settlement, while Lieutenant Bareiller, in 1802, and Mr. Caley, a year or two later, failed in their endeavor to surmount the Blue Mountain range. This formidable ridge attains a height of 3400 feet, and being intersected with precipitous ravines 1500 feet deep, presented a bar to these explorers' passage inland. At last, in 1813, when a summer of severe drought had made it of vital importance to find new pastures, three of the colonists, Messrs. Wentworth and Blaxland and Lieutenant Lawson, crossing the Nepean at Emu Plains, gained sight of an entrance, and ascending the summit of a dividing ridge, obtained a view of the grassy valley of the Fish River. This stream runs westward into the Macquarie, which was discovered a few months afterwards by Mr. Evans, who followed its course across the fertile plains of Bathurst.

In 1816 Lieutenant Oxley, R.N., accompanied by Mr. Evans and Mr. Cunningham, the botanist, conducted an expedition of great interest down the Lachlan River, 300 miles to the north-west, reaching a point 34° S. lat., and 144° 30′ E. long. On his return journey Oxley again struck the Macquarie River at a place he called Wellington, and from this place in the following year he organised a second expedition in hopes of discovering an inland sea. He was, however, disappointed in this, as after descending the course of the Macquarie below Mount Harris, he found that the river ended in an immense swamp overgrown with reeds. Oxley now turned aside—led by Mr. Evans' report of the country eastward—crossed the Arbuthnot range, and traversing the Liverpool Plains, and ascending the Peel and Cockburn Rivers to the Blue Mountains, gained sight of the open sea, which he reached at Port Macquarie. A valuable extension of geographical knowledge had been gained by this circuitous journey of more than 800 miles. Yet its result was a disappointment to those who had looked for means of inland navigation by the Macquarie River, and by its supposed issue in a Mediterranean sea.

During the next two or three years public attention was occupied with Captain King's maritime explorations of the north-west coast in three successive voyages, and by explorations of West Australia in 1821. These steps were followed by the foundation of a settlement on Melville Island, in the extreme north, which, however, was soon abandoned. In 1823 Lieutenant Oxley proceeded to Morton Bay and Port Curtis, the first place 7° north of Sydney, the other 10°, to choose the sight of a new penal establishment. From a shipwrecked English sailor he met with, who had lived with the savages, he heard of the river Brisbane. About the same time, in the opposite direction, south-west of Sydney, a large extent of the interior was revealed. The River Murrumbidgee—which unites with the Lachlan to join the great River Murray—was traced by Mr. Hamilton Hume and Mr. Hovell into the country lying north of the province of Victoria, through which they made their way to Port Phillip. In 1827 and the two following years, Mr. Cunningham prosecuted his instructive explorations on both sides of the Liverpool range, between the upper waters of the Hunter and those of the Peel and other tributaries of the Brisbane north of New South Wales. Some of his discoveries, including those of Pandora's Pass and the Darling Downs, were of great practical utility.

By this time much had thus been done to obtain an acquaintance with the eastern parts of the Australian continent, although the problem of what could become of the large rivers flowing north-west and south-west into the interior was still unsolved. With a view to determine this question, Governor Sir Ralph Darling, in the year 1828, sent out the expedition under Captain Charles Sturt, who proceeding first to the marshes at the end of the Macquarie River, found his progress checked by the dense mass of reeds in that quarter. He therefore turned westward, and struck a large river, with many affluents, to which he gave the name of the Darling. This river, flowing from north-east to south-west, drains the marshes in which the Macquarie and other streams from the south appeared to be lost. The course of the Murrumbidgee, a deep and rapid river, was followed by the same eminent explorer in his second expedition in 1831 with a more satisfactory result. He travelled on this occasion nearly 2000 miles, and discovered that both the Murrumbidgee, carrying with it the waters of the Lachlan morass, and likewise the Darling, from a more northerly region, finally joined another and larger river. This stream, the Murray, in the upper part of its course, runs in a north-westerly direction, but afterwards turning southwards, almost at a right angle, expands into Lake Alexandrina on the south coast, about 60 miles S.E. of the town of Adelaide, and finally enters the sea at Encounter Bay in E. long. 139°.

After gaining a practical solution of the problem of the destination of the westward-flowing rivers, Sir Thomas Mitchell, in 1835, led an expedition northward to the upper branches of the Darling; but the party meeting with a sad disaster in the death of Mr. Cunningham, the eminent botanist, who was murdered by the natives on the Bogan River, further exploration of that region was left to be undertaken by Dr. Leichardt, nine years later, and by the son of Sir Thomas Mitchell. Meantime, from the new colony of Adelaide, South Australia, on the shores of Gulf St. Vincent, a series of adventurous journeys to the north and to the west was commenced by Mr. Eyre, who explored a country much more difficult of access, and more forbidding in aspect, than the "Riverina" of the eastern provinces. He performed in 1840 a feat of extraordinary personal daring, travelling all the way along the barren sea-coast of the Great Australian Bight, from Spencer Gulf to King George's Sound. Mr. Eyre also explored the interior north of the head of Spencer Gulf, where he was misled, however, by appearances to form an erroneous theory about the water-surfaces named Lake Torrens. It was left to the veteran explorer, Sturt, to achieve the arduous enterprise of penetrating from the Darling northward to the very centre of the continent. This

was in 1845, the route lying for the most part over a stony desert, where the heat (reaching 131° Fahr.), with scorching winds, caused much suffering to the party. The most northerly point reached by Sturt on this occasion was about S. lat. 24° 25′. His unfortunate successors, Burke and Wills, travelled through the same district sixteen years later; and other expeditions were organised, both from the north and from the south, which aimed at learning the fate of these travellers, as well as that of Dr. Leichardt. These efforts completed our knowledge of different routes across the entire breadth of Australia, in the longitude of the Gulf of Carpentaria, while the enterprising journeys of MacDouall Stuart, a companion of Sturt, obtained in 1862 a direct passage from South Australia northward to the shores of the Malayan Sea. This route has been utilised by the construction of an overland telegraph from Adelaide to the northern coast.

A military station having been fixed by the British Government at Port Victoria, on the coast of Arnhem Land, for the protection of shipwrecked mariners on the north coast, it was thought desirable to find an overland route between this settlement and Moreton Bay, in what then was the northern portion of New South Wales, now called Queensland. This was the object of Dr. Leichardt's expedition in 1844, which proceeded first along the banks of the Dawson and the Mackenzie, tributaries of the Fitzroy River in Queensland. It thence passed farther north to the Burdekin, ascending to the source of that river, and turned westward across a table-land, from which there was an easy descent to the Gulf of Carpentaria. Skirting the low shores of this gulf all the way round its upper half to the Roper, Leichardt crossed Arnhem Land to the Alligator River, which he descended to the western shore of the peninsula, and arrived at Port Victoria, otherwise Port Essington, after a journey of 3000 miles, performed within a year and three months. In 1847 Leichardt undertook a much more formidable task, that of crossing the entire continent from east to west. His starting point was on the Fitzroy Downs, north of the River Condamine, in Queensland, between the 26th and 27th degrees of S. latitude. But this eminent explorer had not proceeded far into the interior before he met his death, his last despatch dating from the Cogoon, April 3, 1848. In the same region from 1845 to 1847, Sir Thomas Mitchell and Mr. E. B. Kennedy explored the northern tributaries of the Darling, and a river in S. lat. 24°, named the Barcoo or Victoria, which flows to the south-west. This river was more thoroughly examined by Mr. A. C. Gregory in 1858. Mr. Kennedy lost his life in 1848, being killed by the natives while attempting to explore the peninsula of Cape York, from Rockingham Bay to Weymouth Bay.

Among the performances of less renown, but of much practical utility in surveying and opening new paths through the country, we may mention that of Captain Banister, showing the way across the southern part of West Australia, from Swan River to King George's Sound, and that of Messrs. Robinson and G. H. Haydon in 1844, making good the route from Port Phillip to Gipps' Land with loaded drays, through a dense tangled scrub, which had been described by Strzelecki as his worst obstacle. Again, in West Australia there were the explorations of the Arrowsmith, the Murchison, the Gascoyne, and the Ashburton Rivers, by Captain Grey, Mr. Roe, Governor Fitzgerald, Mr. R. Austin, and the brothers Gregory, whose discoveries have great importance from a geographical point of view.

These local researches, and the more comprehensive attempts of Leichardt and Mitchell to solve the chief problems of Australian geography, must yield in importance to the grand achievement of Mr. Stuart in 1862. The first of his tours independently performed, in 1858 and 1859, were around the South Australian lakes, namely, Lake Torrens, Lake Eyre, and Lake Gairdner. These waters had been erroneously taken for parts of one vast horseshoe or sickle-shaped lake, only some twenty miles broad, believed to encircle a large portion of the inland country, with drainage at one end by a marsh into Spencer Gulf. The mistake, shown in all the old maps of Australia, had originated in a curious optical illusion. When Mr. Eyre viewed the country from Mount Deception in 1840, looking between Lake Torrens and the lake which now bears his own name, the refraction of light from the glittering crust of salt that covers a large space of stony or sandy ground produced an appearance of water. The error was discovered, after eighteen years, by the explorations of Mr. Babbage and Major Warburton in 1858, while Mr. Stuart, about the same time, gained a more complete knowledge of the same district.

A reward of £10,000 having been offered by the Legislature of South Australia to the first man who should traverse the whole continent from south to north, starting from the city of Adelaide, Mr. Stuart resolved to make the attempt. He started in March 1860, passing Lake Torrens and Lake Eyre, beyond which he found a pleasant, fertile country till he crossed the M'Donnell range of mountains, just under the line of the tropic of Capricorn. On the 23d of April he reached the mountain in S. lat. nearly 22°, and E. long. nearly 134°, which is the most central marked point of the Australian continent, and has been named Central Mount Stuart. Mr. Stuart did not finish his task on this occasion, on account of indisposition and other causes. But the 18th degree of latitude had been reached, where the watershed divided the rivers of the Gulf of Carpentaria from the Victoria River, flowing towards the north-west coast. He had also proved that the interior of Australia was not a stony desert, like the region visited by Stuart in 1845. On the first day of the next year, 1861, Mr. Stuart again started for a second attempt to cross the continent, which occupied him eight months. He failed, however, to advance further than one geographical degree north of the point reached in 1860, his progress being arrested by dense scrubs and the want of water.

Meanwhile, in the province of Victoria, by means of a fund subscribed among the colonists and a grant by the Legislature, the ill-fated expedition of Messrs. Burke and Wills was started. It made for the Barcoo, with a view to reach the Gulf of Carpentaria by a northerly course midway between Stuart's track to the west and Leichardt's to the east. The leading men of the party were Mr. Robert O'Hara Burke, an officer of police, and Mr. William John Wills, of Melbourne observatory. Messrs. Burke and Wills, with two men named Gray and King, left the others behind at the Barcoo on 16th December 1860, and proceeded, with a horse and six camels, over the desert traversed by Stuart fifteen years before. They got on in spite of great difficulties, past the M'Kinlay range of mountains, S. lat. 21° and 22°, and then reached the Flinders River, which flows into the head of the Gulf Carpentaria. Here, without actually standing on the sea-beach of the northern shore, they met the tidal waters of the sea. On February 23, 1861, they commenced the return journey, having in effect accomplished the feat of crossing the Australian continent. Unhappily, three of the party perished on the road home. Gray, who had fallen ill, died on the 16th of April. Five days later, Burke, Wills, and King had repassed the desert to the place on Cooper Creek (the Barcoo, S. lat. 27° 40′, E. long. 140° 30′), where

they had left the depot, with the rest of the expedition. Here they experienced a cruel disappointment. The depot was abandoned; the men in charge had quitted the place the same day, believing that Burke and those with him were lost. The main body of the expedition, which should have been led up by a Mr. Wright, from Menindie, on the Darling, was misconducted and fatally delayed. Burke, Wills, and King, when they found themselves so fearfully left alone and unprovided in the wilderness, wandered about in that district till near the end of June. They subsisted miserably on the bounty of some natives, and partly by feeding on the seeds of a plant called nardoo. At last both Wills and Burke died of starvation. King, the sole survivor, was saved by meeting the friendly blacks, and was found alive in September by Mr. A. W. Howitt's party, sent on purpose to find and relieve that of Burke.

Four other parties, besides Howitt's, were sent out that year from different Australian provinces. Three of them, respectively commanded by Mr. Walker, Mr. Landsborough, and Mr. Norman, sailed to the north, where the latter two landed on the shores of the Gulf of Carpentaria, while Mr. Walker marched inland from Rockhampton. The fourth party, under Mr. J. M'Kinlay, from Adelaide, made for the Barcoo by way of Lake Torrens. By these means, the unknown region of Mid Australia was simultaneously entered from the north, south, east, and west, and important additions were made to geographical knowledge. Landsborough crossed the entire continent from north to south, between February and June 1862; and M'Kinlay, from south to north, before the end of August in that year. The interior of New South Wales and Queensland, all that lies east of the 140th degree of longitude, was examined. The Barcoo and its tributary streams were traced from the Queensland mountains, holding a south-westerly course to Lake Eyre in South Australia; the Flinders, the Gilbert, the Gregory, and other northern rivers watering the country towards the Gulf of Carpentaria were also explored. These valuable additions to Australian geography were gained through humane efforts to relieve the lost explorers. The bodies of Burke and Wills were recovered and brought to Melbourne for a solemn public funeral, and a noble monument has been erected to their honor.

Mr. Stuart, in 1862, made his third and final attempt to traverse the continent from Adelaide along a central line, which, inclining a little westward, reaches the north coast of Arnhem Land, opposite Melville Island. He started in January, and on April 7 reached the farthest northern point, near S. lat. 17°, where he had turned back in May of the preceding year. He then pushed on, through a very thick forest, with scarcely any water, till he came to the streams which supply the Roper, a river flowing into the western part of the Gulf of Carpentaria. Having crossed a table-land of sandstone which divides these streams from those running to the western shores of Arnhem Land, Mr. Stuart, in the month of July, passed down what is called the Adelaide River of North Australia. Thus he came at length to stand on the verge of the Indian Ocean; "gazing upon it," a writer has said, "with as much delight as Balboa, when he had crossed the Isthmus of Darien from the Atlantic to the Pacific." The line crossing Australia which was thus explored has since been occupied by the electric telegraph connecting Adelaide, Melbourne, Sydney, and other Australian cities with London.

A third part, at least, of the interior of the whole continent, between the central line of Stuart and the known parts of West Australia, from about 120° to 134° E. long., an extent of half a million square miles, still remained a blank in the map. But the two expeditions of 1873, conducted by Mr. Gosse and Colonel Egerton Warburton, have made a beginning in the exploration of this *terra incognita* west of the central telegraph route. That line of more than 1800 miles, having its southern extremity at the head of Spencer Gulf, its northern at Port Darwin, in Arnhem Land, passes Central Mount Stuart, in the middle of the continent, S. lat. 22°, E. long. 134°. Mr. Gosse, with men and horses provided by the South Australian Government, started on April 21 from the telegraph station fifty miles south of Central Mount Stuart, to strike into West Australia. He passed the Reynolds range and Lake Amadeus in that direction, but was compelled to turn south, where he found a tract of well-watered grassy land. A singular rock of conglomerate, 2 miles long, 1 mile wide, and 1100 feet high, with a spring of water in its centre, struck his attention. The country was mostly poor and barren, sandy hillocks, with scanty growth of spinifex. Mr. Gosse, having travelled about 600 miles, and getting to 26° 32′ S. lat. and 127° E. long., two degrees within the West Australian boundary, was forced to return. Meanwhile a more successful attempt to reach the western coast from the centre of Australia has been made by Colonel Warburton, with thirty camels, provided by Mr. T. Elder, M.L.C., of South Australia. Leaving the telegraph line at Alice Springs (23° 40′ S. lat., 133° 14′ E. long.), 1120 miles north of Adelaide City, Warburton succeeded in making his way to the De Grey River, West Australia. Overland routes have now been found possible, though scarcely convenient for traffic, between all the widely separated Australian provinces. In Northern Queensland, also, there have been several recent explorations, with results of some interest. That performed by Mr. W. Hann, with Messrs. Warner, Tate, and Taylor, in 1873, related to the country north of the Kirchmer range, watered by the Lynd, the Mitchell, the Walsh, and the Palmer Rivers, on the east side of the Gulf of Carpentaria. The coasting expedition of Mr. G. Elphinstone Dalrymple, with Messrs. Hill and Johnstone, finishing in December 1873, effected a valuable survey of the inlets and navigable rivers in the Cape York peninsula. The Endeavor River in S. lat. 16°, which was visited by Captain Cook a hundred years ago, seems capable of being used for communication with the country inland. A newly discovered river, the Johnstone or Gladys, is said to flow through a very rich land, producing the finest cedars, with groves of bananas, nutmeg, ginger, and other tropical plants. The colonial geologists predict that the north-east corner of Australia will be found to possess great mineral treasures. At the opposite extremity of the continent, its south-west corner, a tour lately made by Mr. A. Forrest, Government surveyor, from the Swan River eastward, and thence down to the south coast, has shown the poorness of that region. The vast superiority of eastern Australia to all the rest is the most important practical lesson taught by the land-exploring labors of the last half century.

Physical Description.—The continent of Australia, with a circumference of nearly 8000 miles, presents a contour wonderfully devoid of inlets from the sea, except upon its northern shores, where the coast line is largely indented. The Gulf of Carpentaria, situated in the north, is enclosed on the east by the projection of Cape York, and on the west by Arnhem Land, and forms the principal bay on the whole coast, measuring about 6° of long. by 6° of lat. Further to the west, Van Diemen's Gulf, though much smaller, forms a better protected bay, having Melville Island between it

and the ocean; while beyond this Queen's Channel and Cambridge Gulf form inlets about S. lat. 14° 50′. On the north-west of the continent the coast line is much broken, the chief indentations being Admiralty Gulf, Collier Bay, and King Sound, on the shores of Tasman Land. Western Australia, again, is not favored with many inlets, — Exmouth Gulf and Shark Bay being the only bays of any size. The same remark may be made of the rest of the sea-board; for, with the exception of Spencer Gulf, the Gulf of St. Vincent, and Port Philip, on the south, and Moreton Bay, Hervey Bay, and Broad Sound, in the east, the coast line is singularly uniform.

The conformation of the interior of Australia is very peculiar, and may perhaps be explained by the theory of the land having been, at a comparatively recent period, the bed of an ocean. The mountain ranges parallel to the east and west coasts would then have existed as the cliffs and uplands of many groups of islands, in widely scattered archipelagoes resembling those in the Pacific. The singular positions and courses of some of the rivers lend force to this supposition. The Murray and its tributaries, the Murrumbidgee, the Lachlan, and the Darling, rising from the mountains on the east coast, flow inwards so far that they were at one time supposed to issue in a central sea. They do, in fact, spend their waters in a shallow lake; but this is not far from the south coast, and is provided with an outlet to the ocean. The Macquarie and the Lachlan merge in extensive swamps, and their beds in the dry season become a mere chain of ponds. This agrees with the idea that the whole country was a sea-bottom, which has scarcely yet assumed the character of permanent dry land, while another proof consists in the thinness and sterility of the soil in the low lands.

Along the entire line of the east coast there extends a succession of mountain ranges from Portland, in Victoria to Cape York in the extreme north, called in different parts the Australian Grampians, the Australian Alps, the Blue Mountains, the Liverpool Range, and other names. These constitute, like the Andes of South America, a regular Cordillera, stretching from north to south 1700 miles in length, with an average height of 1500 feet above the sea. The rivers flowing down the eastern slope, having but short courses before they reach the sea, are of a more determined character than those which take a westerly and inland direction. They cut their way through the sandstone rocks in deep ravines; but from their tortuous and violent course, and from the insufficient volume of water, they are unfit for navigation.

Minerals.— The useful and precious metals exist in considerable quantities in each of the five provinces of Australia. New South Wales has abundance of gold, copper, iron, and coal, as well as silver, lead, and tin. The mineral riches of Victoria, though almost confined to gold, have been the main cause of her rapid progress. South Australia possesses the most valuable copper mines. Queensland ranks next to the last-named province for copper, and excels her neighbors in the production of tin, while gold, iron, and coal are also found in considerable quantities. In Western Australia mines of lead, silver, and copper have been opened; and there is much ironstone.

The discovery of gold in New South Wales and Victoria took place in 1851, and during the next twenty years Victoria exported 40,750,000 oz. of the precious metal, while New South Wales, from 1851 to 1871, exported nearly 10,000,000 ounces. The Queensland gold mines, since 1860, have displayed increasing promise; up to the end of 1872 they had yielded rather less than 1,000,000 ounces; but much was expected, at a more recent date, from the Palmer River and other districts of the north. The yearly value of the aggregate gold exports of Australia, on the average of fifteen years, has been £10,000,000. Victoria alone has produced gold to the value of £170,000,000. The alluvial gold-fields, in which the early diggers, with the simplest tools, obtained for a short time large quantities of the coveted ore, seem now to be mostly exhausted. It is in the quartz formations of the mountain ranges, or in those at a great depth underground, reached by the sinking of shafts and regular mining operations, that Australian gold is henceforth to be chiefly procured. There are mines in Victoria 1000 feet deep, as at Clunes, and many others from 300 to 600 feet deep.

The copper mines of Burra Burra, in South Australia, proved very profitable some twenty-five years ago, yielding in a twelvemonth ore to the value of £350,000, and the Moonta mines, in 1872, were scarcely less productive. The province of South Australia, in that year, exported copper to the amount of £800,000. Queensland, in 1873, produced one-fourth that quantity. Tin, an article of great mercantile interest, is divided between Queensland and New South Wales in a frontier district, two-thirds of the extent of which belongs to the Darling Downs, within the last-mentioned province. There is a little tin, also, in some parts of Victoria. Lead, silver, and cinnabar have been obtained not only in New South Wales, but likewise in Western Australia.

The abundance of good iron ore, in convenient vicinity to thick beds of excellent coal, ensures a future career of manufacturing prosperity to New South Wales, and not less to Queensland. The country north and south of Sydney, and west of that city 100 miles inland to the dividing range of mountains, is all of Carboniferous formation. At the mouth of the Hunter River, from the port and town of Newcastle, coal was exported in 1873 to the value of £1,000,000 sterling. The collieries there taken up have an extent of 35,000 acres, but the area of the coal-field is officially estimated at 10,000,000 acres, and the seams are 9 feet to 11 feet thick. The quality of this coal is said to be equal to that of Great Britain for most furnace purposes, and it is generally used by steamships in the Pacific and Chinese navigation. Next in importance are the Wollongong collieries, south of Sydney, and those of Hartley, Maitland, and Berrima, now connected by railway with the capital.

In each of the places above named there is iron of a superior quality, the working of which to advantage cannot be long delayed. On the Illawarra coast it is found close to the finest bituminous coal, and to limestone. The iron of New South Wales is mostly hæmatite, and the ironstone contains from 60 to 70 per cent. of ore.

Among other mineral products of the same region are cannel coal and shale yielding kerosene oil. This is a recognised article of export from New South Wales to the other colonies. It is hardly worth while to speak of diamonds, opals, and precious stones, but they are often picked up, though of small size, along the Mudgee and Abercrombie Rivers, and at Beechworth and Daylesford, in Victoria.

Climate.— The Australian continent, extending over 28° of latitude, might be expected to show a considerable diversity of climate. In reality, however, it experiences fewer climatic variations than the other great continents, owing to its distance (28°) from the Antarctic circle and 11° from the equator. There is, besides, a powerful determining cause in the uniform character and undivided extent of its dry interior plain.

With regard to the temperature, the northern regions of the continent being situated within the tropic of Capri-

corn, resemble the parts of South America and South Africa, that are situated in the corresponding latitudes. The seaward districts of New South Wales seem in this respect to be like Southern Europe. The mean annual temperature of Sydney is 62° 4′ Fahr., almost equal to that of Lisbon in Portugal.

In winter, in New South Wales, the prevalent winds blow from the west, with occasional storms of wind and rain from the eastward, while the autumn months have much cloudy weather, not accompanied by rain. January and February are the hottest months of summer, and July the coldest month of winter.

The amount of humidity in the air is liable to great and rapid variations in the summer months. It is sometimes reduced as much as 60 per cent. within a few hours, by the effect of hot dry winds. But this is compensated by an access of moisture upon a change of wind. The annual average rainfall at Melbourne, which for thirty years is stated at 25.66 inches, does not seem less than that of places in similar latitudes in other parts of the world. Yet it proves inadequate, because of the great amount of evaporation, estimated by Professor Neumayer at 42 inches.

The spring season in Victoria, consisting of the months of September, October, and November, is genial and pleasant, with some rain. The summer — December, January, and February — is generally hot and dry, though its first month is sometimes broken by storms of cold wind and heavy rain. In February the north winds assume the character of siroccos, and bush-fires often devastate the grassy plains and forests of the inland country. The autumn months — March, April, and May — are, in general, the most agreeable; and at this season vegetable life is refreshed, and puts forth a growth equal to that of the spring. The winter is June, July, and August, with strong, dry, cold winds from the north, alternating with frequent rain from the opposite quarter; there is little ice or snow, except in the mountain districts.

Botany. — A probable computation of the whole number of distinct vegetable species indigenous to Australia and Tasmania has been made by Baron Ferdinand von Müller, the Government botanist at Melbourne. He believes that, omitting the minute fungi, there will not be found above 10,000 species of Australian plants.

The eastern parts of this continent, New South Wales and Queensland, are very much richer, both in their botany and their zoology, than any other parts of Australia. Much was done here for the former science, half a century ago, by Mr. Allan Cunningham, whose monumental obelisk fitly stands in the Botanic Garden at Sydney. In general the growth of trees on the north and north-west coasts is wanting in size and regularity, compared with their growth in eastern Australia.

From the extreme aridity of the climate in most parts of northern Australia, there is a singular absence of mosses and lichens. North-west Australia possesses, in the *Adansonia Gregorii*, or gouty-stem tree, a counterpart of the West African baobab, or monkey-bread tree. It is worthy of remark that, with but few exceptions, the Australian trees are evergreens. They also show a peculiar reverted position of their leaves, which hang vertically, turning their edges instead of their sides towards the sun; and the eucalypti have the peculiarity of shedding their bark annually instead of their leaves. In Australia the native species of lily, tulip, and honeysuckle appear as standard trees of considerable size. The native grasses do not form a continuous and even greensward, as in Europe, but grow in detached clumps or tufts. None of the cereal plants are indigenous, and very few of the fruits or roots that supply human food; but many Australian plants are likely to be valuable for medicinal or chemical manufactures.

This continent, as might be expected, has some of the same botanical families that occupy South Africa, Polynesia, and South America.

Animals. — The zoology of Australia and Tasmania presents a very conspicuous point of difference from that of other regions of the globe, in the prevalence of non-placental mammalia. The vast majority of the mammalia are provided with an organ in the uterus, by which, before the birth of their young, a vascular connection is maintained between the embryo and the parent animal. There are two orders, the Marsupialia and the Monotremata, which do not possess this organ. Both these are found in Australia, to which region indeed they are not absolutely confined; but the marsupials alone constitute two-thirds of all the Australian species of mammals. It is the well-known peculiarity of this order that the female has a pouch or fold of skin upon her abdomen, in which she can place the young for suckling within reach of her teats. The opossum of America is the only species out of Australasia which is thus provided. Australia is inhabited by at least 110 different species of marsupials, which have been arranged in five tribes, according to the food they eat, viz., the root-eaters (wombats), the fruit-eaters (phalangers), the grass-eaters (kangaroos), the insect-eaters (bandicoots), and the flesh-eaters (native cats and rats).

The kangaroo (Macropus) and most of its congeners show an extraordinary disposition of the hind limbs to the fore part of the body. The rock wallabies again have short tarsi of the hind legs, with a long pliable tail for climbing, like that of the tree kangaroo of New Guinea, or that of the jerboa. Of the larger kangaroos, which attain a weight of 200 lb. and more, eight species are named, only one of which is found in West Australia. There are some twenty smaller species in Australia and Tasmania, besides the rock wallabies and the hare kangaroos; these last are wonderfully swift, making clear jumps eight or ten feet high. To this agility they owe their preservation from the prairie fires, which are so destructive in the interior during seasons of drought. In the rat kangaroo there is not the same disproportion of the limbs; it approaches more nearly to the bandicoot, of which seven species exist, from the size of a rat to that of a rabbit. The carnivorous tribe of marsupials, the larger species at any rate, belong more to Tasmania, which has its "tiger" and its "devil." But the native cat, or dasyurus, is common to every part of Australia. Several different species of pouched rats and mice, one or two living in trees, are reckoned among the flesh-eaters. Fossil bones of extinct kangaroo species are met with, which must have been of enormous size, twice or thrice that of any species now living.

We pass on to the other curious order of non-placental mammals, that of the Monotremata, so called from the structure of their organs of evacuation with a single orifice, as in birds. Their abdominal bones are like those of the marsupials; and they are furnished with pouches for their young, but have no teats, the milk being distilled into their pouches from the mammary glands. Australia and Tasmania possess two animals of this order, — the echidna, or spiny ant-eater (hairy in Tasmania), and the *Platypus anatinus*, the duck-billed water-mole, otherwise named the *Ornithorhynchus paradoxus*. This odd animal is provided with a bill or beak, which is not, like that of a bird, affixed to the skeleton, but is merely attached to the skin and muscles.

Australia has no apes, monkeys, or baboons, and no ruminant beasts. The comparatively few indigenous

placental mammals, besides the dingo, or wild dog — which, however, may have come from the islands north of this continent — are of the bat tribe and of the rodent or rat tribe. There are four species of large fruit-eating bats, called flying foxes, twenty of insect-eating bats, above twenty of land-rats, and five of water-rats. The sea produces three different seals, which often ascend rivers from the coast, and can live in lagoons of fresh water; many cetaceans, besides the "right whale" and sperm whale; and the dugong, found on the northern shores, which yields a valuable medicinal oil.

The birds of Australia in their number and variety of species (reckoned at 960) may be deemed some compensation for its poverty of mammals; yet it will not stand comparison in this respect with regions of Africa and South America in the same latitudes. The black swan of West Australia was thought remarkable when discovered as belying an old Latin proverb. There is also a white eagle. The vulture is wanting. Sixty species of parrots, some of them very handsome, are found in Australia. The emu, a large bird of the order Cursores, or runners, corresponds with the African and Arabian ostrich, the rhea of South America, and the cassowary of the Moluccas and New Guinea.

The ornithology of New South Wales and Queensland is more varied and interesting than that of the other provinces.

As for reptiles, Australia has a few tortoises, all of one family and not of great size. The "leathery turtle," which is herbivorous, and yields abundance of oil, has been caught at sea off the Illawarra coast so large as 9 feet in length. The saurians or lizards are numerous, chiefly on dry sandy or rocky ground in the tropical region. The great crocodile of Queensland is 30 feet long; there is a smaller one, 6 feet long, to be met with in shallow lagoons of the interior. The monitor, or fork-tongued lizard, which burrows in the earth, climbs, and swims, is said to grow to a length of 8 or 9 feet. This species, and many others do not extend to Tasmania.

The snakes are reckoned at sixty-three species, of which forty-two are venomous, but only five dangerous. North Queensland has many harmless pythons. There are forty or fifty different sorts of frogs; the commonest is distinguished by its blue legs and bronze or gold back; the largest is bright green; while the tree-frog has a loud shrill voice, always heard during rain.

The Australian seas and rivers are inhabited by many fishes of the same genera as exist in the southern parts of Asia and Africa. Of those peculiar to Australian waters may be mentioned the arripis, represented by what is called among the colonists a salmon trout. A very fine fresh-water fish is Murray cod, which sometimes weighs 100 lb.; and the golden perch, found in the same river, has rare beauty of color. Among the sea fish, the snapper is of great value as an article of food, and its weight comes up to 50 lb. This is the *Pagrus unicolor*, of the family of Sparidæ, which includes also the bream. Its colors are beautiful, pink and red with a silvery gloss; but the male as it grows older takes on a singular deformity of the head, with a swelling in the shape of a monstrous human-like nose.

Aborigines.—The Papuan, Melanesian, or Australasian aborigines exhibit certain peculiarities which are not found in the African negro, to which they otherwise present some similarity. In the Australasian the forehead is higher, the under jaw less projecting, the nose, though flat and extended compared with that of the European, is less depressed than in the African. His lips are thick, but not protuberant; and the eyes are sunken, large, and black. The color of his skin is lighter — of a dusky hue — than that of the Negro. In stature he equals the average European, but tall men are rare, except in North Queensland; his body and limbs are well shaped, strongly jointed, and highly muscular. The hind parts are not, as in the African, excessively raised; and while the calf of the leg is deficient, the heel is straight. The natives of Papua have woolly spirally-twisted hair. Those of Tasmania, now exterminated, had the same peculiarity. But the natives of the Australian continent have straight or curly black hair. The men wear short beards and whiskers.

Their mental faculties, though probably inferior to those of the Polynesian copper-colored race, are not contemptible. They have much acuteness of perception for the relations of individual objects, but little power of generalisation. No word exists in their language for the general terms tree, bird, or fish; yet they have invented a name for every species of vegetable and animal they know. The grammatical structure of some North Australian languages has a considerable degree of refinement. The verb presents a variety of conjugations, expressing nearly all the moods and tenses of the Greek. There is a dual, as well as a plural form in the declension of verbs, nouns, pronouns, and adjectives. The distinction of genders is not marked, except in proper names of men and women. All parts of speech, except adverbs, are declined by terminational inflections. There are words for the elementary numbers, one, two, three; but "four" is usually expressed by "two-two;" then "five" by "two-three," and so on. They have no idea of decimals. The number and diversity of separate languages, not mere dialects, is truly bewildering. Tribes of a few hundred people, living within a few miles of each other, have often scarcely a phrase in common. This is more especially observed in New South Wales, a country much intersected by dividing mountain ranges. But one language is spoken all along the Rivers Murray and Darling, while the next neighbors of the Murray tribes, on both sides, are unable to converse with them.

It is, nevertheless, tolerably certain that all the natives of Australia belong to one stock. There appears reason to believe that their progenitors originally landed on the north-west coast, that of Cambridge Gulf or Arnhem Land, in canoes drifting from the island of Timor. They seem then to have advanced over the continent in three separate directions. From a comparison of their languages, the diversities of which have been already referred to, it appears that little aid is to be expected from them in ethnological grouping.

The natives of the north-eastern quarter — a tropical region of diversified surface, with many rivers and thick forests, as well as open highlands — are far superior in body, mind and social habits to those of the rest of Australia. They bear, in fact, most resemblance to their neighbors and kindred in the island of New Guinea, but are still below these in many important respects.

If a general view be taken of the tribes of Australia, and the state in which they existed independently of recent European intercourse, two or three extraordinary defects exhibit themselves. They never, in any situation, cultivated the soil for any kind of food-crop. They never reared any kind of cattle, or kept any domesticated animal except the dog, which probably came over with them in their canoes. They have nowhere built permanent dwellings, but contented themselves with mere hovels for temporary shelter. They have neither manufactured nor possessed any chattels beyond such articles of clothing, weapons, ornaments, and utensils as they might carry on their persons, or in the family store-bag for daily use. Their want of ingenuity and contrivance has, however, undoubtedly been promoted

by the natural poverty of the land in which the race settled.

The sole dress of both sexes in their aboriginal state is a cloak of skin or matting, fastened with a skewer, but opened on the right hand side. No headgear is worn, except sometimes a net to confine the hair, a bunch of feathers, or the tails of small animals. The bosom or back is usually tattoed, or rather scored with rows of hideous raised scars, produced by deep gashes at the age when youth comes to manhood or womanhood. Their dwellings, for the most part, are either bowers, formed of the branches of trees, or hovels of piled logs, loosely covered with grass or bark, which they can erect in an hour, wherever they encamp. But some huts of a more commodious and substantial form were seen by Flinders on the south-east coast in 1799, and by Captain King and Sir J. Mitchell on the north-east, where they no longer appear. The ingenuity of the race is mostly to be recognised in the manufacture of weapons of warfare and the chase. While the use of the bow and arrow does not seem to have occurred to them the spear and axe are in general use, commonly made of hard-wood; the hatchets of stone, and the javelins pointed with stone or bone. The peculiar weapon of the Australian is the boomerang, a curved blade of wood, of such remarkable construction, that it swerves from its direct course, sometimes returning so as to hit an object behind the thrower. Their nets, made by women, either of the tendons of animals or the fibres of plants, will catch and hold the strong kangaroo or the emu, or the very large fish of Australian rivers. Canoes of bent bark, for the inland waters, are hastily prepared at need; but the inlets and straits of the north-eastern sea-coast are navigated by larger canoes and rafts of a better construction.

The numbers of the native Australians are steadily diminishing. A remnant of the race exists in each of the provinces, while a few tribes still wander over the interior. Altogether it is computed that not more than about 80,000 aborigines remain on the continent.

Colonial History.—Of the five Australian provinces, that of New South Wales may be reckoned the oldest. It was in 1788, eighteen years after Captain Cook explored the east coast, that Port Jackson was founded as a penal station for criminals from England; and the settlement retained that character, more or less, during the subsequent fifty years, transportation being virtually suspended in 1839. The colony, however, from 1821 had made a fair start in free industrial progress.

By this time, too, several of the other provinces had come into existence. Van Diemen's Land, now called Tasmania, had been occupied as early as 1803. It was an auxiliary penal station under New South Wales, till in 1825 it became a separate province. From this island, ten years later, parties crossed Bass's Straits to Port Phillip, where a new settlement was shortly established, forming till 1851 a part of New South Wales, but now the richer and more populous colony of Victoria. In 1827 and 1829, an English company endeavored to plant a settlement at the Swan River, and this, added to a small convict station established in 1825 at King George's Sound, constituted Western Australia. On the shores of the Gulf St. Vincent, again, from 1835 to 1837, South Australia was created by another joint-stock company, as an experiment in the Wakefield scheme of colonisation.

Such were the political component parts of British Australia up to 1839. The earlier history, therefore, of New South Wales is peculiar to itself. Unlike the other mainland provinces, it was at first held and used chiefly for the reception of British convicts. When that system was abolished, the social conditions of New South Wales, Victoria, and South Australia became more equal. Previous to the gold discoveries of 1851 they may be included, from 1839, in a general summary view.

The first British governors at Sydney, from 1788, ruled with despotic power. They were naval or military officers in command of the garrison, the convicts, and the few free settlers. The duty was performed by such men as Capta.. Arthur Phillip, Captain Hunter, and others. In the twelve years' rule of General Macquarie, closing with 1821, the colony made a substantial advance. By means of convict labor roads and bridges were constructed, and a route opened into the interior beyond the Blue Mountains. A population of 30,000, three-fourths of them convicts, formed the infant commonwealth, whose attention was soon directed to the profitable trade of rearing fine wool sheep, first commenced by Mr. John M'Arthur in 1803.

During the next ten years, 1821–31, Sir Thomas Brisbane and Sir Ralph Darling, two generals of the army, being successively governors, the colony increased, and eventually succeeded in obtaining the advantages of a representative institution, by means of a legislative council. Then came General Sir Richard Bourke, whose wise and liberal administration proved most beneficial. New South Wales became prosperous and attractive to emigrants with capital. Its enterprising ambition was encouraged by taking fresh country north and south. In the latter direction, explored by Mitchell in 1834 and 1836, lay Australia Felix, now Victoria, including the well-watered, thickly-wooded country of Gipps' Land.

This district, then called Port Phillip, in the time of Governor Sir George Gipps, 1838 to 1846, was growing fast into a position claiming independence. Melbourne, which began with a few huts on the banks of the Yarra-Yarra in 1835, was in 1840 a busy town of 6000 inhabitants, the population of the whole district, with the towns of Geelong and Portland, reaching 12,850; while its import trade amounted to £204,000, and its exports to £138,000. Such was the growth of infant Victoria in five years; that of Adelaide or South Australia, in the same period, was nearly equal to it. At Melbourne there was a deputy governor, Mr. Latrobe, under Sir George Gipps at Sydney. Adelaide had its own governors, first Captain Hindmarsh, next Colonel Gawler, and then Captain George Grey. Western Australia progressed but slowly, with less than 4000 inhabitants altogether, under Governors Stirling and Hutt.

The general advancement of Australia, to the era of the gold-mining, had been satisfactory, in spite of a severe commercial crisis, from 1841 to 1843, caused by extravagant land speculations and inflated prices. Victoria produced already more wool than New South Wales, the aggregate produce of Australia in 1852 being 45,000,000 lb.; and South Australia, between 1842 and this date, had opened most valuable mines of copper. The population of New South Wales in 1851 was 190,000; that of Victoria, 77,000; and that of South Australia about the same.

At Summerhill Creek, 20 miles north of Bathurst, in the Macquarie plains, gold was discovered, in February 1851, by Mr. E. Hargraves, a gold-miner from California. The intelligence was made known in April or May; and then began a rush of thousands,—men leaving their former employments in the bush or in the towns to search for the ore so greatly coveted in all ages. In August it was found at Anderson's Creek, near Melbourne; a few weeks later the great Ballarat gold-field, 80 miles west of that city, was opened; and after that, Bendigo, now called Sandhurst, to the north

Not only in these lucky provinces, New South Wales and Victoria, where the auriferous deposits were revealed, but in every British colony of Australasia, all ordinary industry was left for the one exciting pursuit. The copper mines of South Australia were for the time deserted, while Tasmania and New Zealand lost many inhabitants, who emigrated to the more promising country. The disturbance of social, industrial, and commercial affairs, during the first two or three years of the gold era, was very great. Immigrants from Europe, and to some extent from North America and China, poured into Melbourne, where the arrivals in 1852 averaged 2000 persons in a week. The population of Victoria was doubled in the first twelvemonth of the gold fever, and the value of imports and exports was multiplied tenfold between 1851 and 1853.

The colony of Victoria was constituted a separate province in July 1851, Mr. Latrobe being appointed governor, followed by Sir Charles Hotham and Sir Henry Barkly in succession. The more rapid increase of Victoria since that time, in wealth and number of inhabitants, has gained it a pre-eminence in the esteem of emigrants; but the varied resources of New South Wales, and its greater extent of territory, may in some degree tend to redress the balance, if not to restore the character of superior importance to the older colony.

The separation of the northern part of eastern Australia, under the name of Queensland, from the original province of New South Wales, took place in 1859. At that time the district contained about 25,000 inhabitants; and in the first six years (as Sir George Bowen, the first governor, observed in 1865) its population was quadrupled and its trade trebled.

It appears, from a general view of Australian progress in the last twenty years, that the provinces less rich in gold than Victoria have been enabled to advance in prosperity by other means. Wool continues the great staple of Australia. But New South Wales, possessing both coal and iron, is becoming a seat of manufactures; while Queensland is also favored with much mineral wealth, including tin. The semi-tropical climate of the latter colony is suitable for the culture of particular crops, needing only a supply of other than European labor. Meantime South Australia, besides its production of copper and a fair share of wool, has become the great wheat-growing province of the continent.

AUSTRIA, or more strictly AUSTRIA-HUNGARY (Ger. *Oesterreich* and *Oesterreich-Ungarn*), is an extensive country in the southern portion of Central Europe. It extends through 17 degrees of longitude and 9 degrees of latitude, and has an area of about 240,000 English square miles. With the exception of the islands in the Adriatic, and the narrow projecting tract of Dalmatia, it forms a compact region of country, but of an irregular shape. It is surrounded on all sides by other countries, except where it borders upon the Adriatic, which is about one-fifth of the entire extent of its boundaries. Of the rest, about one-third on the W. and N. is formed by the German empire (Bavaria, Saxony, and Prussia), a third on the S. and E. by the Turkish empire and the Danubian Principalities, and the remaining third by Russia on the N.E. and Switzerland and Italy on the S.W. The boundaries are formed in some parts by river courses, in others by mountain ranges, and sometimes they extend through an open country. As compared with France, Austria has a form nearly as compact, but its frontiers are by no means so well defined or so strongly protected by natural barriers. It ranks third in extent among the countries of Europe (after Russia and Sweden), and fourth in point of population (after Russia, the German empire and France).

Austria is, after Switzerland, the most mountainous country of Europe, and about four-fifths of its entire area is more than 600 feet above the level of the sea. The mountains are frequently covered with vegetation to a great elevation. At the base are found vines and maize; on the lower slopes are green pastures, or wheat, barley, and other kinds of corn; above are often forests of oak, ash, elm, &c.; and still higher the yew and the fir may be seen braving the fury of the tempest. Corn grows to between 3400 and 4500 feet above the level of the sea, the forests extend to 5600 or 6400 feet, and the line of perpetual snow is from 7800 to 8200 feet. In some parts, however, particularly in Tyrol, Styria, Carinthia, and Carniola, the mountains appear in wild confusion, with rugged peaks and bare precipitous sides, forcibly reminding the traveller of Switzerland. Tyrol in particular has, like that country, its cascades. its glaciers, its perpetual snows, and its avalanches.

The Alps occupy the south-west portion of the country, and form its highest lands. They are distinguished by various names, as the Rhætian, Noric, Carnic, Julian, and Dinaric Alps. The Rhætian or Tyrolese Alps enter Tyrol from the Swiss canton of the Grisons, and are the loftiest range in the country, a number of the summits rising to the height of 12,000 feet, and the highest, the Orteler Spitze, attaining a height of 12,814 feet above the level of the sea. They divide into three principal chains, the most southern of which occupies the southern portion of Tyrol, and contains the Orteler Spitze, and others of the loftiest points in the country. The middle or principal chain extends in an easterly direction to the borders of Salzburg and Carinthia, and has many of its peaks covered with perpetual snow. The northern chain is inferior in elevation to the others, and few of its most elevated points reach the snow line. The Noric Alps are a continuation of the Rhætian eastward, passing through Salzburg, Styria, Carinthia north of the Drave, Lower and Upper Austria, to Hungary, where they gradually sink into the plains. They comprise three chains, a main chain and two lesser chains proceeding northward — the one the Salzburg, the other the Styria-Austrian Alps. The main chain, the Noric Alps in a stricter sense, traverses Salzburg, Carinthia, and Styria, and has a length of about 170 miles, some of its peaks rising to the height of 12,000 feet. The Carnic or Carinthian Alps are also an offshoot of the Rhætian Alps eastward, occupying the south-east of Tyrol, Carinthia, and the north of Carniola. They form several branches, and some of the summits are over 9,000 feet high. The Julian or Carniolan Alps extend in a south-easterly direction through Carniola and Croatia. They present little of an Alpine character, and with one or two exceptions nowhere rise to the height of 5000 feet. They are for the most part bare and rugged. The Dinaric Alps are a continuation of the preceding, extending through Croatia and Dalmatia, and resemble them in character. The highest point, Mount Dinara, from which they take their name, is 5956 feet above the level of the sea.

After the Alps, the most important mountain system of Austria is the Carpathians, which occupy its eastern and north-eastern portions, and stretch in the form of an arch through Silesia, Moravia, Galicia, Hungary, and Transylvania. They have an extent of about 650 miles, and are divided into three principal groups — the Hungarian Carpathians, the Carpathian Waldgebirge or Forest Mountains, and the Transylvanian Highlands. The Hungarian Carpathians stretch from west to east, through Hungary, Moravia, Silesia, and Galicia for about 200 miles, and comprise various smaller groups, among which are the Beskides, the Little Carpathians,

AUSTRIA - HUNGARY.

SCALE OF MILES.

10 0 10 20 30 40 50 60 70 80 90 100

Rand McNally & Co. Engrs. Chicago.

CONTINUATION OF
DALMATIA.
ON SAME SCALE.

and the Central Carpathians or the Tatra Mountains. This last group constitutes the highest portion of the Carpathians, having an average elevation of over 6000 feet, and its two principal summits, the Eisthaler Thurm and the Lomnitzer Spitze, having a height of 8378 and 8222 feet respectively. In character it resembles the Alps more than the Carpathians, having rugged precipitous sides, deep chasms, snows, glaciers, cascades, &c. The Waldgebirge, or Forest Mountains, are a series of moderate elevations, for the most part wooded, and stretching for about 160 miles through Hungary, Galicia, and Buckowina, with an average breadth of about 45 miles. They are in general from 3000 to 6000 feet in elevation, the highest point, Pietrozza, rising to 7086 feet. The Transylvanian Highlands extend over Transylvania, a part of Hungary, and the Military Frontier, into Moldavia and Wallachia. They have a length of about 350 miles, and breadth of from 30 to 90. Several of the summits rise to the height of 8000 feet. The sides of the Carpathian mountains are generally covered with forests to a considerable height.

The Hercynian mountain system spreads itself over Bohemia, Silesia, Moravia, and the middle and northern portions of Upper and Lower Austria. It includes the lesser systems of the Bohemian Forest, the Erzgebirge, the Riesengebirge, and the Sudetes. The Bohemian Forest is a series of wooded heights on the confines of Bohemia and Bavaria, and extending south from the Eger to the Danube. Its highest point is 4610 feet above the sea. The Erzgebirge, or Ore Mountains, commence on the left bank of the Elbe, run eastward between Bohemia and Saxony, and terminate near the sources of the White Elster. None of the summits rise to the height of 4000 feet. The Risengebirge or Giant Mountains are on the confines of Bohemia towards Prussian Silesia, and have their highest point, Schneekoppe or Riesenkoppe, 5330 feet above the sea. The Sudetes is a name sometimes given to all the mountains of Northern Bohemia, but it more properly belongs to that range which runs between Moravia and Prussian Silesia, from the March to the Oder. The highest summit, the Spieglitzer Schneeberg, is 4774 feet high.

As the highlands of Austria form part of the great water-shed of Europe which divides the waters flowing northward into the North Sea or the Baltic, from those flowing southward or eastward into the Mediterranean or the Black Sea, its rivers flow in three different directions—northward, southward, and eastward. With the exception of the small streams belonging to it which fall into the Adriatic, all its rivers have their mouths in other countries, and its principal river, the Danube, has also its source in another country. This, which after the Volga is the largest river in Europe, rises in the grand duchy of Baden, flows through Würtemberg and Bavaria, and is already navigable when it enters Austria, on the borders of which it receives the Inn, a river which has as large a body of water as itself. It has a course of about 820 miles within the country, which is about 48 per cent. of its entire length. Where it enters it is 898 feet above the level of the sea, and where it leaves only 132 feet. It has thus a fall within the country of 766 feet, and is at first a very rapid stream, but latterly a very slow one. Its affluents, after the Inn, are at first generally small, the principal being the Traun, the Enns, and the March. In Hungary it receives from the Carpathians the Waag, Neutra, Gran, and Eipel; and from the Alps the Drave, the Mur, and the Save. But the principal affluent of the Danube is the Theiss, which rises in the Carpathians, and drains nearly the whole of the eastern half of Hungary. The country drained by the Danube is formed into several basins by the mountains approaching its banks on either side. The principal of these are the Lins and Krems basins, the Vienna basin, and the little and great Hungarian basins. Between this last and the plains of Wallachia, it passes through the narrow rocky channels of Islach, Kasan, and the Iron Door, where the fall is about 41 feet in less than half a mile. The Dniester, which, like the Danube, flows into the Black Sea, has its source in the Carpathians in Eastern Galicia, and pursues a very winding course towards the south-east. It receives its principal affluents from the Carpathians, and drains in Austria a territory of upwards of 12,000 English square miles. It is navigable for about 300 miles. The Vistula and the Oder both fall into the Baltic. The former rises in Moravia, flows first north through Austrian Silesia, then takes an easterly direction along the borders of Prussian Silesia, and afterwards a north-easterly, separating Galicia from Russian Poland, and leaving Austria not far from Sandomir. Its course in Austria is 240 miles, draining an area of 15,500 square miles. It is navigable for nearly 200 miles, and its principal affluents are the Save and the Bug. The Oder has also its source in Moravia, flows first east, and then north-east through Austrian Silesia into Prussia. Its length within the Austrian territory is only about 55 miles, no part of which is navigable. The only river of this country which flows into the North Sea is the Elbe. It has its source in the Riesengebirge, not far from the Schneekoppe, flows first south, then east, and afterwards north-east through Bohemia, and then enters Saxony. Its principal affluents are the Adler, Iser, and Eger, and, most important of all, the Moldau. The last, from the length of its course, and the quantity of water which it brings down, is entitled to be considered the main stream. It has a course of 260 miles, and is navigable for 190. The Elbe itself has a course within the Austrian dominions of 185 miles, for about 65 of which it is navigable. It drains an area of upwards of 21,000 square miles. The Rhine, though scarcely to be reckoned a river of the country, flows for about 25 miles of its course between it and Switzerland. The principal river of Austria which falls into the Adriatic is the Adige. It rises in the mountains of Tyrol, flows south, then east, and afterwards south, into the plains of Lombardy. Its principal affluent is the Eisack. Of the streams which have their course entirely within the country, and which fall into the Adriatic, the principal is the Isonzo, 75 miles in length, but navigable only for a short distance from its mouth.

The lakes and marshes of Austria are very numerous, and some of them are of great extent. The lakes lie principally in the valleys among the Alps, and the marshes are frequent along the courses of the rivers. The largest lake of Austria is the Balaton, in Hungary, which is about 46 miles in length by 18 in breadth, and, including the swamps in connection with it, covers an area of 500 square miles. The Neusiedler, also in Hungary, is 18 miles in length, by from 4 to 7 in breadth, and covers an area of 106 square miles. Among the many smaller ones the principal are the Traunsee, Attersee, Wörthersee, Mondsee, &c. No other European country equals Austria in the number and value of its mineral springs. No fewer than 1500 of these are reckoned, and they occur principally in Bohemia and Hungary. In the former are Karlsbad, Marienbad, Franzenbad, Teplitz, Püllna, and Seidlitz.

The climate of Austria, in consequence of its great extent, and the great differences in the elevation of its surface, is very various. It is usual to divide it into three distinct zones. The most southern extends to 46° N. lat., and includes Dalmatia and the country along the coast, together with the southern portions of Tyrol

and Carinthia, Croatia, Slavonia, and the most southern part of Hungary. Here the seasons are mild and equable, the winters are short (snow seldom falling), and the summers last for five months. The vine and maize are everywhere cultivated, as well as olives and other southern products. In the south of Dalmatia tropical plants flourish in open air. The central zone lies between 46° and 49° N. lat., and includes Lower and Upper Austria, Salzburg, Styria, Carinthia, Carniola, Central and Northern Tyrol, Southern Moravia, a part of Bohemia, the main portion of Hungary, and Transylvania. The seasons are more marked here than in the preceding. The winters are longer and more severe, and the summers are hotter. The vine and maize are cultivated in favorable situations, and wheat and other kinds of grain are generally grown. The northern zone embraces the territory lying north of 49° N. lat., comprising Bohemia, Northern Moravia, Selesia, and Galicia. The winters are here long and cold; the vine and maize are no longer cultivated, the principal crop being wheat, barley, oats, rye, hemp, and flax. The mean annual temperature ranges from about 59° in the south to 48° in the north. In some parts of the country, however, it is as low as 46° 40′ and even 36°. In Vienna the average annual temperature is 50°, the highest temperature being 94°, the lowest 2° Fahr. In general the eastern part of the country receives less rain than the western. In the south the rains prevail chiefly in spring and autumn, and in the north and central parts during summer. Storms are frequent in the region of the South Alps and along the coast. In some parts in the vicinity of the Alps the rainfall is excessive, sometimes exceeding 60 inches. It is less among the Carpathians, where it usually varies from 30 to 40 inches. In other parts the rainfall usually averages from 20 to 24 inches, but in the plains of Hungary it is as low as 26.

From the varied character of its climate and soil the vegetable productions of Austria are very various. It has floras of the plains, the hills, and the mountains; an alpine flora, and an arctic flora; a flora of marshes, and a flora of steppes; floras peculiar to the clay, the chalk, the sandstone, and the slate formations. The number of different species is estimated at 12,000, of which one-third are phanerogamous, or flowering plants, and two-thirds cryptogamous, or flowerless. The crown-land of Lower Austria far surpasses in this respect the other divisions of the country, having about four-ninths of the whole, and not less than 1700 species of flowering plants. Hungary, Bohemia, Moravia, and Gálicia are the principal corn-growing reigons of the country; and Tyrol, Salzburg, and Upper Styria are the principal pastoral regions.

The animal kingdom embraces, besides the usual domestic animals (as horses, cattle, sheep, swine, goats, asses, &c.), wild boars, deer, wild goats, hares, &c.; also bears, wolves, lynxes, foxes, wild cats, jackals, otters, beavers, polecats, martins, weasles, and the like. Eagles and hawks are common, and many kinds of singing birds. The rivers and lakes abound in different kinds of fish, which are also plentiful on the sea-coast. Among insects the bee and the silkworm are the most useful. The leech forms an article of trade. In all there are 90 different species of mammals, 248 species of birds, 377 of fishes, and more than 13,000 of insects.

Austria comprises five countries, each bearing the name of kingdom—viz., Hungary, Bohemia, Galicia. Illryia, and Dalmatia; one archduchy, Austria; one principality, Transylvania; one duchy, Styria; one margraviate, Moravia; and one county, Tyrol. These are now divided into provinces, which are called *crown-lands*, and of which at present there are 18, 14 being in Austria Proper, and 4 in Hungary. These various countries, while under the rule of one sovereign, have nothing else in common, and their union is only a political one; and it is not too much to say that nationalism, in its ordinary sense, does not exist. This will be evident when we consider the various races included.

The population of Austria is made up of a number of distinct races, differing from each other in manners, customs, language and religion, and united together only by living under the same government. The most numerous race is the German, amounting to 9,000,000, and forming 25 per cent. of the entire population. They are found more or less in all the crown-lands, but are most numerous in Lower and Upper Austria, Salzburg, Styria, Carinthia, and Northern Tyrol. The different Slavonic races number together 16,540,000, or 46 per cent. The principal Slavonic races are,—in the north, the Czechs and Moravians (4,480,000), who, together with the Slovacks in the Western Carpathians (1,940,000), form 18 per cent. of the entire population, and the Poles (2,370,000) and the Ruthens (3,360,000), occupying Galicia; and in the south, the Slovens (1,220-000), the Croats (1,520,000), and the Serbians (1,651,000). The Northern Slavonians are found chiefly in Bohemia, Moravia, Galicia, and the north of Hungary; the southern in Carniola, Dalmatia, Croatia, Slavonia, and the Military Frontier. The Maygars or Hungarians occupy chiefly Hungary and Transylvania, and number 5,590,-000, or 16 per cent. of the whole population. The Rumäni or Wallachians number 2,940,000, or over 8 per cent.; the Jews, 1,105,000, or 3 per cent.; the Italians, 515,000, or 1.4 per cent.; and the gipsies, 140.000. The rest consists of Armenians, Bulgarians, Albanians, Greeks, &c.

Austria has always remained strongly attached to the Roman Catholic Church. Her sovereigns, however, have in general resisted the temporal pretensions of the popes, and reserved to themselves certain important rights, such as the imposing of taxes on church property the nomination of bishops and archbishops, and the option of restricting, or even prohibiting, the circulation of Papal bulls. About two-thirds of the people, or nearly 24,000,000, profess the Roman Catholic religion. If, however, we deduct the kingdom of Hungary and Galicia, where less than one-half of the people are Roman Catholics, the proportion in the rest of the country is much increased. In some parts the proportion to the entire population is as high as 90 to 98 per cent. The Greek Catholics number in Austria Proper 2,342,168 (almost all in Galicia), and in Hungary 1,599,-628. The Eastern Greek Church numbers 461,511 adherents in Austria, and 2,589,319 in Hungary. Of the Protestant denominations, the Lutherans are more numerous in the western half of the empire, the Calvinists in the eastern. The numbers are — in Austria Proper, Lutherans, 252,327, and Calvinists, 111,935; in Hungary, Lutherans, 1,365,835, Calvinists, 2,143,178. The principal other religions are the Jewish, 1,375,861 (nearly half of them in Galicia); Armenian, 10,133; Unitarian, 55,079 (nearly all in Transylvania). The Catholic Church (including the Greek and Armenian Catholics) has 11 archbishops, 24 suffragan bishops, 2 vicariate bishops, and 1 military bishop, in Austria Proper, and 5 archbishops and 23 bishops in Hungary. Altogether there are about 34,000 ecclesiastics, and 950 convents, with 8500 monks and 5700 nuns. The Oriental Greek Church has, in Austria Proper, 3 bishops (1 in Buckowina and 2 in Dalmatia), and in Hungary, the patriarch of Karlowitz, the archbishop of Herrmannstadt, and 8 bishops, with, in all, 4000 priests, and 40 convents, with 300 monks.

Previous to 1848 Austria was very far behind in the matter of education; but since that time great improvements have been effected, and an entire change has taken place. This subject now receives the greatest attention; schools of all kinds have been established throughout the country, improved systems of teaching have been introduced, and instruction is open to all without regard to class or creed at a very small cost, or even gratuitously. It still continues, however, to be in great measure under the control of the priests, and many of the teachers are ecclesiastics. The Roman Catholic religion forms an essential part of the instruction in all schools, except those for special subjects. The Oriental Greek and Protestant Churches have, as a rule, their own common schools, and where this is not the case, they have to send their children to the Catholic schools. The Jews also, in places where they have no special schools, are obliged to send their children to Christian schools.

The majority of the people of Austria are engaged in agricultural pursuits or in connection with the forests, the proportion varying in different parts from 50 to 80 per cent. of the entire population.

Austria is distinguished for the number and superiority of its horses, for the improvement of which numerous studs exist over the country. The breeding of horses is more or less extensively carried on in all the crown-lands, but more especially in Hungary, Transylvania, Buckowina, Galicia, Styria, Bohemia, Moravia, and Upper and Lower Austria.

Austria cannot be said to be remarkable as a cattle-rearing country. Indeed, except in certain districts, particularly among the Alps, it must be considered to be much behind in this branch of industry. The finest cattle are to be found in the Alpine regions; in other parts the breeds are generally very inferior. The Hungarian crown-lands, however, have of late years been improving in this respect.

Bees are extensively kept, particularly in the crown-lands of Lower Austria, Hungary, Galicia, and Transylvania.

In the extent and variety of its mineral resources Austria ranks among the first countries of Europe. Besides the noble metals, gold and silver, it abounds in ores of more or less richness of iron, copper, lead, and tin; while in less abundance are found zinc, antimony, arsenic, cobalt, nickel, manganese, bismuth, chromium, uranium, tellurium, sulphur, graphite, asphalt, rock-salt, coal, and petroleum.

The manufactures of Austria have made great progress during the last twenty years, and now some of them are extensively carried on. They include cotton, flax, hemp, woollen and silk stuffs; gold, silver, iron, lead, copper, tin, and zinc articles; leather, paper, beer, brandy, and sugar; porcelain and earthenware; chemical stuffs; scientific and musical instruments, &c. The manufactures are principally carried on in the western crown-lands, and more particularly in Bohemia, Moravia, Silesia, and Lower Austria.

The *cotton* manufacture has made very rapid progress, and is now one of the most extensive and flourishing in the country.

The *flax* and *hemp* manufacture is one of the oldest in the country, and was long the most important. In consequence, however, of the rapid advancement of the cotton manufacture it is no longer of the same importance as formerly; yet it still affords employment to a great number of persons, and is very generally extended over the country.

The *woollen* manufacture is also an old established branch of industry, and is actively carried on.

The *iron* and *steel* manufactures form one of the most important branches of industry, and afford employment to a great number of persons. They are more or less extensively carried on in all the crown-lands, except in the Maritime District, Dalmatia, Croatia, and Slavonia; but their principal seats are in Lower and Upper Austria, Bohemia, Moravia, Styria, and Carinthia.

The principal *copper*-works are at Brixlegg and other places in Tyrol, and in Galicia, Buckowina, and Hungary.

The manufacture of mathematical, optical, and surgical instruments, and of physical and chemical apparatus, has of late years risen rapidly into importance, particularly in Vienna and Prague, and now these are to be found among the exports to other countries, Austria is also distinguished for the manufacture of musical instruments, particularly pianos and organs, and also for other stringed and wind instruments. Clock or watch making is not very extensively carried on.

Austria is noted for its *beer*, particularly that of Vienna and Bohemia.

The manufacture of *sugar* from beet-root is in a very flourishing state, and is rapidly extending.

The manufacture as well as the growth of *tobacco* is a government monopoly. There are 22 establishments for the manufacture of tobacco and cigars, employing about 20,000 work people.

Austria is not favorably situated for commerce on account of its inland position, its small extent of sea-coast, and the mountainous character of much of its surface. Its trade was also formerly very much hampered by high duties, and restrictions of various kinds. These, however, have now been very much modified or removed, and its trade has in consequence rapidly improved. Much has been done, too, in the way of making and improving the roads, opening mountain passes, constructing railways, and establishing lines of steamers.

The principal seaports of Austria are Trieste and Fiume, at the head of the Adriatic, the former in the Maritime crown-land, the latter in that of Croatia.

The head of the Austro-Hungarian monarchy is the emperor and king, who is also the head of the army and of the executive. The succession is hereditary, in the order of primogeniture, in the male line of the house of Hapsburg-Lothringen, or Lorraine; and failing this, in the female line. The monarchy comprises two distinct states — a German or Cisleithan, commonly called Austria, and a Magyar or Transleithan, usually termed Hungary. Each of these has its own parliament, ministers, and government; while the army and navy and foreign relations are common. These are under the direction of a controlling body known as the Delegations, consisting of sixty members for each state, two-thirds being elected by the Lower House, and one-third by the Upper House of each of the parliamentary bodies. They usually sit and vote in two chambers — one for Austria, the other for Hungary; but in the event of disagreement on any question, they meet together, and without further deliberation give their final vote, and the decision thus arrived at is binding on the whole empire. Their resolutions require neither the approval nor the confirmation of the representative assemblies by which they are chosen, but only imperial assent. The executive is vested in three departments — (1), A ministry of foreign affairs; (2), a ministry of war; and (3), a ministry of finance. These are responsible to the Delegations. The Reichsrath, or Parliament of Austria, consists of an Upper and a Lower House. The former, the House of Lords is composed — (1), of princes of the imperial house who are of age to serve; (2), of the heads of noble houses of high rank, in whom the dignity is hereditary (66); (3), of the archbishops (10) and of bishops with the rank of princes (7); and (4) of life members nomin-

ated by the emperor on account of distinguished services (102). The Lower House, or House of Representatives, is composed of 353 members, elected to represent the different crown-lands by all citizens who are of age and possessed of a small property qualification. The emperor annually convokes the Reichsrath, and nominates the presidents and vice-presidents of each division out of the members. The business of the Reichsrath embraces all matters of legislation relating to laws, duties, and interest, except such as are specially excluded as belonging to other departments. It also takes up matters connected with trade, commerce, and finance, the post-office, railways, telegraphs, customs, the mint, raising of new loans, imposing of new taxes, budgets, matters relating to military service, &c. The members of either House have the right to propose new laws on matters within their province; but the consent of both Houses, as well as the sanction of the emperor, is required to render them valid. The executive is vested in the president and ministries of the interior, religion and education, finance, commerce, agriculture, national defence, and justice. The ministers form also the Ministerial Council, which is presided over by the emperor or a minister-president.

In addition to the Reichsrath, there are seventeen provincial diets established in different districts of the country for the direction and regulation of local matters, taxation, education, religion, public works, charitable institutions, industry, trade, &c. Each diet is composed of the archbishops and bishops of the Roman Catholic and Greek Catholic Churches, of the rectors of the universities, and of representatives of the great landed estates, of the towns, of chambers of industry and commerce, and of rural communes. The number of members varies according to the size and importance of the districts — from 20 or 30 up to 100 for Moravia, 151 for Galicia, and 241 for Bohemia.

The Hungarian Parliament or Reichstag consists of an Upper and a Lower House,—the former known as the House of Magnates, the latter as the House of Representatives. The Upper House is composed of 3 princes of the reigning house, having estates in the kingdom, 31 archbishops and bishops of the Roman Catholic and Greek Churches, and 381 high officials and peers of the kingdom. The Lower House is composed of representatives elected for three years by citizens of age who pay a certain amount of direct taxes. The number of representatives, in 1890, was 444, of whom 334 represented the counties, rural districts, and towns of Hungary; 75 represented Transylvania; and 35 Croatia and Slavonia. The president and vice-president of the House of Magnates are nominated by the king from among the members; and the president and two vice-presidents of the House of Representatives are elected by the members. The sovereign, though emperor of Austria, is styled "king" in all public documents. The executive is vested in a president and ministries of national defence, the court, finance, interior, religion and education, justice, public works, agriculture, industry and commerce, and for Croatia and Slavonia.

The revenue and expenditure are presented in three distinct budgets:—(1), That of the Delegations for the whole empire; (2), that of the Austrian Reichsrath for Austria; and (3), that of the Hungarian Reichstag for Hungary. By an arrangement of 1868 Austria pays 70 per cent., and Hungary 30 per cent., towards the common expenditure of the empire.

The present empire of Austria took its rise in a margraviate founded by Charlemagne, toward the close of the 8th century, in that fertile tract of country lying along the southern bank of the Danube to the east of the River Enns, now included in Lower Austria. It was called *Ostreich* or *Oesterreich*, the eastern country, from its position relative to the rest of Germany. It continued to be ruled by margraves (Ger. *Markgraf*, lord of the marches) for several centuries, down to the year 1156, when the territory west of the Enns was added to it, and it was raised to a duchy. It subsequently received further accessions of territory, and in 1453 was made an archduchy.

The country of the present archduchy of Austria was in early times inhabited by the Taurisci, a Celtic race, who were afterwards better known as the Norici. They were conquered by the Romans in 14 B.C.; and thereafter a portion of what is now Lower Austria and Styria, together with the municipal city of *Vindobona*, now Vienna, and even then a place of considerable importance, was formed into the province of Pannonia; and the rest of Lower Australia and Styria, together with Carinthia and a part of Carniola, into that of Noricum. Tyrol was included in Rhætia, while north of the Danube, and extending to the borders of Bohemia and Moravia, were the territories of the Marcomanni and the Quadi. These were not unfrequently troublesome to the Romans; and during the greater part of the reign of Marcus Aurelius, from 169 to 180 A.D., they maintained with varying success a harassing war against them. In 174 the Roman army was so nearly cut off by the Quadi that its safety was attributed to a miracle. The emperor died at Vindobona when on an expedition against those troublesome neighbors, and his successor, Commodus, was glad to make peace with them. On the decline of the imperial power these Roman provinces became a prey to the incursions of barbaric tribes. During the 5th and 6th centuries the country was successively occupied by the Boii, Vandals, Heruli, Rugii, Goths, Huns, Lombards, and Avari. About 568, after the Lombards had settled in Upper Italy, the River Enns became the boundary between the Bajuvarii, a people of German origin, and the Avari, who had come from the east. In 788 the Avari crossed the Enns and attacked Bavari, but were subsequently driven back by Charlemagne, and forced to retreat as far as the Raab, their country from the Enns to that river being then made a part of Germany. It was taken by the Hungarians in 900, but was again annexed to Germany in 955 by Otho I. In 983 the emperor appointed Leopold I., of Babenberg or Bamberg, margrave of Austria, and his dynasty ruled the country for 263 years. He died in 994, and was succeeded by his son, Henry I., who governed till 1018. In 1156 Austria received an accession of territory west of the Enns, and was raised to a duchy by the Emperor Frederick I. The first duke was Henry Jasomirgott, who took part in the second crusade. He removed the ducal residence to Vienna, and began the building of St. Stephen's cathedral. His successor, Leopold V., in 1192, obtained Styria as an addition to his territory, and Frederick II. received possession of Carniola. Frederick, in the latter years of his life, contemplated the erection of Austria into a kingdom, but his sudden death in a battle against the Magyars, in 1246, put an end to the project, and with him the line became extinct.

The Emperor Frederick II. now declared Austria and Styria to have lapsed to the imperial crown, and appointed a lieutenant to govern them on the part of the empire. But claims to the succession were brought forward by descendants of the female branch of the Babenburg line; and after various contests Ottocar, son of the king of Bohemia, gained possession about 1252 of the duchies of Austria and Styria. In 1269 he succeeded to Carinthia, a part of Carniola and Friuli; but he lost all by refusing to acknowledge the Emperor Ru-

dolph of Hapsburg, and eventually fell in battle in an attempt to recover them in 1278.

The emperor now took possession of the country, and appointed his eldest son governor; but subsequently, in 1282, having obtained the sanction of the electors of the empire to act, he conferred the duchies of Austria and Styria, with the province of Carinthia, on his sons Albert and Rudolph, and thus introduced the Hapsburg dynasty. The brothers transferred Carinthia to Meinhard, count of Tyrol; and in 1283 Albert became sole possessor of Austria, Styria, and Carniola. He increased his possession considerably by wars with his neighbors, but was murdered at Rheinfelden in 1308, when on an expedition against the Swiss, by his nephew, John of Swabia, whom he had deprived of his hereditary possessions. He was succeeded by his five sons, Frederick, Leopold, Henry, Albert, and Otto. In 1314 Frederick, the eldest, was set up by a party as emperor in opposition to Louis, duke of Bavaria, but was defeated and taken prisoner by his rival in 1322. In 1315 Duke Leopold was defeated in an attempt to recover the forest towns of Switzerland which had revolted from his father. Leopold died in 1326, Henry in 1327, and Frederick in 1330. The two surviving brothers then made peace with the Emperor Louis, and in 1335 they acquired Carinthia by inheritance. On the death of Otto in 1339 Albert became sole ruler. He died in 1358. His son and successor, Rudolph II., finished the church of St. Stephen's and founded the university of Vienna, dying childless in 1365. He was succeeded by his two brothers, Albert III. and Leopold III., who in 1379 divided their possessions between them, the former taking the duchy of Austria, the latter Styria and other parts. Leopold fell at Sempach in 1386, but his descendants continued to rule in Styria. Albert acquired Tyrol and some other districts, and died in 1395. He was succeeded by his son, Albert IV., who was poisoned at Znaim in 1404, when on an expedition against Procopius, count of Moravia. Albert V. succeeded his father, and having married the daughter of the Emperor Sigismund, he obtained the thrones of Hungary and Bohemia, and became emperor (Albert II.) in 1438. He died the following year, and was succeeded by his posthumous son Ladislaus, who died without issue in 1457. The Austrian branch of the family thus became extinct, and was succeeded by that of Styria. The crowns of Hungary and Bohemia passed for a time into other hands.

The possession of Austria, which in 1453 had been raised to an archduchy, was for some years a subject of dispute between the Emperor Frederick III. and his brothers, but at length, on the death of Albert in 1463, the emperor obtained sole possession. His son Maximilian, by marrying the daughter of Charles the Bold, acquired the Netherlands in 1477, but on the death of his father in 1493 he succeeded him as emperor, and transferred the government of the Netherlands to his son Philip. He added Tyrol and some parts of Bavaria to his paternal possessions, and made some advances towards the recovery of Hungary and Bohemia. His son Philip, by his marriage with Johanna, daughter of Ferdinand and Isabella, acquired a right to the crown of Spain, but died in 1506. Maximilian died in 1519, and was succeeded by his grandson Charles (son of Philip), who two years before had obtained the Spanish crown, and was now made emperor under the title of Charles V. By treaties dated 1521 and 1524, Charles resigned all his hereditary possessions in Germany, except the Netherlands, to his brother Ferdinand. The latter, by his marriage with Anna, sister of the king of Hungary, acquired right to the kingdoms of Hungary and Bohemia, together with Moravia, Silesia and Lausatia. His right to Hungary, however, was contested by John Zapolya, waywode of Transylvania, who was elected by a party of the nobles, and was crowned king in 1527. Being unable to cope single-handed with Ferdinand, John sought the aid of the sultan, Soliman II., who in 1529 advanced with a large army to the very gates of Vienna; but after several ineffectual attempts to take the city he raised the siege and returned to Buda. At length, in 1535 an agreement was come to, in terms of which John was allowed to retain the title of king, together with half of Hungary, but his descendants were to be entitled to Transylvania only. John died in 1540, but the people of Lower Hungary were opposed to Ferdinand, and set up the son of their late king against him. In the struggle which ensued the aid of the Turks was again invoked, and the result was that Ferdinand had to agree to pay an annual sum of 30,000 ducats to the sultan for this part of Hungary. Ferdinand was also under the necessity of surrendering Würtemberg to Duke Ulrich, on condition of its remaining a fief of Austria and reverting to that country on the extinction of the male line. Notwithstanding this, the possessions of the German line of the house of Austria at this time are estimated at 114,000 square miles. On the abdication of Charles V. in 1556, Ferdinand succeeded to the imperial throne. He died in 1564, leaving directions for the division of his possessions among his three sons. The eldest, Maximilian II., received the imperial crown, together with Austria, Hungary, and Bohemia; the second, Ferdinand, obtained Tyrol and Lower Austria; and the third, Charles, was made master of Styria, Carinthia, Carnolia, and Görtz. In 1556 the sultan Soliman again marched at the head of a great army into Hungary, but met with a very determined resistance at Szigeth, before which town he was suddenly cut off by apoplexy. Peace was concluded with his successor, and in 1572 Maximilian caused his eldest son Rudolph to be crowned king of Hungary. He was afterwards crowned king of Bohemia, and was also elected king of the Romans. Maximilian died in 1576, and was succeeded by Rudolph on the imperial throne. This monarch was little fitted to rule, and left the management of affairs very much to others. He was entirely under the power of the Jesuits, set at nought the ancient laws of the country, and persecuted the Protestants. The latter, under Bocskay, revolted in 1604, and having secured the aid of the sultan, gained repeated victories over the imperial troops, compelling Rudolph to give them terms of peace in 1606. During this reign the possessions of the Archduke Ferdinand of Tyrol reverted to the two other lines; while in 1608 Rudolph was compelled to cede Hungary, and in 1611 Bohemia and Austria, to his brother Matthias, who on the death of Rudolph in 1612 was crowned emperor. His reign was full of promise, but unfortunately it was only of short duration. Being an old man and childless, he chose as his successor his cousin Ferdinand, archduke of Styria, whom he caused to be crowned king of Bohemia in 1616, and of Hungary in 1618. He died the following year, when Ferdinand became emperor.

Before the death of Matthias, the memorable struggle between Roman Catholicism and Protestantism, known as the *Thirty Years' War* (1618 to 1648), had commenced. It originated in an insurrection of the Protestants of Bohemia, who renounced their allegiance to Ferdinand and chose for their king the elector palatine Frederick V. Frederick was supported by all the Protestant princes except the elector of Saxony, while Ferdinand was assisted by the king of Spain and the other Catholic princes. At first success attended the arms of the insurgents, who repeatedly routed the imperial troops, and even laid siege to Vienna. But the

Duke Maximilian of Bavaria, coming to the assistance of the imperialists at the head of a well-appointed army, totally defeated Frederick at the White Hill near Prague (8th November 1620). The following day Prague opened its gates to the conqueror, and in a short time the whole country was reduced to subjection, and the territories of the elector palatine divided among the allies. The war might have ended here had Ferdinand adopted a conciliatory policy, but impelled by revenge and fanatical zeal he adopted an opposite course, and instituted against the Protestants a severe persecution. They were thus again compelled to take up arms, and in 1625 Christian IV., king of Denmark, supported by subsidies from England, put himself at their head. He was subsequently joined by Count Mansfield and Christian of Brunswick, while opposed to him were Wallenstein and Tilly at the head of two powerful armies. In April 1626 Mansfield was defeated by Wallenstein at Dessau, and a few months later Tilly vanquished the Danish king at Lutter. The victorious armies afterwards marched into Denmark, and the king was compelled to conclude a humiliating peace at Lübeck in 1629. The Protestants were now awed into submission, and Ferdinand was emboldened to carry out to still greater lengths, his policy of suppression. Aiming at the total extirpation of Protestant doctrines throughout his dominions, he revoked all the privileges that had formerly been granted, even such as had previously received his approval. By the so-called *Edict of Restitution*, dated 6th March 1629, he enjoined the restitution of all ecclesiastical property secularised since the peace of Passau, and ordered the Protestants to relinquish to the Catholics all benefices which they had appropriated contrary to the peace of Passau and the Ecclesiastical Reservation.

The Catholic princes themselves were now becoming alarmed at the enormous power which they had contributed to place in the hands of the emperor. They therefore demanded a reduction of the army and the dismissal of Wallenstein, and with these demands the emperor felt himself obliged to comply. But a new champion of the Protestant cause now appeared in the north, in the person of Gustavus Adolphus, king of Sweden. This valiant prince, having received promises of aid from France as well as from England and the United Provinces, suddenly landed an army of 15,000 men at Usedom in June 1630. Pomerania and Mecklenburg were soon conquered by him and a great part of Brandenburg was overrun by his army. He was unable, however, to relieve the town of Magdeburg, which was besieged by Tilly and taken by assault 20th May 1631, when the most barbarous atrocities were perpetrated upon the unfortunate inhabitants. The elector of Brandenburg and afterwards the elector of Saxony joined Gustavus, and the combined army met the imperialists under Tilly at Breitenfeld, near Leipsic, and defeated them with great slaughter (7th September 1631). The victor now rapidly regained all that had been lost. Again Tilly was beaten at the passage of the River Lech on 5th April 1632, and the following day he died of his wounds. Wallenstein was now recalled and placed at the head of the imperial troops. His name inspired fresh ardor among the soldiery, men flocked to his standard, and he speedily found himself at the head of a very large army. He drove the Saxons out of Bohemia, and afterwards marched to Nuremberg, where Gustavus was entrenched in a strong position. The two armies watched each other for eight weeks, when the king directed an attack against the imperialists, but after a fierce struggle was repulsed. A fortnight later Gustavus moved in the direction of Bavaria, but Wallenstein, instead of following him, marched into Saxony, and thus obliged him to suspend his operations in Bavaria and to set out in pursuit of his opponent. The two armies met at Lützen, where a battle took place on 16th November 1632. The greatest skill and bravery were displayed on both sides, and the issue was long doubtful, but at length victory declared in favor of the Swedes, though dearly purchased with the loss of their brave commander, who fell mortally wounded.

The death of Gustavus was an irreparable loss to the Protestants in Germany. Wallenstein, however, made but little use of the advantages he now possessed, and has even been accused of treacherous designs against the empire. Be this as it may, his enemies at court and in the army were numerous and powerful, and he was at length assassinated by some of his own officers, 25th February 1634. The Protestant cause met with another disaster in the defeat of Bernard of Weimar at Nordlingen on 6th September. On 30th May 1635 Saxony concluded at Prague a treaty of peace with the emperor, in terms of which the Lutherans were freed from the operation of the Edict of Restitution. The other Lutheran princes soon after accepted the like terms; but the Calvinists, who were disliked by both parties, were left to their fate.

Sweden, no longer able to carry on the war as she had done, entered into a treaty with France, resigning the direction of operations to that power, a position of which Richelieu gladly availed himself, as according with his ambitious designs. The war now assumed a new phase, France and Sweden being allied against the empire and the Lutheran states of Germany, aided by Spain. Richelieu's efforts were in great measure directed to humbling the latter power. He sent an army into Spain, and entered into leagues with the dukes of Savoy and Parma and the United Provinces for attacking the Spanish power in Italy and the Netherlands. These projects did not meet with success, and the war was for a time carried into the French territories. In the meantime the Swedes, under General Baner, gained a brilliant victory over the Saxons and imperialists at Wittstock (4th October 1636). The emperor died on the 15th February 1637, and was succeeded by his son Ferdinand III. The war was carried on for eleven years longer, and the success which at first was with the imperialists, after a time came round to their adversaries, till at length the emperor, pressed on all sides and deserted by his allies, was glad to agree to terms of peace. By the peace of Westphalia, signed 24th October 1648, France acquired Alsace; Sweden got Upper Pomerania, the Isle of Rugen, and some other territory; the sovereignty and independence of the different states was recognised; the Calvinists were placed on the same footing as the Lutherans; and the independence of the United Provinces and the Swiss Confederation was acknowledged.

Ferdinand III. died in 1657, and was succeeded by his son Leopold I. This prince, by his harsh treatment of the Hungarians, drove that people into revolt; and they, being unable to cope with the power of the empire single-handed, called in the aid of the Turks, who, under Kara Mustapha in 1683, besieged Vienna, which was only saved by an army of Poles and Germans under John Sobieski. The imperial army then reduced the whole of Hungary into subjection, and united to it Transylvania, which had been hitherto governed by its own princes, and the whole was declared to be a hereditary kingdom. In 1699 Turkey, after being defeated in several sanguinary engagements by the celebrated general Prince Eugene, was compelled by the peace of Carlowitz to cede to Hungary the country lying between the Danube and the Theiss. Previous to his troubles with Hungary and Turkey,

Leopold had lent his aid in 1672 to the Dutch in their struggle against the ambitious designs of France. This was brought to a close by the peace of Nimeguen in 1678; but the conflict broke out afresh the following year, when the English also came forward and contributed largely both in troops and money. The chief scenes of warfare were the Netherlands and the banks of the Rhine. At last, in 1697, came the peace of Ryswick, which left the contending parties in nearly the same relative positions as at the beginning of the contest. The allies had, however, the satisfaction of having compelled the French king to stop short in his schemes of aggrandisement.

The death of Charles II. of Spain in 1700, without leaving issue, led to what is known as the *War of the Succession*. Louis XIV. had married the eldest sister of the late king, but she had by solemn covenant renounced her right to the Spanish crown. The second sister had married the Emperor Leopold, and she had made no such renunciation, but her daughter had, who was married to the elector of Bavaria. Leopold had two sons by a second marriage, and now claimed the crown for the younger of these, on the ground of his mother being an aunt of the deceased king. Intrigues had been carried on by the several parties concerned for some time before the king's death, and he had been induced to make a secret will, in which he named Philip, duke of Anjou, grandson of Louis XIV., as his successor. Leopold, however, was by no means inclined to depart from what he considered his rights, and the other states of Europe looked on with jealousy on the prospect of a union of France and Spain under a Bourbon dynasty. An alliance was accordingly formed by Austria with England and Holland against France, with which power on the other hand Bavaria allied herself. The emperor dispatched an army into Italy under Prince Eugene, to take possession of the Spanish territories in that country; while the English and Dutch united their forces under Marlborough. The former experienced a good deal of hard fighting, but effected little of consequence, while the latter busied himself in taking one after another of the French strongholds in the Netherlands. At length the two generals combined their forces and met the united army of the enemies at Blenheim. The latter numbered about 56,000 men and occupied a strong position, while the number of the former was about 52,000. The fight commenced by Marlborough leading the right wing against the French, while Eugene with the left wing advanced against the Bavarians. The battle was long and fierce, the assailants being repeatedly driven back by a most terrible fire from the enemy's artillery. At length victory declared for the allied English and Austrian armies (13th August 1704). About 10,000 of the French and Bavarians fell on the field, and nearly 13,000 were made prisoners, among whom was the commander of the French army, Marshal Tallard. The elector of Bavaria was compelled to cross the Rhine with the French, and his territory was occupied by the imperialists. The following year the emperor died, and was succeeded by his eldest son, Joseph. The war was continued with vigor, but for a time nothing of importance was anywhere effected. France now directed her chief attention to the conquest of the Netherlands, and sent into that country a magnificent army under the command of Marshal Villeroi. But this general was no match for Marlborough; and in the battle of Ramillies (23d May 1706) he was totally defeated with a loss of about 13,000 men. Prince Eugene's efforts in Italy were also this year crowned with much success. After a memorable march of more than 200 miles, he suddenly appeared before Turin, which was then closely besieged by the enemy. Having effected a junction with the duke of Savoy, he attacked the French lines (7th September), and though repeatedly driven back, at length succeeded in totally routing the enemy. The French general, Count Marson, was wounded, taken prisoner, and died the following day. The French power in Northern Italy was thus shattered, and soon after both French and Spaniards were driven out of the country. The like success attended the efforts of Marlborough in the Netherlands, where he took possession of every place of note. After Eugene had settled affairs in Italy, he again formed a junction with Marlborough in the Netherlands, and on 11th June 1708 they attacked and routed the French under Vendôme at Oudenarde. France now made overtures for peace; but these being rejected, she sent a new army into the field, under the command of Marshal Villars. He was attacked by the two victorious generals in his entrenchments at Malplaques (11th September 1709) and totally defeated. France again made proposals for peace, but these meeting with no better success, the war was continued. The emperor died on 17th April 1711, and his successor being his brother, the Archduke Charles, who laid claim to the Spanish crown, this event contributed not a little to restore peace. The prospect of the union on one head of the crowns of Austria and Spain did not accord with the views of those who had been hitherto supporting the claims of Austria, and the transfer of Spain to a grandson of Louis XIV. appeared to them the less dangerous alternative of the two. This, joined to the change of ministry in England, and the removal of Marlborough from the command altogether, with the impatience of the Dutch under so long and so burdensome a war, led to the peace of Utrecht, which was signed 11th April 1713. Austria continued the war for some time longer, but the next year agreed to substantially the same terms at Baden. By this treaty France engaged that the crowns of France and Spain should never be united, and that no part of the Spanish Netherlands should ever be transferred to her; she also ceded to England Nova Scotia, Newfoundland, Hudson's Bay, and St. Kitt's, and agreed to destroy the fortifications of Dunkirk; Spain gave up her possessions in the Netherlands and in Italy to Austria (who, on her part, renounced her claim to the Spanish succession) and ceded Gibraltar and Minorca to England; the Dutch received a small accession of territory; and the duke of Savoy obtained Sicily, with the title of king — afterwards (1720) exchanged for the island of Sardinia. The Austrian monarchy now embraced about 190,000 square miles of territory, with nearly 29,000,000 of inhabitants. Its annual revenue was between 13,000,000 and 14,000,000 florins, and its army consisted of 130,000 men.

Austria next became involved in a war with the Turks, and in 1716 Prince Eugene set out at the head of an army against them. The result was a series of splendid successes, which led to a peace signed at Passarowitz (1718), by which Austria received a considerable accession of territory. Disaffection still continued to subsist between Spain and Austria, which led to repeated negotiations on the part of the other powers to preserve peace. Charles being without heirs-male, was desirous of securing the succession to his eldest daughter, Maria Theresa, and with this view he framed the celebrated Pragmatic Sanction, and it became his great object to get the assent of the other powers to this arrangement. England and almost all the other powers, except France, Spain, and Sardinia, acceded to it in 1731. In 1733 the emperor became involved in a war with France on behalf of Augustus III. of Saxony, who had been elected king of Poland. France supported the claims of Stanislaus Leszczinski, and received the aid of Spain and Sardinia.

The war was carried on principally in Italy, where Austria was driven out of most of her possessions, and was glad to sue for peace. By this treaty Augustus was confirmed on the throne of Poland; but Austria was obliged to cede to Stanislaus the duchies of Lorraine and Bar, to be afterwards transferred to France; Don Carlos was placed on the throne of the Two Sicilies, and the grand duchy of Tuscany was bestowed on the duke of Lorraine, the emperor receiving as compensation Parma and Placentia; and France, and afterwards Spain and Sardinia, acceded to the Pragmatic Sanction. War again broke out with the Turks, and Prince Eugene being now no more, the Austrians were repeatedly beaten and expelled from one stronghold after another, till, by the peace of Belgrade (1739), the emperor was compelled to yield up almost all that the arms of Eugene had formerly gained for him. The emperor died on the 20th October 1740, and his eldest daughter, Maria Theresa, who was married to the duke of Lorraine or Lothringen (afterwards archduke of Tuscany), assumed the government. Immediately counter-claims were advanced on all sides. The elector of Bavaria claimed to be rightful heir to the kingdom of Bohemia; the elector of Saxony and king of Poland, and also the king of Spain, claimed the entire succession; the king of Sardinia laid claim to the duchy of Milan, and Frederick II. of Prussia to the province of Silesia. France espoused the cause of Bavaria, while England alone came forward to the assistance of the queen, and the Hungarians, now united and loyal, willingly recruited her armies. Aided by France and Saxony, the elector of Bavaria, took possession of Bohemia, and was proclaimed king in 1741, and the following year he was elected emperor under the title of Charles VII. The king of Prussia marched suddenly into Silesia and took possession of that country. The elector of Bavaria, aided by French troops, next invaded Austria, and even threatened Vienna. The queen fled to Presburg and convoked the Hungarian diet. She appeared in the midst of the assembly with her infant son Joseph in her arms, and appealed to them for protection and help. A burst of enthusiasm followed, and a powerful Hungarian army was speedily at her service. The French and Bavarians were soon driven out of the archduchy. A battle was fought between the Austrians under the prince of Lorraine and the Prussians under Frederick, at Czaslau (17th May 1742), in which the former were defeated, and this was followed by the peace of Breslau (11th June), by which Prussia acquired possession of Upper and Lower Silesia (excepting the towns of Troppau and Jägerndorf, and the mountains of Silesia) and the county of Glatz. Austria now turned her arms against the French and Bavarians, the former of whom were driven out of the country. In 1744 the king of Prussia, jealous of the success attending the Austrians, again took the field against them in support of the emperor. He marched into Bohemia and took Prague, but subsequently was forced to retreat; and the death of the emperor Charles on 20th January 1745 changed the aspect of affairs. Maria Theresa's husband was in September elected emperor under the title of Francis I., and after some more fighting, a peace was concluded with Prussia at Dresden, by which the king was confirmed in the possession of Silesia. The war with France was prosecuted for some time longer in the Netherlands and in Italy, with varying success, but ultimately peace was concluded at Aix-la-Chapelle, in October 1748. Austria gave up the duchies of Parma, Placentia, and Guastalla to Don Philip, son of the king of Spain, and several districts of Milan to Sardinia; Prussia was confirmed in the possession of Silesia and Gletz; while Maria Theresa was recognised as rightful monarch of Austria. After having acquired peace, and been thus confirmed in her possessions, her great desire was to recover Silesia from Frederick, whose conduct towards her had sunk deep into her heart. She directed her attention to strengthening and improving her army, and to forming alliances with the other states against the Prussian king, particularly with Russia and Saxony. In 1755 war broke out in North America between France and England, and in view of its becoming more general England solicited the aid of Austria, but without success. This naturally led to a union between England and Prussia, while France allied herself with Austria and Russia.

In July 1756, Frederick despatched a messenger to Vienna to ascertain the meaning of the large forces assembled in Bohemia and Moravia. Receiving an evasive answer, he at once marched an army of 60,000 men into Saxony, took Dresden, and made himself master of the country, the Saxon army of only about 17,000 men being shut up in a strong position, but ill provisioned, between Pirna and Königstein. An Austrian army, under the command of Marshal Browne, advanced from Bohemia to the relief of Saxony, but was met by Frederick. A battle took place at Lowositz (1st October), which, though not decisive, ended in the retreat of the Austrians; and the famished Saxon army, after an ineffectual attempt to effect a retreat to Bohemia, laid down their arms. This ended the first campaign, and both sides did their utmost to prepare for renewing hostilities the following year. The empress strengthened her forces in Bohemia, and the imperial diet conceded an army of 60,000 men to assist her. France engaged to send an army of 80,000 or 100,000 men into Germany, and Russia set in motion an army of 100,000 men against Prussia. In all, the allies were estimated to muster about 500,000 men, while Fredrick could scarcely raise 200,000 of his own, his auxiliaries (English, Hanoverians, &c.) probably amounting to about 40,000 more. Frederick renewed the war by marching an army into Bohemia, where, on 6th May, he gained a victory over the Austrians, under Prince Charles of Lorraine, in the neighborhood of Prague, and then laid siege to that city. General Daun, at the head of an Austrian army, advanced to the relief of the city, and the king set out to meet him. The encounter took place at Kolin (18th June), and the Prussians, being much inferior in numbers, were beaten with great slaughter. Frederick was compelled at once to raise the seige and to evacuate Bohemia. In honor of this victory the empress instituted the military order of Maria Theresa. It had also the effect of inspiring the allies with fresh courage. The Russians invaded the kingdom of Prussia; the Swedes entered Pomerania; and two French armies crossed the Rhine in order to attack Hesse and Hanover and then march into Prussia. One of these armies under the command of Prince Soubise, advanced towards Thuringia, in order to form a junction with the imperial forces under the prince of Hildburghausen, while Marshal d'Estrées, who commanded the larger French army, entered Hanover, and through the incapacity of his opponent, gained an easy victory over the Anglo-Germanic army, under the duke of Cumberland, near Hastenback, on the Weser (26th July). The duke afterwards completed his disgrace by agreeing to disband his troops and give up Hanover, Hesse, Brunswick, and the whole country between the Weser and the Rhine, to the French. The other French army effected a union with the imperial troops of Thuringia, and made preparations for driving the Prussians out of Saxony. Frederick, however, determined to meet them, and after a series of marches and countermarches the two armies came together near Rossbach. The Prussian army amounted to about

22,000 men, while that of the French and Austrians numbered nearly 60,000. Frederick's troops were encamped upon a height, and the allies, when they advanced to the attack, were suddenly met by such a tremendous fire that they were thrown into confusion and unable to recover themselves. In less than half an hour the day was decided (5th November 1757). The allies had 1200 killed and more than 7000 taken prisoners, while the loss of the Prussians scarcely exceeded 500 in killed and wounded. At this time the imperialists had entered Silesia and there gained several advantages over the Prussians, who were at length driven to the walls of Breslau. Here a battle was fought (22d November) in which the Austrians were victorious, and the city itself soon after surrendered to the conquerors. Frederick now made what haste he could to retrieve his fortunes in this quarter, and met the Austrian army, under Prince Charles of Lorraine, in a plain near the village of Leuthen. The Austrians numbered about 80,000 men, while the Prussians did not exceed 30,000, yet by the skilful disposal of his troops and the celerity of his movements Frederick again gained a complete victory (5th December). The field was covered with slain, and it is estimated that about 20,000 surrendered themselves prisoners. Breslau was speedily retaken, and the Austrians driven out of Silesia.

The English were very indignant at the treaty entered into by the duke of Cumberland, and another army was speedily raised and placed under the command of Duke Ferdinand of Brunswick, who commenced the campaign of 1758 by suddenly attacking the French in their winter quarters. In a few weeks he succeeded in driving them out of the country, pursued them across the Rhine, and attacked them furiously at Crefeld, where they were completely routed.

While Field-Marshal Daun. who had received the command of the Austrian army, was waiting the attack of Frederick in Bohemia, the latter, by forced marches, entered Moravia and laid siege to Olmütz. The town, however, defended itself with the greatest bravery, and the Prussians were compelled to raise the seige. By this time, Daun having blocked up Frederick's retreat into Silesia, the Prussian army was marched suddenly northward into Bohemia, and attacked the Russians who had invaded Brandenburg. After a desperate battle the latter were defeated with great slaughter at Zorndorf (26th August), and compelled to retreat into Poland. Frederick now entered Saxony, where his brother Prince Henry was hard pressed by the Austrians. Thereupon Daun retired to a strong position in Lusatia, and Frederick took up a position near him, little thinking that Daun would attack him. Early in the morning of the 14th of October, however, the Austrians suddenly fell upon him at the village of Hochkirchen, and in the confusion and darkness the slaughter was terrible. Frederick lost several of his best generals, including Prince Francis of Brunswick, Prince Maurice of Dessau, and Field-Marshal Keith, with about 9000 of his soldiers. His camp, baggage, and ammunition also fell into the hands of the Austrians. The victory, however, was productive of little material results; Frederick retreated into Silesia, while the Austrians, after ineffectual attempts on Leipsic, Torgau, and Dresden, retired to Bohemia for the winter. The Austrian army was again largely reinforced, and every preparation made for renewing hostilities with vigor. The following year (1759) Duke Ferdinand found himself hard pressed by two French armies under the Duke de Broglie and the Marshal de Contades. He sustained a defeat at Bergen (12th April), but afterwards gained a signal victory at Minden (1st August), and compelled the French to retreat. Daun, waiting the approach of the Russians, did not take the field till the beginning of May, when, on their advance towards the Oder, he moved into Lusatia. In June, Dohna, who was sent to check the advance of the Russians, was forced to retreat, and, on the 23d July, Wedel, who succeeded him in the command, was totally routed near Züllichau. The Russians then marched on to Frankfort-on-the-Oder, where they were joined by 18,000 Austrians under Marshal Loudon. Frederick hastened with what troops he could collect to give battle to the combined army. The latter took up a strong position on the heights near Kunersdorf, and there they were attacked early on the 12th of August by the king. The Prussians numbered about 50,000, while the Russians and Austrians amounted to 90,000. The battle raged long and furiously, and the issue was long doubtful, but at length the Russians were giving way on all sides, and victory was about to be declared for the Prussians, when unexpectedly the Austrians made a furious attack upon them, threw them into confusion, and in a short time drove them from the field. Frederick lost in this action 20,000 of his bravest troops, and the loss on the side of the allies was not less than 24,000 men killed and wounded. In the meantime the Austrians overran Saxony, took Torgau, Wittenberg, and Leipsic, and invested Dresden, which, after a spirited defence, surrendered when an army of relief was close at hand. But Frederick was speedily in the field again at the head of a new army, and, by dint of skilful manœuvring and cutting off supplies, he succeeded in harassing the two armies, and compelled the Russians again to retire into Poland. An army of 13,000 men, under General Fink, attacked the rear of the Austrian army near Maxen, but after a brief but sanguinary conflict they were defeated and taken prisoners. Daun took up his winter quarters in Saxony, notwithstanding every effort of Frederick to dispossess him.

The imperial troops had been very successful during the last campaign, and were in good condition to renew the fight, while the Prussians had sustained great losses, were dispirited, and could only muster about 80,000 fighting men, and these no longer veterans, but in great measure raw recruits. In the campaign of 1760 Frederick was himself to conduct the war in Saxony, Prince Henry was to protect the marches against the Russians, and General Fouquet was to defend Silesia against the Austrians under Loudon. On 23d June, 8000 Prussians, under Fouquet, were surrounded and attacked on all sides by 30,000 Austrians at Landshut, and, after defending themselves long with great bravery, were obliged to yield. The king, after an ineffectual attack upon Dresden, marched into Silesia followed by the Austrians. At Liegnitz he found himself between three armies, under Generals Daun, Lacy, and Loudon, numbering about 90,000 men, while his own army amounted to only about 30,000. On the night preceding the 15th of August, Frederick took up a position on the neighboring heights of Pfaffendorf. Scarcely had he done so when the Austrian army, under Loudon, made its appearance, it having also intended to occupy the same position, and then fall upon the Prussians. The Austrians were greatly astonished to find the enemy before them; nevertheless, they fought for three hours with great bravery, returning again and again to the attack, but were at length compelled to retreat with a loss of 4000 killed and 6000 wounded. Daun afterwards came up and made an attack upon the Prussians, but, learning what had happened to Loudon, he withdrew. Frederick now directed his march on Breslau; and meanwhile the Russians effected a junction with the Austrians, and marched on Berlin, which surrendered to them (3d October). A week later, hearing that the

king was advancing against them, they left the city and retired into Saxony. Daun had likewise arrived in Saxony, and taken up a very strong position near Torgau. Here the Prussians attacked him with great fury on 3d November. The battle lasted till night without being decisive, and the carnage on both sides was fearful. The Prussians prepared to renew the attack next day, but the Austrians retreated during the night. They lost about 12,000 men killed and wounded, and 8000 prisoners. By this battle Frederick reconquered the greater part of Saxony, and accordingly he fixed his winter quarters there, establishing his headquarters at Leipsic. In 1761 Frederic employed every stratagem to prevent the junction of the Russian army under Buturlin with the Austrian under Loudon. The two armies, however, at length came together in the environs of Strigau (12th August), the combined force amounting to 130,000 men, while the Prussians numbered only about 50,000. The leaders, however, could not agree to a common course of proceeding, and the two armies separated without affecting anything of consequence. The Austrians surprised and took Schweidnitz (1st October), and the Prussians, after a four month's siege, took possession of Colberg (13th December). In Saxony Prince Henry had to retreat before Daun; but the latter gained no great advantages, and Frederic settled in Breslau for the winter. It seemed as if Prussia must at last yield to her assailants, but this was as far as ever from the king's mind. To add to his difficulties, the subsidies from England were stopped by the earl of Bute after the death of George II. But by the death of the Czarina Elizabeth (5th January 1762) he was freed from one of the most powerful of his enemies; and her successor, Peter III., not only recalled the army, but delivered up all the Prussian prisoners, and even entered into an alliance with the king. Sweden also retired from the contest, and entered into terms of peace. Frederick was therefore in a better condition to carry on the war vigorously against Austria, and the seventh campaign was marked by a series of disasters to that power. He attacked and overthrew Daun's right wing at Burkersdorf (21st July), gained a victory at Reichenbach (16th August), and took Schweidnitz after a very gallant defence (9th October). Prince Henry was also victorious at Freiberg (29th October). In the meantime Duke Ferdinand had been during the last three years successfully maintaining the war with the French. Fresh reinforcements and new generals were brought against him, but he could not be crushed; and, by the victories of Wilhelmsthal (24th June) and Lutternburg (23d July), France was brought to agree to peace. Thus Austria and Prussia were left to carry on the war alone; and the former, though amply provided with troops, was without money to furnish the necessary supplies, while Frederick was ever ready to come to terms on having the possession of Silesia secured to him. Austria found herself obliged to yield this point, and peace was at last agreed to. The treaty was signed at the castle of Hubertsburg, in Saxony, 15th February 1763, and thus ended the Seven Years' War, — a war disasterous to all concerned, and which is estimated to have cost in actual fighting men 853,000. It effected no territorial change in any of the countries, but through it Prussia rose to be one of the great powers of Europe. Austria, on her part, had carried on the conflict with remarkable vigor and determination; her soldiers had displayed great bravery, and some of her generals had shown a military genius not greatly inferior to that of Frederick himself.

Maria Theresa now zealously devoted herself to improving the condition of her people and country. She established schools, removed feudal hardships, improved the condition of the serfs, reformed ecclesiastical abuses, and fostered industry and commerce. The Emperor Francis died 18th August 1765, and was succeeded by his son, Joseph II., who the previous year had been elected king of the Romans. He also became joint-regent with his mother of the hereditary states. Maria established two collateral branches of her house in the persons of her two younger sons, the Archduke Leopold in Tuscany, and the Archduke Ferdinand, who married the heiress of Este, in Modena. By the first partition of Poland (1772) Austria acquired Galicia and Lodomeria, and in 1777 Buckowina was ceded by the Porte. On the death of the elector of Bavaria without issue, the Emperor Joseph laid claim to his dominions. To this Frederick was opposed, and again took the field against Austria. The dispute, however, was settled without war (1779), Austria being content with the cession by Bavaria of the frontier district called the quarter of the Inn, and one or two others. The empress died 29th November 1780, in the sixty-fourth year of her age and the forty-first of her reign. She was a woman of many and great virtues, with few weaknesses, and effected more for Austria than any of her predecessors. Mr. Carlyle says that she was "most brave, high and pious minded; beautiful, too, and radiant with good nature, though of a temper that will easily catch fire; there is, perhaps, no nobler woman then living." At her death the monarchy comprised 234,500 square miles, with a population estimated at 24,000,000, and a public debt of 160,000,000 florins, or £16,000,000.

The Emperor Joseph II., whose zeal for reform had in great measure been kept in check during the lifetime of his mother, now felt himself at liberty to give it full scope. He attempted a number of changes, of which several were praiseworthy in their objects, but abrupt and premature in their operation, so that in the end they were productive of evil consequences. He sought to establish a system of central government and uniformity of legislation throughout his dominions; enjoined the exclusive use of the German language in all schools, courts of justice, &c.; granted free and unreserved toleration to all sects of Christians; abolished numerous convents and monasteries; dismantled various fortresses; and did away with primogeniture and feudal vassalage. Had his people been ripe for these changes he would probably have been hailed as a reformer of abuses; but the Austrians were attached to their old usages, and were little inclined for change, while the arbitrary manner in which the improvements were introduced could not fail to provoke discontent. General uneasiness, therefore, began to prevail, which in the Netherlands broke out into open revolt in 1789. This, together with an unsuccessful war in which he had engaged with Russia against Turkey, is understood to have preyed upon his over-sensitive mind, and caused his death on 20th February 1790. He was, says Mr. Carlyle, "a man of very high qualities, and much too conscious of them; a man of ambition without bounds; one of those fatal men — fatal to themselves first of all — who mistake half genius for whole; and rush on the second step without having made the first."

He was succeeded by his brother Leopold, grand duke of Tuscany, who by his moderation and firmness was successful in restoring peace to the country, and in quelling the insurrection in the Netherlands. He also made peace with the Porte. The misfortunes of his sister Maria Antoinette and her husband, Louis XVI., of France, led him to enter into an alliance with Prussia against the Revolutionists, but he died before the war broke out (1st March 1792). He was succeeded by his son, Francis II., who had hardly ascended the throne when he found himself involved in a war with France.

Hostilities commenced on 28th April with an attempted invasion of Flanders by the French, but their undisciplined troops were speedily routed and put to flight. A combined army of 50,000 Prussians, under the command of the duke of Brunswick, and 15,000 Austrians under General Clairfait, besides about 20,000 French, soon after crossed the French frontier, took Longwy and Verdun, and marched on Paris. In the meantime Dumouriez was actively engaged in collecting an army, and soon found himself in a condition to meet them. A series of engagements took place without any decided result, beyond checking the advance of the allied troops, who were now also suffering very severely from sickness and famine. It was therefore deemed prudent to retire, and Verdun and Longwy were soon after retaken. Dumouriez next invaded the Netherlands with an army of 100,000 men, to oppose which the Austrian army only amounted to 40,000. A battle took place at Jemappes on the 6th of November, in which the Austrians fought with heroic bravery, and the contest was long doubtful, but the superior numbers of the French carried the day. The loss on both sides was very great; and soon after the whole of the Austrian Netherlands, with the exception of Luxemburg, was in the hands of the French. The commencement of the campaign of 1793 was distinguished by a series of brilliant victories gained by the allies in the Netherlands. Dumouriez was defeated at Aldenhoven, and again in a great battle at Neerwinden (18th March). Soon after, afraid of falling into the hands of the Jacobians in Paris, he passed over to the allies. His successor, General Dampierre, was defeated and slain on the plains of Famars, and the allies became masters of Valenciennes and Condé. Towards the end of the campaign, however, the republican troops were successful in a number of engagements. At the commencement of the year 1794, the Austrians, Dutch, English, and Hanoverians united their forces in the Netherlands under the command of the prince of Coburg, and the Emperor Francis himself joined the camp, in order by his presence to encourage the troops. In April the allies were successful at Cateau and at Landrecies, and took that town; but their good fortune then forsook them. Clairfait was attacked singly at Kortryk by Pichegru, and forced to yield to superior numbers; and the allies under the prince of Coburg were attacked by him at Tournay (22d May), when an extremely long and bloody, but undecisive, battle was fought. The Austrian troops were now greatly dispirited; and, on the 26th June they were defeated by General Jourdan at Fleurus. This was followed by other disasters, so that all Flanders was soon in the hands of the French. Pichegru, pursuing his victorious career, next invaded Holland, which, before the end of the year, was transformed into a republic. In the beginning of 1795 Prussia abandoned the cause of the allies, and concluded a treaty of peace with the French republic at Basle (5th April), and was joined therein by Hanover and Hesse Cassel, so that Austria and England were left alone to prosecute the war. For some months a cessation of hostilities took place between the contending parties; but on the 6th of September the French army under Jourdan suddenly crossed the Rhine near Düsseldorf, invested that town, and drove the Austrians before it over the Maine. Clairfait, however, reassembled his troops behind the latter river, and attacked the French at Höchst near Frankfort, and completely defeated them (11th October), so that they were obliged to recross the Rhine. In the meantime Pichegru had crossed the river with another army, near Mannheim, and took possession of that town. Wurmser, who was sent for its relief, arrived too late for that purpose, but attacked the French army near it, put them to flight, and compelled them to recross the Rhine, leaving a garrison of 8000 men to defend the town, which, after a vigorous siege, surrended to the Austrians. The French, undismayed by these failures, were only stimulated to greater efforts; and the following year they sent out three armies against Austria, one under Jourdan towards the Lower Rhine, another under Moreau towards the Upper Rhine, and a third into Italy. In the end of May the French army under Jourdan crossed the Lower Rhine, and gained some successes, but was afterwards attacked by the Archduke Charles (16th June), and forced to recross the river. Moreau soon after effected his passage over the Upper Rhine at Strasburg, defeated the Austrians in several partial engagements, and reduced the circle of Swabia to subjection. Jourdan again pushed forward his troops, and took Frankfort by bombardment, but was defeated with great loss by the archduke at Amberg (24th August), and again at Wurzburg (3d September). Moreau had in the meantime continued his advance into Bavaria, but was ultimately obliged to effect a retreat, which he carried out with great skill, suffering comparatively little loss, and recrossing the Rhine on 20th October. But a different fate was attending the army in Italy, under the command of a young officer, who afterwards became world-famous for his generalship, namely, Bonaparte. By the promptitude of his movements, and the suddenness of his attacks, he completely overcame and separated the army of the Sardinians from that of the Austrians, and forced the Sardinian king to sign a treaty of peace. He then turned his arms against the Austrians, defeated them in several engagements and made himself master of the whole of Lombardy, except Mantua. Wurmser was now summoned from Germany with an army of 30,000 men, which raised the Austrian force to about 60,000; while opposed to them were about 55,000 French. Instead, however, of advancing in one body, the Austrians were divided into two columns, which advanced by different routes, a mistake of which Bonaparte did not fail to take advantage. One division of 20,000 men was attacked and compelled to retreat towards the mountains, while Wurmser with the other division entered Mantua. Leaving that city he sustained a double defeat at Lonato and Castiglione (3d August); and, being again severely beaten at Medola (5th August), he was forced to seek shelter in the mountains of Tyrol. Having received reinforcements, however, he again advanced in divided columns, one of which was defeated at Roveredo, the other, under himself, near Bassano. He took the road to Mantua with the remains of his army, and reached that town after a brilliant victory over a body of French troops that had been sent to intercept him. Meanwhile the Austrians collected another army of 40,000 men under Alvinzi, who after a series of successes, gained a decided victory over Bonaparte at Caldiero (11th November). Four days later the Austrians were again attacked by the French near the village of Arcola, and after three days' desperate fighting on both sides the Austrians at length retreated. Alvinzi received reinforcements, and again set out to attack the French, but suffered a severe defeat at Rivoli on 14th January 1797. A fortnight later Mantua capitulated, and the French became undisputed masters of the country. Speaking of the perseverance and patriotic spirit of the Austrians in this struggle in Italy, Sir A. Alison says, "It is impossible to contemplate without admiration the vast armies which they successively sent into the field and the unconquerable courage with which these returned to a contest where so many thousands of their countrymen had perished before them. Had they been guided by greater or opposed by less ability they unquestionably would have

been successful, and even against the soldiers of the army of Italy and the genius of Napoleon, the scales of fortune repeatedly hung equal."—(*History of Europe.*) The Archduke Charles was now recalled from the Rhine to oppose Bonaparte. The latter set out on his journey northward on the 10th of March, with the view of crossing the Alps and so reaching Vienna. The Austrians attempted to oppose his progress at the river Tagliamento, but without success; and a desperate struggle took place for the possession of the Col de Tarvis, which ended in favor of Napoleon, so that in twenty days after the campaign opened the army of the archduke was driven over the Julian Alps, and the victorious French army of 45,000 strong was on the northern declivity of the Alps, within 60 leagues of Vienna. Napoleon, still pressing on, took possession of Klagenfurt, and advanced as far as Judenburg on the River Mur; but finding his position very insecure, and dangers thickening upon him, he despaired of carrying out his intention of dictating peace under the walls of Vienna. He therefore offered terms of accommodation to the Austrians, which they deemed it prudent to accept. Preliminaries were agreed to at Leoben (18th of April), and a formal treaty of peace was signed at Campo Formio, 17th October 1797. By this treaty Austria ceded to France Flanders and her Italian possessions, and received in return Venice and its dependent provinces. It, however, contained certain secret articles, by one of which Austria consented to surrender the whole of the left bank of the Rhine to France; and a convention was appointed to meet at Rastadt to provide equivalents on the right bank for the princes dispossessed on the left, and otherwise to settle the affairs of the empire. The terms were not particularly hard as regards Austria. The ceded territories contained about 3,500,000 souls, and those acquired about 3,400,000. But the taking away of the independence of Venice, which had been maintained for 1400 years, was an act of rapacity which excited the indignation of Europe, and Austria's share in it must ever remain a stain on her annals.

This peace was not of long duration. As the business of a convention which met at Rastadt advanced, and the bearing of the secret articles became known, a great sensation was created in Germany. The high-handed manner in which the French conducted their negotiations, and the insolence and contempt with which they treated the empire, led to the recall of the Austrian ambassador from the convention in the beginning of 1799, and on the 13th of March France again declared war against Austria. In the meantime the latter power had entered into an alliance with England and Russia against the former. In Germany the Archduke Charles defeated Jourdan at Stockach (26th March), and in several other encounters, and drove him out of the country; and he afterwards reconquered the whole of the western portion of Switzerland to beyond Zurich from Massena. In Italy Scherer was defeated by the Austrian general Kray at Verona and at Magnano, and then resigned the command into the hands of Moreau. The Russian army, under Suwaroff, now formed a junction with the Austrian, and the French were again beaten near Cassano (27th April). This was followed by other successes, so that in less than three months the French standards were driven back to the summit of the Alps, and the whole plain of Lombardy, with the exception of a few of its strongest fortresses, was recovered. After this the Russian general marched against Macdonald, who was advancing with a French army from Naples. A desperate conflict took place on the banks of the Trebbia, which was maintained with consummate bravery and skill for three days (17–19 June), until victory deciared for the Russians. Out of 36,000 men in the field the French lost above 12,000 in killed and wounded, and the allies nearly as many. One place after another now fell into the hands of the allies; but mutual jealousies and divisions breaking out among them, the Russian and Austrian forces were eventually separated. This led to the most disastrous results. The Russians were to prosecute the war in Switzerland, while the Austrians remained to carry it on in Italy. In the meantime another French army had been collected under General Joubert; and, on the 15th of August he was attacked by the allies at Novi. The battle was long and obstinate, but at length the allies were victorious. The French lost their general, who fell mortally wounded, besides about 1500 killed, 5500 wounded, and 3000 prisoners. The loss of the allies was 1800 killed, 5200 wounded, and 1200 prisoners. The Russian general now directed his march towards the Alps, forced the St. Gotthard, and descended into the valley of the Urseren, driving the French before him with great slaughter. With great difficulty and loss he effected a passage through the horrible defile of the Shächenthal, between Altdorf and Mutten; but, at the latter place, instead of meeting the allied troops, as he had expected, he found himself in the midst of the enemy. Before this time Massena had so beset the Russian general Korsakoff at Zürich, that he was compelled to fight, and with difficulty made his escape with the remains of his army, while the Austrian forces under Hotze had also been beaten by Soult. Nothing remained for Suwaroff but retreat, a course which he adopted with extreme reluctance, making his way with incredible resolution and perseverance over the rugged Alps into Glarus and the Grisons, and at length reaching the valley of the Rhine (10th October). Disagreements having taken place between the Austrian and Russian generals regarding their future proceedings, the latter withdrew to winter quarters in Bavaria; and soon after this the capricious czar of Russia, Paul, withdrew from the alliance and recalled his troops.

Bonaparte, who had now returned from his Egyptian campaign, made proposals for peace, which were rejected, and both sides prepared to renew the contest in 1800. A numerous and well appointed French army was collected at Dijon, at the head of which the first consul suddenly put himself, and set out for Italy across the Great St. Bernard. The passage was effected with great skill and determination in spite of every obstacle, and he arrived in Lombardy before Melas, the Austrian general there, had been informed of the expedition. On the 14th of June a great battle took place near the village of Marengo, the most obstinate and sanguinary that had up to this time been fought. The Austrian army numbered at least 21,000 foot and 7,000 horse, while opposed to them was an army of 22,000 men. The battle was maintained with great spirit and obstinacy on both sides; but at length, after repeated charges, the French were compelled to give way, and the retreat became general. At this moment, however, a fresh body of French troops under Desaix arriving on the field the contest was renewed, and after a final struggle the Austrians were compelled to yield. They lost about 7000 men in killed and wounded, and 3000 prisoners; while the French lost about the same number in killed and wounded, and 1000 prisoners, taken in the early part of the day. Their retreat being cut off, the Austrians capitulated to the conqueror, who thus again acquired possession of the whole of Italy. In the meantime Moreau had invaded Germany, and defeated Kray in several engagements, particularly at Stockah and Möskirch, and again at Biberach and Hochstädt; he also took Munich, and laid Bavaria and Swabia under contribution. An armistice was now agreed to (Pars-

dorf, 15th July), and overtures were made for peace, but without success. Hostilities were resumed in the end of November, and at first the Austrians gained some advantages, but on the 3d of December they sustained a crushing defeat at Hohenlinden. The fight was long and obstinate; the French lost on that and the preceding days 9000 men, while the loss of the Austrians was nearly twice as great. The moral effects of the defeat were most disastrous. Moreau now advanced by hasty marches, crossed the Inn, took Salzburg and pressed on towards Vienna. But an armistice was agreed to on 25th December. In Italy the Austrian forces sustained a severe defeat at the passage of the Mincio (26th December). Suffering under these disasters Austria was glad to agree to terms, which were concluded at Luneville, 9th February 1801.

By this treaty the whole of the left bank of the Rhine was again ceded to France, and the Adige was declared to be the boundary of Austria in Italy; the grand duke of Tuscany, on the promise of an indemnity in Germany, renounced his dukedom in favor of the infant duke of Parma, created king of Etruria; the duke of Modena received the margraviate of Breisgau in exchange for his territory; and the independence of the Batavian, Helvetic, Cisalpine, and Ligurian republics was recognised and guaranteed. A convention was to be again summoned for the regulation and adjustment of the rights of all concerned. In order to provide indemnities for the despoiled princes, a large proportion of the ecclesiastical sovereignties of the empire was *secularised*, or, in other words, confiscated; and all the free imperial cities were deprived of their privileges with the exception of six. To the share of Prussia fell the bishopries of Hildesheim and Paderborn, the city of Munster, and other cities and abbacies, to the amount of more than four times what she had lost on the left bank of the Rhine. Thus was she rewarded for her discreditable neutrality and impolitic desertion of the European alliance, though she subsequently suffered for this at Jena and by the treaty of Tilsit. The grand duke of Tuscany received the archbishopric of Salzburg, the Bishopric of Eichstadt, and part of that of Passau, in exchange for his hereditary possessions. Austria received the Tyrolese archbishoprics of Trent and Brixen. She had also received, in 1795, Western Galicia as her share in the third division of Poland, so that now her territory comprised over 254,000 square miles, her public debt amounting to 1,220,000,000 florins, or £122,000,000.

Austria now enjoyed a short period of peace, and employed it in silently repairing the breaches in her army and finances which had been produced by the late wars. After Napoleon had assumed the title of emperor of the French, the Emperor Francis took for himself and his successors that of emperor of Austria (11th August 1804). On 11th April 1805, an alliance was formed between England and Russia for resisting the encroachments of France, and some months later Austria and Sweden likewise joined it. Prussia held aloof, in the hope of receiving Hanover as a reward for her neutrality; while Baden, Würtemberg, and Bavaria sided with France. Deceived by the efforts that Napoleon was ostensibly making for the invasion of England, the Austrians (9th September) crossed the Inn, invaded Bavaria, and took up a position in the Black Forest. Meanwhile the French troops were in full march from the shores of the Channel to the banks of the Rhine; and the force in Hanover, under Bernadotte, was ordered to cross the Prussian territory without asking permission, and form a junction with the Bavarians in the rear of the Austrians, while other corps were at the same time directed by circuitous routes upon their flanks. The Austrian general, Mock, on the first intelligence of the approach of the French, had concentrated his forces at Ulm, Memmingen, and Stockach, contemplating an attack only in front. Great was his consternation, therefore, when he found that there was also an army on his rear. After several partial engagements, in which the Austrians were defeated, the Archduke Ferdinand, at the head of a body of cavalry, succeeded in making his way through the enemy, and in reaching Bohemia; while Mack, with the rest of the army, shut himself up in Ulm, which, with 30,000 men, he was forced to surrender (20th October). After this, Napoleon, with his usual rapidity, marched with the main body of his troops upon Vienna, and on the 5th of November established his headquarters at Linz, the capital of Upper Austria. The Russian and Austrian troops made various attempts to obstruct his farther progress (particularly at Dürrenstein, where a desperate engagement took place), but without success; and, on the 13th November, Vienna was in the hands of the conqueror, who made his headquarters at Schönbrunn. In the meantime the Archduke Charles was with the army in Italy, where, on 29th October, he was attacked with great fury on the heights of Caldiero, by the French under Massena. A terrible conflict ensued, and continued till night parted the combatants. It was renewed the following day, when at length victory declared for the Austrians. The archduke, however, was unable to avail himself of his success, for, hearing of the unfortunate state of matters in Germany, he set out with his army for the defence of the capital, and conducted it with great skill over the mountains, so that it suffered no serious loss. Marshal Ney, who had been sent with a body of troops into Tyrol, succeeded in taking the mountain barrier of Scharnitz by storm, and in making himself master of Innsbruck. Two bodies of Austrian troops had been so hard pressed that they were obliged to capitulate — one under General Jellachich at Feldkirch, and another under the Prince de Rohan at Castel-Franco in Italy.

After the loss of Vienna the allied forces collected themselves in Moravia, whither they were followed by Napoleon. At length the two armies came in sight of each other at Austerlitz, and both sides prepared for battle, which it was felt must be a most momentous one, and was to be witnessed by three emperors (those of France, Austria, and Russia). The allied forces numbered fully 80,000 men, of whom 15,000 were cavalry, while the French had 90,000 men in the field. The army of the allies was not well generaled, while on the side of the French were Soult, Bernadotte, Davoust, Murat, Lannes, Oudinot, Bessières, &c. The battle commenced on the morning of the 2d December, and continued till night. Both sides displayed the greatest skill and bravery; at one part of the field the allies would be victorious, at another the French; at one time victory would incline to the French, and again to the allies. At length, however, towards evening, the allies came to be beaten at all points, and the route soon became general. Numbers sought to save themselves by crossing the frozen lake of Satschan; but shots from the French batteries on the heights above broke the ice in all directions, and about 2000 men perished. The allies lost about 30,000 men, killed, wounded, or made prisoners, while the French lost about 12,000 in killed and wounded. This was the most glorious of all Napoleon's victories; but he was still in a very dangerous position. The archduke Charles, with an army of 80,000 men, was now approaching Vienna; Hungary was rising *en masse* against him; Russian reserves were advancing; and Prussia was at length preparing to declare war, on account of the unauthorised passage of French troops

through her territories. From these difficulties, however he was freed by the desire of the Emperor Francis for peace. An armistice was agreed to, and finally a treaty of peace was drawn up and signed at Presburg (25th December 1805) By this treaty Austria ceded to Bavaria, now erected into a kingdom, the whole of the Tyrol, Vorarlberg, Lindau, Burgau, Passau, Eichstädt, Trent, and Brixen, besides several petty lordships; to Würtemberg, now also become a kingdom, the bordering Austrian dominions in Swabia; and to Baden the Breisgau, the Ortenau, and the town of Constance. She also yielded up her Venetian possessions, and agreed to pay a war contribution of £1,600,000. In exchange for all these sacrifices she merely received the small electorate of Salzburg, and the possessions of the Teutonic Order. In all, Austria lost about 28,000 square miles of territory, with a population of 2,700,000, and a revenue of 14,175,000 florins. It was evidently not the intention of Napoleon to overthrow the Austrian monarchy, but rather to throw its strength to the eastward, and to impose a barrier of subordinate kingdoms between it and France, so as to prevent its interference with his schemes of aggrandisement in Germany and Italy.

A blow was inflicted upon the constitution of the German empire by Napoleon, in the formation of the Confederation of the Rhine. Representatives of the different powers concerned assembled at Paris in the beginning of July 1806; and, on the 12th of that month, an Act was signed whereby the kings of Bavaria and Würtemberg, the elector of Baden, and thirteen other princes of Western Germany, separated themselves from the German empire, and formed a confederation under the protection of the emperor of the French. 16,000,000 men were thus, by a single stroke, transferred from the empire to a foreign alliance. Wisely yielding to what he could not prevent, the Emperor Francis, by solemn deed, renounced the title of emperor of the Romans, and declared himself the first of the emperors of Austria.

The peace of Presburg was quickly followed by the war between France and Prussia, in which the latter suffered terrible retribution for her selfish policy in leaving Austria to struggle unaided against the common foe of Europe. Great efforts were made to induce Austria to take part in this war, but she prudently remained neutral, contenting herself with making every effort to strengthen and improve her army, and increase her warlike resources. During the whole of 1806 and 1807 the efforts of the war department, under the guidance of the Archduke Charles, were incessant to restore the losses that had been sustained in the late war. The army was also remodelled upon the system adopted by Napoleon. The transfer of a large portion of the French army in Germany to the Peninsula on the breaking out of war there, emboldened the Austrian Government to issue a decree (9th June 1808), instituting a landwehr or militia to be raised by conscription, which soon amounted to 300,000 men, in addition to a regular standing army of 350,000. On hearing of this, Napoleon addressed strong remonstrances to the court at Vienna, which made loud professions of pacific intentions, but did not cease its warlike preparations. In the spring of 1809 the armies on both sides took the field, and, on 8th April, Austrian troops crossed the frontiers at once in Bohemia, on the Inn, in the Tyrol, and in Italy. In the meantime France was bringing together her forces from all quarters towards the valley of the Danube, where at length she had an army, including the troops of the German Confederation, of about 200,000 men, and Berthier was despatched to take the command till the arrival of the emperor. The Archduke Charles had crossed the Inn with upwards of 120,000 men, and on the 16th they had advanced as far as the Isar, which they crossed. Berthier, instead of concentrating his troops, was separating them, so that they were in the utmost danger, when the arrival of Napoleon at once changed the aspect of affairs. On the 19th an action took place at Thann, between a body of about 20,000 French and a like number of Austrians, without any decisive result; and the following day the main body of the Austrians, over 50,000 strong, was suddenly attacked and defeated after a feeble resistance at Abensberg, by a French army of 65,000 men. The same day the Austrians attacked and took Ratisbon, and secured the bridge over the Danube there. Both sides now prepared for a general engagement, which took place at Eckmühl on the 22d of April. The battle was bravely contested; but at length the French were victorious, the loss to the Austrians being 5000 killed and wounded, and 7000 prisoners. The archduke retired during the night to recruit his army in Bohemia, and Ratisbon was taken by storm. In other parts, particularly in Italy, success was attending the Austrian arms.

Napoleon now lost no time in again marching on to Vienna, and no great attempt was made to impede his progress except at Ebersberg, where Hiller with about 30,000 Austrians took his stand to defend the wooden bridge over the Traun. He was gallantly attacked by a body of French troops under Massena, and a fearful struggle took place; but at length the French prevailed, and Hiller withdrew his troops. Each side lost about 6000 men on this occasion. On the 10th of May the French eagles appeared before the walls of Vienna, and, after an ineffectual attempt at defence, the city surrendered on the 13th. The Archduke Charles was hastening to the relief of the town, but arrived too late. The two armies therefore prepared for battle, the one on the north bank of the Danube, the other on the south. On the night of the 19th the French prepared to cross the river at the island of Lobau, and by daybreak on the 21st they had 40,000 men landed on the northern side. The Austrians now resolved upon an attack, and by two o'clock, when the fight began, the French force amounted to about 50,000 men, while the Austrians had 80,000 to oppose them. The scene of action was near the villages of Aspern and Essling, and the struggle was maintained with the most desperate courage on both sides till night parted the combatants. The Austrians had everywhere the advantage, but both sides prepared to renew the contest the next day. During the night, and early in the morning, French troops were still passing over, so that, notwithstanding his losses, Napoleon had fully 70,000 men to renew the fight. It commenced early in the morning, and continued the greater part of the day; but at length the French were beaten on all sides, and compelled to retreat to the island of Lobau. In these two days they lost upwards of 30,000 men, and the Austrians not less than 20,000. The victory produced a great impression on the mind of Europe, and dissipated in a great degree the charm of Napoleon's invincibility.

He, however, made every preparation for renewing the contest. He summoned troops from different parts, and fortified his position on the island of Lobau, connecting it also by several bridges with the south bank of the river. On the evening of the 4th July he assembled his troops on the island, amounting to 150,000 infantry and 30,000 cavalry, with 750 pieces of cannon. During the night several bridges, which had been secretly prepared, were thrown over to the northern bank at a point where they were not looked for, and by six o'clock the following morning the whole body had passed over. In the afternoon the French made a vehement attack upon the Austrians, but were repulsed

with great slaughter. Early on the morning of the 6th the Austrians began the attack. There numbers were then about 115,000 infantry and 25,000 cavalry; but they were in hourly expectation of the arrival of an additional body of 30,000 under the Archduke John, which was known to be not far off. The battle was contested with the utmost determination and bravery on both sides. The Austrian right wing succeeded in overthrowing and putting to flight the left wing of the enemy. On the other wing the contest was long and doubtful; but two divisions of troops having at length succeeded in turning the extreme flank of the Austrians, the latter, after a gallant defence, were compelled to abandon their position. In these circumstances, Napoleon collected all his disposable forces and brought them to bear upon the centre of the Austrians, which was their weak point, the archduke having thrown his strength chiefly into the two wings. After repeated charges, which were repulsed with great bravery, the French succeeded in forcing their line, and the archduke, despairing of maintaining his position, ordered a retreat, which was effected in good order and with little loss. The French were so exhausted that they displayed little vigor in the pursuit, and neither guns nor prisoners were taken. The Archduke John came up in the afternoon, but too late to be of any service. Had he made his appearance sooner there can be no doubt that the result would have been different. As it was, the Austrians succeeded in making a most gallant stand against a greater number of the best troops of France, led by Napoleon and some of his greatest generals. This battle of Wagram was one of the greatest and most obstinately contested fights in the whole war, and is perhaps the most glorious in the annals of Austria. The loss on both sides was immense, amounting to about 25,000 on each, including killed and wounded. The Archduke Charles retreated towards Bohemia without any serious molestation from the enemy. A battle was fought at Znaim (11th July) between the Austrians and a French army under Massena which was following them, but before it was decided news of an armistice arrived. This was followed by the peace of Vienna (14th October). "The campaign of Aspern and Wagram," says Sir A. Alison, "is the most glorious in the Austrian annals,—one of the most memorable example of patriotic resistance recorded in the history of the world. . . . Other empires have almost invariably succumbed upon the capture of the capital. . . . Austria is the only state recorded in history which (without the aid of a rigorous climate like Moscow) fought two desperate battles in defence of its independence after its capital had fallen."—(*History of Europe*). By the peace of Vienna Austria was compelled to cede Salzburg, Berchtesgaden, the Innviertel, and the Hausruckviertel, to Bavaria; portions of Galicia to Russia and the grand duke of Warsaw; and Carniola, Trieste, the greater part of Croatia, Istria, the circle of Villach, &c., to Italy, In all she lost about 42,000 square miles of territory and 3,500,000 inhabitants, together with more than 11,000,000 florins of revenue. The emperor also agreed to reduce his army to not more than 150,000 men; and a war contribution of £3,400,000 was imposed on the provinces occupied by the French troops. Before leaving the Austrian capital Napoleon caused the fortifications to be blown up.

Soon after this Napoleon obtained a divorce from his wife Josephine, and offered his hand to Maria Louisa, daughter of the emperor of Austria, and was accepted. The marriage was celebrated with great pomp at Vienna on the 11th March 1810. In 1812 Austria was obliged to enter into an alliance with France against Russia, and to furnish an auxiliary force of 30,000 men for the invasion of the latter country. The disastrous result of that expedition to the invaders showed Germany that the fortunate moment had now arrived for regaining her independence. Prussia was the first to form an alliance with Russia, and declared war against France (17th March 1813). Great efforts were made to induce Austria to join this alliance, but without success. She directed her attention to raising her military strength, and making other preparations to enable her to take an important part in the coming struggle, on the one side or the other. After the defeat of the allies at Lützen and Bautzen, and the conclusion of an armistice at Pleswitz, Austria, came forward as a mediator, with a view of affecting a peace between the parties, and not without the view, also, of gaining some material advantage for herself. In fact, she now held in her hand the balance between the contending parties. Her army of 150,000 or 200,000, which she had collected in Bohemia, would bring victory to whatever side she joined. Metternich, who at that period had the direction of the cabinet of Vienna, was too clear-headed not to perceive the advantages of the position, and he determined to avail himself of them, in order if possible to restore to Austria her lost possessions. He had openly avowed, that if Napoleon would accede to the terms which he proposed Austria would throw her whole 200,000 men into the scale in his favor. At first it seemed doubtful to which side she would attach herself; but it would appear that the allies had reason to believe that she was favorable to them, and that Napoleon had also reason for suspecting the strength of her attachment to him. It is evident that she would have more to expect from the allies than from Napoleon, but at the same time it was doubtful how far she would be influenced by the existing matrimonial alliance. While things were in this doubtful state news arrived of the battle of Vitoria, by which the death-blow was given to the power of France in the Peninsula, and after this there was little hope of peace on either side. Austria, whatever her previous intentions, doubtless now felt that there was little to be gained from attaching herself to a sinking empire and a falling cause, and she agreed, in the event of Napoleon not accepting the terms proposed, to join the allies. They could have had little hope that the terms would be accepted; they included the cession to Austria of all the Illyrian provinces, with Trieste, the reinstatement of Prussia in her ancient possessions, with a frontier on the Elbe, and the dissolution of the grand duchy of Warsaw, to be divided between Russia, Austria, and Prussia. These terms not being acceded to, both parties prepared for war. Austria agreed to furnish 200,000 to the allied forces, stipulating in return that she should be restored to the condition in which she was in 1803, or, at any rate, at the peace of Presburg.

By gigantic efforts Napoleon was able to raise his army to 400,000 men, of whom nearly 350,000 were effective and he resolved to make Dresden the pivot on which all his operations should turn. To oppose him the allies mustered about 400,000 men, so that the two forces were pretty nearly equal. Of the latter, a grand army of 220,000 men, chiefly Austrians, under Prince Schwarzenberg, was stationed in Bohemia; Blücher, with 95,000 men, was to protect Silesia; while Bernadotte, the crown prince of Sweden, who had joined the allies with 28,000 troops, was to protect Berlin and Brandenburg with an army of 90,000. Napoleon resolved to march with the main body of his troops into Silesia against Blücher, having despatched an army of 80,000 men under Oudinot against Berlin, and sending a force of 30,000 to keep the passes from Bohemia to

Dresden. Blücher judiciously retreated before the French troops, and while Napoleon was following him, the allied army in Bohemia came down upon Dresden. In place, however, of at once beginning the attack, it was delayed till Bonaparte, who had been informed of their movements, had time to arrive. The attack was commenced on 28th August, and kept up with great fury during the day; but in the evening a series of sallies were made from the town, which took the besiegers completely by surprise, and compelled them to withdraw. Napoleon had now received sufficient reinforcements to enable him to give battle, which he did the next day. He was then able to muster 130,000 men, while the allies numbered about 160,000. The fight was maintained for some time with great bravery on both sides, but at length a body of French troops under Murat succeeded in turning the flank of the allied left wing, and then attacking them suddenly on flank and rear; they were thus thrown into confusion, and the great body of them killed or made prisoners. The allies lost on this occasion about 26,000 men, of whom about 13,000 were prisoners. A French force under Vandamme had been sent to cut off the retreat of the allies, but this was engaged near Culm (29th August) by a body of Russians under Osterman, and a desperate struggle took place, which was renewed the next day, and only ended by the appearance in the rear of the French of a large body of Prussians, when the leader and most of his troops were made prisoners. The French lost in the two days 18000 men, of whom 7000 were prisoners.

Napoleon, on quitting Silesia, had left Macdonald with an army of 80,000 men to oppose Blücher. The latter suddenly attacked them with great fury on the Katzbach (26th August), and defeated them with great slaughter. The fight was several times renewed during the three following days when the allies were in pursuit, and in all the French lost about 7000 men in killed and wounded, and 18,000 prisoners. Nor was the French army under Oudinot more successful, for it sustained a severe defeat at Gross Beeren (23d August), and in that and subsequent engagements lost about 4000 in killed and wounded, and an equal number of prisoners. Napoleon was strongly affected by these reverses, the more so that they were quite unexpected. He gave the command of the army in the north to Ney, and set out himself against Blücher. Ney engaged the allied army at Dennewitz, and a desperate battle was fought (6th September), in which the French were at length beaten and put to flight with a loss of 13,000 men, of whom one-half were prisoners. The army in Bohemia now again resumed the offensive, and was preparing to fall upon Dresden, when Napoleon suddenly returned and drove them back. He again marched against Blücher, but returned to Dresden without effecting anything. He then resolved to enter Prussia and take Berlin, but was obliged to give up this project on learning that Bavaria had joined the allies (8th October). Now fearing that his retreat might be cut off, he directed his march toward the Rhine, and reached Leipsic on the 15th of October. Here the combined allied armies under Schwarzenberg, Blücher, and Bernadotte assembled, and on the 16th an indecisive battle was fought, which to the French was equivalent to a defeat, and the same evening Napoleon made proposals for peace, but no answer was returned. The battle was renewed on the 18th. The French army numbered about 175,000 men, while the allied forces amounted to about 290,000. The French strength was also weakened by two Saxon brigades of foot and one of cavalry passing over to the enemy during the engagement. Notwithstanding these disadvantages the French fought with great bravery and determination, but were at length beaten on every side. Next day they were in full retreat, and Leipsic was taken by the allies after a gallant defence. The total loss of the French during these four days exceeded 60,000 men. The emperor reached Erfurt on the 23d October, and there collected the scattered remains of his army. The Bavarians, under Wrede, attempted to intercept his retreat at Hanau, but though aided by some of the allied troops, they were defeated with great slaughter (30th October). The Rhine was crossed on 1st November, and on the 9th Napoleon arrived in Paris. Thus Germany regained its independence, and the Confederation of the Rhine was dissolved. Austria, as we have seen, had a principal share in bringing this about; but the Emperor Francis was opposed to the adoption of extreme measures against Napoleon, being desirous that the sceptre of France should continue in the hands of his daughter and her descendants. Other views, however, prevailed. The war was carried into the enemy's country, and at length, not without a good deal of fighting, the allies entered Paris on 31st March 1814. On 11th April Napoleon resigned the imperial crown.

In the end of September following a congress was assembled at Vienna to adjust the claims and the mutual relations of the several states. This, however, was found to be a matter of no small difficulty. Russia demanded the whole of Poland, and Prussia laid claim to Saxony. Austria, France, and England were opposed to these claims, and determined to resist them, so that at one time it appeared as if war was again to break out; but more peaceful views began to prevail, and when the news arrived that Napoleon had secretly quitted Elba, all minor differences were forgotten in the presence of this pressing danger. They at once declared him an enemy and a disturber of the peace of the world, and prepared to bring against him an army of upwards of half a million of men. But before these had all been collected, Wellington and Blücher had brought the military career of Bonaparte to a close on the field of Waterloo. In the new partition of Europe, which was fixed by the Congress of Vienna (1815), Austria received Lombardy and Venice, the Illyrian provinces, Dalmatia, the Tyrol, Vorarlberg, Salzburg, the Innviertel, and Hausruckviertel, together with the part of Galicia formerly ceded by her, making in all about 3,200 square miles of territory.

The emperors of Austria and Russia and the king of Prussia also entered into a "Holy Alliance," by which they bound themselves to remain united in the bands of true and brotherly love, to mutually help and assist each other, to govern their people like fathers of families, and to maintain religion, peace, and justice in their dominions. This alliance, beautiful in theory, was made, in fact, the means of maintaining absolute power in the hands of the rulers, and of suppressing free institutions and almost every form of liberty among the people. This was particularly the case in Austria, under the direction of Metternich, who did everything in his power to carry out these principles. A strict censorship of the press was established, not only to overlook the home press, but also to superintend the introduction of foreign publications. A system of secret police was also organised to observe and report what was said and done by the people in private. Besides this, Austria was ever ready to aid in the suppression of revolutionary movements in other states. In the construction of the German Confederation she used her influence to suppress the popular voice in all matters of government; her armies were employed in quelling the popular insurrections in Naples and Piedmont in 1822; and by diplomacy she aided in the sup-

pression of the popular movement in Spain in 1823. During the insurrection in Greece the influence of Austria was exerted against it; and when Greece was established as a kingdom (1827), under the protection of England, France, and Russia, she kept aloof. When, however, Russia invaded Turkey in 1828, Austria joined with England in interfering to prevent the fall of Constantinople, and in bringing about peace.

The commotions that followed the French revolution of July 1830 in different parts of Europe considerably affected Austria. This manifested itself chiefly in Lombardy, where the presence of 30,000 troops was required to maintain the imperial authority. In Parma and Modena the people suddenly rose in insurrection and expelled their rulers, and Austrian troops were employed to restore them. An insurrection also broke out in the Papal States, and the Pope invoked the aid of Austria, whose troops entered Bologna and established themselves there (January 1832). Upon this the French sent a force to occupy Ancona, and at one time it seemed as if France and Austria were again to cross swords on Italian soil, but this danger was at length averted. In the minor states of Germany the cry for popular institutions was raised, and in many cases the rulers were obliged for a time to comply with them, but after the danger appeared to pass away, Austria, acting in concert with Prussia, succeeded in bringing back the old state of things in the confederation. The Poles, tired of Russian rule, and hoping to be supported by France, took up arms to regain their independence (1831). Although Austria professed a strict neutrality in the struggle, a Polish corps that was driven into her territories was disarmed and detained, while a body of Russian troops under the same circumstances was allowed to continue its operations against Poland. During the remainder of the reign of Francis I. no public event of importance occurred. He died on the 2d of March 1835, in the sixty-seventh year of his age and the forty-third of his reign. He was one of those well-meaning but weak-minded men, who unfortunately adopt the wrong means for effecting the good which they intend. He wished to make his people contented and happy, but he sought to do so by repressing all independence in thought or action, and keeping them in most abject subjection. He earnestly strove for their advancement, but it was by strenuously endeavoring to keep things as they were, and opposing every form of change. The transition from an old to a new state of things was in his mind always associated with the utmost danger, and to be by all means avoided. He did much in the way of establishing elementary schools throughout the country, but said that he wished to have no learned men, only good loyal citizens. He was thoroughly conscientious and correct in his conduct, but at the same time narrow-minded, suspicious, and bigoted. He was most assiduous in his attention to the business of the state, but occupied himself chiefly with small matters and minor details, while more important concerns were entirely overlooked and neglected. His good qualities, however, commended him to the affections of his people, and this doubtless did much to repress among his subjects the insurrectionary spirit which subsequently manifested itself.

He was succeeded by his eldest son, Ferdinand I., an amiable but weak-minded prince, who left the government very much in the hands of his prime minister, Metternich. The various signs of discontent which had been manifested during the former reign soon became stronger and more marked. Baron Pillersdorf, the successor of Metternich, speaking of this period, says, "Circumstances permitted an uninterrupted enjoyment of peace, but the necessity for internal ameliorations became by so long a delay more urgent, the demand for them more sensible, whilst, owing to the procrastinations of the Government, faith and confidence were diminished. It is true that the prosperity of the provinces generally did not decline; on the contrary, many branches of commerce manifested an increase in their development; but in spite of this the situation of the whole empire inspired in different respects serious apprehensions arising from the disordered state of the economy of finance, the yearly augmentation of the public debt, the inefficiency of the measures adopted, and still more from the oppressed disposition of mind of the clear-sighted and intelligent classes of the population."—(*The Political Movement in Austria during* 1848–49.) The people saw growing up in the nations around them freer institutions and more liberal modes of government, and they could not help contrasting those with their own system. Austria, too, was made up of a number of different nationalities, and the Government attempted to strengthen its position by working upon their national prejudices and antipathies, setting race against race, and creed against creed. In particular, the German element was favored at the expense of the nationalities; and the Germanising measures of the Government excited great discontent among the other races. It has been remarked that the aversion of Austria to the development of the Slavonic element in her population was greatly owing to jealousy of Russia, which power she regarded as desirous of attaching all the Slavonic races to itself. Hence Austria has always been opposed to the encroachments of Russia in Turkey, and in favor of maintaining the integrity of the latter, so that, when war broke out in 1839 between the Sublime Porte and the Pasha of Egypt, she readily joined England in support of the former.

The court of Vienna was first frightened from its sense of security by an insurrection in Galicia in 1846. This having been suppressed, Austria, in conjunction with the other two powers which had dismembered Poland, determined to lay hold on Cracow, and thus extinguish the last remnant of Polish independence. This step being contrary to the treaty of Vienna, was strongly remonstrated against both by England and France; but these remonstrances were unheeded, and the republic was incorporated in the Austrian empire. The French revolution of 1848, which convulsed almost the whole of continental Europe, caused the Austrian empire to totter to its foundations. Scarcely had the news of the fall of Louis Philippe reached Vienna when the whole city was in a state of open rebellion (13th March). The populace, headed by the students, and forcing the magistracy along with them, made their way into the imperial palace, and loudly demanded from the emperor the dismissal of his old counsellors, and the immediate grant of a new constitution. Alarmed at these demonstrations Prince Metternich resigned, and was soon after on his way to London; and an imperial proclamation was issued, declaring the abolition of the censorship of the press, the establishment of a national guard, and the convocation of a national assembly. These measures, however, as well as the nomination of a new ministry, were far from sufficing to arrest the popular movement, encouraged and led on by the students and other members of the university. The national guard just called into being, along with the academic legion, formed themselves into a permanent committee, and dictated laws to the Government. On the 17th of May, Ferdinand, accompanied by the empress and the members of his family, secretly quitted the palace, and fled to Innsbruck. An attempt to dissolve the academic legion caused an outbreak on the 25th, and the streets were barricaded; but no fighting took place, for the ministers yielded to the demands of the rioters, and gave

up their design. A committee of citizens, national guards, and students, which was formed for the preservation of peace and order, was legalised by the prime minister, and assumed the authority of the Government. In the meantime the revolutionary spirit was manifesting itself in other parts of the empire. In Italy the inhabitants of Milan and Venice rose against their rulers, and expelled the Austrian troops. This was followed by a general rising throughout Lombardy and Venice. The insurgents found an ally in Charles Albert, king of Sardinia, who came with an army to their assistance, and declared war against the empire. At first he succeeded in driving the Austrians back to the northern frontier of Italy; but General Radetzky, having received reinforcements, vanquished him in several engagements, and compelled him to flee to his own dominions, and conclude a truce with the victors. This was followed by the reconquest of Milan and the whole of Lombardy. Venice withstood the besieging army of the Austrians for some months, but was at length obliged to surrender. In Bohemia the Czechs or Slavonic party determined to obtain redress against the Germanising measures of the Government, and forwarded a petition to the emperor, demanding a united and independent national assembly for Bohemia and Moravia, independent municipal institutions, and an equal share in public offices with the German part of the population. An evasive answer was returned, and the citizens of the capital rose in insurrection. A national assembly of delegates of the Slavonians in all parts of the empire was summoned to meet at Prague. Three hundred made their appearance, and the assembly was opened in the beginning of June. The efforts of the military to maintain peace excited the enmity of the citizens, and they petitioned for the removal of the commander, Prince Windischgrätz. Meanwhile a collision took place between the Slavonic militia and the regular troops. The Germans joined with the military, and the insurrection raged for five days; the town was bombarded and taken, and the leaders dispersed or taken prisoners.

In Hungary the National Diet had passed measures in favor of a responsible ministry, a perfect equality of civil rights, religious toleration, the formation of a national guard, and the abolition of the censorship of the press. The emperor gave his consent to these measures; but a strong Austrian party in the country, chiefly Slavonians, was opposed to them, and, instigated and supported by the Austrian Government, they broke out in open revolt. Jellachich, the ban or governor of Croatia, was the leader of the insurgents, and collecting an army of 65,000 men, he marched on towards Pesth. An army was speedily raised by the Hungarians to meet him, and a battle was fought within 25 miles of the capital on 29th September, in which Jellachich was beaten. The emperor now openly declared against the Hungarians, annulled the decrees of the Diet, suspended the civil authorities, and appointed Jellachich commander of the army. The Diet, denying the authority of the emperor, organised a committee of safety, and elected Kossuth president. This was equivalent to a declaration of war, and an Austrian army was ordered out against them. The people of Vienna, sympathising with the Hungarians, rose in arms, when the garrison of that city departed for Hungary (6th October). A deputation waited on the minister of war, Latour, demanding their recall, and on his refusal they took the arsenal by storm and murdered him. The National Diet, which had met on the 22d of July, now declared its sittings permanent, and elected a committee of public safety. It sent an address to the emperor asking for a new ministry, the revocation of the edict against the Hungarians, the dismissal of Jellachich, and an amnesty for the rioters. The emperor, who had returned from Innsbruck to Vienna in June, returned an evasive answer, and fled to Olmütz. The people in the capital armed themselves under the leadership of General Bem, and prepared to resist the impending attack of the army. The garrison, after having retired outside the limits of the city, was joined by Jellachich's horde of Croatians and by the army of Windischgrätz. On 23d October, an army of 100,000 men appeared before Vienna, and the city was summoned to surrender. This the people refused to do, and the attack was commenced on the 28th, when the city was set on fire in many places. The next day a part of the suburbs was taken, and the leaders began to think of surrendering when the news of a Hungarian army hastening to their relief inspired them with fresh courage. This force, however, was attacked and put to flight by Jellachich (30th October), and the next day the city was taken by storm, after a desperate struggle, which was attended with immense slaughter. On 22d November a new ministry was formed, of which Prince Schwarzenberg was president; and on 2d December the Emperor Ferdinand was induced to abdicate the throne. His brother, Francis Charles, who was his legal successor, likewise renounced his right in favor of his son, Francis Joseph, who was proclaimed emperor under the title of Francis Joseph I.

The war in Hungary was renewed by Windischgrätz, who crossed the Leitha, and after several successful engagements entered the capital of that country (January 1849), the Hungarian Government and one division of the army having departed eastward to Debreczins while the other under Görgei retired northward toward Waitzen. The Austrian general, instead of pursuing them, remained inactive for seven weeks at Pesth, and thus afforded them time to organise. In Transylvania General Bem gained a decisive victory over the Austrians in that territory, and also defeated and put to flight a Russian force that had come to their assistance. At length Windischgrätz moved forward towards Debreczin, and met the Hungarins at Kapolna, where an obstinate and bloody but indecisive battle was fought (26th February). Next day the Austrians, having received reinforcements, renewed the fight, and the Hungarians were obliged to retire. The latter having recruited their forces, another obstinate battle was fought near Gödölö (5th April), in which the Austrians were defeated, as they were in several subsequent engagements, so that they were compelled to abandon the capital and recross the Danube, leaving a small garrison at Buda, which afterwards surrendered. Had the victorious army now marched on to Vienna they would doubtless have succeeded in bringing the Austrians to terms; but disputes among the rulers and dissensions among the generals prevented such a course. In June Prince Paskewitch crossed the Galician frontier at the head of a Russian army of 130,000 men; and General Haynau, who now had the command of the Austrian troops, was joined by a Russian corps under General Palutin. The Hungarians were unable to contend against these forces, and had again to leave their capital, the seat of the Government being transferred to Szegedin. Driven from this place, the army made a stand at Temesvar, but were defeated with great slaughter (9th August), and again, two days later, at Arad. On 13th August the Hungarian general, Görgei, who had been named dictator, surrendered to the Russians. Hungary was now treated as a conquered country, and the greatest cruelties were practised against the people by the Austrian general, Haynau. The military and parliamentary leaders were shot or hanged, and the prisons filled with unhappy vic-

tims. In the meantime the war in Italy was renewed by the king of Sardinia. He was, however, defeated at Mortara (21st March) by the Austrian general, Radetzky, and again at Novara (23d March), when he abdicated in favor of his son, Victor Emmanuel, with whom a peace was concluded. Venice held out against the Austrians till 23d August, when it was forced to surrender.

The congress which, since the final struggle in Vienna, had been adjourned to Kremsier, was dissolved (March 4, 1849), and a constitution promulgated by the free will of the emperor. At this time efforts were made in the German National Assembly at Frankfort to form Germany into one integral empire, excluding Austria, the imperial crown being offered to the king of Prussia. This was violently opposed by the Austrian Government, and though the king of Prussia did not venture in the face of this opposition to accept the imperial crown, he concluded a treaty with the kings of Saxony and Hanover (May 1849), with the view of forming a strict union with the different states of the German confederacy to the exclusion of Austria. To this treaty the majority of the lesser states afterwards acceded, and a diet was convened at Erfurt (May 1852), under the presidency of Prussia, for the reorganisation of Germany. Austria, to counteract the efforts of her rival, invited the different states to send their representatives to Frankfort, where she assumed the lead. The legality of the assembly was at once acknowledged by Bavaria, and Saxony and Hanover were subsequently gained over to it. While matters were in this state disturbances arose in Hesse-Cassel. The margrave invoked the assistance of Austria, while the people looked for aid to Prussia. Having received the authority of the diet at Frankfort, Austria sent an army into Hesse, where they were confronted by another army from Prussia, and an immediate commencement of hostilities was looked for, but this was averted by a conference held at Olmütz, when Prussia acknowledged the right of Austria to enter Hesse. Soon after this Austria and Prussia convoked a congress of all the states at Dresden, where it was agreed that the final settlement of the affairs of the confederacy should be submitted to the decision of the diet at Frankfort. Austria now proposed to the diet that all her provinces, including Hungary and Lombardo-Venetia, should be included in the German confederacy, but this bold proposal failed of acceptance.

Austria now made strenuous efforts to develop the resources of the monarchy by encouraging agriculture, industry, and commerce. The land was freed from the burdens of feudalism, taxes were removed, new roads were formed, and railways were constructed. A new tariff was adopted (July 1851), and negotiations were entered into with the other German states for a complete customs' union with the Zollverein, but this was strongly opposed by Prussia and several of the other states in the union. A commercial treaty, however, was, after considerable negotiation, concluded between Austria and the Zollverein (19th February 1853). The liberal concessions that had been made by the Government were rapidly disappearing, a rigorous military system of rule was being introduced, and centralisation was taking the place of the old provincial system. On the 1st of January 1852 it was announced that the constitution and fundamental rights were abolished, the ministers were declared responsible only to the emperor, trial by jury was set aside, the censorship of the press was again in operation. The influence of the Roman Catholic clergy and the Jesuits was also re-established. A popular outbreak occurred in Milan (6th February 1853), when a number of the military were killed, but it was speedily suppressed. An attempt was made to assassinate the emperor in Vienna by a young Hungarian (18th February). In the quarrel between the Montenegrins and the Porte, Austria sided with the former, and Count Leiningen was sent to Constantinople (February 1853) to demand the redress of their grievances, which was granted. About this time Russia demanded the protectorate of the Greek Christians in Turkey, and this being denied, her troops crossed the Pruth and occupied the principalities of Moldavia and Wallachia (July 1853). Austria took a leading part, along with France and England, in condemning these proceedings and in endeavoring to bring about peace. She also gave the Western powers to believe that she would actively co-operate with them in the defence of Turkey, but afterwards fell back upon vague promises, and on April 20, 1854, entered into an alliance with Prussia, by which the two powers guaranteed each other's dominions from attack, and pledged themselves only to take an active part in the war when the interests of Germany appeared to be endangered. On June 14th Austria agreed with Turkey to occupy the Danubian principalities with an armed force, and by the end of August she had a large army there, which virtually brought the war on the Danube to an end. Austria still continued to use her exertions to bring about peace, and with this view a conference was opened at Vienna in March 1855, but the representatives of the several powers were unable to agree upon a basis. After the fall of Sebastapol she again renewed her efforts, and having ascertained the terms on which the Western powers would be prepared to treat, she sent Count Esterhazy to St. Petersburg to lay them before the czar, by whom they were accepted, and a treaty of peace was signed at Paris, 31st March 1856.

In August 1855 the emperor signed a concordat with the Pope, giving the church greater power in the country than it had ever possessed before. The clergy were to have unlimited control over all ecclesiastical matters and matters connected with education, and were to enjoy free communication with Rome without the intervention of the civil power. The Government now seemed desirous of relaxing somewhat their restrictions, and of making the people forget the troubles of 1848 and 1849. The military rule was made less strict, and a general amnesty was proclaimed for political offences (12th July 1856). The emperor visited Italy in the end of 1856 and Hungary in May 1857, but the remembrance of past wrongs was still alive in the minds of the people, and he was everywhere received with the greatest coolness. Austria was opposed to the union of the Danubian principalities, and for some time refused to evacuate them, but at length (March 1857) her troops were recalled.

Sardinia had frequently remonstrated with Austria concerning her policy in Italy, while Austria, on the other hand, complained of the attacks made upon her by the Sardinian press. A growing coolness had also sprung up between Austria and France on this subject, which reached its climax when the French emperor said to the Austrian minister, M. Hübner, at the levee on the 1st of January 1859, "I regret that our relations with your Government are not so good as they were; but I request you to tell the emperor that my personal feelings for him have not changed." The preparations for war were carried on with the greatest activity by Austria, France, and Sardinia. England sent Lord Cowley to Vienna to endeavor to arrange differences, but without success. Russia proposed a congress of the five great powers, and this was agreed to, but Austria demanded the disarmament of Sardinia previous to the congress, which the latter declined to agree to, and both sides prepared for war. Austrian troops poured into Italy, France was concentrating her forces at Toulon, and Garibaldi was

organising a corps of Italian volunteers. The Austrians crossed the Ticino (April 26), and the French troops were marched into Italy. Napoleon left Paris on the 10th of May, and reached Genoa on the 12th, where he was the next day joined by Victor Emmanuel. The first serious encounter took place at Montebello (May 20), when a strong body of Austrians was, after a desperate resistance, defeated and put to flight by a body of French troops. The Austrians again suffered a severe defeat at Palestro (May 31.) On 4th June the battle of Magenta was fought, in which the Austrians were, after a long and desperate conflict, defeated and put to flight by the combined army of the French and Sardinians, under the command of the Emperor Napoleon in person. The Austrians fought with great bravery and determination, but were not well officered, and the arrival of General M'Mahon with his troops at an opportune moment decided the battle against them. They had about 75,000 men in the field, while the allies numbered about 55,000. The latter lost about 4000 men in killed and wounded, the former about 10,000, besides 7000 prisoners. Next day the inhabitants of Milan rose in insurrection, and the garrison fled. Pavia was evacuated on the 7th, and on the 8th the fortified position of Melegnano was taken after three hours' hard fighting. The same day the allied monarchs made their triumphal entry into Milan. One stronghold after another now fell into the hands of the conquerers. The defeated army retreated to the further bank of the Mincio, where it was reorganised, and the emperor himself assumed the command. It then recrossed the Mincio, and took up a position near the village of Solferino. Here the allies came up to it, and both sides prepared for battle. The Austrian army numbered about 170,000 men, while the allied troops were not less than 150,000. The battle commenced early in the morning of the 24th June, and continued till late in the afternoon. The Austrian line extended for nearly 12 miles. The right and left wings of the Austrians were for some time successful, while Napoleon was using every effort to break their centre. In this he was at length successful, and the wings were then obliged to retire in order that they might not be overflanked. The French lost in killed and wounded 12,000 men, the Sardinians 5000, and the Austrians 20,000, besides 7000 prisoners. The Austrians now abandoned the line of the Mincio, and fell back upon Verona. The allies crossed the Mincio, Peschiera was invested, and great preparations were made on both sides for renewing the contest. While all Europe was in the expectation of another great battle, news arrived that an armistice for five weeks had been agreed to; and on 11th July the two emperors met at Villafranca, and agreed to terms of peace. A conference was afterwards held at Zürich, and a treaty drawn up and signed (10th November 1859). By it Austria gave up Lombardy, with the exception of the fortresses of Mantua and Peschiera, to Napoleon, who was to hand it over to the king of Sardinia; Italy was to be formed into a confederation under the presidency of the Pope, and Austria was to be a member on account of Venetia; and the princes of Tuscany and Modena were to have their possessions restored to them.

In March 1860 the emperor, by patent, enlarged the number and powers of the Reichsrath or council of the empire, and on 21st October promulgated a new constitution, in which he declared the right to issue, alter, and abolish laws, to be exercised by him and his successors only with the co-operation of the lawfully assembled diets and of the Reichsrath. The things to be settled with the co-operation of the Reichsrath were all legislative matters relating to the rights, duties, and interests of the several kingdoms and countries, such as the laws connected with the coinage, currency, public credit, customs, and commercial matters. This was followed by proposals of similar changes for Hungary; and, on 27th February following, it was decreed that their former constitutions should be restored to Hungary, Croatia, Salvonia, and Transylvania. At last-mentioned date a fundamental law was also promulgated for the representation of the empire by a Reichsrath, composed of two bodies, a house of peers and a house of deputies, and declaring the constitution and functions of each. It was declared to be the earnest wish of the Government that hyper-centralisation should be avoided. On 1st May the new Reichsrath was formally opened by the emperor at Vienna, when he declared his conviction "that liberal institutions, with the conscientious introduction and maintenance of the principles of equal rights of all the nationalities of his empire, of the equality of all his subjects in the eye of the law, and of the participation of the representatives of the people in the legislation, would lead to a salutary transformation of the whole monarchy." Hungary, Croatia, Slavonia, and Transylvania declined to send representatives, claiming to have constitutions and rights distinct from the empire. The Reichsrath sat till the close of 1862, occupying itself chiefly with ecclesiastical affairs, the state of education, personal liberty, and the laws relating to the press, commerce, feudal tenures, &c. In 1863 the emperor of Austria invited the different potentates of Germany to meet him at Frankfort, in order to determine upon a scheme of reform for their common country. They almost all responded to the invitation except the king of Prussia, and the congress was opened (August 16) by a speech from the emperor. The proceedings, however, did not result in any important change, owing in great measure to the want of sympathy from Prussia.

The death of Ferdinand VII., king of Denmark (15th November 1863), gave rise to a general ferment in Germany on the subject of the duchies Schleswig, Holstein, and Lauenburg. To the Germans a united fatherland had long been a favorite idea, and they now saw a step towards its accomplishment. Notwithstanding the treaty of London (8th May 1852), which fixed the succession to the Danish crown, and was signed by Austria and Prussia, they denied the right of the new king, Christian IX., to the duchies, and laid claim to them as part of Germany. To enforce their claim the diet determined that they should be occupied by an armed force, and Saxony and Hanover were directed to enter and take possession of Holstein. This was done without their coming into hostile collision with the Danish troops, who retired to Schleswig (December 1863). Soon after this, however, Austria and Prussia gave notice that they, as the chief powers in Germany, intended to take upon themselves the carrying on of the war. Hostilities commenced (1st February 1864) when Austrian and Prussian troops crossed the Schleswig frontier. Denmark had trusted to England and France coming forward to maintain the conditions of the treaty of 1852; but these powers remained passive, and the Danes, after a short but heroic stand, were forced to succumb. An armistice was concluded (1st August), and a treaty of peace was eventually signed at Vienna (30th October), by which Denmark made over Schleswig, Holstein,, and Lauenburg to Austria and Prussia.

But Austria speedily suffered terrible retribution for the part she had taken in this affair. By inducing Austria to with join her, Prussia succeeded in removing part of the odium of the proceeding from herself, and she also succeeded in obtaining the aid of a rival power to secure territories which she had previously determined

to appropriate as her own. The acquired territory naturally lay very convenient for Prussia, and Austria would have willingly enough given up her claim on it if Prussia had agreed to grant her a territorial equivalent in some other quarter of her dominions. This the latter power declined to do, but would readily have consented to a pecuniary compensation. A convention was therefore held at Gastein (August 1865), which brought about a temporary understanding. Prussia was to receive Lauenburg on payment of a sum of 1,500,000 thalers, while Austria was to have the administration of affairs in Holstein, and Prussia in Schleswig. Austria, however, was desirous of the formation of the duchies into a separate state, and supported the claims of the duke of Augustenburg to them. This was strenuously opposed by Prussia, who regarded the public meetings that were permitted to be held in Holstein in support of this as a breach of agreement. Austria referred the question to the Frankfort diet, which decided in favor of the duke. Matters were now approaching a crisis. Prussia had long looked with jealousy upon the power of Austria, and considered a war with that country for the supremacy of Germany as sooner or later a necessity. The German people had for some time felt that there was not room for two great powers,—each too great to submit to the other,—one or other must give way before the country could obtain its proper place and influence in Europe. While both powers were professing the utmost desire for peace, each was actively preparing for war. Prussia entered into an alliance with Victor Emanuel (27th March 1866), the latter undertaking to declare war against Austria as soon as Prussia commenced hostilities, while the former engaged to secure Venetia for her Italian ally. In the beginning of May orders were issued by the emperor of Austria for putting the whole army upon a war footing, and for concentrating a portion of it upon the Bohemian and Silesian frontiers; and about the same time the Prussian cabinet issued orders to fill up to the war strength the different branches of the service. On 7th June the Prussian troops entered Holstein, and compelled the Austrians to retire, which they did without bloodshed.

Austria was in an unprepared state when the war actually broke out, but the Prussian forces, on the other hand, were thoroughly equipped. The Austrian army in the north amounted to 247,000 men, besides the Saxon army at Dresden of 24,000, in all 271,000. The Prussian force consisted of three armies: the first, under the command of Prince Frederick Charles, consisted of 93,000 men and was destined for Saxony and Bohemia; and second, under the crown prince, numbered 115,000 men, and was to operate in Silesia; while the third, or army of the Elbe, under General Herwarth, consisting of 46,000 men, was to march on the right flank of the first army, making in all 254,000 men, besides reserve corps of 24,300 men stationed at Berlin. General Benedek was appointed commander-in-chief of the Austrian army, and his forces were distributed along the frontier that separates Moravia from Saxony and Silesia. On the 16th of June the Prussians entered Saxony, and marched upon Dresden, the Saxon army retiring to join the Austrians. On the 18th the Austrians entered Silesia, and the same day the Prussians took possession of Dresden. The three Prussian armies now advanced into Bohemia, and endeavored to concentrate in the direction of Gitschin. On June 26th an engagement took place between some companies of the first army and a body of Austrians at Podol, in which the latter were defeated, while, at Hühnerwasser, the advanced guard of the Elbe army attacked some Austrian troops and drove them back towards Münchengrätz. Here, on the 28th, a severe struggle took place between the Prussians and the Austrians, supported by the Saxons, but the latter were ultimately driven back in the direction of Gitschin. In the meantime the second army, under the crown prince, had to march through the long and narrow passes of the mountains lying between Silesia and Bohemia. On the 27th one of the corps of this army, under General Steinmetz, engaged an Austrian force under General Ramming, and after a severe contest began to give way, but the crown prince coming up, the Austrians were driven back. The same day another corps of this army took possession of Trautenau, but were attacked by the Austrians under General Gablenz, and sustained a repulse. Both sides having received reinforcements, the action was renewed next day at Soor, when victory ultimately declared for the Prussians. At Skalitz, on the 28th, the Prussians, under Steinmetz, were attacked by the Austrians under Archduke Leopold, but the latter were defeated, and the town taken by storm. It is said that on this occasion the archduke had disobeyed positive orders, which were on no account to make an attack. On the 29th, two divisions of the first army, under Generals Tümpling and Werder defeated the Austrians under Count Clam Gallas, at Gitschin, and took the town. The count, who occupied a strong position here, had orders not to attack the enemy, but these he had disobeyed, and the consequence was that Benedek, who had taken up a strong position at Dubenets to oppose the army of the crown prince, found himself at once in a most dangerous situation, and was obliged to retreat towards Königgrätz. On the same day bodies of Austrians were defeated at Königinhof and Schweinschädel. In these various engagements the Austrians lost in all from 30,000 to 40,000 men. Both sides now concentrated their forces in the direction of Königgrätz, and prepared for a general engagement. On June 30 the king of Prussia joined the army, and the battle of Königgrätz, or Sadowa, was fought on the 3d of July. The Austrians numbered about 220,000, and the Prussians probably about 240,000. The battle was long and well contested, both sides fighting with the greatest determination and bravery; but at length the Austrians were broken, and obliged to retire. The Prussians lost 359 officers and 8794 men, while the Austrians and Saxons lost in all about 44,200 men, of whom 19,800 were prisoners. This terminated what has been sometimes called the *Seven Days' War*. The Austrians retreated to Zwittau and afterwards to Olmütz. A portion of the Prussians went in pursuit, but the king, with an army of upwards of 100,000 men, marched on towards Vienna, and reached Nikulsburg, July 18. After the battle of Königgrätz, the emperor, seeing the disastrous state of his affairs, resolved to cede Venetia to the Emperor Napoleon, so as to be able to bring his army in Italy against the Prussians, and he also expressed his willingness to accept the mediation of the latter to bring about a peace. The Archduke Albert, who had the command of the army in Italy, with which he had inflicted a severe defeat on the Italians at Custozza, was recalled to take the chief command in place of Benedek. An armistice, however, was agreed upon through the mediation of France (22d July). The preliminaries of peace were signed at Nikolsburg (26th July), and negotiations were afterwards carried on at Prague, where a treaty was signed (23d August). By this treaty Austria gave up to the kingdom of Italy Venetia and the fortresses of the quadrilateral, namely, Peschiera, Mantua, Verona, and Legnano; recognised the dissolution of the late German Confederation, and consented to a new formation of Germany, in which she should have no part; gave up all claim to the duchies of Holstein and Schleswig; and agreed to pay a

war indemnity of 40,000,000 thalers, less 20,000,000 allowed her on account of the duchies.

Having thus obtained peace, the emperor now turned his attention to home affairs. Hungary was still in a very troubled and dissatisfied state. We have seen that she declined to send representatives to the Reichsrath, insisting on her right to self-government, and refusing to have anything else. The plan of opposition she adopted was that of passive resistance, by the non-payment of taxes. At length, at the opening of the Hungarian diet at Pesth by the emperor in person, on December 14, 1865, he recognised the necessity of self-government for Hungary so far as it did not affect the unity of the empire and the position of Austria as a great European power. He also recognised the Pragmatic Sanction as the basis on which a settlement of their difficulties was to be sought. At the opening of the diet on 19th November 1866, an imperial rescript, signed by the emperor, was read, in which he promised, by the appointment of a responsible ministry and the restoration of municipal self-government, to do justice to the constitutional demands of the Hungarians. In the end of 1866, Baron Beust, who had previously been prime minister of Saxony, and was not only a foreigner but a Protestant, was made foreign minister. He subsequently became prime minister and chancellor of the empire. In the spring of 1867 the emperor summoned the Reichsrath to assemble at Vienna to deliberate upon various important measures. It was opened by the emperor in person on May 22, and in his speech on the occasion he earnestly recommended to their attention these subjects. On June 8 the emperor and empress were crowned king and queen of Hungary at Pesth amid great public rejoicings, on which occasion full pardon was given for all past political offenses, and full liberty to all offenders residing in foreign countries to return. Many important and liberal measures were discussed and carried in the Reichsrath; in particular, marriage was made a civil contract, and the perfect equality of believers of different creeds was recognized. On May 25, 1868, the civil marriage bill received imperial assent, and on July 30, 1870, the concordat with Rome was declared to be suspended in consequence of the promulgation of the doctrine of Papal infallibility. This last measure introduced a very beneficial change in the relations between Austria and the kingdom of Italy.

For some years the Government had much difficulty in settling the law of elections so as to secure the due representation of the different races and classes of the people in the Reichsrath. On March 6, 1873, a reform bill was passed by the lower house, taking the election of members of the Reichsrath out of the hands of the provincial diets and transferring it to the body of the electors in the several provinces, thus substituting direct for indirect election. In April it passed the upper house and received the imperial assent. This measure was hailed with great satisfaction, and has established the government upon a much broader and more secure basis. The session of the new Reichsrath was opened by the emperor in person on November 5. In the same year a great exhibition of the industries of all nations was held at Vienna. It was opened on May 1 by the emperor, and attracted to the capital, among others, the prince of Wales, the czar of Russia, the emperor and empress of Germany, the king of Italy, and the shah of Persia. On December 2 the twenty-fifth anniversary of the emperor's accession to the throne was celebrated amid great rejoicing in Vienna, having been celebrated three days before in Pesth. The emperor and empress were present on both occasions, and everywhere met with an enthusiastic reception. In the spring of 1874 a bill for the abolition of the concordat was introduced by the Government, and measures for restricting the powers of the clergy passed both houses. In 1878 Bosnia and Herzegovina were placed under the protection of Austria.

AUSTRIA, ARCHDUCHY OF, the cradle and nucleus of the Austrian Empire, lies on both sides of the Danube, from the mouth of the Inn to Presburg, on the borders of Hungary, and embraces an area of 18,052 square miles, with a population of nearly 3,300,000. It now forms three of the crown-lands, or administrative provinces of the empire—viz.: Lower and Upper Austria (*i. e.*, Austria below and Austria above the Ens), and the duchy of Salzburg. The population is mostly German Catholic. The chief towns, besides Vienna, are Wiener-Neustadt, Salzburg, Steyer, Linz, and Ischl.

AUTEUIL, formerly a country village at the entrance of the Bois de Boulogne, now inclosed within the fortifications of Paris. It is known as the residence of famous literary men—such as Boileau and Molière.

AUTOCRACY (Gr., sole mastery, ruling by one's self) signifies that form of government in which the sovereign unites in himself the legislative and the executive power of the State, and thus rules uncontrolled. Such a sovereign is therefore called an autocrat. Nearly all eastern Governments are of this form.

AUTOCHTHONES, in *Greek Mythology*, the first human beings who appeared in the world, and who, as their name implies, were believed to have sprung from the earth itself. Instead of one pair as the first parents of the whole race, each district of Greece had its own autochthones, who, according to the prominent physical features of the neighborhood, were supposed to have been produced from trees, rocks, or marshy places, the most peculiar, and apparently the most widely-spread belief being that which traced the origin of mankind to the otherwise unproductive rocks.

AUTO-DA-FÉ (*Act of Faith*), a public solemnity of the Inquisition in Spain and Portugal, at which the sentences of the court were read; those who were declared innocent were formally absolved, and the condemned were handed over to the secular power for punishment. The day chosen was usually some Sunday between Trinity and Advent. The first auto-da-fe was held by Torquemada at Seville in 1481; the last was probably that mentioned by Llorente, the historian of the Inquisition, as having been solemnised in Mexico in 1815. See INQUISITION.

AUTOGRAPH, that which is written with a person's own hand, an original manuscript as opposed to an *apograph* or copy, is used to designate either a whole document (*e.g.*, a letter) or a signature only.

AUTOLYCUS of PITANE, in Æolis, was one of the earliest Greek writers on mathematics and astronomy. As he is said to have given instruction to Arcesilaus, he probably flourished about the middle of the 4th century B.C.

AUTOMATON (from self, and to seize), a self-moving machine, or one in which the principle of motion is contained within the mechanism itself. According to this description, clocks, watches, and all machines of a similar kind, are automata, but the word is generally applied to contrivances which simulate for a time the motions of animal life. If the human figure and actions be represented, the automaton has sometimes been called specially an *androides*. We have very early notices of the construction of automata *e.g.*, the tripods of Vulcan, and the moving figures of Dædalus. 400 years B.C., Archytas of Tarentum is said to have made a wooden pigeon that could fly; and during the Middle Ages numerous instances of the construction of automata are recorded. Regiomontanus is said to have

made an iron fly, which would flutter round the room and return to his hand, and also an eagle, which flew before the Emperor Maximilian when he was entering Nuremberg. Roger Bacon is said to have forged a brazen head which spoke, and Albertus Magnus to have had an androides, which acted as doorkeeper, and was broken to pieces by Aquinas. Of these, as of some later instances, *e.g.*, the figure constructed by Descartes and the automata exhibited by Dr. Camus, not much is accurately known. But in the 18th century, Vaucanson, the celebrated mechanician, exhibited three admirable figures, — the flute-player, the tambourine-player, and the duck, which was capable of eating, drinking, and imitating exactly the natural voice of that fowl. No notice of automata can be complete without at least a reference to Kempelen's famous chess player, which for many years astonished and puzzled Europe. This figure, however, was no true automaton, although the mechanical contrivances for concealing the real performer and giving effect to his desired movements were exceedingly ingenious.

AUTOPSY (Gr. seeing for one's self), eye-witnessing, a direct observation; but generally used of a post-mortem examination or dissection of the dead body.

AUTOTYPE. In this process a sheet of paper coated with a film of bichromatized gelatine, in which lampblack or other permanent pigment has been held in solution or suspension, is exposed to the action of light in a printing-frame, beneath an ordinary photograph negative. In proportion as the light is admitted to the gelatine film, or "tissue," through the negative, it becomes hardened and insoluble in water. The print is afterward treated by washing away the unaltered portions of the film, and the result is a permanent print of the object photographed. The process is admirably adapted for the reproduction of oil-paintings.

AUTUMN, the third season of the year, between summer and winter. Astronomically, in the Northern Hemisphere, it begins at the autumnal equinox, when the sun enters Libra, September 22, and ends at the winter solstice, when the sun enters Capricorn, December 21. According to Webster, in North America it includes the months of September, October and November. In the Southern Hemisphere it corresponds in time to the northern spring.

AUTUN, the capital of an arondissement of the same name in the department of Saône and Loire, in France, is picturesquely situated on the declivity of a hill, at the foot of which flows the Arroux. It is one of the most ancient towns of France; and when Cæsar invaded Gaul it was the most important of the Ædui. Its name was then Bibracte, but being afterward much improved and embellished by Augustus it took that of Augustodunum. Population, 12,682.

AUVERGNE, a district, and formerly a province, of France, corresponding to the departments of Cantal and Puy-de-Dôme, with the arrondissement of Brioude in Haute-Loire. It is divided into Lower and Upper by the River Rue, the distinction between the two portions being well marked. Population (1890) 54,000.

AUXENTIUS of CAPPADOCIA was an Arian theologian of some eminence. When Constantine deposed the orthodox bishops who resisted, Auxentius was installed into the seat of Dionysius, bishop of Milan, and came to be regarded as the great opponent of the Nicene doctrine in the West.

AUXERRE (the ancient *Autissiodurum*), a town of France, in the department of Yonne, situated on the banks of the Yonne, in a wine-producing district, and built in an antique fashion. Population, 18,390.

AUXONNE (formerly *Assonium*, *i. e.*, *ad Sonam*, from its position on the Saône), a city of France, in the arrondissement of Dijon and department of Côte d'Or. It is strongly fortified, and possesses an old castle, an arsenal, and a school of artillery. Population, 5,000.

AVA, the former capital of the Burman empire, is situated on the Irawadi, which is here 3,282 feet broad, and which, making a bend out of its ordinary course, flows past the city on the north. On the east it has the river Myt-nge, a rapid stream 450 feet broad, which flows into the Irawadi close under its walls.

This former capital of the Burman dominions comprehends, according to the political divisions of that empire, the town of Sagaing, on the opposite shore of the Irawdi, and the town of Amarapura, four miles to the east. To each of the towns of Ava, Sagaing, and Amarapura, are attached districts, the two former of which extend twelve miles along the river, and are of equal breadth. The district of Amarapura is of equal size, so that Ava must be considered as not only the name of the former capital, but of a large district, which includes an area of 288 miles, containing, according to the most accurate estimate, 354,200 inhabitants; but the city of Ava is not supposed to contain more than 50,000 inhabitants.

AVALANCHES (Fr., from *avaler*, to descend) are masses of snow or ice that slide or roll down the declivities of high mountains, and often occasion great devastation. Ice avalanches are those that are seen and heard in summer thundering down the steeps of the Alps. They consist of masses of ice that detach themselves from the glaciers in the upper regions. They are most common in July, August, and September. Nine great Alpine avalanches, which cost 447 lives, are on record between 1518 and 1879, the most destructive being one of 1827, which swept away half the village of Biel, in the Upper Valais, with eighty-eight inhabitants. Sudden avalanches, larger or smaller, constitute one of the special dangers of Alpine climbing.

AVALLON, a town of France, in the department of Yonne, finely situated on a granite rock, at the foot of which flows the river Voisin or Cousin. Pop., 6,100.

AVATAR (Sanskrit, *avatâra*) signifies primarily a descent, but is specially applied to the descent of a Hindu deity upon the earth in a manifest shape, either for beneficent or for retributive ends.

AVATCHA, one of the numerous volcanoes of Kamchatka. It rises to a height of nearly 9,000 feet (Mr. Kennan says 11,000), and has an extensive crater at the summit and another on the side. It was in active eruption in 1827, 1837, and 1855.

AVEBURY, a village of England, in the county of Wilts, six miles west of Marlborough. It occupies the site of one of the most remarkable megalithic structures in England. This consisted of a large outer circle formed of 100 stones of from fifteen to seventeen feet in height and about forty feet in circumference, enclosing an area of about 1,000 feet in diameter. This circle was surrounded by a broad ditch and lofty rampart. Within its area were two smaller circles, 350 and 325 feet in diameter respectively, each consisting of a double concentric row of stones.

AVEIRO, a town in Portugal, province of Beira, the seat of a bishopric and college. Population, 7,167.

AVELLA, a town of Italy, in the province of Principato Ulteriore, a fine situation, and commanding most extensive prospects. Pop., 3,714.

AVELLINO, a fortified city of Italy, in the province of Principato Ulteriore, at the foot of Mount Vergine, and twenty-eight miles east of Naples. Pop., 16,376.

AVEMPACE. ABU BEKR MOHAMMED IBN JAHYA, surnamed Ibn Badja or Ibn Sayeg (*i.e.* son of the goldsmith), whose name has been corrupted by the Latins into Avempace, Avenpace, or Aben Pace, was the ear-

liest and one of the most distinguished of the Arab philosophers in Spain. Almost nothing is known in the events of his life; he was born, probably at Saragossa, toward the close of the eleventh century, and died at Fez in 1148 at a not very advanced age.

AVENBRUGGER, or AUENBRUGGER, LEOPOLD, a physician of Vienna, the discoverer of the important mode of investigating diseases of the chest and abdomen by AUSCULTATION. (*q.v.*) His method was to apply the ear to the chest, and to note the sounds it afforded on percussion by the hand, or what is called *immediate auscultation*.

AVENTINUS (JOHANN THURMAYR), author of the *Annals of Bavaria*, was born in the year 1466 at Abensberg, and died in 1534.

AVENZOAR [ABU MERWAN ABDAMALEC IBN ZOHR], an eminent Arabian physician, who flourished about the end of the 11th or beginning of the 12th century, was born at Seville, where he exercised his profession with great reputation. His ancestors had been celebrated as physicians for several generations, and his son was afterwards held by the Arabians to be even more eminent in his profession than Avenzoar himself. He was contemporary with Averroes, who, according to Leo Africanus, heard his lectures and learned physic of him. This seems probable, because Averroes more than once gives Avenzoar very high and partly deserved praise, calling him admirable, glorious, the treasure of all knowledge, and the most supreme in physic from the time of Galen to his own. He wrote a book entitled *The Method of Preparing Medicines and Diet*, which was translated into Hebrew in the year 1280, and thence into Latin by Paravicius, whose version, first printed at Venice 1490, has passed through several editions.

AVERAGE, a term used in maritime commerce to signify damages or expenses resulting from the accidents of navigation. Average is either *general* or *particular*. General average arises when sacrifices have been made, or expenditures incurred, for the preservation of the ship, cargo, and freight, from some peril of the sea, or from its effects. It implies a subsequent contribution, from all the parties concerned, rateably to the values of their respective interests, to make good the loss thus occasioned. Particular average signifies the damage or partial loss happening to the ship, goods, or freight by some fortuitous or unavoidable accident. It is borne by the parties to whose property the misfortune happens, or by their insurers.

Although nothing can be more simple than the fundamental principle of general average, that a loss incurred for the advantage of all the coadventurers should be made good by them all in equitable proportion to their stakes in the adventure, the application of this principle to the varied and complicated cases which occur in the course of maritime commerce has given rise to many diversities of usage at different periods and in different countries. It is soon discovered that the principle cannot be applied in any settled or consistent manner unless by the aid of rules of a technical and sometimes of a seemingly arbitrary character. The distinctions on which these rules turn are often very refined indeed. This is the chief reason why no real progress has yet been made toward an international system of general average, notwithstanding repeated conferences and other efforts by most competent representatives from different countries, seeking to arrive at a common understanding as a preliminary basis for such a system.

The subject of general average is only incidentally connected with that of marine insurance, being itself a distinct branch of maritime law. But the subject of particular average arises directly out of the contract of insurance, and will therefore be best considered in connection with it. (See INSURANCE.)

AVERNUS, a lake of Campania in Italy, near Baiæ, occupying the crater of an extinct volcano, and about a mile and a half in circumference. From the gloomy horror of its surroundings, and the mephitic character of its exhalations, it was regarded by ancient superstition as an entrance to the infernal regions. It was especially dedicated to Proserpine, and an oracle was maintained on the spot. Originally there seems to have been no outlet to the lake, but Agrippa opened a passage to the Lucrine, and turned this "mouth of hell" into a harbor for ships. The channel, however, appears to have become obstructed at a later period. The *Lago d'Averno* is now greatly frequented by foreign tourists, who are shown what pass for the Sibyl's Grotto, the Sibyl's Bath, and the entrance to the infernal regions, as well as the tunnel from Cumæ, and ruins variously identified as belonging to a temple or a bathing-place.

AVERROES, known among his own people as Abûl-Walid Mohammed Ibn-Ahmed Ibn-Mohammed IBN-ROSHD, the kâdi, was born as Cordova in 1126, and died at Marocco in 1198. His early life was occupied in mastering the curriculum of theology, jurisprudence, mathematics, medicine, and philosophy, under the approved teachers of the time. The years of his prime were a disastrous era for Mahometan Spain, where almost every city had its own petty king, whilst the Christian princes swept the land in constant inroads. But with the advent of the Almohades, the enthusiasm which the desert tribes had awakened, whilst it revived religious life and intensified the observance of the holy law within the realm, served at the same time to reunite the forces of Andalusia, and inflicted decisive defeats on the chiefs of the Christian North. For the last time before its final extinction the Moslem caliphate in Spain displayed a splendor which seemed to rival the ancient glories of the Ommiade court. Great mosques arose; schools and colleges were founded; hospitals, and other useful and beneficent constructions, proceeded from the public zeal of the sovereign; and under the patronage of two liberal rulers, Jusuf and Jakûb, science and philosophy flourished apace. It was Ibn-Tofail (Abubacer), the philosophic vizier of Jusuf, who introduced Averroes to that prince, and Avenzoar (Ibn-Zohr), the greatest of Moslem physicians, was his friend. Averroes, who was versed in the Malekite system of law, was made kâdi of Seville (1169), and in similar appointments the next twenty-five years of his life were passed. We find him at different periods in Seville, Cordova, and Marocco, probably following the court of Jusuf Almansur, who took pleasure in engaging him in discussions on the theories of philosophy and their bearings on the faith of Islam. But science and free thought then, as now, in Islam, depended almost solely on the tastes of the wealthy and the favor of the monarch. The ignorant fanaticism of the multitude viewed speculative studies with deep dislike and distrust, and deemed any one a Zendik (infidel) who did not rest content with the natural science of the Koran. These smouldering hatreds burst into open flame about the year 1195. Whether, as one story ran, he had failed in conversation and in his writings to pay the customary deference to the emir, or a court intrigue had changed the policy of the moment, at any event Averroes was accused of heretical opinions and pursuits, stripped of his honors, and banished to a place near Cordova, where his actions were closely watched. Tales have been told of the insults he had to suffer from a bigoted populace. At the same time efforts were made to stamp out all liberal culture in Andalusia, so far as it went beyond the little medicine, arithmetic, and astronomy required for practical

life. But the storm soon passed, when the transient passion of the people had been satisfied, and Averroes for a brief period survived his restoration to honor. He died in the year before his patron Almansur, with whom (in 1199) the political power of the Moslems came to an end, as did the culture of liberal science with Averroes.

For Aristotle the reverence of Averroes was unbounded, and to expound him was his chosen task. The uncritical receptivity of his age, the defects of the Arabic versions, the emphatic theism of his creed, and the rationalising mysticism of some Oriental thought, may have sometimes led him astray, and given prominence to the less obvious features of Aristotelianism. But in his conception of the relation between philosophy and religion, Averroes had a light which the Latins were without. Averroes maintains that a return must be made to the words and teaching of the prophet; that science must not expend itself in dogmatising on the metaphysical consequences of fragments of doctrine for popular acceptance, but must proceed to reflect upon and examine the existing things of the world. Averroes, at the same time, condemns the attempts of those who tried to give demonstrative science where the mind was not capable of more than rhetoric; they harm religion by their mere negations, destroying an old sensuous creed, but cannot build up a higher and intellectual faith.

Averroes, rejected by his Moslem countrymen, found a hearing among the Jews, to whom Maimonides had shown the free paths of Greek speculation. In the cities of Languedoc and Provence, to which they had been driven by Spanish fanaticism, the Jews no longer used the learned Arabic, and translations of the works of Averroes became necessary. His writings became the text-book of Levi ben Gerson at Perpignan, and of Moses of Narbonne. Meanwhile, before 1250, Averroes became accessible to the Latin Schoolmen by means of versions, accredited by the names of Michael Scot and others. William of Auvergne is the first Schoolman who criticises the doctrines of Averroes, not, however, by name. Albertus Magnus and St. Thomas devoted special treatises to an examination of the Averroist theory of the unity of intellect, which they labor to confute in order to establish the othodoxy of Aristotle. But as early as Ægidius Romanus (1247-1316), Averroes had been stamped as the patron of indifference to theological dogmas and credited with the emancipation which was equally due to wider experience and the lessons of the Crusades. There had never been an absence of protest against the hierarchical doctrine. Berengar had struggled in that interest, and with Abelard, in the 12th century, the revolt against authority in belief grew loud. The dialogue between a Christian, a Jew, and a philosopher suggested a comparative estimate of religions, and placed the natural religion of the moral law above all positive revelations. Nihilists and naturalists, who deified logic and science at the expense of faith, were not unknown at Paris in the days of John of Salisbury. In such a critical generation the words of Averroism found willing ears, and pupils who outran their teacher. Paris became the centre of a sceptical society, which the decrees of bishops and councils, and the enthusiasm of the orthodox doctors and knight-errants of Catholicism, were powerless to extinguish. At Oxford Averroes told more as the great commentator. In the days of Roger Bacon he had become an authority. Bacon, placing him beside Aristotle and Avicenna, recommends the study of Arabic as the only way of getting the knowledge which bad versions made almost hopeless; and the student of the present day might echo his remark.

Meanwhile Averroism had, in the eye of the great Dominican school, come to be regarded as the archenemy of the truth. When Frederick II. consulted a Moslem free-thinker on the mysteries of the faith, when the phrase or legend of the "Three Impostors" presented in its most offensive form the scientific survey of the three laws of Moses, Christ, and Mahomet, and when characteristic doctrines of Averroes were misunderstood, it soon followed that his name became the badge of the scoffer and the sceptic.

It was in the universities of North Italy that Averroism finally settled, and there for three centuries it continued as a stronghold of Scholasticism to resist the efforts of revived antiquity and of advanced science. Padua became the seat of Averroist Aristotelianism; and, when Padua was conquered by Venice in 1405, the printers of the republic spread abroad the teaching of the professors in the university. As early as 1300 at Padua, Petrus Aponensis, a notable expositor of medical theories, had betrayed a heterodoxy in faith; and John of Jandun, one of the pamphleteers on the side of Louis of Bavaria, was a keen follower of Averroes, whom he styles a "perfect and most glorious phycicist."

With Pomponatius, in 1495, a brilliant epoch began for the school of Padua. Questions of permanent and present interest took the place of outworn scholastic problems. The disputants ranged themselves under the rival commentators, Alexander and Averroes; and the immortality of the soul became the battle-ground of the two parties. Pomponatius defended the Alexandrist doctrine of the utter mortality of the soul, whilst Augustinus Niphus, the Averroist, was entrusted by Leo X. with the task of defending the Catholic doctrine.

Meantime, in 1497, Aristotle was for the first time expounded in Greek at Padua. Plato had long been the favorite study at Florence; and Humanists, like Erasmus, Ludovicus Vives, and Nizolius, enamored of the popular philosophy of Cicero and Quintilian, poured out the vials of their contempt on scholastic barbarism with its "impious and thrice-accursed Averroes." The editors of Averroes complain that the popular taste had forsaken them for the Greek. Nevertheless, while Fallopius, Vesalius, and Galileo were claiming attention to their discoveries, the Professors Zabarella, Piccolomini, Pendasio and Cremonini continued the traditions of Averroism, not without changes and additions. Cremonini, the last of them, died in 1631, after lecturing twelve years at Ferrara, and forty at Padua. The legend which tells that he laid aside his telescope rather than see Jupiter's moons, which Galileo had discovered, is a parable of the fall of scholastic Averroism. Mediævalism, with its misconstruction of Averroes, perished because it would not see that the interpretation of the past calls for the ripest knowledge of all discoveries in the present.

AVERSA, a town of Italy, province of Terra di Lavoro, situated in a beautiful plain covered with orange-groves and vineyards, about midway between Naples and Capua. It is the seat of a wealthy bishopric, and its foundling hospital and lunatic asylum, the latter founded by Murat, are very celebrated. Aversa owed its origin to the Normans, and dates from 1030, the people of the ancient city of Atella being transported thither. Population, 21,176.

AVESNES, a town of France, in the department of Nord, situated on the Greater Helpe. Pop., 4,000.

AVEYRON, a department in the S. of France, bounded on the N. by Cantal, E. by Lozère, S. Hérault and Tarn, and W. by Tarn-et-Garonne and Lot, containing an area of 3429 square miles. It corresponds to a large portion of the ancient district of Rouergue in Guienne, which formerly gave its name to a family of counts. Its earliest inhabitants known to us were the Rutheni, whose capital was Segodunum, identified

with the modern Rodez. The department is rich in prehistoric antiquities, such as the dolmens at Taurines, Laumières, Grailhe, etc. Pop., 410,000.

AVEZZANO, a town of Italy, in Abruzzo Ulteriore II., containing a castle, which was built in 1499 by Virgilio Orsini, afterward belonged to the family of the Colonnas, and is now in possession of the Barberinis. Population about 5,900.

AVIARY, a place for keeping birds. Amongst the Romans, the name *aviarium* was sometimes used of a place for keeping and fattening birds meant to be killed for food.

AVICEBRON. The writer referred to by the scholastics of the 13th century under this name was supposed by them to be an Arabian philosopher, and was accordingly classed along with Avempace, Abubacer, and others. Recent researches have shown that this is an error, and that this author, about whom so little was known, is identical with Salomon ben Gebirol, a Jewish writer, several of whose religious poems are still celebrated among the Jews. Few details are known regarding the life of Gebirol. He was born at Malaga, and received his education at Saragossa, where, in 1045, he wrote a small treatise on morals, which has been several times reprinted. He died in 1070 at Valencia.

AVICENNA (in Arabic, Abû Ali el-Hosein Ibn-Abdallah Ibn-Sina) was born about the year 980 A.D. at Afshena, one of the many hamlets in the district of Bokhara. His mother was a native of the place; his father, a Persian from Balkh, filled the post of tax-collector in the neighboring town of Harmaitin, under Nûh ibn Mansir, the Samanide emir of Bokhara. On the birth of Avicenna's younger brother the family migrated to the capital, then one of the chief cities of the Moslem world, and famous for a culture which was older than its conquest by the Saracens. Avicenna was put in charge of a tutor, and his precocity soon made him the marvel of his neighbors,—as a boy of ten who knew by rote the Koran and much Arabic poetry besides. Under him Avicenna read the *Isagoge* of Porphyry, and the first propositions of Euclid. But the pupil soon found his teacher to be but a charlatan, and betook himself, aided by commentaries, to master logic, geometry, and the Almagest. Before he was sixteen he not merely knew medical theory, but by gratuitous attendance on the sick had, according to his own account, discovered new methods of treatment. For the next year and a half he worked at the higher philosophy, in which he encountered greater obstacles. In such moments of baffled inquiry he would leave his books, perform the requisite ablutions, then hie to the mosque, and continue in prayer till light broke on his difficulties. Deep into the night he would continue his studies, stimulating his senses by occasional cups of wine, and even in his dreams problems would pursue him and work out their solution. Forty times, it is said, he read through the metaphysics of Aristotle, till the words were imprinted on his memory; but their meaning was hopelessly obscure, until one day they found illumination from the little commentary by Alfarabius, which he bought at a bookstall for the small sum of three drachmæ. So great was his joy at the discovery, thus made by help of a work from which he expected only mystery, that he hastened to return thanks to God, and bestowed an alms upon the poor. Thus, by the end of his seventeenth year, he had gone the round of the learning of his time; his apprenticeship of study was concluded, and he went forth a master to find a market for his accomplishments.

His first appointment was that of physician to the emir, whom the fame of the youthful prodigy had reached, and who owed him his recovery from a dangerous illness. Avicenna's chief reward for this service was access to the royal library, contained in several rooms, each with its chests of manuscripts in some branch of learning. The Samanides were well-known patrons of scholarship and scholars, and stood conspicuous amid the fashion of the period, which made a library and a learned retinue an indispensable accompaniment of an emir, even in the days of campaign. In such a library Avicenna could inspect works of great rarity, and study the progress of science. When the library was destroyed by fire not long thereafter, the enemies of Avicenna accused him of burning it, in order for ever to conceal the sources of his knowledge. Meanwhile, he assisted his father in his financial labors, but still found time to write some of his earliest works for two wealthy patrons, whose absolute property they became. Among them was the *Collectio*, one of those short synopses of knowledge which an author threw off for different patrons.

At the age of twenty-two Avicenna lost his father. The Samanide dynasty, which for ten years had been hard pressed between the Turkish Khan of Kashgar on the north and the rulers of Ghazni on the south, came to its end in December 1004. Avicenna seems to have declined the offers of Mahmud the Ghaznevide (who, like his compeers, was rapidly gathering a brilliant cortege of savants, including the astronomer Albiruni), and proceeded westwards to the city of Urdjensh in the modern district of Khiva, where the vizier, regarded as a friend of scholars, gave him a small monthly stipend. But the pay was small, and Avicenna wandered from place to place through the districts of Nishapur and Merv to the borders of Khorasan, seeking an opening for his talents. In the restless change which threw the several cities of Iran from hand to hand among those feudal emirs of the Buide family, who disputed for the fragments of the caliphate, the interests of letters and science were not likely to be regarded. Shems al-Maâli Kabûs, the generous ruler of Deilem, himself a poet and a scholar, with whom he had expected to find an asylum, was about that date (1013) starved to death by his own revolted soldiery. Avicenna himself was at this season stricken down by a severe illness. Finally at Jorjân, near the Caspian, he met with a friend, who bought near his own house a dwelling in which Avicenna lectured on logic and astronomy. For this patron several of his treatises were written; and the commencement of his *Canon of Medicine* also dates from his stay in Hyrcania.

He subsequently settled at Rai, in the vicinity of the modern Teheran, where a son of the last emir, Medj Addaula, was nominal ruler, under the regency of his mother. At Rai about thirty of his shorter works are said to have been composed. But the constant feuds which raged between the regent and her second son, Shems Addaula, compelled the scholar to quit the place, and after a brief sojourn at Kaswîn, he passed southwards to Hamadân, where that prince had established himself. At first he entered into the service of a high-born lady; but ere long the emir, hearing of his arrival, called him in as medical attendant, and sent him back with presents to his dwelling. Avicenna was even raised to the office of vizier; but the turbulent soldiery, composed of Koords and Turks, mutinied against their nominal sovereign, and demanded that the new vizier should be put to death. Shems Addaula consented that he should be banished from the country. Avicenna, however, remained hidden for forty days in a sheikh's house, till a fresh attack of illness induced the emir to restore him to his post. Even during this perturbed time he prosecuted his studies and teaching. Every

evening extracts from his great works, the *Canon* and the *Sanatio*, were dictated and explained to his pupils; among whom, when the lesson was over, he spent the rest of the night in festive enjoyment with a band of singers and players. On the death of the emir Avicenna ceased to be vizier, and hid himself in the house of an apothecary, where, with intense assiduity, he continued the composition of his works. Meanwhile, he had written to Abu Jaafar, the prefect of Ispahan, offering his services; but the new emir of Hamadân getting to hear of this correspondence, and discovering the place of Avicenna's concealment, incarcerated him in a fortress. War meanwhile continued between the rulers of Ispahan and Hamadân; in 1024 the former captured Hamadân and its towns, and expelled the Turkish mercenaries. When the storm had passed Avicenna returned with the emir to Hamadân, and carried on his literary labors; but at length, accompanied by his brother, a favorite pupil, and two slaves, made his escape out of the city in the dress of a Sufite ascetic. After a perilous journey they reached Ispahan, and received an honorable welcome from the prince. The remaining ten or twelve years of Avicenna's life were spent in the service of Abu Jaafar Ala Addaula, whom he accompanied as physician and general literary and scientific adviser, even in his numerous campaigns. During these years he began to study literary matters and philology, instigated, it is asserted, by criticisms on his style. But amid his restless study Avicenna never forgot his love of enjoyment. Unusual bodily vigor enabled him to combine severe devotion to work with facile indulgence in sensual pleasures. His passion for wine and women was almost as well known as his learning. With much gaiety of heart, and great powers of understanding, he showed at the same time the spirit of an Aristippus more than that of an Aristotle at the courts of the wealthy. Versatile, light-hearted, boastful, and pleasure-loving, he contrasts with the nobler and more intellectual character of Averroes. His bouts of pleasure gradually weakened his constitution; a severe colic, which seized him on the march of the army against Hamadân, was checked by remedies so violent that Avicenna could scarcely stand. On a similar occasion the disease returned; with difficulty he reached Hamadân, where, finding the disease gaining ground, he refused to keep up the regimen imposed, and resigned himself to his fate. On his deathbed remorse seized him; he bestowed his goods on the poor, restored unjust gains, freed his slaves, and every third day till his death listened to the reading of the Koran. He died in June 1037, in his 58th year, and was buried among the palm-trees by the Kiblah of Hamadân.

The rank of Avicenna in the mediæval world as a philosopher was far beneath his fame as a physician. Still, the logic of Albertus Magnus and succeeding doctors was largely indebted to him for its formulæ.

The place of Avicenna amongst Moslem philosophers is seen in the fact that Shahrastani takes him as the tpye of all, and that Algazali's attack against philosophy is in reality almost entirely directed against Avicenna. His system is in the main a codification of Aristotle modified by fundamental views of Neo-Platonist origin, and it tends to be a compromise with theology. In order, for example, to maintain the necessity of creation, he taught that all things except God were admissible or possible in their own nature, but that certain of them were rendered necessary by the act of the creative first agent,—in other words, that the possible could be transformed into the necessary. Avicenna's theory of the process of knowledge is an interesting part of his doctrine. Man has a rational soul, one face of which is turned towards the body, and, by the help of the higher aspect, acts as practical understanding; the other face lies open to the reception and acquisition of the intelligible forms, and its aim is to become a reasonable world, reproducing the forms of the universe and their intelligible order. In man there is only the susceptibility to reason, which is sustained and helped by the light of the active intellect. Man may prepare himself for this influx by removing the obstacles which prevent the union of the intellect with the human vessel destined for its reception.

Upwards of 100 treatises are ascribed to Avicenna. Some of them are tracts of a few pages, others are works extending through several volumes. The best-known amongst them, and that to which Avicenna owed his European reputation, is the *Canon of Medicine;* an Arabic edition of it appeared at Rome 1593, and a Hebrew version at Naples in 1491.

AVIENUS, Rufus Festus, a Latin poet, who appears to have flourished in the latter half of the 4th century, but of whom nothing definite is known.

AVIGLIANO, a towo of Italy, in the province of Basilicata, eleven miles north-northwest of Potenza. A peculiar kind of pottery produced here toward the end of the 18th century is still sought after by collectors. The surrounding country is said to produce the finest cattle in the kingdom. Population (1890), 16,000.

AVIGNON, the chief town of the department of Vaucluse in France, situated in a beautiful plain, on the left bank of the Rhone, not far from the entrance of the Durance. It is surrounded by its ancient crenellated walls, which are in a state of remarkable preservation, and, on the outside, by a line of pleasant boulevards planted with trees. A precipitous rock rises from the river's edge; and from its summit the cathedral of *Nôtre Dame des Domes*, a building of the 12th century, looks down on the city, but is almost thrown into insignificance by the Palace of the Popes, which rises by its side, and stretches in sombre grandeur along the southern slope. This building, or congeries of buildings, was commenced by Benedict XII. in 1336, and continued by successive popes for sixty years. It covers an area of rather more than 1¼ acres. The paintings with which it was profusely adorned are in a great measure destroyed, and even the grandeur of its dismantled interiors was for a long time broken in upon by the carpentry and plaster-work of French barracks. A restoration has, however, been for some time in progress; and the building will again be appropriated for ecclesiastical and civic purposes. The churches of St. Agricol, St. Didier, and St. Pierre may be mentioned as of some importance; also the papal mint, now known as a music academy; the town-hall, built in 1862; the Calvet museum, rich in Roman remains; the Requien museum of natural history; and the Hôtel des Invalides. From 1309, when Clement V. took up his abode in the city, to 1377, when Gregory XI. returned to Rome, Avignon was the seat of the papal court, and it continued from 1378 to 1418 to be the seat of French anti-popes. In 1348 it was purchased by Pope Clement VI. from Joanna of Sicily for the sum of 80,000 florins, and it remained in possession of the popes till the French Revolution. Population, 38,196.

AVILA, a province of Spain, one of the modern divisions of the kingdom of Old Castile. It is bounded on the N. by Valladolid, E. by Segovia and Madrid, S. by Toledo and Caceres, and W. by Salamanca. The area is 2570 square miles; population, 176,769. It naturally divides itself into two sections, differing completely in soil, climate, productions, and social economy. The northern portion is generally level; the soil is of indifferent quality, strong and marly in a few places, but rocky in all the valleys of the Sierra de Avila; and

the climate alternates from severe cold in winter to extreme heat in summer. The population of this part is agricultural. The southern division is one mass of rugged granitic *sierras*, interspersed, however, with sheltered and well-watered valleys, abounding with rich vegetation. The winter here, especially in the elevated region of the Paramera and the waste lands of Avila, is long and severe, but the climate is not unhealthy. The inhabitants are occupied in the rearing of cattle.

AVILA (the ancient *Abula*), a city of Spain, the capital of the above province, is situated on the right bank of the Adaja, about 3,000 feet above the sea level, at the termination of the Guadarrama mountains.

AVILA, GIL GONZALEZ D', a Spanish biographer and antiquary, was born at Avila about the year 1577, and died there in 1658.

AVILA Y ZUNIGA, LUIS D', author of a Spanish history of the wars of Charles V. Nothing is known as to the place or date either of his birth or of his death.

AVILES, SAN NICOLAS DE (the Latin *Flavionavia*), a town of Spain, in the province of Oviedo, about a league from the sea-coast. It has considerable trade by means of its port, which affords good anchorage for all classes of vessels. Population, 3,299.

AVLONA, or VALONA, a town and seaport of Albania, in the eyalet of Yanina. It stands on an eminence near the Gulf of Avlona, an inlet of the Adriatic, almost surrounded by mountains. In 1464 it was taken by the Ottomans, and after being in Venetian possession in 1690, was restored to them in 1691. In 1851 it suffered severely from an earthquake.

AVOCA, or OVOCA (Celt. meeting of the waters), a small river in the southeast of County Wicklow, formed by the union of the Avonmore and Avonbeg, which rise in the hills of the center of the county. The Avoca runs through a very picturesque vale only a quarter of a mile broad, with wooded banks 300 to 500 feet high, and after a course of nine miles reaches the sea at Arklow. The "sweet vale" is celebrated in one of Moore's *Irish Melodies*. At Avondale, on the Avonmore, was born Mr. C. S. Parnell.

AVOCET (*Recurvirostra*), a genus of birds which, although having the feet webbed nearly to the end of the toes, is usually ranked among the Grallæ, or Grallatores, on account of the length of the legs, the half-naked thighs, the long, slender, elastic bill, and the general snipe-like habit. They scoop through the mud with the bill, first to one side and then to the other, in quest of worms and other small animals; although Audubon also observed the American avocet taking insects which were swimming on the surface of the water, and expertly catching them in the air, running after them with partially expanded wings. The avocets are found in most parts of the globe. The American avocet (*R. americana*) has the bill less recurved than the common avocet.

AVOIRDUPOIS, or AVERDUPOIS, the name of a system of weights, commonly supposed to be derived from the French *avoir du pois*, to have weight. The suggested derivation from *averer*, to verify, seems, however, more probable, *averdupois* being the earlier form of the word. Avoirdupois weight is used for all commodities except the precious metals, gems and medicines. The pound avoirdupois, which is equal to 7,000 grains troy, or 453.54 grammes, is divided into 16 ounces, and the ounce into 16 drams. See WEIGHTS AND MEASURES.

AVOLA, a city on the coast of Sicily, in the province of Syracuse, with 11,912 inhabitants.

AVON, the name of several rivers in England, Scotland and France. The word is Celtic, appearing in Welsh, as *afon*, in Manx as *aon*, and in Gaelic as *abhuinn* (pronounced *avain*), and is radically identical with the Sanskirt *ap*, water, and the Latin *aqua* and *amnis*. Of the principal English rivers of this name in its full form three belong to the basin of the Severn. The Upper, or Shakespearean Avon, rising in Northamptonshire, near the battlefield of Naseby, flows through Warwickshire, Worcester, and Gloucester, past Rugby, Warwick, Stratford and Evesham, and joins the larger river at Tewkesbury; while the Lower Avon has its sources on the borders of Wiltshire, and enters the estuary of the Severn at King's Roads, after passing Malmesbury, Bath and Bristol.

AVRANCHES (ancient *Abrincatæ*, or *Ingena*) a town of France, in the department of Manche. It was an important military station of the Romans, and has in more modern times sustained several sieges, the most noticeable of which was the result of its opposition to Henry IV. Avranches was formerly a bishop's see, and its cathedral, destroyed as insecure in the time of the first French Revolution, was the finest in Normandy. Its site is now occupied by an open *place*, called after the celebrated Huet, bishop of Avranches; and one stone remains with an inscription marking it out as the spot where Henry II. received absolution for the murder of A' Becket. Population (1890), 8,500.

AWN (*Arista*), in the flowers of grasses, a solitary pointed bristle, growing either from a glume or a palea. The flowers of some grasses are entirely *awnless;* in many the glumes alone are *awned*, or only one of them; in others the glumes are awnless, and the paleæ, or one palea awned. In barley it is known as the "beard."

AXE, an instrument, usually of iron, edged with steel, for hewing timber and chopping wood. The haft or handle is of a length and size suitable for wielding with both hands, and is fitted into a head with an arching edge in the plane of the sweep of the tool—the axe differing in this last respect from the adze, which is found in use amongst some uncivilized people that do not use axes at all. Similar instruments of smaller size, for use with one hand, are called hatchets (Fr. *hachette*, diminutive of *hache*, an axe). Within historic times the axe has recovered its early importance with the progress of colonization, and its importance to settlers has led to the invention of the American axe, which effects speedier results with the smallest expenditure of strength.

AXEL, see ABSALON, Vol. 1, p. 18.

AXESTONE, a variety of the mineral Jade or Nephrite. It is of greenish, grayish or grayish-white color, is more or less translucent, hard, tough and not easily broken. It occurs in Silesia, in Central Asia and China, and in New Zealand and other islands of the Southern Pacific.

AXIL (*axilla*), in Botany, the angle between the upper side of a leaf and the stem or branch from which it grows. (2) In anatomical terminology, the axilla is the armpit.

AXHOLM, or AXELHOLM, an island in the northwest part of Lincolnshire, England, formed by the rivers Trent, Idle and Don. Area, 47,000 acres.

AXIOM is a word of great import both in general philosophy and in special science; it also has passed into the language of common life, being applied to any assertion of the truth of which the speaker happens to have a strong conviction, or which is put forward as beyond question. The scientific use of the word is most familiar in mathematics, where it is customary to lay down under the name of axioms, a number of propositions of which no proof is given or considered necessary, though the reason for such procedure may not be the same in every case, and in the same case may be variously understood by different minds.

AXIS, a genus of deer, abundant on the banks of the Ganges, but found throughout India and in many islands

of the Eastern archipelago. One of its Indian names is Chittra or Cheetal, and by British sportsmen in India it is often called the Spotted Hog-deer, though that name is also given to a rarer species. The axis has a great resemblance in size and coloring to the European fallow deer.

AXIS, in Geometry. The axis of a curved line is formed by a right line dividing the curve into two symmetrical parts, so that the part on one side exactly corresponds with that on the other; as in the parabola, the ellipse and the hyperbola. The axis of any geometrical solid is the right line which passes through the center of all the corresponding parallel sections of it; in this sense, we speak of the axis of a cylinder, a globe or a spheroid. In physical science, the axis of a *lens* is the right line passing through it in such a manner as to be perpendicular to both sides of it; and the axis of a telescope is the right line which passes through the center of all the glasses in the tube. The axis of the *eye* is the right line passing through the centers of the pupil and the crystalline lens.

AXIS, in Botany, a term applied to the central portion of the higher plants (higher cryptograms as well as phanerogams), which bears the appendages or lateral members arranged upon it. Those plants in which no distinction of axis and appendages can be made out are termed *Thallophytes*, and include algæ, litchens and fungi. The stem is called the *ascending axis*; the root, the *descending axis*. (2) In human anatomy the axis is the second vertebra of the neck.

AXMINSTER, a market-town of England, in the county of Devon, 147 miles from London, and 24 from Exeter. It takes its name from the river Axe, on which it stands. Population (1890), 3,000.

AXOLOTL (the Aztec word), an amphibian form occurring abundantly in some Mexican lakes, and found widely distributed in the western United States. It used to rank among the forms which permanently retain their gills (*Perennibranchiata*), but more complete observation has shown that it develops into a gill-less adult form (*Amblystoma*) like a salamander.

AXUM, an ancient city of Abyssinia, eighty-five miles northwest of Antalo, still remarkable for its ruins. It was for a long time the capital of a great Shemitic people, who extended their sway over a large part of Abyssinia; and the language spoken there at the time of the introduction of Christianity has continued to be the ecclesiastical language ever since. The chronicles of Abyssinia were preserved in the church, and are frequently referred to as the *Books of Axum*. The most interesting of the monuments still extant are the obelisk and the so-called coronation-room, both constructed of granite, and the latter containing some valuable bilingual inscriptions.

AYACUCHO, formerly Huamanga or Guamanga, a town in the Peruvian department of the same name, 220 miles east-southeast of Lima. Founded by Pizarro in 1539, it is now a handsome and thriving town. Here, on December 9, 1824, the combined forces of Peru and Colombia—the latter then comprising Ecuador, New Granada and Venezuela—totally defeated the last Spanish army that ever set foot on the continent. Population, 9,387. The department of Ayacucho has an area of 24,213 square miles, and a population of 142,000.

AYAMONTE, a fortified city of Spain, in the province of Huelva, on the left bank of the Guadiana, about two miles from it mouth. Population, 6,000.

AYE-AYE (*Cheiromys madagascariensis*) a rare and aberrant member of the Lemur family. It inhabits the woods of Madagascar, and was first noted in 1780 by Sonnerat, who was said to have given it the name aye-aye in reference to the astonished exclamation of some natives when they saw the first specimen of the curious creature caught by a European. It was long a puzzle to zoölogists; Buffon placed it beside squirrels, and Cuvier was also inclined to regard it as a rodent. It was carefully described by Owen in the *Transactions* of the Zoölogical Society, 1866, and since the publication of this beautiful and exhaustive memoir, there has been no doubt as to the position of the aye-aye as an aberrant lemur.

AYESHAH (also *Aysha* or *Aïsha*), the favorite wife of Mohammed, and daughter of Abu-Bekr, was born at Medina about 610 A. D., and was only nine years of age when the prophet married her. She was the only one of Mohammed's wives who accompanied him in his campaigns. Although Ayeshah bore no children to Mohammed, she was tenderly beloved by him. She was accused of adultery, but Mohammed produced a revelation from heaven (now in the Koran) to the effect that she was innocent. Mohammed expired in her arms (632). She died in 677.

AYLESBURY, a market town, parliamentary borough and railway junction, in the county of Buckingham, thirty-nine miles northwest of London. Population of parliamentary borough, 28,760.

AYLESFORD, a village of England, in the county of Kent, three and one-half miles from Maidstone, and thirty-two from London. Population of parish in 1889, 2,400.

AYLMER, John, Bishop of London in the reign of Queen Elizabeth, was born in the year 1521 at Aylmerhall, in the parish of Tilney, in the county of Norfolk. He seems to have been a man of harsh and violent temper, coarse and avaricious, and with few redeeming qualities. He is said to have been an able scholar, but he has left nothing which could prove this. He died in 1594.

AYR, County of, or Ayrshire, a Scottish county, bounded by Wigtownshire and the stewartry of Kirkcudbright on the south; by Kirkcudbright, Dumfries, and Lanark on the east, and by Renfrewshire on the north. On the west it has a coast line extending to seventy miles on the Irish Sea and the Firth of Clyde. The county contains 1,149 square miles, or 735,262 acres. The middle part, which is the broadest, is about twenty-six miles across. There are six rivers of some note in Ayrshire—Stinchar, Girvan, Doon, Ayr, Irvine and Garnock. Of these the Ayr, from which the county and country town take their name, is the largest. It rises at Glenbuck, on the border of Lanarkshire, and, after a course of thirty-three miles, falls into the Firth of Clyde at the county town. The scenery along its banks from Sorn downward—passing Catrine, Ballochmyle, Barskimming, Sundrum, Auchencruive and Craigie—is varied and beautiful. The lesser streams are numerous; and there are many fresh-water lochs, the largest of which is Loch Doon, the source of the river Doon. The southern and eastern parts of the county are hilly, but none of the peaks reaches a height of 2,000 feet.

The manufactures of Ayrshire have attained considerable importance. The cotton works at Catrine are extensive, and have been a long time established. The site was chosen with the view of utilizing the water power of the river Ayr, and steam is still merely an auxiliary. At Kilmarnock and Ayr there are extensive engineering establishments, and large carpet works; and other fabrics are manufactured in those towns and at Dalry, Kilbirnie, Beith and Stewarton.

The iron trade at Ayrshire has risen to great importance. The manufacture has long been carried on at Muirkirk, although the iron had to be carted long distances to Ayr and Glasgow before the introduction of

railways. Immense fields of ironstone have been opened up within the last quarter of a century; and there are now thirty-three furnaces in blast within the county, producing about 330,000 tons per annum. Ayrshire is well supplied with railways.

The rural population of Ayrshire is decreasing, but the mining population has increased, and the towns are growing.

AYR, the capital of the above county, is situated at the mouth of the river of the same name, and about forty miles south-southwest from Glasgow. The spot has probably been inhabited from a remote antiquity. Nothing, however, is known of its history till the close of the thirteenth century, when it was made a royal residence, and soon afterward a royal burgh, by William the Lion. On better authority, the records of the burgh, it is known that early in the sixteenth century Ayr was a place of considerable influence and trade. The liberality of William the Lion had bestowed upon the corporation an extensive grant of lands; while in addition to the well-endowed church of St. John's, it had two monasteries, each possessed of a fair revenue. When Scotland was overrun by Cromwell, Ayr was selected as the site of one of those forts which he built to command the country. This fortification, termed the citadel, enclosed an area of ten or twelve acres, and included within its limits the church of St. John's, in which the Scottish Parliament on one occasion met, and confirmed the title of Robert Bruce to the throne. Ayr proper lies on the south bank of the river, and is connected with Newton and Wallacetown on the north by two bridges, the old and the new, the "twa Brigs" of Burns. Of late years the town has extended greatly on the Ayr side of the stream. Ayr possesses several good streets and a number of elegant public buildings. Population, 20,000.

AYRER, JACOB, one of the earliest dramatists of Germany, was born in 1560, probably at Nuremberg, —at least he resided there when a mere boy. His first occupation was keeping an iron-store, which he did with considerable success. After studying law for some time at Bamberg, where he attained a good position as a lawyer, he returned to Nuremberg, and continued to practice there, acquiring the freedom of the city in 1594, and ultimately becoming an imperial notary. He died 26th March 1605.

AYTON, SIR ROBERT (1570–1638), a Scottish lyrical poet, the second son of Andrew Ayton of Kinaldie in Fifeshire, was educated at the University of St. Andrews, and seems afterwards to have resided for several years in France, where he gained considerable reputation as a poet and scholar. On the accession of James VI. in 1603, Ayton published a very elegant Latin panegyric, which at once brought him into notice and favor at court.

AYTOUN, WILLIAM EDMONSTOUNE, a Scottish poet, humorist, and miscellaneous writer, was born at Edinburgh, 21st June 1813. He was the only son of Roger Aytoun, a writer to the Signet, and the family was of the same stock as Sir Robert Ayton noticed above. In 1836 he made his earliest contributions to *Blackwood's Magazine*, in translations from Uhland; and from 1839 till his death he remained on the staff of *Blackwood's*. About 1841 he became acquainted with Mr. Theodore Martin, and in association with him wrote a series of light humorous papers on the tastes and follies of the day, in which were interspersed the verses which afterwards became popular as the *Bon Gualtier Ballads*. The work on which his reputation as a poet chiefly rests is the *Lays of the Scottish Cavaliers*. The first of these appeared in *Blackwood's Magazine* in April 1843, and the whole were published in a collected edition in 1848. They became very popular, and have passed through nineteen editions, the last of which has spirited and beautiful illustrations by Sir J. Noel Paton and W. H. Paton. In 1860 Aytoun was elected honorary president of the Associated Societies of Edinburgh University. The death of his mother took place in November 1861, and his own health was failing. In December 1863 he married Miss Kinnear, and health and happiness for a time revived; but his malady recurred, and he died at Blackhills, near Elgin, 4th August 1865.

AZAIS, PIERRE HYACINTHE, a brilliant French writer on philosophy, was born at Sorrèze in 1766, and died at Paris in 1845. He was educated at the college in his native town; and at the age of 17 joined a religious body with the view of afterwards entering the church. He remained only a year in this society, and then accepted an appointment as teacher in the college at Tarbes. The duties of this office proved most uncongenial to him, and he gladly entered the service of the bishop of Olèron, to whom he acted as secretary. He afterward acted as tutor to the Count de Bosc's sons, with whom he remained till the outbreak of the Revolution. Azais, at first an ardent admirer of that great movement, was struck with dismay at the atrocities that were perpetrated, and published a vehement pamphlet on the subject. He was denounced, and had to seek safety in flight. For eighteen months he found refuge in the hospital of the Sisters of Charity at Tarbes; and it was not till 1806 that he was able to settle at Paris. There, three years later, he published his treatise *Des Compensations dans les Destinées Humaines*, in which he sought to show that happiness and misery were fairly balanced in this world, and that consequently it was the duty of citizens to submit quietly to a fixed government. This doctrine was not displeasing to Napoleon, who made its author professor at St. Cyr. After the removal of that college, he obtained, in 1811, the post of inspector of the public library at Avignon, and from 1812 to 1815 he held a similar office at Nancy.

AZARA, DON FELIX DE, a Spanish naturalist, was born 18th May 1746, and died in 1811. He studied first at the university of Huesca, and afterwards at the military academy of Barcelona. In 1764 he entered the army as a cadet, and in 1767 obtained an ensigncy in the engineer corps. In 1781 he was appointed, with the rank of lieutenant-colonel of engineers and captain in the navy, on a commission to lay down the line of demarcation between the Spanish and Portuguese territories in South America. There he spent many years, observing and collecting specimens of the various interesting objects of natural history that abound in those wide and little-known regions.

AZARA, DON JOSE NICHOLAS D', the elder brother of the naturalist, born in 1731, was appointed in 1765 Spanish agent and procurator-general, and in 1785, ambassador at Rome. During his long residence there he distinguished himself as a collector of Italian antiquities and as a patron of art.

AZEGLIO, MASSIMO TAPARELLI, MARQUIS D', an eminent Italian author and statesman, was born in October 1798, at Turin. He was descended from an ancient and noble family of Piedmont, and was the son of a military officer, who, when the subject of this notice was in his fifteenth year, was appointed ambassador to Rome. The boy went with him, and, being thus introduced to the magnificent works of art for which the Eternal City is famous, contracted a love for painting, as well as for music. He desired to become a painter, and, although his studies were for a time interrupted by his receiving a commission in a Piedmontese cavalry regiment, and by a subsequent illness, brought on by the severity of his scientific investigations and resulting in

his quitting the service, he eventually returned to Rome, and, with some difficulty, obtained his father's permission to devote himself to art. He remained at the Papal capital eight years, and acquired great skill and some fame as a landscape-painter. At the close of that period events directed his mind into other channels. His father died in 1830, and the younger Azeglio then removed to Milan, where he became acquainted with Alessandro Manzoni, the poet and novelist, whose daughter he married. In this way his thoughts were turned towards literature and politics. At that time, Italy was profoundly agitated by the views of the national and liberal party. The country was divided into several distinct states, of which the greater number, even of those that were nominally independent, were under the influence of Austria. Lombardy and Venetia formed parts of the Austrian dominions. The petty monarchies of the north were little better than vassals to the house of Hapsburg; the Papacy, in the centre, was opposed to all national aspirations; and the kingdom of the Two Sicilies, in the south, was a despotism, which for cruelty and mental darkness could not have been exceeded in Asia itself. The French revolution of July 1830 gave additional force to the movements of the Italian liberal party, and the young men of the day threw themselves with fervor into the crusade against old abuses and foreign domination. Mazzini was just beginning his career as an agitator, and the whole air was surcharged with revolutionary enthusiasm. This was especially the case in the north of Italy, where Massimo d'Azeglio was now settled. Art was abandoned by him for literature, and literature was practised with a view to stimulating the sense of national independence and unity. In 1833, M. d'Azeglio published a novel called *Ettore Fieramosca*, which was followed in 1841 by another, entitled *Niccolo di Lapi.* Both had a political tendency, and between the two dates at which they appeared, M. d'Azeglio visited various parts of Italy, diffusing those liberal principles which he saw were the only hope of the future. His views, however, were very different from those of the republican party. He was a constitutional monarchist, and strongly opposed to the insurrections and secret conspiracies which Mazzini and others so frequently fostered at that time, and which always resulted in failure and renewed oppression. His treatise *Degli Ultimi Casi di Romagna* (Of the Last Events in the Romagna), published in 1846, before the death of Pope Gregory XVI., was at once a satire on the Papal Government, a denunciation of the republican attempts at insurrection, and an exhortation to the Italian princes to adopt a national policy. M. d'Azeglio returned to Rome in 1846, after the death of Pope Gregory, in June, and, it is thought, had considerable influence in persuading the new Pope (Pius IX.) to conduct his government in accordance with liberal principles. He supported measures relating to the freedom of the press, the reform of the Papacy, and the emancipation of the Jews. In 1848 he accompanied the Papal army of observation sent from Rome to watch the insurgent forces in Lombardy and Venetia, which had temporarily discomfited the Austrians, and were being supported by Charles Albert, king of Sardinia. General Durando, who had the command of the Papal army, actively assisted the rebels, in defiance, it is said, of his instructions; and Azeglio was severely wounded in the leg at the battle of Vicenza, where he commanded a legion. In the same year (1848) he published a work on the *Austrian Assassinations in Lombardy;* and on the opening of the first Sardinian parliament he was chosen a member of the chamber of deputies. After the crushing defeat of the Sardinians at Novara, March 23, 1849,—a defeat which brought the second of the two brief wars with Austria to a disastrous close,—D'Azeglio was made president of the cabinet by Victor Emmanuel, in whose favor his father, Charles Albert, had just resigned. In this position the marquis used his high powers with great advantage to the progress and consolidation of the Sardinian kingdom. His occupation of the office lasted from the 11th of May 1849 to the 20th of October 1852, when he was replaced by Count Cavour. At the termination of the war of 1859, when a large portion of the States of the Church shook off the dominion of the Pope, and declared for annexation to the kingdom of Northern Italy, Azeglio was appointed general and commissioner-extraordinary, purely military, for the Roman States — a temporary office, which he administered in a conciliatory and sagacious spirit. He died on the 11th of January 1866, leaving a reputation for probity and wisdom, which his countrymen will not forget to cherish. His writings, chiefly of a polemical character were numerous. In addition to those already mentioned, the most noteworthy was a work on *The Court of Rome and the Gospels*, of which an English translation, with a preface by Dr. Layard appeared in 1859. A volume of personal recollections was issued, in 1867, after M. d'Azeglio's death.

AZERBIJAN (so called, according to Sir William Ouseley, from a fire-temple, a province of Persia, corresponding to the ancient Atropatene. It is separated from a division of the Russian Empire on the N. by the River Araxes, and from Irak on the S. by the Kizil-Uzen, or Golden Stream, while it has the Caspian Sea and Ghilan on the E., and Asiatic Turkey on the W. Its area is estimated at 25,280 square miles. The country is superior in fertility to the southern provinces of Persia. It differs entirely from the provinces of Fars and Irak, as it consists of a regular succession of undulating eminences, partly cultivated, and opening into extensive plains such as Anjan, Tabreez, and Urumiyah or Van. Near the centre of the province the mountains of Sahend or Serhund rise in an accumulated mass to the height of 9000 feet above the sea. The highest point, Mount Sevellan, towards its eastern frontier, attains a height of about 12,000 feet, according to some authorities, but according to Khanikoff, it is 15,400; and the Talish Mountains, which run from N. to S. parallel to, and at no great distance from, the Caspian, have an altitude of 7000 feet. Except the boundary rivers already mentioned, there are none of any great extent; but these both receive a number of tributaries from the province, and several streams of considerable volume, such as the Jughutu, the Agi, and the Shar, belong to the basin of the Lake Urumiyah. This lake is about 300 miles in circumference, and 4200 feet above the sea. Its waters are more intensely salt than the sea, and it is "supposed to contain no living creature except a kind of polype;" but it is the resort of great flocks of the flamingo. The country to the N. and W., namely, the districts of Urumiyah and Selmart, is the most picturesque and prosperous part of Azerbijan; yet even here the traveller from the more civilised regions of Europe laments the want of enterprise among the inhabitants. Azerbijan is on the whole, however, reckoned one of the most productive provinces of Persia, and the villages have a more pleasing appearance than those of Irak. The Persian army is largely composed of natives of Azerbijan, who make excellent soldiers; they are subject to compulsory enlistment. The province is under the government of the heir-apparent to the Persian throne.

AZIMGARH, a district and city in the Benares division of British India, and under the jurisdiction of the Lieutenant-Governor of the North-Western Provinces

It is bounded on the N. by the river Ghagrá, separating it from Gorakhpur district; on the E. by Gházípur district and the river Ganges; on the S. by the districts of Jaunpur and Gházípur; and on the W. by Jaunpur and the Oudh district or Faizábád. Its area in 1872 was returned at 2494 square miles, of which 1268 square miles are under cultivation, 344 square miles are cultivable waste, and the remaining 882 square miles are barren and uncultivable. The population of the district in 1865 was 1,385,872 souls, of whom 1,184,689 were Hindus, and 201,183 Mahometans. The pressure of the population on the soil averaged 555 per square mile. The soil is fertile and very highly cultivated, bearing magnificent crops of rice, sugar-cane, and indigo. The principal industries of the district are cotton and silk manufactures, the total value of which in 1872 amounted to £109,081.

AZIMGARH CITY, the principal place in the district of the same name, is situated on the river Tons. The city is said to have been founded about 1620 by a powerful landholder named Azím Khán, who owned large estates in this part of the country.

AZO, a distinguished professor of civil law in the university of Bologna, and a native of that city. He was the pupil of Joannes Bassianus, who taught at Bologna towards the end of the 12th century, and who was the author of the famous *Arbor Actionum*. Azo, whose name is sometimes written Azzo and Azzolenus, and who is sometimes described as Azo Soldanus from the surname of his father, occupied a very important position amongst the gloss-writers, and his *Readings* (*Lectura*) *on the Code*, which were collected by his pupil, Alexander de Sancto Ægidio, are considered by Savigny, a most competent judge, to be the most valuable of the works of that school which have come down to us.

AZOFF, or Asov (in Turkish, *Asak*), a town on the left bank of the southern arm of the Don, about 20 miles from its mouth. Peter the Great obtained possession of it after a protracted siege in 1696, and did a great deal for the security and prosperity of the town. At the peace of 1711, however, he had to restore it to the Turks; and it was not till 1774 that it was finally united to the Russian empire.

AZOFF, THE SEA OF, an inland sea of Southern Europe, communicating with the Black Sea by the Strait of Yenikale, the ancient *Bosphorus Cimmerius*. To the Romans it was known as the *Palus Mœotis*, from the name of the neighboring people, who called it in their native language *Temarenda*, or Mother of Waters. Possibly to account for the outward current into the Black Sea, it was long supposed to possess direct communication with the Northern Ocean, and, when it was discovered that there was no visible channel, recourse was had to a "secret sluice;" there being, it was thought, but a comparatively narrow isthmus to be crossed. In some prehistoric time, according to Pallas and Murchison, a connection with the Caspian Sea seems to have existed; but no great change has taken place in regard to the character or relations of the Sea of Azoff since our earliest records.

AZORES, THE, or WESTERN ISLANDS, are situated in the Atlantic Ocean, and extend in an oblique line from N. W. to S.E. They are generally considered as pertaining to Europe, though separated by a distance of 800 miles from the coast of Portugal. They are divided into three distinct groups; the south-eastern consisting of Saõ Miguel, or St. Michael's, and Sta. Maria; the central and largest, of Fayal, Pico, Saõ Jorge, Terceira, and Graciosa; and the north-western, of Flores and Corvo.

It does not appear that the ancient Greeks and Romans had any knowledge of the Azores, but from the number of Carthaginian coins discovered at Corvo it has been supposed that the islands must have been visited by that adventurous people. The Arabian geographers, Edrisi in the 12th century, and Ibn-al-Wardi in the 14th, describe, after the Canaries, nine other islands in the Western Ocean, which are in all probability the Azores. This identification is supported by various considerations. The number of islands is the same; the climate under which they are placed by the Arabians makes them north of the Canaries; and special mention is made of the hawks or buzzards, which were sufficiently numerous at a later period to give rise to the present name (Port. *Açor*, a hawk.) The Arabian writers represent them as having been populous, and as having contained cities of some magnitude; but they state that the inhabitants had been greatly reduced by intestine warfare. The Azores are first found distinctly marked in a map of 1351, the southern group being named the Goat Islands (*Cabreras*); the middle group, the Wind or Dove Islands; and the western, the Brazil Island (*De Brasi*) — the word Brazil at that time being employed for any red dye-stuff. It has been conjectured that the discoverers were Genoese, but of this there is not sufficient evidence. It is plain, however, that the so-called Flemish discovery by Van der Berg is only worthy of the name in a very secondary sense. According to the usual account, he was driven on the islands in 1432, and the news excited considerable interest at the court of Lisbon. The navigator, Gonzalo Velho Cabral — not to be confounded with his greater namesake, Pedro Alvarez Cabral — was sent to prosecute the discovery. Another version relates that Don Henry of Portugal had in his possession a map in which the islands were laid down, and that he sent out Cabral through confidence in its accuracy. The map had been presented to him by his brother, Don Pedro, who had travelled as far as Babylon. Be this as it may, Cabral reached the island, which he named Santa Maria, in 1432, and in 1444 took possession of St. Michael's. The other islands were all discovered by 1457. Colonisation had meanwhile been going on prosperously; and in 1466 the Azores were presented by Alphonso V. to his aunt, Isabella, the duchess of Burgundy. An influx of Flemish settlers followed, and the islands became known for a time as the Flemish Islands. From 1580 to 1640 they were subject to Spain like the rest of the Portuguese kingdom, of which they now form a province. At that time the Azores were the grand rendezvous for the fleets on their voyage home from the Indies; and hence they became a theatre of that maritime warfare which was carried on by the English under Queen Elizabeth against the Peninsular powers. The connection with England has long since been of a more peaceful description; no other country affording such a ready market for Azorean productions.

The islands are now divided into three administrative districts, which take their names from the chief towns of Angra in Terceira, Horta in Fayal, and Ponta-Delgada in St. Michael's — the first of the three being also the capital of the islands. The most of the inhabitants are of Portuguese origin, but there is a mixture not only of Flemish but Moorish blood. Negroes, Mulattoes, English, Scotch, and Irish immigrants are present in considerable numbers, especially in San Miguel and Fayal. Education is in a very backward state, the great proportion of the lower classes being unable to read or write. Progress, however, is being made in this as well as other respects.

Under the active administration of Pombal, considerable efforts were made for the improvement of the Azores, but the stupid and bigoted Government which

followed rather tended to destroy these benefits, and to create a retrograde course. Towards the beginning of the present century, the possession of the islands was contested by the claimants for the crown of Portugal. The adherents of the constitution, who supported against Miguel the rights of Maria da Gloria, obtained possession of Terceira in 1829, where they succeeded in maintaining themselves, and after various struggles, Queen Maria's authority was established over all the islands. She resided at Angra from 1830 to 1833.

The aspect of all the islands is very similar in general characteristics, presenting an elevated and undulating outline, with little or no table-land, and rising into peaks, of which the lowest (that of Sta. Maria) is 1889 feet, and the highest (that of Pico) 7613 feet above the level of the sea. Their lines of sea-coast are, with few exceptions, high and precipitous, with bases of accumulated masses of fallen rock, in which open bays, or scarcely more enclosed inlets, form the harbors of the trading towns. The volcanic character of the whole archipelago is very obvious, and has been abundantly confirmed by the numerous earthquakes and eruptions which have taken place since its discovery. Hitherto the western group of Flores and Corvo has been quite exempt, Graciosa has been equally undisturbed, and Fayal has only suffered from one eruption, in 1672. The centre of activity has for the most part been St. Michael's, while the neighboring island of Santa Maria has altogether escaped. In 1444–45 there was a great eruption at St. Michael's, of which, however, the accounts that have been preserved exaggerate the importance. In 1522 the town of Villa Franca, at that time the capital of the island, was buried, with all its 6000 inhabitants, during a violent convulsion. In 1572 an eruption took place in the island of Pico; in 1580 St. George was the scene of numerous outbursts; and in 1614 a little town in Terceira was destroyed. In 1630, 1652, 1656, 1755, 1852, &c., St Michael's has been visited with successive eruptions and earthquakes, several of them of great violence. On various occasions, as in 1638, 172c, 1811, and 1867, subterranean eruptions have taken place, which have sometimes been accompanied by the appearance of temporary islands. Of these the most remarkable was thrown up in June 1811, about half a league from the western extremity of St. Michael's. It was called Sabrina by the commander of the British man-of-war of that name, who witnessed the phenomenon. Details will be found in a valuable chapter of Hartung's *Die Azoren*, p. 99, and in the 23d vol. of the *Philosophical Transactions*.

The climate is particularly temperate and equable, the extremes of sensible heat and cold being, however, increased by the humidity of the atmosphere. This is so great that paper-hangings will not adhere to the walls, and the veneering of furniture strips off. The range of the thermometer is from 45° Fahr,. the lowest known extreme, or 48°, the ordinary lowest extreme of January, to 82°, the ordinary, or 86°, the highest known extreme of July, near the level of the sea. Between these two points (both taken in the shade) there is from month to month a pretty regular gradation of increase or decrease, amounting to somewhat less than four degrees (*Geographical Journal*, vol. xv.) In winter the prevailing winds are from the north-west, west, and south; while in summer the most frequent are the north, north-east, and east. The weather is often extremely stormy, and the winds from the west and south-west render the navigation of the coasts very dangerous.

The general character of the flora is decidedly European, no fewer than 400 out of the 478 species generally considered as indigenous belonging likewise to that continent, while only four are found in America, and forty are peculiar to the archipelago. Vegetation in most of the islands is remarkably rich, especially in grasses, mosses, and ferns, heath, juniper, and a variety of shrubs.

The mammalia of the Azores are limited to the rabbit, weasel, ferret, rat (brown and black), mouse, and bat, in addition to domestic animals. Among the fish caught off the coast may be mentioned the mullet, the tunny, the bonito. The numbers of birds are so remarkable that in St. Michael's, where a reward is given for the destruction of the blackbird, the bullfinch, the redbreast, the chaffinch, and the canary, the sum paid annually represents a deathlist of 420,000. The game includes the woodcock, red partridge (introduced in the 16th century), quail and snipe.

St Michael's the largest and most populous of the islands, has an area of 224 square miles, and 105,404 inhabitants. The east end rises from a bluff cliff, from 1200 to 1400 feet high, to a lofty inland peak, whence a central range, varying in height from 2000 to 2500 feet, runs to the westward, terminating in the Serra de Agoa de Paõ, 3060 feet above the sea. The sea-coast gradually declines in approaching the last point, where it is not more than about 100 feet high. The middle part of the island is lower, and more undulating; its western extremity being marked by the conspicuous Serra Gorda, 1574 feet above the sea; its shores on both sides are low, broken, and rocky. The aspect of the western portion of the island is that of a vast truncated cone, irregularly cut off at an elevation of about 800 feet, and falling on the N., S., and W. sides to a perpendicular coast of between 300 and 800 feet high. In the higher parts an undergrowth of shrubs gives the mountains a rich and wooded appearance. Like all volcanic countries, the face of the island is uneven and irregular, being deeply excavated by numerous ravines, and roughened by streams of semi-vitrified and scoriaceous lava, that resist all atmospheric influences and repel vegetation. Heavy rains falling on the mountains afford a constant supply of water to four lakes at the bottom of extinct craters, and a number of minor reservoirs, and through them to small streams running rapidly down on all sides into the sea (*Geographical Journal*, vol. xv.)

Hot springs abound in many parts of the island, and from almost every crevice vapor is seen issuing. But the most remarkable phenomena are the Caldeiras or boiling fountains, which rise chiefly from a valley called the Furnas, near the western extremity of the island. The water ascends in columns to the height of 12 feet, after which it dissolves in clouds of vapor. The ground in the immediate vicinity is entirely covered with native sulphur, like hoar frost.

The plains are fertile, producing wheat, barley, and Indian corn; whilst vines and oranges grow luxuriantly on the sides of the mountains. The plants are made to spring even from the interstices of the volcanic rocks, which are sometimes blasted to receive them. Raised in this manner, these fruits are said to be of superior quality; but the expense of such a mode of cultivation necessarily restricts it. The western part of the island yields hemp, which might be raised to a considerable extent. The exports consist of wine, fruit, and provisions, the most important trade being in oranges. Foreign intercourse was at one time confined rigorously to Lisbon; but the inhabitants now trade directly with England, America, and other countries. The exports during 1872 at the port of St. Michael's were of the value of £85,279, and the imports amounted to £91,943.

The principal town in the island is Ponta-Delgada, which contains 15,520 inhabitants.

St. Mary is a small island immediately adjacent to St. Michael's, through the medium of which its trade is conducted, as it has no good harbors of its own. It has an area of 36 square miles, and produces wheat in abundance, of which a considerable quantity is exported.

Terceira (so called as being the third in order of discovery) is smaller than St. Michael's, but being placed in a more central position with respect to the other islands, has been chosen as the seat of government. The port of Angra, protected by Mt. Brazil, is also superior to any of those in St. Michael's.

Fayal (so called from the extreme abundance of the *faya*, an indigenous shrub) is the most frequented of all the Azores, after St. Michael's, as it has one of the best harbors in the islands, and lies directly in the track of vessels that are crossing the Atlantic in any direction. Its principal town is Villa de Horta. Population 26,264.

A considerable quantity of wine used to be exported from Fayal under the name of Fayal wine, which was really the produce of Pico, one of the most remarkable of the Azores. This island is composed of an immense conical mountain, rising to the height of 7613 feet, and bearing every trace of volcanic formation. The soil consists entirely of pulverised lava. All the lower parts of the mountain used to be in the highest state of cultivation, and covered with vine and orange plantations. But in 1852 the vines were attacked by the *Oidium* fungus and completely destroyed, while the orange-trees suffered almost as much from the *Coccus Hesperidum*. The people were consequently reduced to want, and forced to emigrate in great numbers. The planting of fig-trees and apricots alleviated the evil, and after a time many of the emigrants returned. Pico also produces a valuable species of wood resembling, and equal in quality to, mahogany. Population, 24,000.

Graciosa and St. George are two small islands, situated between Fayal and Terceira. The chief town of St. George is Velas, and the population 18,000.

The two small islands of Corvo and Flores seem but imperfectly to belong to the group. They lie also out of the usual track of navigators; but to those who, missing their course, are led thither, Flores affords good shelter in its numerous bays. Its poultry is excellent; and the cattle are numerous, but small. It derives its name for the abundance of the flowers that find shelter in its deep ravines. Population of Corvo, 1000 and of Flores, 10,508.

AZOTUS, the name given by Greek and Roman writers to Ashdod, or Eshdod, an ancient city of Palestine, now represented by a few remains in the little village of Esdud, in the pashalik of Acre. It was situated a short distance inland from the Mediterranean, on the usual military route between Syria and Egypt, about 18 geographical miles N.E, of Gaza. As one of the five chief cities of the Philistines, and the seat of the worship of Dagon, it maintained, down even to the days of the Maccabees, a vigorous, though somewhat intermittent independence against the power of the Israelites, by whom it was nominally assigned to the territory of Judah. In spite of its being dismantled by Uzziah, and somewhat later, in 731 B.C., captured by the Assyrians, it was strong enough in the next century to resist the assaults of Psammetichus for twenty-nine years. Restored by the Roman Gabinius from the ruins in which it had been left by the Jewish wars, it was presented by Augustus to Salome, the sister of Herod. It became the seat of a bishop early in the Christian era, but seems never to have attained any importance as a town.

AZPEITIA, a town of Spain, in the province of Guipuzcoa, on the left bank of the Urola, 15 miles S. W. of San Sebastian. The neighboring country is fertile, and quarries of marble are wrought in the mountains. During the Carlist movement in 1870–74, Azpeitia was the seat of the Guipuzcoan *Diputacion*, or court for the management of the war; and gunpowder, cartridges, and cannon were manufactured in the town. The famous monastery of San Ignacio, dedicated to Loyola, about a mile distant, was also appropriated for military purposes. Population stated at 2335.

AZTECS, the native name of one of the tribes that occupied the table-land of Mexico on the arrival of the Spaniards in America. It has been very frequently employed as equivalent to the collective national title of Nahuatlecas, or Mexicans. The Aztecs came, according to native tradition, from a country to which they gave the name of Aztlan, usually supposed to lie towards the N.W., but the satisfactory localisation of it is one of the greatest difficulties in Mexican history. The date of the exodus from Aztlan is equally undetermined, being fixed by various authorities in the 11th and by others in the 12th century. One Mexican manuscript gives a date equivalent to 1164 A.D. They gradually increased their influence among other tribes, until, by union with the Toltecs, who occupied the table-land before them, they extended their empire to an area of from 18,000 to 20,000 square leagues. The researches of Humboldt gave the first clear insight into the early periods of their history. See MEXICO.

AZUNI, DOMENICO ALBERTO, a distinguished jurist and writer on international law, was born at Sassari; in Sardinia, in 1749. He studied law at Sassari and Turin, and in 1782 was made judge of the consulate at Nice. In 1786-88 he published his *Dizionario Universale Ragionato della Giurisprudenza Mercantile*. In 1795 appeared his systematic work on the maritime law of Europe, *Sistema Universale dei Principii del Diritto Maritimo dell' Europa*, of which a second edition was demanded in the following year. A French translation by Digeon was published in 1798, and in 1805 Azuni recast the work, and translated it into French. In 1806 he was appointed one of the French commission engaged in drawing up a general code of commercial law, and in the following year he proceeded to Genoa as president of the court of appeal. After the fall of Napoleon in 1814, Azuni lived for a time in retirement at Genoa, till he was invited to Sardinia by Victor Emmanuel I., and appointed judge of the consulate at Cagliari, and director of the university library. He resided at Cagliari till his death in 1827.

B.

B is the second symbol of all European alphabets, except those derived from the Cyrillic original (see ALPHABET), such as the Russian. In these a modified form, in which only the top of the upper loop appears, stands as the second letter, with the value of the originl sound *b;* whilst the old symbol B comes third with the phonetic value *v* or *w*. In Egypt this letter was originally a hieroglyph for a crane, and afterwards represented also the sound *b*. The symbol and its phonetic value were borrowed by the Phœnicians, but not its name, as we infer from finding it called in Hebrew *beth*, *i. e.*, a house. In its oldest known Phœnician form the upper loop only exists in a more or less rounded shape. In different alphabets even the upper loop was gradually opened, so that in the square Hebrew the original form can no longer be detected. The Greeks, when they borrowed it from the Phœnicians, closed up the lower loop, as well as the upper, for convenience of writing. Sometimes the loops were angular, but more generally they were rounded. There is little variation of the form, except in the old alphabets of Corinth and Corcyra, where the original is harldly recognisable. In old Latin both the rounded and the pointed loops appear.

The original sound which this symbol represented, and which it still represents in most European languages, is a closed labial, *i.e.*, one in which perfect closure of the lips is necessary, the sound being heard as the lips open.

In the earliest stage to which we can trace back the language spoken by the forefathers of the Indo-European nations, it cannot be certainly proved that the sound *b* was ever heard at the beginning of a word. Perhaps in this position it may have been sounded indistinctly as a labial *v*.

BAADER, FRANZ XAVER VON, an eminent German philosopher and theologian, born 27th March 1765 at Munich, was the third son of F. P. Baader, court physician to the elector of Bavaria. His two elder brothers were both distinguished, the eldest, Clemens, as an author, the second, Joseph, as an engineer. Franz when young was extremely delicate, and from his seventh to his eleventh year was afflicted with a species of mental weakness, which singularly enough disappeared entirely when he was introduced for the first time to the mathematical diagrams of Euclid. His progress thenceforth was very rapid. At the age of sixteen he entered the university of Ingolstädt, where he studied medicine, and graduated in 1782. He then spent two years at Vienna, and returning home, for a short time assisted his father in his extensive practice. This life he soon found unsuited for him, and he decided on becoming a mining engineer. He studied under Werner at Frieburg, traveled through several of the mining districts in North Germany, and for four years, 1792–1796, resided in England. There he became acquainted with the works of Jakob Böhme, and at the same time was brought into contact with the rationalistic 18th-century ideas of Hume, Hartley, and Godwin, which were extremely distasteful to him. For Baader throughout his whole life had the deepest sense of the *reality* of religious truths, and could find no satisfaction in mere reason or philosophy. "God is my witness," he writes in his journal of 1786, "how heartily and how often I say with Pascal, that with all our speculation and demonstration we remain without God in the world." Modern philosophy he thought essentially atheistic in its tendencies, and he soon grew to be dissatisfied with the Kantian system, by which he had been at first attracted. Particularly displeasing to him was the ethical autonomy, or the position that man had in himself a rule of action, that duty contained no necessary reference to God. This Baader called "a morality for devils," and passionately declared that if Satan could again come upon earth, he would assume the garb of a professor of moral philosophy. The mystical, but profoundly religious, speculations of Eckhart, St. Martin, and above all of Böhme, were more in harmony with his mode of thought, and to them he devoted himself. In 1796 he returned from England, and in his passage through Hamburg became acquainted with Jacobi, the *Faith* philosopher, with whom he was for many years on terms of close friendship. He now for the first time learned something of Schelling, and the works he published during this period were manifestly influenced by that philosopher. Yet Baader is no disciple of Schelling, and probably, in the way of affecting the future course of Schelling's thought, gave out more than he received. Their personal friendship continued till about the year 1822, when Baader's vehement denunciation of modern philosophy in his letter to the Czar of Russia entirely alienated Schelling.

While prosecuting his philosophical researches, Baader had continued to apply himself diligently to his profession of engineer. He gained a prize of 12,000 gulden (about £1000) for his new method of employing Glauber's salts instead of potash in the making of glass. From 1817 to 1820 he held the post of superintendent of mines, and was raised to the rank of nobility for his services. He retired from business in 1820, and soon after published one of the best of his works, *Fermenta Cognitionis*, 6 pts., 1822–25, in which he combats modern philosophy, and recommends the study of J. Böhme. In 1826, when the new university was opened at Munich, he was appointed professor of philosophy and speculative theology. Some of the lectures delivered there he published under the title, *Spekulative Dogmatik*, 4 pts., 1827–1836. In 1838 he opposed the interference in civil matters of the Roman

Catholic Church, to which he belonged, and in consequence was, during the last three years of his life, interdicted from lecturing on the philosophy of religion. He died 23d May 1841.

Baader is, without doubt, the greatest speculative theologian of modern Catholicism, and his influence has extended itself even beyond the precincts of his own church.

BAAL is a Semitic word, which primarily signifies *lord* or *owner*, and then, in accordance with the Semitic way of looking at family and religious relations is specially appropriated to express the relation of a *husband* to his wife, and of the *deity* to his worshipper. In the latter usage, which does not occur among the Arabian Semites, the word Baal seems at first to have been a mere title of deity and not a proper name. In the Old Testament it is regularly written with the article — "the Baal;" and the Baals of different tribes or sanctuaries were not necessarily conceived as identical, so that we find frequent mention of Baalim, or rather "the Baalim," in the plural. There is even reason to believe that at an early date the Israelites applied the title of Baal to Jehovah himself, for one of Saul's sons is named Esh-baal, while everything we know of Saul makes it most unlikely that he was ever an idolater. Afterwards, when the name Baal was exclusively appropriated to idolatrous worship, abhorence for the unholy word was marked by writing *Bosheth* (shameful thing) for Baal in compound proper names, and thus we get the usual forms Ishbosheth, Mephibosheth.

The great difficulty which has been felt by investigators in determining the character and attributes of the god Baal mainly arises from the originally appellative sense of the word, and many obscure points become clear if we remember that when the title became a proper name it might be appropriated by different nations to quite distinct deities, while traces of the wider use of the word as a title for any god, might very well survive even after one god had come to be known as Baal *par excellence*. That Baal is not always one and the same god was known even to the ancient mythologists, who were very much disposed to fuse together distinct deities; for they distinguish an "old" Baal or Belitan (Bel êthan) from a younger Baal, who is sometimes viewed as the son of the other. The "old" Baal has sometimes been identified with the planet Saturn, but it is more likely that he is the Baal (in Assyrian pronunciation Bil) of the first triad of the Babylonian Pantheon, that is the Bel. as distinct from the Baal, of the Old Testament. This Assyrian and Babylonian Bel is no mere solar or planetary god, but is represented in Chaldean cosmogony as the shaper of heaven and earth, the creator of men and beasts, and of the luminaries of heaven. At the same time, we find that the inscriptions give the title of Bel to other and inferior gods, especially to Merodach or the planet Jupiter. This planet was, we know, the Baal (Bâl, Bêl) of the heathen Mesopotamians (Sabians) of later times, and of the Babylonian Mendeans.

The Baal of the Syrians, Phœnicians, and heathen Hebrews is a much less elevated conception than the Babylonian Bel. He is properly the sun-god, Baal Shamem, Baal (lord) of the heavens, the highest of the heavenly bodies, but still a mere power of nature, born like the other luminaries from the primitive chaos. As the sun-god he is conceived as the male principle of life and reproduction in nature, and thus in some forms of his worship is the patron of the grossest sensuality, and even of systematic prostitution. An example of this is found in the worship of Baal-Peor, and in general in the Canaanitish high places, where Baal, the male principle, was worshipped in association with the unchaste goddess Ashera, the female principle of nature. The frequent references to this form of religion in the Old Testament are obscured in the English version by the rendering "grove" for the word Ashera, which sometimes denotes the goddess, sometimes the tree or post which was her symbol. Baal himself was represented on the high places not by an image, but by obelisks or pillars sometimes called sun-pillars, a name which is to be compared with the title Baal-chamman, frequently given to the god on Phœnician inscriptions. There is reason to believe that these symbols, in their earliest form of the sacred tree and the sacred stone, were not specially appropriated to Baal worship, but were the mark of any sanctuary, memorials of a place where the worshipper had found God, while the stone pillar was also a primitive altar. Gradually, however, they came to be looked upon as phallic symbols, appropriate only to sensual nature worship, and as such were attacked by the prophets, and destroyed by such orthodox kings as Josiah. The worship of Baal among the Hebrews has two distinct periods — one before the time of Samuel, and a second from the introduction of the Tyrian worship of Baal by Ahab, who married a Phœnician princess. The ritual of this new Baal, with his long train of priests and prophets, his temple and sacred vestments, was plainly much more splendid than the older Canaanitish worship. Of the worship of the Tyrian Baal, who is also called Melkart (king of the city), and is often identified with the Greek Heracles, but sometimes with the Olympian Zeus, we may have many accounts in ancient writers, from Herodotus downwards. He had a magnificent temple in insular Tyre, founded by Hiram, to which gifts streamed from all countries, especially at the great feasts. The solar character of this deity appears especially in the annual feast of his awakening shortly after the winter solstice (Joseph., *Ant.*, viii. 5). At Tyre, as among the Hebrews, Baal had his symbolical pillars, one of gold and one of smaragdus, which, transported by phantasy to the Farthest West, are still familiar to us as the pillars of Hercules. The worship of the Tyrian Baal was carried to all the Phœnician colonies. His name occurs as an element in Carthaginian proper names (Hanni*bal*, Asdru*bal*, &c.), and a tablet found at Marseilles still remains to inform us of the charges made by the priests of the temple of Baal for offering sacrifices.

Finally, we may mention as a special form of Baal the Philistine Baal-zebub, or "Baal of flies," a conception which has more than one analogy in Greek religion. The use of the word Beelzebub, or rather, with a slight change, Beelzebul, by the later Jews, to denote the prince of the devils, is easily understood on the principle laid down in 1 Cor. x. 20.

BAALBEC, or BA'ALBAK, an ancient city of Syria, celebrated for the magnificence of its ruins, which, with the exception of those at Palmyra, are the most extensive in that region.

The origin of Baalbec is lost in remote antiquity, and the historical notices of it are very scanty. The silence of the classical writers respecting it would seem to imply that previously it had existed under another name, and various attempts have been made to identify it with certain places mentioned in the Bible. In the absence of more positive information, we can only conjecture that its situation on the high road of commerce between Tyre and Palmyra and the farther East rendered it at an early period a seat of wealth and splendor.

From the accounts of Oriental writers, Baalbec seems to have continued a place of importance down to the time of the Moslem invasion of Syria. They describe it as one of the most splendid of Syrian cities, enriched with stately palaces, adorned with monuments of ancient

times, and abounding with trees, fountains, and whatever contributes to luxurious enjoyment. After the capture of Damascus it was regularly invested by the Moslems, and after a courageous defence, at length capitulated. The ransom exacted by the conquerors was 2000 ounces of gold, 4000 ounces of silver, 2000 silk vests, and 1000 swords, together with the arms of the garrison. The city afterwards became the mart for the rich pillage of Syria; but its prosperity soon received a fatal blow from the caliph of Damascus, by whom it was sacked and dismantled, and the principal inhabitants put to the sword (748 A.D.) It continued, however, to be a place of military importance, and was frequently an object of contest between the caliphs of Egypt and the various Syrian dynasties. In 1090 it passed into the hands of the Seljuk princes of Aleppo and Damascus, who in 1134 were disputing its possession among themselves, and had to yield in 1139 to the power of Genghis Khan. He held the city till 1145, when it reverted to Damascus, and continued mostly, from that time, to follow the fortunes of that city. During the course of the century it suffered severely from one or more of the earthquakes that visited the district in 1139, 1157, 1170. In 1260 it was taken by the forces of Hulagu, who destroyed the fortifications; but, in the 14th century, it is again described by Abulfeda as enclosed by a wall with a large and strong fortress. Whether it was Baalbec, or, as others say, Cairo, that was, in 1367, the birthplace of Takkieddin Ahmed, the Arabic historian, he appears to have derived the name by which he is best known, El-Makrizi, from one of the quarters of the city. In 1400 it was pillaged by Timur in his progress to Damascus; and afterwards it fell into the hands of the Metaweli, a barbarous predatory tribe, who were nearly exterminated when Djezzar Pacha permanently subjected the whole district to Turkish supremacy.

The ancient walls of the city are about 4 miles in compass, but the present town is, with the exception of some portions of its Saracenic fortifications and its two mosques, a cluster of mean-looking buildings, which serve only to bring out into greater prominence the grandeur of the neighboring ruins. These consist of three temples, usually known as the Great Temple (and it well deserves the name), the Temple of Jupiter, Apollo, or the Sun, and the Circular Temple.

The ruins of Baalbec have awakened the admiration of European travellers from the 16th century down to the present day. Baumgarten visited them in 1507, Belon in 1548, Thevet in 1550, Melchior von Seydlitz in 1557, Radzivil in 1583, Quaresmius in 1620, Monconys in 1647, De la Roque in 1688, and Maundrell in 1699. In the 18th century Pococke gave a sketch of the ruins, which was followed by the magnificent work of Wood and Dawkins (1751), to this day one of our principal authorities, and Volney, in 1784, supplied a graphic description. During the present century the number of travellers who have visited Baalbec has enormously increased; it may be sufficient to mention Richardson, Addison, Lindsay, Wilson, the Duke of Ragusa, Lamartine, De Saulcy, Chesney, and Robinson.

BABATAG, or BABADAG, a city of Turkey in Europe, in the government of Bulgaria and sanjak of Silistria. It stands on the lake or estuary Rasein, which communicates with the Black Sea, and is surrounded by mountains covered with woods. It used to be the winter headquarters of the Turkish army during their wars with Russia; and, in 1854, it was bombarded by the Russians. The population of 10,000 includes many Jews Armenians, Tatars, and Greeks. Babatag was founded by Bajazet.

BABBAGE, CHARLES, a distinguished English mathematician and mechanician, was born, 20th December 1792, at Teignmouth in Devonshire. He was educated at a private school, and afterwards entered Trinity College, Cambridge, where he graduated in 1814. Though he did not compete in the mathematical tripos, he acquired a great reputation at the university. In the year after his graduation he contributed a paper on the "Calculus of Functions" to the *Philosophical Transactions*, and in 1816 was made a fellow of the Royal Society. Along with Herschel and Peacock he labored to raise the standard of mathematical instruction in England, and specially endeavored to supersede the Newtonian by the Leibnitzian notation in the Calculus. With this object the three friends translated, in 1816, Lacroix's *Treatise on the Differential and Integral Calculus*, and added, in 1820, two volumes of examples. During the later years of his life he resided in London, and surrounded by his workshops, still continued to devote himself to the construction of machines capable of performing arithmetical and even algebraical calculations. He died at London, 20th October 1871.

BABEL was the native name of the city called Babylon by the Greeks. It means "gate of god," or "gate of the gods," and was the Semitic translation of the original Accadian designation Ca-dimirra. According to Gen. xi. 1-9, mankind, after the deluge, travelled from the mountain of the East (or Elwand), where the ark had rested, and settled in Shinar, (Sumir, or the north-west of Chaldea.) Here they attempted to build a city and a tower whose top might reach unto heaven, but were miraculously prevented by their language being confounded. In this way the diversity of human speech was accounted for; and an etymology was found for the name of Babylon in the Hebrew verb *balbel*, "to confound." According to Alexander Polyhistor and Abydenus, the tower was overthrown by the winds. The native version of the story has recently been discovered among the cuneiform tablets in the British Museum. It is fuller and more complete than the account in Genesis, and formed part of a collection of Babylonian legends older, probably, than 2000 B.C. We learn from it that the tower was erected under the supervision of a semi-divine being called Etanna. The tower has been identified with the temple or tomb of Belus, which Strabo stated with some exaggeration to have been a stade (606 feet) high, but without sufficient reason. It is most probably represented by the modern *Birs Nimrud*, the ruined remains of the "Temple of the Seven Lights of the Earth," at Borsippa, a suburb of Babylon, which was dedicated to Nebo. The temple had been begun by "a former king," and built to the height of 42 cubits, but it lay an uncompleted ruin for many centuries, and was not finished till the reign of Nebuchadnezzar. Dr. Schrader believes that the state of wreck in which it so long remained caused "the legend of the confusion of tongues" to be attached to it.

BAB-EL-MANDEB, that is, the Gate of Tears, is the strait between Arabia and Abyssinia which connects the Red Sea with the Indian Ocean. It derives its name from the dangers attending its navigation, or, according to an Arabic legend, from the numbers who were drowned by the earthquake which separated Asia and Africa. The distance across is about 20 miles, from Ras Menheli on the Arabian coast to Ras Seyan on the African. In the end of the 18th century (1799) the island of Perim was taken possession of by the British and held as a military outpost, so to speak, of the Indian empire. They again asserted their right to it in 1857, and in 1861 a lighthouse was built at Straits Point, at the eastern extremity of the island. The harbor is accessible and commodious and the position gives complete command of the Red Sea.

BABER. ZEHIR-ED-DÎN MAHOMET, surnamed Ba-

ber, or the Tiger, the famous conqueror of India and founder of the so-called Moghul dynasty, was born on the 14th February 1483. He was a descendant of Genghis Khan and Timur, and his father, Omar Sheikh, was king of Farghana, a district of Transoxiana, lying east of Samarcand. Omar died in 1495, and Baber, though only twelve years of age, succeeded to the throne. An attempt made by his uncles to dislodge him proved unsuccessful, and no sooner was the young sovereign firmly settled than he began to meditate an extension of his own dominions. In 1497 he attacked and gained possession of Samarcand, to which he always seems to have thought he had a natural and hereditary right. A rebellion among his nobles robbed him of his native kingdom, and while marching to recover it, his troops deserted him, and he lost Samarcand also. After some reverses he regained both these places, but in 1501 his most formidable enemy, Schaibani Khan, ruler of the Usbeks, defeated him in a great engagement, and drove him from Samarcand. For three years he wandered about trying in vain to recover his lost possessions; at last, in 1504, he gathered some troops, and crossing the snowy Hundu Kush, besieged and captured the strong city of Cabul. By this dexterous stroke he gained a new and wealthy kingdom, and completely re-established his fortunes. In the following year he united with Hussian Mirza of Herat against Schaibani. The death of Hussian put a stop to this expedition, but Baber spent a year at Herat, enjoying the pleasures of that capital. He returned to Cabul in time to quell a formidable rebellion, but two years later a revolt among some of the leading Moghuls drove him from his city. He was compelled to take to flight, with very few companions, but his great personal courage and daring struck the army of his opponents with such dismay that they again returned to their allegiance, and Baber regained his kingdom. Once again, in 1510, after the death of Schaibani, he endeavored to obtain possession of his native country. He received considerable aid from Shah Ismael of Persia, and in 1511 made a triumphal entry into Samarcand. But in 1514 he was utterly defeated by the Usbeks, and with difficulty reached Cabul. He seems now to have resigned all hopes of recovering Farghana, and as he at the same time dreaded an invasion of the Usbeks from the west, his attention was more and more drawn towards India. Several preliminary incursions had been already made, when in 1521 an opportunity presented itself for a more extended expedition. Ibrahim, emperor of Delhi, had made himself detested, even by his Afghan nobles, several of whom called upon Baber for assistance. He at once assembled his forces, 12,000 strong, with some pieces of artillery, and marched into India. Ibrahim, with 100,000 soldiers and numerous elephants, advanced against him. The great battle was fought at Paniput, 21st April 1526, when Ibrahim was slain and his army routed. Baber at once took possession of Arga. A still more formidable enemy awaited him; the Rana Sanga of Mewar collected the enormous force of 210,000 men, with which he moved against the invaders. On all sides there was danger and revolt, even Baber's own soldiers, worn out with the heat of this new climate, longed for Cabul. By vigorous measures and inspiriting speeches he restored their courage, though his own heart was nearly failing him, and in his distress he abjured the use of wine, to which he had been addicted. At Kanweh, on the 10th March 1527, he won a great victory, and made himself absolute master of India. The remaining years of his life he spent in arranging the affairs and revenues of his new empire and in improving his capital, Agra. He died 26th December 1530, in his forty-eighth year. Baber was above the middle height, of great strength, and an admirable archer and swordsman. His mind was as well cultivated as his bodily powers; he wrote well, and his observations are generally acute and accurate; he was brave, kindly and generous.

BABEUF, FRANÇOIS-NOEL, surnamed by himself *Gracchus* Babeuf, the earliest of the French socialists, was born in 1762, in the department of Aisne. From his father, a major in the Austrian army, he received special instruction in mathematics, but was deprived of him by death at the age of sixteen. Established as a land-surveyor at Roye, in the Somme department, he became a fervid advocate of the Revolution, and wrote articles in the *Correspondant Picard*, for which he was prosecuted in 1790. He was acquitted on that occasion, and was afterwards elected an administrator of the department; but a charge of forgery being brought against him, he was condemned by the Somme tribunal to twenty years' imprisonment in 1793. Escaping to Paris, he became secretary to the Relief Committee of the Commune, and joined Garin in his denunciation of the Committee of Public Safety. This led to his incarceration, ostensibly under the former sentence. This was, however, annulled by the Court of Cassation; and he was also discharged by the Aisne tribunal (18th July 1794), to which he had been remitted. Returning to Paris, he entered on a violent crusade against the remains of the Robespierre party, and started the *Journal de la Liberté de la Presse* to maintain his views. In the following year (1795) the Girondists acquired supremacy in the Convention; Babeuf's journal was suspended, and himself imprisoned — first in Paris and then at Arras. Thrown into the society of certain partisans of Robespierre, he was won over by them, and was ready, on his release, to become the indiscriminating defender of the very men whom he had previously attacked (No. 34 of the *Tribun*, as he now called his journal). In April 1796 Babeuf, Lepelletier, and others constituted themselves a "Secret Directory of Public Safety," and took the title of the "Equals;" while another association of self-styled "Conventionals" and "Patriots" met at the house of Amar. The latter party aimed at the re-establishment of the revolutionary government, while Babeuf and his friends wanted besides to realise their schemes for the organisation of common happiness. Disputes naturally arose; and to reconcile the Equals and the Patriots, it was agreed, first, to re-establish the constitution of 1793; and secondly, to prepare for the adoption of true equality by the destruction of the Government. Everything was ready by the beginning of May 1796, and the number of adherents in Paris was reckoned at 17,000; but on the 10th the Government succeeded in arresting the main leaders of the plot. The army protected the Government, and the people of Paris looked on. The trial was opened at Vendôme on Feb. 2, 1797, and lasted three months. Babeuf and Darthé were sentenced to death; Germain, Buonarroti, and five others, to transportation; Amar Vadier, Duplay, and the remaining fifty-three, were acquitted. On the announcement of the sentence, Babeuf and Darthé stabbed themselves, but the wounds were not mortal. They passed a frightful night, and next morning were borne bleeding to the scaffold. Ardent and generous, heroic and self-sacrificing, Babeuf had neither solid knowledge nor steadiness of judgment. "The aim of society is happiness, and happiness consists in equality," is the centre of his doctrine.

BÂBI, or BÂBY, the appellation of a remarkable modern sect in Persia, is derived from the title (*bâb*, *i. e.*, gate) assumed by its founder, Seyed Mohammed Ali, born at Shiraz about 1824, according to Count Gobineau, but ten years earlier according to Kasem Beg.

Persia, as is well known, is the least strictly Mahometan of all Mahometan countries, the prophet himself occupying an almost secondary place in the popular estimation to his successor Ali, and the latter's sons, Hassan and Hosein. The cause of this heterodoxy is, no doubt, to be sought in ethnological distinctions, the Aryan Persians never having been able to thoroughly accommodate themselves to the creed of their Semitic conquerors. Their dissatisfaction has found vent partly in the universal homage paid to Ali, and the rejection of the Sunna or great mass of orthodox Mahometan tradition, partly in violent occasional outbreaks, most characteristically of all in the mystical philosophy and poetry of the Sufis, which, under the guise of a profound respect for the externals of Mahometanism, dissolves its rigid Monotheism into Pantheism. Bâbism is essentially one of the innumerable schools of Sufism, directed into a more practical channel by its founder's keen perception of the evils of his times. The doctrines of Bâbism are contained in an Arabic treatise, entitled *Biyan* (the Exposition), written by the Bâb himself. It is essentially a system of Pantheism, with additions from Gnostic, Cabbalistic, and even Buddhistic sources. The prophetic character of Moses, Christ, and Mahomet is acknowledged, but they are considered as mere precursors of the Bâb. The morality of the sect is pure and cheerful, and it manifests an important advance upon all previous Oriental systems in its treatment of woman. Polygamy and concubinage are forbidden, the veil is disused, and the equality of the sexes so thoroughly recognised that one at least of the nineteen sovereign prophets must always be a female. The other chief precepts of Bâbism inculcate hospitality, charity, and generous living, tempered by abstinence from intoxicating liquors and drugs. Asceticism is entirely discountenanced, and mendicancy, being regarded as a form of it, is strictly prohibited.

BABOON, the popular name of apes belonging to the genus *Cynocephalus* of the family *Simiadæ*. See APE.

BABRIUS, or BABRIAS, or GABRIAS (the original name being possibly Oriental), a Greek fabulist, who wrote, according to Sir G. C. Lewis, shortly before the Augustan age, though dates have been assigned to him from 250 B.C. to 250 A. D.

BABYLON (the modern *Hillah*) is the Greek form of Babel or Bab-ili, "the gate of god" (or, as it is sometimes written, "of the gods"), which, again, is the Semitic rendering of *Ca-dimirra*, the ancient name of the city in the Turanian language of the primitive Accadian population of the country. It is doubtful whether the god meant was Merodach or Anu, Merodach being the patron divinity of Babylon in the Semitic period, and Su-Anna, "the valley of Anu" (Anammelech), being one of its oldest names. Another synonym of the place was *E-ci*, "the hollow," in reference to its situation, and it was also known, down to the latest times, as Din-Tir, "the house of the jungle," though this seems properly to have been the designation of the town on the left bank of the Euphrates. Under the Cassite dynasty of Khammuragas, it received the title of Gan-Duniyas or Gun-Duni, "the Fortress of Duniyas," which was afterwards made to include the neighboring territory, so that the whole of Babylonia came to be called this name. Sir H. Rawlinson has suggested that it was the origin of the Biblical Gan Eden, or "Garden of Eden," to which a popular etmology has given a Hebrew form. However this may be, Babylon figures in the antediluvian history of Berosus, the first of his mythical monarchs, Alorus, being a native of it. The national epic of the Babylonians, which grouped various old myths round the adventures of a solar hero, knows of four cities only -- Babylon, Erech, Nipur (*Niffer*) or Calneh, and Surippac or Larankha, and, according to Genesis x., Babylon was a member of the tetrapolis of Shinar or Sumir, where the Semite invaders of the Accadians first obtained permanent settlement and power. It seems, however, to have ranked below its three sister-cities, among which Erech took the lead until conquered by the Accadian sovereigns of Ur. It was not until the conquest of Khammuragas that Babylon became a capital, a position, however, which it never afterwards lost, except during the Assyrian supremacy. But it suffered severely at the hands of its northern neighbors. Tiglath-Adar drove the Cassi from it, and established an Assyrian dynasty in their place; and after being captured by Tiglath-Pileser I. (1130 B.C.) and Shalmaneser (851 B.C.) it became a dependency of the Assyrian empire in the reign of the son of the latter. The decline of the first Assyrian empire restored Babylon to independence; but it had soon afterwards to submit to the Caldai, and from the reign of Tiglath-Pileser II. to the death of Assurbanipal, it was a mere provincial town of Assyria, breaking now and then into fierce revolt under the leadership of the Caldai, and repeatedly taken and plundered by Sargon, Sennacherib, and Assur-bani-pal. Sennacherib, indeed, razed the city to its foundations. After the defeat of Suzub (690 B.C.), he tells us that he "pulled down, dug up, and burned with fire the town and the palaces, root and branch, destroyed the fortress and the double wall, the temples of the gods and the towers of brick, and threw the rubbish into the Araxes," the river of Babylon. After this destruction it is not likely that much will ever be discovered on the site of Babylon older than the buildings of Essar-haddon and Nebuchadnezzar. It was under the latter monarch and his successors that Babylon became the huge metropolis whose ruins still astonish the traveller, and which was described by Greek writers. Of the older city we can know but little. The Babylon of Nebuchadnezzar and his father, Nabopolassar, must have suffered when taken by Cyrus; but two sieges in the reign of Darius Hystaspes, and one in the reign of Xerxes, brought about the destruction of the defences, while the monotheistic rule of Persia allowed the temples to fall into decay. Alexander found the great temple of Bel a shapeless ruin, and the rise of Seleucia in its neighborhood drew away its population and completed its material decay. The buildings became a quarry, first for Seleucia and then for Ctesiphon, Al Modain, Baghdad, Kufa, Kerbelah, Hillah, and other towns, and our only cause for wonder is that the remains of the great capital of Babylon are still so extensive.

The principal of these lie on the left bank of the Euphrates, and consist of three vast mounds — the *Babil* or *Mujellib*, the *Kasr*, and the *Amrám*, which run from north to south; two parallel lines of rampart east and west of them; and an isolated mass, together with a series of elevations separated by the river westward of the *Kasr*, — the whole being surrounded by a triangulur rampart. Our two chief authorities for the ancient topography of the city are Herodotus and Ctesias; and though both were eye-witnesses, their statements differ considerably. The city was built, we are told, on both sides of the river, in the form of a square, and enclosed within a double row of high walls. Ctesias adds a third wall, but the inscriptions refer only to two, the inner *enceinte*, called Imgur-Bel, and its *salkhu* or outwork, called Nimitti-Bel. Ctesias makes the outermost wall 360 stades (42 miles) in circumference, while according to Herodotus it measured 480 stades (56 wiles), which would include an area of about 200 square miles! Pliny follows Herodotus in his figures,

but Strabo with his 385 stades, Qu. Curtius with his 368 stades and Clitarchus with 365 stades agree sufficiently closely with Ctesias. Even the estimate of Ctesias, however, would make Babylon cover a space of about 100 square miles, nearly twice the size of London. Such an area could not have been occupied by houses, especially as these were three or four stories high. Indeed Q. Curtius asserts that even in the most flourishing times, nine-tenths of it consisted of gardens, parks, fields, and orchards. According to Herodotus, the height of the walls was about 335 feet, and their width 85 feet; while Ctesias makes the height about 300 feet. Later writers give smaller dimensions, but it is clear that they have merely tried to soften down the estimates of Herodotus (and Ctesias); and we seem bound, therefore, to accept the statements of the two oldest eye-witnesses, astonishing as it is. But we may remember that the ruined wall of Nineveh was 150 feet high, even in Xenophon's time, while the spaces between the 250 towers irregularly disposed along the wall of Babylon were broad enough to allow a four-horse chariot to turn. The clay dug from the moat had served for the bricks of the wall, which was pierced with 100 gates, all of brass, with brazen lintels and posts. The two inner enclosures were faced with colored brick, and represented hunting-scenes. Two other walls ran along the banks of the Euphrates and the quays with which it was lined, each containing 25 gates, which answered to the number of the streets they led into. Ferry-boats plied between the landing-places of the gates; and a movable drawbridge (30 feet broad), supported on stone piers, joined the two parts of the city together. At each end of the bridge was a palace; the great palace of Nebuchadnezzar on the eastern side (the modern *Kasr*), which Herodotus incorrectly transfers to the western bank, being the more magnificent of the two. It was surrounded, according to Diodorus, by three walls, the outermost being 60 stades (7 miles) in circuit. The inner walls were decorated with hunting-scenes painted on brick, fragments of which have been discovered by modern explorers. Two of its gates were of brass, and had to be opened and shut by machine; and Mr. Smith has found traces of two libraries among its ruins. The palace, called "the Admiration of Mankind" by Nebuchadnezzar, and commenced by Nabopolassar, overlooked the Ai-ipursabu, the great reservoir of Babylon, and stretched from this to the Euphrates on the one side, and from the Imgur-Bel, or inner wall, to the Libil, or eastern canal, on the other. Within its precincts rose the Hanging Gardens, consisting of a garden of trees and flowers on the topmost of a series of arches at least 75 feet high, and built in the form of a square, each side measuring 400 Greek feet. Water was raised from the Euphrates by means, it is said, of a screw. Some of the materials for the construction of this building may have been obtained from the old ruined palace of the early kings, now represented by the adjoining Amrám mound. The lesser palace in the western division of the city belonged to Neriglissar, and contained a number of bronze statues.

The most remarkable edifice in Babylon was the temple of Bel, now marked by the *Babil*, on the north-east. It was a pyramid of eight square stages, the basement stage being over 200 yards each way. A winding ascent led to the summit and the shrine, in which stood a golden image of Bel 40 feet high, two other statues of gold, a golden table 40 feet long and 15 feet broad, and many other colossal objects of the same precious material. At the base of the tower was a second shrine, with a table and two images of solid gold. Two altars were placed outside the chapel, the smaller one being of the same metal. A similar temple, represented by the modern *Birs Nimrud*, stood at Borsippa, the suburb of Babylon. It consisted of seven stages, each ornamented with one of the seven planetary colors, the azure tint of the sixth, the sphere of Mercury, being produced by the vitrifaction of the bricks after the stage had been completed. The lowest stage was a square, 272 feet each way, its four corners exactly corresponding to the four cardinal points, as in all other Chaldean temples, and each of the square stages raised upon it being placed nearer the south-western than the north-eastern edge of the underlying one. It had been partly built by an ancient monarch, but, after lying unfinished for many years, like the Biblical tower of Babel, was finally completed by Nebuchadnezzar.

The amount of labor bestowed upon these brick edifices must have been enormous, and gives some idea of the human force at the disposal of the monarch. If any further illustration of this fact were needed, it would be found in the statement made by Nebuchadnezzar in one of his inscriptions (and quoted also from Berosus), that he had finished the Imgur-Bel in fifteen days. The same monarch also continued the embankment of the Euphrates for a considerable distance beyond the limits of Babylon, and cut some canals to carry off the overflow of that river into the Tigris. The great reservoir, 40 miles square, on the west of Borsippa, which had been excavated to receive the waters of the Euphrates while the bed of its channel was being lined with brick, was also used for a similar purpose. The reservoir seems to have been entered by the Arakhtu or Araxes, "the river of Babylon," which flowed through a deep wady into the heart of Northern Arabia. Various nomad tribes, such as the Nabathæans or the Pekod, pitched their tents on its banks; but, although it is not unfrequently mentioned in early Babylonian history, we hear no more of it after the time of Nebuchadnezzar. It is possible, therefore, that it was drained by the western reservoir.

BABYLONIA AND ASSYRIA. Geographically, as well as ethnologically and historically, the whole district enclosed between the two great rivers of Western Asia, the Tigris and Euphrates, forms but one country. The writers of antiquity clearly recognized this fact, speaking of the whole under the general name of Assyria, though Babylon, as will be seen, would have been a more accurate designation. It naturally falls into two divisions, the northern being more or less mountainous, while the southern is flat and marshy; and the near approach of the two rivers to one another, at a spot where the undulating plateau of the north sinks suddenly into the Babylonian alluvium, tends still more completely to separate them. In the earliest times of which we have any record, the northern portion was comprehended under the vague title of Gutium (the *Goyim* of Gen. xiv. 1), which stretched from the Euphrates on the west to the mountains of Media on the east; but it was definitely marked off as Assyria after the rise of that monarchy in the 16th century B.C. Aram Naharaim, or Mesopotamia, however, though claimed by the Assyrian kings, and from time to time overrun by them, did not form an integral part of the kingdom until the 9th century B.C., while the region on the left bank of the Tigris, between that river and the Greater Zab, was not only included in Assyria, but contained the chief capitals of the empire. In this respect the monarchy of the Tigris resembled Chaldea, where some of the most important cities were situated on the Arabian side of the Euphrates. The reason of this preference for the eastern bank of the Tigris was due to its abundant supply of water, whereas the great Mesopotamian plain on the western side had to depend upon the streams which flowed into the Euphrates. This vast

flat, the modern El-Jezireh, is about 250 miles in length, interrupted only by a single limestone range, rising abruptly out of the plain, and branching off from the Zagros mountains under the names of *Sarazûr*, *Hamrin*, and *Sinjar*. The numerous remains of old habitations show how thickly this level tract must once have been peopled, though now for the most part a wilderness. North of the plateau rises a well-watered and undulating belt of country, into which run low ranges of limestone hills, sometimes arid, sometimes covered with dwarf-oak, and often shutting in, between their northern and north-eastern flank and the main mountain-line from which they detach themselves, rich plains and fertile valleys. Behind them tower the massive ridges of the Niphates and Gargos ranges, where the Tigris and Euphrates take their rise, and which cut off Assyria from Armenia and Kurdistan. The name Assyria itself originally denoted the small territory immediately surrounding the primitive capital "the city of Asur" (*al Asur*, the Ellasar of Genesis), which was built, like the other chief cities of the country, by Turanian tribes, in whose language the word signified "water meadow." It stood on the right bank of the Tigris, midway between the Greater and the Lesser Zab, and is represented by the modern *Kalah Sherghat*. It remained the capital long after the Assyrians had become the dominant power in Western Asia, but was finally supplanted by Calah (*Nimrûd*), Nineveh (*Nebi Yunus* and *Kouyunjik*), and Dur-Sargina (*Khorsabad*), some 60 miles further north. See NINEVEH.

In contrast with the arid plateau of Mesopotamia, stretched the rich alluvial plain of Chaldea, formed by the deposits of the two great rivers by which it was enclosed. The soil was extremely fertile, and teemed with an industrious population. Eastward rose the mountains of Elam, southward were the sea-marshes and the ancient kingdom of Nituk or Dilvun (the modern Bender-Dilvun), while on the west the civilisation of Babylonia encroached beyond the banks of the Euphrates, upon the territory of the Semitic nomades (or Suti). Here stood Ur (now *Mugheir*), the earliest capital of the country; and Babylon, with its suburb, Borsippa (*Birs Nimrûd*), as well as the two Sipparas (the Sepharvaim of Scripture, now *Mosaib*), occupied both the Arabian and Chaldean side of the river. (See BABYLON.) The Araxes, or "River of Babylon," was conducted through a deep valley into the heart of Arabia, irrigating the land through which it passed; and to the south of it lay the great inland fresh-water sea of *Nedjef*, surrounded by the red sandstone cliffs of considerable height, 40 miles in length and 35 in breadth in the widest part. Above and below this sea, from Borsippa to Kufa, extend the famous Chaldean marshes, where Alexander was nearly lost; but these depend upon the state of the Hindiyah canal, disappearing altogether when it is closed. Between the sea of *Nedjef* and Ur, but on the left side of the Euphrates, was Erech (now *Warka*), which with Nipur or Calneh (now *Niffer*), Surippac (*Senkereh?*), and Babylon (now *Hillah*), formed the tetrapolis of Sumis and Shinar. This north-western part of Chaldea was also called Gan-duniyas or Gun-duni after the accession of the Cassite dynasty. South-eastern Chaldea, on the other hand, was termed Accad, though the name came also to be applied to the whole of Babylonia. The Caldai, or Chaldeans, are first met with in the 9th century B.C. as a small tribe on the Persian Gulf, whence they slowly moved northwards, until under Merodach-Baladan they made themselves masters of Babylon, and henceforth formed so important an element in the population of the country, as in later days to give their name to the whole of it. In the inscriptions, however, Chaldea represents the marshes of the sea-coast, and Teredon was one of their ports. The whole territory was thickly studded with towns; but among all this "vast number of great cities," to use the words of Herodotus, Cuthah, or Tiggaba (now *Ibrahim*), Chilmad (*Kalwadah*), Is (*Hit*), and Dur-aba (*Akkerkuf*) alone need be mentioned. The cultivation of the country was regulated by canals, the three chief of which carried off the waters of the Euphrates towards the Tigris above Babylon,—the "Royal River," or Ar-Malcha, entering the Tigris a little below Baghdad, the Nahr-Malcha running across to the site of Seleucia, and the Nahr-Kutha passing through Ibrahim. The Pallacopas, on the other side of the Euphrates, supplied an immense lake in the neighborhood of Borsippa. So great was the fertility of the soil that, according to Herodotus, grain commonly returned two hundredfold to the sower, and occasionally three hundredfold. Pliny, too (*H. N.*, xviii. 17), says that wheat was cut twice, and afterwards was good keep for sheep; and Berosus remarked that wheat, barley, sesame, ochrys, palms, apples, and many kinds of shelled fruit grew wild, as wheat still does in the neighborhood of Anah. A Persian poem celebrated the 360 uses of the palm, and Ammianus Marcellinus states that from the point reached by Julian's army to the shores of the Persian Gulf was one continuous forest of verdure.

Such a country was well fitted to be one of the primeval seats of civilisation. Where brick lay ready to hand, and climate and soil needed only settled life and moderate labor to produce all that man required, it was natural that the great civilising power of Western Asia should take its rise. The history of the origin and development of this civilisation, interesting and important as it is, has but recently been made known to us by the decipherment of the native monuments. The scanty notices and conflicting statements of classical writers have been replaced by the evidence of contemporaneous documents; and though the materials are still but a tithe of what we may hope hereafter to obtain, we can sketch the outlines of the history, the art, and the science of the powerful nations of the Tigris and Euphrates. Before doing so, however, it would be well to say a few words in regard to our classical sources of information, the only ones hitherto available. The principal of these is Berosus, the Manetho of Babylonia, who flourished at the time of Alexander's conquests. He was priest of Bel, and translated the records and astronomy of his nation into Greek. His works have unfortunately perished, but the second and third hand quotations from them, which we have in Eusebius and other writers, have been strikingly verified by inscriptions so far as regards their main facts. The story of the flood, taken from Berosus, for instance, is almost identical with the one preserved on the cuneiform tablets. Numerical figures, however, as might be expected, are untrustworthy. According to Berosus, ten kings reigned before the Deluge for 120 *saroi*, or 432,000 years, beginning with Alorus of Babylon, and ending with Otiartes (Opartes) of Larankha, and his son Sisuthrus, the hero of the flood. Then came eight dynasties, which are given as follows:—

(1.)	86	Chaldean kings	34,080	years.
(2.)	8	Median "	224	"
(3.)	11	(Chaldean) "	*	
(4.)	49	Chaldean "	458	"
(5.)	9	Arabian "	245	"
(6.)	45	Assyrian "	526	"
(7.)	*	(Assyrian) "	*	
(8.)	6	Chaldean "	87	"

Ptolemy's canon (in the *Almagest*) gives the seventh dynasty in full—

(1.) Nabonassar (747 B.C.)..... .....14 years.

(2.) Nadios	2	years.
(3.) Khinziros and Poros (Pul)	5	"
(4.) Iluæos	5	"
(5.) Mardokempados (Merodach-Baladan)	12	"
(6.) Arkeanos (Sargon)	5	"
(7.) Interregnum	2	"
(8.) Hagisa	1	month.
(9.) Belibos (702 B.C.)	3	years.
(10.) Assaranadios (Assur-nadin-sum)	6	"
(11.) Rêgebelos	1	"
(12.) Mesêsimordakos	4	"
(13.) Interregnum	8	"
(14.) Asaridinos (Essar-haddon)	13	"
(15.) Saosdukhinos (Savul-sum-yucin)	20	"
(16.) Sinêladanos (Assur-bani-pal)	22	"

Next to Berosus, the authority of Herodotus ranks highest. His information, however, is scanty, and he had to trust to the doubtful statements of *ciceroni*. Herodotus was controverted by Ctesias of Cnidus, the physician of Artaxerxes Mnemon. But Ctesias mistook mythology for history, and the Ninus and Semiramis, the Ninyas and Sardanapalus, of Greek romance were in great measure his creations. We may yet construct an Assyrian epopee, like the Shahnameh of Firdusi, out of his pages, but we must not look to them for history. Other historical notices of Assyria and Babylonia, of more or less questionable value, are to be gathered from Diodorus and one or two more writers, but beyond Berosus and, to a limited extent, Herodotus, our only ancient authority of much value upon this subject is the Old Testament.

Ethnology and History.—The primitive population of Babylonia, the builders of its cities, the originators of its culture, and the inventors of the cuneiform system of writing, or rather of the hieroglyphics out of which it gradually developed, belonged to the Turanian or Ural-Altaic family. Their language was highly agglutinative, approaching the modern Mongolian idioms in the simplicity of its grammatical machinery, but otherwise more nearly related to the Ugro-Bulgaric division of the Finnic group; and its speakers were mentally in no way inferior to the Hungarians and Turks of the present day. The country was divided into two halves, the Sumir (Sungir, or Shinar) in the north-west, and the Accad in the south-east, corresponding most remarkably to the Suomi and Akkara-k, into which the Finnic race believed itself to have been separated in its first mountain home. Like Suomi, Sumir signified "(the people) of the rivers," and just as Finnic tradition makes Kemi a district of the Suomi, so Came was another name of the Babylonian Sumir. The Accadai, or Accad, were "the highlanders" who had descended from the mountainous region of Elam on the east, and it was to them that the Assyrians ascribed the origin of Chaldean civilisation and writing. They were, at all events, the dominant people in Babylonia at the time to which our earliest contemporaneous records reach back, although the Sumir, or "the people of the home language," as they are sometimes termed, were named first in the royal titles out of respect to their prior settlement in the country. A survey of the syllabary has led to the conclusion that the first attempts at writing were made before the Accad had descended into the plains and exchanged papyrus as a writing material for clay; other considerations, however, go to show that although the system of writing may have been invented before they had entered Babylonia, it was not completed until after they had done so. In harmony with this, we find Berosus ascribing the culture of "the mixed population of Chaldea" to Oannes and other similar creatures from the Persian Gulf. So far as we can judge, the civilisation of Elam is at least coeval with that of Babylonia, and the capture of Babylon by the Medes, with whom the historical dynasties of Berosus are commonly supposed to begin, must be explained by an Elamite conquest. Media was the Accadian *Mada*, "the land" *par excellence;* and Accadian tradition looked back upon the mountainous district to the south-west of the Caspian as the cradle of their race. Among these "mountains of the east," and in the land of Nisir (the furthermost division of Gutium beyond the Lesser Zab), rose "the mountain of the world," the Turanian Olympus, on which the ark of the Chaldean Noah was believed to have rested. From this centre Turanian tribes spread in all directions, meeting Alarodians on the north, and the Semites on the south-west. The Aryans had not yet penetrated across the great Sagartian desert. The numerous tribes of Susiana, both civilised and uncivilised, spoke languages more closely Ugrian than even that of the Accadians; the oldest towns of Northern Syria, where the Semite afterwards reigned supreme, bore Accadian names, and as in the case of Haran, were mythologically connected with Babylon; while the chief cities of Assyria were founded by Accadians, were denoted by Accadian symbols, and were ruled by Accadian princes, in strict accordance with the statement of Genesis that out of Babylonia "went forth Ashur." An Elamite conqueror of Chaldea, like Chedorlaomer (Gen. xiv. 1), imposed his authority, not only over Shinar, but over Assyria and Gutium as well. The earliest geographical lists know only of Nuvva, or Elam, on the east, the Khani on the west, Martu, the land of "the path of the setting sun," Subarti, or Syria, with its four races, and Gutium, which stretched across Mesopotamia from the Euphrates on the one side to the mountains of Media on the other. To these must be added Anzan, or southern Elam, with its capital Susa, Dilvun, or Nituk, on the Persian Gulf, and, at a considerably later date, the Hittites, with their chief city Carchemish.

The first monarchs whose monumental records we possess had their seats at Ur, on the right bank of the Euphrates. Ur, in Accadian, signified "the city" *par excellence*, and so bore testimony to the supremacy claimed by its rulers over the rest of Babylonia. The great temple of the Moon-god there was one of the oldest buildings in the country, and its erection was due to a prince who claimed sovereignty over the whole of Babylonia, and adorned Erech, Nipur, Larsa, and other cities with temples of vast size, dedicated to the sun, to Istar, and to Bel. He seems to have been the first great Babylonian builder; and this would imply that it was under him that Ur rose to its prominent position, and united the numerous principalities of Chaldea under one head. The enormous brick structures were cemented with bitumen in the place of lime mortar; but the use of the buttress, of drains, and of external ornamentation, shows that architectural knowledge was already advanced. The cuneiform system of writing had attained its full development, signet stones were carved with artistic skill, and the amount of human force at the disposal of the monarch may be estimated from the fact that the Bowariyeh mound at Warka, on the site of the temple of the Sun-god, is 200 feet square and 100 feet high, so that above 30,000,000 bricks must have been employed upon its construction. The vicinity of Ur to the Semitic tribes of Arabia implies that the Accadian sovereigns had been turning their attention in that direction, and we find nothing surprising therefore in the Scriptural account of Abraham's migration from this place, or the Phœnician tradition of the original home of the Canaanitish race on the shores of the Persian Gulf (Strab. i. 2, 35, xvi. 3, 4, 27; Justin, xviii. 3, 2; Pliny, *N. H.*, iv. 36). Indeed, we have clear evidence that Semitic was spoken in Ur itself at this remote epoch. Although the

ruling caste were Accadian, and generally wrote their inscriptions in that language, Dungi, one of their earliest monarchs, in spite of his Turanian name, has left us a short legend in Semitic; and it is more than probable that the imperial title of "Sumir and Accad" was soon to be assumed to mark a linguistic as well as a geographical distinction. The brick legends of the various viceroys who governed the cities of Chaldea under this dynasty are all, however in Accadian.

The supremacy of Ur had been disputed by its more ancient rival Erech, but had finally to give way before the rise of Nisin or Karrak, a city whose site is uncertain, and Karrak in its turn was succeeded by Larsa. Elamite conquest seems to have something to do with these transferences of the seat of power. In 2280 B.C. —the date is fixed by an inscription of Assur-bani-pal's —Cudur-nankhundi, the Elamite, conquered Chaldea at a time when princes with Semitic names appear to have been already reigning there, and Cudur-mabug not only overran "the west," or Palestine, but established a line of monarchs in Babylonia. His son and successor took an Accadian name, and extended his sway over the whole country. Twice did the Elamite tribe of Cassi or Kossæans furnish Chaldea with a succession of kings. At a very early period we find one of these Kossæan dynasties claiming homage from Syria, Gutium, and Northern Arabia, and rededicating the images of native Babylonian gods, which had been carried away in war, with great splendor and expense. The other Cassite dynasty was founded by Khammuragas, who established his capital at Babylon, which henceforth continued to be the seat of empire in the south. The dynasty is probably to be identified with that called Arabian by Berosus, and it was during its domination that Semitic came gradually to supersede Accadian as the language of the country. Khammuragas himself assumed a Semitic name, and a Semitic inscription of his is now in the Louvre. A large number of canals were constructed during his reign, more especially the famous Nahr-Malcha, and an embankment built along the banks of the Tigris. The king's attention seems to have been turned to the subject of irrigation by a flood which overwhelmed the important city of Mullias. His first conquests were in the north of Babylonia, and from this base of operations he succeeded in overthrowing Naram-Sin (or Rim-Acu?) in the south and making himself master of the whole of Chaldea. Naram-Sin and a queen had been the last representatives of a dynasty which had attained a high degree of glory both in arms and in literature. Naram-Sin and his father Sargon had not only subdued the rival princes of Babylonia, but had successfully invaded Syria, Palestine, and even, as it would seem, Egypt. At Agane, a suburb of Sippara, Sargon had founded a library, especially famous for its works on astrology and astronomy, copies of which were made in later times for the libraries of Assyria. Indeed, so prominent a place did Sargon take in the early history of Babylonia, that his person became surrounded with an atmosphere of myth. Not only was he regarded as a sort of eponymous hero of literature, a Babylonian Solomon, whose title was "the deviser of law and prosperity," popular legends told of his mysterious birth, how, like Romulus and Arthur, he knew no father, but was born in secrecy, and placed by his mother in an ark of reeds and bitumen, and left to the care of the river; how, moreover, this second Moses was carried by the stream to the dwelling of a ferryman, who reared him as his own son, until at last the time came that his rank should be discovered, and Sargon, "the constituted king," for such is the meaning of his name, took his seat upon the throne of his ancestors. It was while the Cassite sovereigns were reigning in the south, and probably in consequence of reverses that they suffered at the hands of the Egyptians, who, under the monarchs of the 18th dynasty, were pushing eastward, that the kingdom of Assyria took its rise. Its princes soon began to treat with their southern neighbors on equal terms; the boundaries of the two kingdoms were settled, and inter-marriages between the royal families took place, which led more than once to an interference on the part of the Assyrians in the affairs of Babylonia. Finally, in the 14th century B.C., Tiglath-Adar of Assyria captured Babylon, and established a Semitic line of sovereigns there, which continued until the days of the later Assyrian empire. From this time down to the destruction of Nineveh, Assyria remained the leading power of Western Asia. Occasionally, it is true, a king of Babylon succeeded in defeating his aggressive rival and invading Assyria; but the contrary was more usually the case, and the Assyrians grew more and more powerful at the expense of the weaker state, until at last Babylonia was reduced to a mere apanage of Assyria.

We possess an almost continuous list of Assyrian kings; and, as from the beginning of the 9th century downwards there exists a native canon, in which each year is dated by the *limmu* or *archon eponymous*, whose name it bears, as well as a portion of a larger canon which records the chief events of each eponymy, it is evident that our chronology of the later period of Assyrian history is at once full and trustworthy. Similar chronological lists once existed for the earlier period also, since an inscription of a king of the 14th century B.C. is dated by one of these eponymies; and the precise dates given in the inscriptions for occurrences which took place in the reigns of older monarchs cannot otherwise be accounted for. How far back an accurate chronological record extended it is impossible to say; but astronomical observations were made in Babylonia from a remote period, and the era of Cudur-nankhundi was known, as we have seen, more than 1600 years afterward; while in Assyria not only can Sennacherib state at Bavian that Tiglath-Pileser I. was defeated by the Babylonians 418 years before his own invasion of that country, but the same Tiglath-Pileser can fix 701 years as the exact interval between his restoration of the temple of Anu and Rimmon at Kalah Sherghat and its foundation by the dependent viceroys of the city of Assur.

This Tiglath-Pileser, in spite of his subsequent defeat by the Babylonians, was one of the most eminent of the sovereigns of the first Assyrian empire. He carried his arms far and wide, subjugating the Moschians, Comagenians, Trumians, and other tribes of the north, the Syrians and Hittites in the west, and the Babylonians (including their capital) in the south. His empire, accordingly, stretched from the Mediterranean on the one side to the Caspian and the Persian Gulf on the other; but, founded as it was on conquest, and centralised in the person of a single individual, it fell to pieces at the least touch. With the death of Tiglath-Pileser, Assyria seems to have been reduced to comparative powerlessness, and when next its claims to empire are realised, it is under Assur-natsir-pal, whose reign lasted from 883 to 858 B.C. The boundaries of his empire exceeded those of his predecessor, and the splendid palaces, temples, and other buildings raised by him, with their elaborate sculptures and rich painting, bear witness to a high development of wealth and art and luxury. Calah, which had been founded by Shalmaneser I. some four or five centuries previously, but had fallen into decay, became his favorite residence, and was raised to the rank of a capital. His son Shalmaneser had a long reign of 35 years, during which he

largely extended the empire he had received from his father. Armenia and the Parthians paid him tribute; and under the pretext of restoring the legitimate monarch he entered Babylon, and reduced the country to a state of vassalage. It is at this time that we first hear of the Caldai or Chaldeans,—carefully to be distinguished from the *Casdim* or Semitic "conquerors" of Scripture,—who formed a small but independent principality on the sea-coast. In the west Shalmaneser succeeded in defeating in 854 B.C. a dangerous confederacy, headed by Rimmon-idri or Ben-hadad of Damascus and including Ahab of Israel and several Phœnician kings. Later on in his reign he again annihilated the forces of Hazael, Ben-hadad's successor, and extorted tribute from the princes of Palestine, among others from Jehu of Samaria, whose servants are depicted on the black obelisk. The last few years of his life, however, were troubled by the rebellion of his eldest son, which well-nigh proved fatal to the old king. Assur, Arbela, and other places joined the pretender, and the revolt was with difficulty put down by Shalmaneser's second son, Samas-Rimmon, who shortly after succeeded him. Samas-Rimmon (824–811) and Rimmon-nirari (811–782) preserved the empire of Assyria undiminished; but their principal exploits were in Babylonia, which they wasted with fire and sword, and converted into an Assyrian province.

The first Assyrian empire came to an end in 744, when the old dynasty was overthrown by a usurper, Tiglath-Pileser, after a struggle of three or four years. Once settled on the throne, however, Tiglath-Pileser proceeded to restore and reorganise the empire. Babylonia was first attacked; the Assyrian monarch offered sacrifices and set up his court in its chief cities; and the multitudinous Arab tribes who encamped along the banks of the Euphrates were reduced to subjection. The Caldai in the south alone held out, and to them belonged the first four kings given in Ptolemy's canon. Indeed, it may be said that from the invasion of Tiglath-Pileser to the revolt of Nabopolassar, Babylonia ceased to have any separate existence. It was governed by Assyrian kings or the viceroys they appointed, and the only attempts to recover independence were made under the leadership of the "Caldean" chiefs. It becomes nothing more than an important province of Assyria.

The second Assyrian empire differed from the first in its greater consolidation. The conquered provinces were no longer loosely attached to the central power by the payment of tribute, and ready to refuse it as soon as the Assyrian armies were out of sight; they were changed into satrapies, each with its fixed taxes and military contingent. Assyrian viceroys were nominated wherever possible, and a turbulent population was deported to some distant locality. This will explain the condition in which Babylonia found itself, as well as the special attention which was paid to the countries on the Mediterranean coast. The possession of the barbarous and half-deserted districts on the east was of little profit; the inhabitants were hardy mountaineers, difficult to subdue, and without wealth; and although Tiglath Pileser penetrated into Sagartia, Ariana, and Aracosia, and even to the confines of India, the expedition was little more than a display of power. The rich and civilised regions of the west, on the contrary, offered attractions which the politicians of Nineveh were keen to discover. Tiglath-Pileser overthrew the ancient kingdoms of Damascus and Hamath, with its nineteen districts, and after receiving tribute from Menahem (which a false reading in the Old Testament ascribes to a non-existent Pul) in 740, placed his vassal Hoshea on the throne of Samaria in 730 in the room of Pekah. Hamath had been aided by Uzziah of Judah; and, on the overthrow of the Syrian city, Judah had to become the tributary of Assyria. Tiglath-Pileser seems to have met with a usurper's fate, and to have fallen in a struggle with another claimant of the throne, Shalmaneser. The chief event of Shalmaneser's reign (727–722) was the campaign against Samaria. The capture of that city, however, was reserved for his successor, Sargon, in 720, who succeeded in founding a new dynasty. Sargon's reign of seventeen years forms an era in later Assyrian history. At the very commencement of it he met and defeated the forces of Elam, and so prepared the way for the future conquest of that once predominant monarchy. He came into conflict, also, with the kingdoms of Ararat and Van in the north; and the policy of the countries beyond the Zagros was henceforth influenced by the wishes of the Assyrian court. But it was in the west that the power of Nineveh was chiefly felt. Syria and Palestine were reduced to a condition of vassalage, Hamath was depopulated, and Egypt, then governed by Ethiopian princes, first came into collision with Assyria. The battle of Raphia in 719, in which the Egyptians and their Philistine allies were defeated, was an omen of the future; and from this time onward the destinies of civilised Asia were fought out between the two great powers of the ancient world. As the one rose the other fell; and just as the climax of Assyrian glory is marked by the complete subjugation of Egypt, so the revolt of Egypt was the first signal of the decline of Assyria. The struggle between the representative states of the East led, as was natural, to the appearance of the Greek upon the stage of history. Sargon claims the conquest of Cyprus as well as Phœnicia, and his effigy, found at Idalium, remains to this day a witness of the fact. Babylonia, however, was the point of weakness in the empire. It was too like, and yet too unlike, Assyria to be otherwise than a dangerous dependency; and its inhabitants could never forget that they had once been the dominant nation. New blood had been infused into them by the arrival of the Caldai, whose leader, Merodach-Baladan, the son of Yacin, called Mardokempados in Ptolemy's canon, had taken advantage of the troubles which closed the life of Tiglath-Pileser to possess himself of Babylonia; and for twelve years he continued master of the country, until in 710 Sargon drove him from the province, and crowned himself king of Babylon. Merodach-Baladan had foreseen the attack, and endeavored to meet it by forming alliances with Egypt and the principalities of Palestine. The confederacy, however, was broken up in a single campaign by the Assyrian monarch; Judea was overrun, and Ashdod razed to the ground. Sargon, who now styled himself king of Assyria and Babylon, of Sumir and Accad, like Tiglath-Pileser before him, spent the latter part of his reign in internal reforms and extensive building. A new town, called after his name, was founded to the north of Nineveh (at the modern Kouyunjik), and a magnificent palace was erected there. The library of Calah was restored and enlarged, in imitation of his semi-mythical namesake of Agane, whose astrological works were re-edited, while special attention was given to legislation. In the midst of these labors Sargon was murdered, and his son, Sennacherib, ascended the throne on the 12th of Ab 705 B.C. Sennacherib is a typical representative of the great warriors and builders of the second Assyrian empire, and is familiar to the readers of the Old Testament from his invasion of Judah, which the native monuments assign to the year 701. The check he received at Eltakeh, where he was met by the forces of Egypt and Ethiopia, saved the Jewish king, not, however, before his towns had been ravaged, a heavy tribute laid upon the capital, and his allies in Ascalon and Akron severely punished.

At the commencement of this campaign Sennacherib had reduced Tyre and Sidon, and the overthrow of these centres of commerce, caused a transfer of trade to Carchemish. Babylonia had shaken off the yoke of Assyria at the death of Sargon under Merodach-Baladan, who had escaped from his captivity at Nineveh, but was soon reduced to obedience again, and placed under the government of the Assyrian viceroy Belibus. In 700, however, the year after the Judæan war, Babylon rebelled once more under the indomitable Merodach-Baladan, and Suzub, another Chaldean. Sennacherib was occupied with a naval war — the first ever engaged in by the Assyrians — against a body of Chaldeans who had taken refuge in Susiana, and the revolt in his rear was stirred up by the Susianian king. But the insurgents were totally defeated; Assur-nadin-sum, Sennacherib's eldest son, was appointed viceroy of the southern kingdom; and the Assyrian monarch felt himself strong enough to carry the war into the heart of Elam, wasting the country with fire and sword. A last attempt, made by the Susianians and the Chaldeans of Babylonia, to oppose the power of Assyria was shattered in the hardly-contested battle of Khaluli. The interregnum, however, which marks the last eight years of Sennacherib's rule in Ptolemy's canon, shows that Chaldea still continued to give trouble and resist the Assyrian yoke.

Meanwhile Sennacherib had been constructing canals and aqueducts, embanking the Tigris, and building himself a palace at Nineveh on a grander scale than had ever been attempted before. His works were interrupted by his murder, in 681, by his two sons, who, however, soon found themselves confronted by the veteran army of Essar-haddon, their father's younger and favorite son. Essar-haddon had been engaged in Armenia; but in January 680 he defeated them at Khanirabbat, and was proclaimed king. Soon afterwards he established his court at Babylon, where he governed in person during the whole of his reign. After settling the affairs of Chaldea his first campaign was directed against Syria, where Sidon was destroyed and its inhabitants removed to Assyria, an event which exercised a profound influence upon Asiatic trade. The most remarkable expedition of his reign was into the heart of Arabia, to the kingdoms of Huz and Buz, 980 miles distant from Nineveh, 280 miles of the march being through arid desert. The Assyrian army accomplished a feat never since exceeded. In the north, also, it penetrated equally far, subjugating the tribes of the Caucasus, receiving the submission of Teispes the Cimmerian, and taking possession of the copper-mines on the most remote frontiers of Media. All this part of the country was now in the hands of Aryan settlers, and each small town had its independent chief, like the states of Greece. In fact, on two sides, on both north and west, the Assyrian empire was in contact with an Aryan population, and among the twenty-two kings who sent materials for Essar-haddon's palace at Nineveh were Cyprian princes with Greek names. But the most important work of Essar-haddon's reign was the conquest of Egypt, which left the ancient world under the rule of a single power for some twenty years, and by fusing the nations of Western Asia together, broke down their differences, spread an equalised civilisation, and first struck out the idea of universal empire. In 672 B.C. the land of the Pharaohs was invaded, Tirhakah, the Ethiopian, driven beyond its borders, and the country divided into twenty governments. Vain efforts to shake off the Assyrian supremacy were made from time to time; but just as Babylon had to look to the foreign Caldai for the championship of its independence, so Egypt found its leaders in Ethiopian princes. In 669 Essar-haddon fell ill, and on the 12th day of Iyyar in the following year he associated his son, Assur-bani-pal, with him in the kingdom. On his death at Babylon in 667, Assur-bani-pal was left sole king. One of his first acts was to appoint his brother Savul-sum-yucin (Sammughes) governor of Babylonia.

Assur-bani-pal, the Sardanapalus of the Greeks, was the "grand monarque" of ancient Assyria. The empire on his accession was at the height of its glory and magnitude; the treasures and products of the world flowed into Nineveh, and its name was feared from the frontiers of India to the shores of the Ægean. Constant wars asserted the superiority of the Assyrian troops, though they drained the empire of money and men; and the luxury, which had come in like a flood, was sapping the foundations of the national strength. Assur-bani-pal, in spite of his victories, his buildings, and his patronage of literature, left a diminished inheritance to his son; and the military expeditions, formerly conducted by the king in person, were now entrusted to his generals. His first work was to check the southward advance of the Cimmerians, who were thus driven upon Asia Minor, and to quell a revolt that had broken out in Egypt. Two campaigns were requisite to effect this, and meanwhile Gyges of Lydia had sent tribute to the formidable Assyrian monarch. War had also broken out with Elam, which ended, after a long and hard struggle, with the complete conquest of the country. It was divided into two states, each ruled by Assyrian vassals. But soon after this (in 652) the first blow was struck which eventually led to the downfall of the empire. A general insurrection suddenly took place, headed by Assur-bani-pal's own brother, the viceroy of Babylonia. Elam, Arabia, Egypt, and Palestine made common cause against the oppressor. Egypt alone, however, under the guidance of Psammitichus, and with the help of Gyges, succeeded in recovering her independence; the wandering tribes of Northern Arabia, Kedar, Zobah, Nabathæa, &c., were chastised, and summary vengeance taken on Babylonia and Elam. Babylon and Cuthah were reduced by famine (649), Sammughes was captured and burnt to death, and fire and sword were carried through Elam. After a protracted war, in which Assur-bani-pal was aided by internal dissensions, Shushan was plundered and razed, and the whole of Susiana reduced to a wilderness. This happened in 643.

Assur-bani-pal's buildings were unrivalled for size and grandeur. Assyrian culture reached its culminating point in his reign, and his palaces glittered with the precious metals, and were adorned with the richest sculpture. The library which he formed at Nineveh far surpassed any that had ever existed before; literary works were collected from all sides; the study of the dead language of Accad was encouraged, grammars and dictionaries were compiled, and learned men of all nations were attracted to the court. Patron of the arts as he was, however, Assur-baní-pal's character was stained by cruelty and sensuality. Under his second name of Sin-inadina-pal, he appears as king of Babylon in Ptolemy's list; and the complete amalgamation of Assyria and Babylonia in the later years of his rule is shown by the appearance of a prefect of Babylon among the Assyrian eponyms. He was succeeded in 625 by his son Assur-ebil-ili. His death was the signal for a general revolt. Nabopolassar, the viceroy of Babylonia, made himself independent; and Assyria, shorn of its empire, was left to struggle for bare existence, until, under Saracus its last monarch, Nineveh was taken and burnt by the Babylonians and Medes.

The seat of empire was now transferred to the southern kingdom. Nabopolassar was followed in 604 by his son Nebuchadnezzar, whose long reign of forty-three

years made Babylon the mistress of the world. The whole East was overrun by the armies of Chaldea, Egypt was invaded, and the city of the Euphrates left without a rival. Until systematic explorations are carried on in Babylonia, however, our knowledge of the history of Nebuchadnezzar's empire must be confined to the notices of ancient writers, although we possess numerous inscriptions which record the restoration or construction of temples, palaces, and other public buildings during its continuance. One of these bears out the boast of Nebuchadnezzar, mentioned by Berosus, that he had built the wall of Babylon in fifteen days. Evil-Merodach succeeded his father in 561, but he was murdered two years after, and the crown seized by his brother-in-law, Nergal-sharazer, who calls himself son of Belsumaiscun, "king of Babylon." Nergal-sharezer reigned four years, and was succeeded by his son, a mere boy, who was put to death after nine months of sovereignty (555 B.C.). The power now passed from the house of Nabopolassar, Nabu-nahid, who was raised to the throne, being of another family. Nebuchadnezzar's empire already began to show signs of decay, and a new enemy threatened it in the person of Cyrus the Persian. The Lydian monarchy, which had extended its sway over Asia Minor and the Greek islands, had some time before come into hostile collision with the Babylonians, but the famous eclipse foretold by Thales had parted the combatants and brought about peace. Crœsus of Lydia and Nabu-nahid of Babylonia now formed an alliance against the common foe, who had subjected Media to his rule, and preparations were made for checking the Persian advance. The rashness of Crœsus, however, in meeting Cyrus before his allies had joined him, brought about his overthrow; Sardis was taken, and the Persian leader occupied the next fourteen years in consolidating his power in the north. This respite was employed by Nabu-nahid in fortifying Babylon, and in constructing those wonderful walls and hydraulic works which Herodotus ascribes to Queen Nitocris. At last, however, the attack was made; and after spending a winter in draining the Gyndes, Cyrus appeared in the neighborhood of Babylon. Belshazzar, Nabu-nahid's eldest son, as we learn from an inscription, was left in charge of the city, while his father took the field against the invader. But the Jews, who saw in the Persians monotheists and deliverers, formed a considerable element of the population and army; and Nabu-nahid found himself defeated and compelled to take refuge in Borsippa. By diverting the channel of the Euphrates the Persians contrived to march along the dry river-bed, and enter the city through an unguarded gate. Babylon was taken, and Nabu-nahid shortly afterwards submitted to the conqueror, receiving in return pardon and a residence in Carmania. He probably died before the end of Cyrus's reign; at all events, when Babylon tried to recover its independence during the troubles that followed the death of Cambyses, it was under impostors who claimed to be "Nebuchadnezzar, the son of Nabu-nahid."

Art, Science, and Literature.—Although in art, as in other things, Assyria was but the pupil and imitator of Babylonia, there was yet a marked difference between its development in the two countries, due partly to natural causes. While the Assyrians had stone in abundance, the Babylonians were obliged to import it from a distance. Brick-clay, on the contrary, lay ready at hand, and architecture among them, consequently, took the forms imposed upon it by the use of bricks instead of stone. Where the Assyrians employed sculptured alabaster to ornament their buildings, the Babylonians contented themselves with enamelled bricks and painted plaster. It is a curious proof of the servile dependence of the northern upon the southern kingdom in artistic matters, that the Assyrians continued to make large use of brick up to the downfall of the empire, in spite of the accessibility of stone and the rapid decay of their palaces caused by the employment of the more fragile material. Still, though Assyrian art clung thus unaccountably to the building materials of another country, it did not dispense with its native stone altogether; and speaking broadly, we may say that the architecture of Nineveh is characterised by the use of stone in contradistinction to the brickwork of Babylonia. Sculpture was naturally developed by the one, just as painting was by the other; and the ornamentation which could be lavished on the exterior in Assyria had to be confined to the interior in Chaldea.

Another distinction between the art of the two monarchies arose from the character of their respective populations. Babylonia was essentially a religious country, and its art, therefore, was primarily religious. Nearly all the great edifices, whose ruins still attract the traveller, were temples, and the inscriptions we possess of the Babylonian princes relate almost wholly to the worship of the gods. In Assyria, on the other hand, the temple was but an appendage of the palace, the king among "these Romans of Asia," as Prof. Rawlinson calls them, being the central object of reverence. While the Chaldean temple, with its huge masses of brickwork, rose stage upon stage, each tier smaller than the lower, differently colored, and surmounted at the top by a chamber which served at once as a shrine and an observatory, the Assyrian palace was erected upon a mound of rubble, with open courts and imposing entrances, though never more than one or two stories high.

Closely connected with this difference in the religious feelings of the two nations was the greater care and attention paid to burial in Babylonia. As yet not a single tomb had been found in Assyria, while sepulchral remains abound in Chaldea. The vast necropolis of Erech astonishes us by the number of its graves, and the potters of Babylonia were largely employed in making clay coffins. The character of the Assyrian art being thus secular, and that of Babylonia sacred and sepulchral, necessarily led to a different application and development of it in the two countries.

We must regard Assyrian art as parallel with later Babylonian, both having branched off from Accadian. In Assyrian we may trace two or even three periods of development; but our want of materials makes it impossible to do this in the case of later Babylonian. Among neither people, however, did art altogether escape from the swathing-bands of its nursery, although it was never crystallised as in ancient Egypt. The oldest monuments of Accad already display it in all its forms, rude and rudimentary though they may be. The terraced temples of Ur, Erech, and other places, mount back to the earliest times of Chaldean history, and we find them already adorned with enamelled bricks, which were first colored, then glazed, and finally baked in the fire. Terra-cotta cones of various hues, embedded in plaster, were used for external ornamentation, and at Warka (Erech) colored half-columns are employed for the same purpose, — an ornamentation which recurs in Sargon's palace at Khorsabad, and was the germ of the many kinds of pillars met with in Assyria. The internal walls of the shrine were bright with paint and bronze and gilding; but the brilliant coloring of the Chaldeans was not reproduced in the northern monarchy where more sombre tints were preferred. The huge structures themselves, of burnt and unburnt brick, were supported by buttresses, and the rain was carried off by elaborately-constructed drains, some of which afford us the earliest examples of the arch. A leaded pipe for the same object was found by Mr. Loftus at Mugheir (Ur).

Stone, on account of its scarcity, was highly prized, and used only for sculpture and carving. Fragments of the statue of an Accadian king have been brought from Hammám, and a portrait of Merodach-iddin-akhi, the successful opponent of Tiglath-Pileser I. (1120 B.C.), is cut in low relief on a stone now in the British Museum. Like all other Babylonian stone relics, they are of small size, and of hard black granite, and the royal portrait is interesting not only as being one of the few specimens we possess of Babylonian sculpture, but as showing the marked contrast of the Babylonian face to the typically Jewish features of the Assyrians. If larger stones were rare, however, the same cannot be said of the smaller ones, which were used as signets and talismans. These were always incised, and though the figures are frequently rude, and still more often grotesque, they are always clearly cut and vigorous. Indeed, it is clear that emery must have been used for the purpose, while many of the carvings are so minute as to suggest the employment of a magnifying glass. This, however, seems to be out of the question at so early a date as that to which many of the gems belong, although a crystal lens was discovered by Mr. Layard at Nimrúd. The design on the signet-cylinder of the earliest king of Ur of whom we have any knowledge is of a high order of merit.

Next to gem-cutting, pottery was carried to a considerable perfection by the Accadians. Some of their vases and lamps exhibit great beauty of form, and bear evidence of the potter's wheel; though the large majority are made by the hand, and extremely rude. Spirited bas-reliefs in terra-cotta, however, have been exhumed at Senkereh, and some small terra-cotta figures may also be assigned to this early period. Metallurgy was more backward. Stone implements were still in use, although weapons and ornaments of bronze and copper are met with in abundance; and even iron was not unknown. Bronze bowls occur in almost every tomb, sometimes wrought with considerable skill. Metallurgic art, however, attained its highest point in the manufacture of gold objects like ear-rings and fillets. The latter may be compared with the gold head-dresses found by Dr. Schliemann in the Troad. This backward state of metallurgy is somewhat remarkable when we consider the skill displayed in the making of textile fabrics. The oldest gems portray the most richly embroidered robes, and it is probable that the muslins and carpets for which Babylonia was afterwards so famous were already a branch of industry.

Art in Assyria developed chiefly, as has been said, on the side of architecture and sculpture. Its first period is best represented by the reign of Assur-natsir-pal, in whose palaces we obtain excellent illustrations of its excellencies and defects. The period is characterised by a simplicity and vigor which shows itself in the bas-reliefs, where the figures, more especially the animal forms, are spirited and natural beyond anything that we meet with at a later time. Nothing, for instance, can be bolder and more life-like than the lion-hunt depicted on the slabs of Assurnatsir-pal. There is a freedom in the attitude of the animals which evidences a remarkable grandeur of conception. On the other hand, the execution is somewhat heavy, the perspective is worse even than in later works, and the outlines are reproduced with too servile an exactitude. A background, again, is entirely wanting, the attention of the artist being concentrated upon the principal group. In the second period, which extends from the beginning of the second empire to the reign of Essarhaddon, the freshness and boldness of the preceding stage have passed away. The care once exclusively bestowed upon the chief figures is now shared with an elaborate background, and a pre-Raffaellite minuteness prevails throughout the whole. This, added to a total want of perspective, causes too obtrusive a realism. Still, what is lost in vigor is gained in delicacy and finish, and the general effect of such rich and intricate grouping could not but have been effective. The reign of Assur-bani-pal marks the third and last period of Assyrian art. Drawing has made a rapid advance, and the sculptures furnish several instances of successful foreshortening. The art of this period is distinguished by great softness and chasteness; vegetable forms are represented with admirable skill, and the overcrowding of the preceding stage is avoided by recurring to the plain backgrounds of the first period, or introducing merely the main outlines of a landscape. At the same time, it is clear that Assyrian art is beginning to decline; the freedom and boldness that once marked it tend to disappear, and it is prevaded by a spirit of effeminacy which is well exemplified by the subjects portrayed. For the first time scenes are taken from the harem; the king lies, with his wife seated beside him, banqueting under the shade of the vine; and the lions that Assur-natsir-pal hunted in the open field at the risk of life are now tame creatures, kept in cages, and let out for a royal *battue*, where they have to be whipped into activity.

The effect of this Assyrian bas-relief sculpture was heightened by judicious coloring. Red, blue, black, and white — none of them, however, of very great brilliancy — were laid upon certain parts of the picture, such as the eyes, hair, and fringes of the garments. This partial coloring was also adopted by the Greeks, and it is extremely probable that they borrowed it from Assyria. The beginning of Greek art coincides with the decadence of Assyrian; and the objects found by M. Cesnola and others in Cyprus show us the transition of the one into the other. While the remains found by Dr. Schlieman in the Troad do not exhibit any Assyrian influence, the oldest works of art in Greece itself are thoroughly Assyrian in character. Indeed, we can trace the lion-sculpture at Mycenæ through the similar rock-carving at Kumbet, in Phrygia, back to the artists of Nineveh. The lions themselves are Assyrian in all their details, and the pillar against which they rest reappears in the monuments of Assur-bani-pal. Columnar architecture, in fact, obtained a more extensive development in the empire of the Tigris than has ever been the case elsewhere. The half columns of ancient Chaldea germinated into a wonderful variety of elaborate forms. The most peculiar are those which rest with circular pedestals upon the backs of lions, dogs, and winged bulls. The chasteness of Hellenic taste preserved it from this Eastern fantasticness, but the Doric and Ionic pillars had their first home on the banks of the Tigris. There was something in the round firm column which was congenial to the mind of the Assyrian.

Indeed, it may be said that solidity and realism underlie all Assyrian art. Muscular strength and power of an intensely earthly and human nature is expressed in their bas-reliefs and the colossal bulls that guarded the palace from the entrance of evil spirits. Nowhere else in the world can we find such an embodiment of brute force and unimaginative energy. Not only is Assyrian art valuable as disclosing the genesis of Hellenic, but yet more so as filling up a vacant chapter in the history of æsthetics. The divine calm and mysterious immensity of Egyptian sculpture was not more foreign to the Greek than the stiff unspirituality and coarse vigor of the Assyrians, which found in the lion an appropriate symbol. But the Assyrian artists did not confine themselves to architecture and bas-reliefs. Gem-cutting was carried to high perfection, and even sitting statues of "the great king" were attempted. These, however,

were not so successful as the terra-cotta models, some of which are of great beauty. Indeed, the potters' work of Nineveh can quite vie with that of ancient Greece, and their lamps seem to be prototypes of those which we find in the tombs of Athens or Syracuse. Besides porcelain, glass was also manufactured, and though transparent glass does not appear to have been known before the reign of Sargon, colored glass, with all the tints that we admire in Venetian ware, had long been an article of trade. Metallurgy, again, was a branch of industry in which the Assyrians particularly excelled. Their gold ear-rings and bracelets are admirable both in design and workmanship; their bronze casts are free from the narrowness of their sculptures in stone; and so well were they acquainted with the art of inlaying one metal with another, that our modern artists have been content to learn from them the method of covering iron with bronze. Household furniture, too, gives us a high idea of Assyrian skill. Like gem-cutting, it brought out the Chinese minuteness and accuracy of the people, and the profuse, though tasteful ornamentation of the seats is especially to be noticed.

It is unfortunate that our knowledge of the development of art in the sister kingdom is still so imperfect. As has been said, however, it is characterised by painting rather than sculpture, and the use of brick instead of stone. The few bas-reliefs that exist are small and inferior in execution; but brilliant coloring and a lavish use of the metals made up for this want. The walls were covered with the most costly materials, and "images portrayed with vermilion" excited the admiration of the stranger. The love of bright colors, in contrast with the sober hues of the Assyrian palaces, led also to the cultivation of gardens, and the hanging gardens of Babylon, raised upon tiers of arches, were one of the wonders of the world. The Babylonian had, too, a strong sense of humor. In the engraved gems and metal work of the southern empire, we miss the finish and minute care of the sister-kingdom, but they are replaced by a spirit of grotesqueness and serio-comedy. In pottery and the manufacture of textile fabrics the Babylonians particularly excelled; their carpets and variegated dresses were highly prized, while their fondness for music was much celebrated. The history of the latter art, however, both in Babylonia and Assyria, has yet to be traced.

The science of Assyria, like most things else, was derived from Accad. A large number of its technical terms were borrowed from the Turanian, and continued to the last an enduring monument of the debt owed by the Semite to his predecessor. At the same time, he did not remain a mere imitator; science received a development in his hands, which might have been looked for in vain from a Turanian race. First and foremost comes the astronomy, for which Babylonia was so famous in the ancient world. Its beginning goes back to the time when the Accadai had not yet descended from their mountain fastnesses. The zenith was fixed above Elam, and not above Babylonia, and "the mountain of the East," the primitive home of the race, was supposed to support the firmament. The shrines on the topmost terraces of the temples were used also as observatories. Ur had its royal observatory, and so probably had the other cities of Chaldea; in Assyria they existed at Assur, Nineveh, and Arbela, and the astronomers-royal had to send in their reports to the king twice a month. At an early date the stars were numbered and named; but the most important astronomical work of the Accadians was the formation of a calendar. This came after the division of the heavens into degrees, since the twelve months (of 30 days each) were named after the zodiacal signs, and would seem to belong to about 2200 B.C. Somewhat strangely, the Accadian calendar appears to have passed to the Assyrians (and through them to the Jews) through the medium of the Aramæans. The year being roughly made to consist of 360 days, intercalary months had to be added, one of them being regularly inserted every six years, and two others being counted in by the priests when necessary. The *soss* of 60 years, the *ner* of 600, and the *sar* of 3600, were merely cycles dependent upon the general mathematical system of the Babylonians, which made 60 the unit, and then multiplied it by the factors of itself. The week of 7 days was in use from an early period; indeed, the names which we still give to the days can be traced to ancient Babylonia; and the seventh day was one of *sulum* or "rest." The night was divided into three watches; but this was afterward superseded by the more accurate division of the day into 12 *casbu* (of 2 hours each), corresponding to the divisions of the equator, each *casbu* being further subdivided into 60 minutes, and these again into 60 seconds. The sections of the equator contained 30 degrees each — a degree being 60 sosses or minutes; but since an astrolabe, now in the Museum, divides each of the 12 sections in the outer circle into 20 degrees, and those in the inner circle into 10 degrees, it is plain that a different system was adopted for astrological purposes. Eclipses were carefully recorded from a very remote epoch, and since some of these are said to have happened "according to calculation," and others "contrary to calculation," their recurrence after a cycle of eighteen years must have been roughly determined. One of the Assyrian reports states that a watch was kept for an eclipse of the sun on the three last days of the month, but that, contrary to expectation, the eclipse did not take place, and we possess notices of eclipses which have been verified by modern astronomers, though antecedent to the era of Nabonassar, with whom, so far as Ptolemy knew, the first record of them began. The chief work on astronomy was one compiled for the library of Sargon of Agane in seventy tablets or books, which went through many editions, one of the latest being now in the British Museum. It was called "The Illumination of Bel," and was translated into Greek by Berosus. The catalogue of its contents includes observations on comets, on the pole star, the conjunction of the sun and moon, and the motions of Venus and Mars. The main purpose, however, of all these Babylonian astronomical observations was an astrological one; to cast a horoscope, or predict the weather, was the chief business of the Chaldean astronomer. Indeed, the patient minuteness of the meteorological observations is most curious, and it was believed that the same weather recurred after a definite number of years. In the later Assyrian period the study became more scientific, and the observatory reports have something of the precision of modern times. But from a much earlier era we obtain interesting tables of lunar longitudes and numerical equivalents of the daily increase and decrease of the moon. As is implied by the attention given to astronomy, mathematics was fairly advanced. The unit was 60, a very convenient number, especially when used as the denominator of a fraction. A tablet found at Senkereh gives a table of squares and cubes, correctly calculated, from 1 to 60; and a people who were acquainted with the sun dial, the clepsydra; the lever, and the pulley, must have had no mean knowledge of mechanics. The lens, too, discovered at Nineveh, explains the minuteness of the cuneform writing on so many of the tablets, and suggests the possibility of artificial aids to the observation of the heavens.

Assyria possessed but little native literature. It was essentially a land of soldiers, and the more peaceful pur-

suits had their home in Babylonia, where the universities of Erech and Borsippa were renowned down to classical times. It was not until the reign of Assur-bani-pal that any attempt was made to rival Babylon in learning; then for the first time original compositions came from the pens of Assyrian scholars, and works were even written in the dead language of Accad. Syllabaries, together with grammars, dictionaries, and reading-books of Assyrian and Accadian, were drawn up, besides lists of Semitic synonyms. In these grammars and vocabularies lay the germ of comparative philology, and they are otherwise valuable as affording us the earliest native analysis of Semitic speech. But before this closing period of the empire, the Assyrians had been chiefly content to translate the ancient Accadian literature, or re-edit the contents of Babylonian libraries; and the cramping influence of a dead language, in which all the precedents of law and the first principles of science were locked up, could not but make itself felt. Every great city of Chaldea had at least one library, and it was in imitation of this that the royal libraries at Calah, Nineveh, Assur, and elsewhere, were founded. The larger part of the literature was in clay, stamped in minute characters upon baked bricks, *laterculæ coctiles* as Pliny calls them; but papyrus was also used, though none of this fragile material has been preserved to our day. In fact, the use of papyrus seems to have preceded that of clay, which was not employed until after the settlement of the Accadians in the plains. The clay tablets or books were arranged in order; and we learn from the catalogue of Sargon's library at Agane (about 2000 B.C.) that each was numbered, so that the student had only to write down the number of the tablet he wanted and the librarian thereupon handed it to him. The subjects of Accadian literary composition were multifarious. Among the most interesting are the hymns to the gods, some of which strikingly resemble the Hebrew psalms in substance as well as in form. Indeed, the parallelism of Hebrew and Assyrian poetry seems to have been borrowed from the Accadians. But the similarity of expression and feeling is no less remarkable. Thus we read in one—(1.) "May god, my creator, take mine hands. (2.) Guide thou the breath of my mouth: guide thou mine hands; (3.) O lord of light!" and in another—(1.) "In heaven who is high? Thou alone, thou art high. (2.) In earth who is high? Thou alone, thou art high. (3.) As for thee, thy word in heaven is declared: the gods bow their faces to the ground. (4.) As for thee, thy word in earth is declared: the spirits of earth kiss the ground;" or in a third—(1.) "O Lord, my transgressions are many: great are my sins. (2.) The Lord in the anger of his heart: has confounded me. (3.) God in the strength of his heart set himself against me." A collection was afterwards made of these hymns, which was used for ritualistic purposes, and regarded as an inspired volume, and has been aptly compared by M. Lenormant with the Rig-Veda of the Hindus. Of an older date is the collection of magic formulæ and charms, chiefly intended to counteract the effects of sorcery and demoniac possession, which go back to the Shamanistic period of Accadian religion. Later than the hymns, but still prior to the second millennium B.C. and the formation of the calendar, are the mythological poems which grew out of the development of a solar worship and the personification of the attributes of the gods. Two of these poems we possess intact,—on the Deluge and the descent of Istar into Hades,—and part of a third which describes the war of the seven evil spirits against the moon. The first two form the sixth and eleventh books of a very remarkable epic which centred round the adventures of a solar hero, older and originally independent lays being woven into it as episodes. The epic was divided into twelve books, each book dealing with a legend appropriate to the name of the corresponding zodiacal sign. This astronomical basis of the national epic shows how thoroughly the study had penetrated the mind of the people; and the clearness with which we can trace the growth and formation of the whole work throws great light on the history of epic literature generally, and adds one more confirmation to the theory of Wolf. The Assyrians also had their epic, in imitation of the Accadians, and M. Lenormant has pointed out that the Semiramis and Nannarus of the Greeks and the other personages of Ctesias were really figures of this mythical epopee. The historical and chronological works that have been preserved are of purely Assyrian origin, though there is every reason to suppose that when the libraries of Accad come to be excavated similar compositions will be found in them. The legal literature of the Accadians was certainly very extensive, and a collection of fables, one a dialogue between the ox and the horse, and another between the eagle and the sun has been met with.

Language and Trade.—As above stated, the language of the primitive Sumirian and Accadian population of Assyria and Babylonia belonged to the Turanian or Ural-Altaic family of speech. The Semitic tribes, who first possessed themselves of the tetrapolis of Sumir or Shinar, and then gradually spread over the whole of Assyria and Babylonia, borrowed many words from their more civilised predecessors, and lent them a few others in return. The so-called Assyrian language is sub-divided into the two dialects of Assyria and Babylonia, the latter dialect being characterised by a preference for the softer sounds, and a fuller use of the vowels. Literature and the influence of a dead language stereotyped it to such an extent that it underwent comparatively little change during the 1500 years during which we can watch its career; at least this is the case with the literary dialect. The closest affinities are with Hebrew and Phœnician; it shares their peculiarities in phonology, grammar, and vocabulary; and some obscure points in Hebrew etymology have already been cleared up by its help. Next to Hebrew, it shows perhaps the greatest resemblance to Arabic; differing most widely, on the other hand, from Aramaic. Aramaic, however, from becoming the *lingua franca* of trade and diplomacy after the fall of Tyre and Sidon, ended (like Arabic in later times) in superseding its sister idioms; but in Babylonia this did not happen until after the Persian conquest.

The earliest Semitic settlements in Babylonia seem to have been mainly for commercial purposes, and their career there may be compared with that of the English in India. In the 12th century B.C. the trading spirit had so thoroughly pervaded them that not only were objects of utility and art a marketable commodity, but we find Tiglath-Pileser I. bringing trees from the countries he had overrun, and acclimatising them in Assyria. The fullest development of business and commerce, however, does not show itself until the 8th and 7th centuries B.C., when Nineveh was a busy centre of trade. Sidon and Tyre had been ruined by the Assyrian kings—indeed, it is very possible that the obstinate wars with the Phœnician cities had their origin in commercial jealousy, and trade had accordingly transferred itself to Carchemish, which was conveniently situated on the Euphrates. The maneh of Carchemish became the standard of weight, and Aramaic the common language of trade. The interest upon money was usually at 4 per cent.; but sometimes, more especially when objects like iron were borrowed at

3 per cent. Payment might still be made in kind; but more ordinarily in bars of the three chief metals, which were weighed, though mention of coined money also occurs. Houses could be let on lease, and the deeds which conveyed them give a careful inventory of the property and its appurtenances. Commercial relations extended from India on the one side, whence came ivory and the teak found at Mugheir, which Sennacherib probably means by "wood of Sinda," to the tin islands of Cornwall on the other.

Religion and Mythology.— The earliest religion of Accad was a Shamanism resembling that of the Siberian or Samoyed tribes of to-day. Every object had its spirit, good or bad; and the power of controlling these spirits was in the hands of priests and sorcerers. The world swarmed with them, especially with the demons, and there was scarcely an action which did not risk demoniac possession. Diseases were regarded as caused in this way, and the cherubs, bulls, and other composite creatures which guarded the entrance to a house, were believed to protect it from mischief. In course of time certain spirits (or rather deified powers of nature) were elevated above the rest into the position of gods; and at the head of all stood the Triad of Na or Anna, "the sky," Ea, "the earth," and Mulge, "the lord of the underworld." The old Shamanism gradually became transformed into a religion with a host of subordinate semi-divine beings; but so strong a hold had it upon the mind, that the new gods were still addressed by their spirits. The religion now entered upon a new phase; the various epithets applied to the same deity were crystallised into fresh divinities, and the sun-god under a multitude of forms became the central object of worship. This inevitably led to a mythology, the numerous personified attributes passing into demi-gods and heroes. A large part of the Accadian mythology was solar, and the transparency of its proper names which, as in other agglutinative languages, never disguise their primitive meaning, makes it valuable in verifying the so-called "solar theory" of compaartive mythology. At this stage of development, however, an important change passed over the old faith. The Semitic settlers in Sumir had adopted the Accadian pantheon and belief, and after a conflict between the discordant religious conceptions of the two races, a great sacerdotal "reform" took place analogous to that of Brahmanism, and the official religion fused them into one whole. The magicians were taken into the priestly body, and the hierachy of divine beings was determined. The old triad of Na, Ea, and Mulge became the trinity of Anu, Ea, and Bel the Demiurge, all children of Zicu or Zicara, "the sky" Ea, "the god of life and knowledge," "the lord of the abyss," "the king of rivers and the garden," the husband of Bahu (the Bohu of Gen. i. 2), whose spirit pervades the universe, being made the father of Bel-Merodach, the tutelary divinity of Babylon. In accordance with the genius of the sex-denoting Semitic idioms, each deity was furnished with a female principle, and "The god" in Babylonia, and the personified city of Assur, with his wife Seruá, in Assyria, were placed at the head of the Pantheon. Below these four supreme divinities came a second trinity of the Moon-god, Sun-god, and Air-god, and the seven together formed "the seven magnificent deities." After these were arranged "the fifty great gods," and then the 300 spirits of heaven, and the 600 spirits of earth, among whom was found a place for the primeval divinities of Accad as well as for the many local deities of Chaldea. The most dreaded of "the spirits of earth" were "the seven spirits" who were born "without father and mother" in the encircling abyss of ocean, and carried plague and evil over the earth. An old myth told of their war against the moon, which was deputed to watch over the interests of mankind.

Along with the establishment of the Babylonian official religion, an astro-theology was created by the introduction of astronomy into the religious sphere. The "spirits" of the various stars were identified with the gods of the new creed, Merodach, for instance, properly one of the forms of the sun-god, being identified with the planet Jupiter, and the five planetary deities were added to the seven magnificent gods, making up altogether "the twelve chiefs of the gods." The elaboration of this astro-theology was also accompanied by the formation of a cosmogony. The details of the latter are to be found in the fragments of Berosus and Nicolaus Damascenus, whose statements are confirmed by the inscriptions, and they show a remarkable resemblance to the cosmogonies of Genesis and Phœnicians. It must be remembered that both Phœnicians and Hebrews profess to have migrated from Chaldea.

The resemblance is still more striking when we examine the Babylonian mythology. The sacred tree of Babylonia, with its guardian "cherubs" — a word, by the way, which seems of Accadian origin — as well as the flaming sword or thunderbolt of fifty points and seven heads, recall Biblical analogies, while the Noachian deluge differs but slightly from the Chaldean one. Indeed, the Jehovistic version of the flood story in Genesis agrees not only in details, but even in phraseology with that which forms the eleventh lay of the great Babylonian epic. The hero of the latter is Tam-zi or Tammuz, "the sun of life," the son of Ubaratutu, "the glow of sunset," and denotes the revivifying luminary of day, who sails upon his "ark" behind the clouds of winter to reappear when the rainy season is past. He is called Sisuthrus by Berosus, that is, Susru "the founder," a synonym of Na "the sky." The mountain on which his ark rested was placed, as already noticed, in Nisir, south-west of Lake Urumiyeh. Its peak, whereon the first altar was built after the deluge, was the legendary model after which the *zigurats* or towers of the Babylonian temples were erected. Besides the account of the flood, fragments have been met with of stories resembling those of the tower of Babel or Babylon, of the creation, of the fall, and of the sacrifice of Isaac,— the latter by the way, forming probably the first lay of the great epic. The sixth lay we possess in full. It describes the descent of Istar into Hades in pursuit of her dead husband Dū-zi, "the offspring," the Babylonian Adonis. Dū-zi is but another form of Tam-zi, and denotes the sun when obscured by night and winter. At each of the seven gates of Hades the goddess left some portion of her apparel, until she at last reached the abode of the dead, dark and joyless, where dust alone is the food of the unhappy shades. In the midst rose the golden throne of the spirits of earth, beneath which welled "the waters of life," and here, too, was the seat of Bahu. Bahu, as queen of the underworld, smote Istar with many diseases, and confined her in Hades until her brother the Sun-god complained to the Moon-god and Ea, who sent a sphinx to pour the waters of life upon the imprisoned goddess and restore her to the light of day. This myth gives a good idea of the Chaldean conception of the next world. Certain favored individuals, however, might look forward to a happier state of existence. A psalm which invokes blessings upon the king wishes him everlasting life in "the land of the silver sky," where the gods feast and know no evil. It will be observed that the Babylonian Hades (like the Hebrew Sheol) is not very dissimilar to the Homeric one; and the possibility of borrowing on the part of the Greeks is suggested by the fact, that the seven-headed

serpent of Hindu legend is of foreign origin, being taken from the seven-headed serpent of the Accadians, "which lashes the waves of the sea," while the story of Andromeda came through Phœnician hands from a Chaldean myth which forms the subject of one of the lays of the great epic. So, too, the Oceanus of Homer finds its prototype in the encircling abysmal waters of Accadian geography, and the *fravashis* and *mithras* of Mazdaism were introduced by the Magian (or Turanian) population found in Media by the Arvan invaders.

But the old Shamanistic ideas survived also in Assyria and Babylonia, and so were handed on to the Jews. An elaborate system of augury flourished down to the last days of the empire, and omens were drawn from every event that could possibly happen. Magic formulæ for warding off the attacks of demons were extensively used, and the bronze bowls found by Mr. Layard, as well as the part played by charms and demons in the Talmud, show how strongly the belief had seized upon the Jewish mind.

BABYLONISH CAPTIVITY, the deportation, under Nebuchadnezzar, of a large portion of the principal inhabitants of Judah, after the fall of Jerusalem, 586 B. C. It must be carefully distinguished from the carrying into Assyria of a large number of the inhabitants of the northern kingdom—the ten tribes—by Sargon, the successor of Shalmaneser, as early as 721. A large number of the inhabitants of Judah had been already carried off to Babylon in 597, when Zedekiah had become King over the remainder. It was not long before these excited the anger of the powerful Chaldean king, and the second capture of the city and captivity of the inhabitants put an end to the kingdom of Judah. They were allowed the free exercise of their religion, and here Ezekiel and the unknown author of the last part of the book of Isaiah gave hope to the spiritual aspirations of the despondent people.

BACCARAT (Fr. *Baccara*) is one of the most widespread French games of chance, played for money between a banker and several punters.

BACCARAT, a town of France, in the department of Meurthe and arrondissement of Lunéville.

BACCHIGLIONE, a river of north-eastern Italy, which, rising in the mountains eastward of Trent, passes by Vicenza, and Padua, and, after a course of 90 miles, falls into the lagune of Venice, south of Chioggia.

BACCHUS, the Latin name of Dionysus, the god of wine. See DIONYSUS.

BACCHYLIDES, a famous Greek lyric poet, born at Iulis in Ceos, was the nephew of Simonides, and flourished about 470 years before Christ.

BACCIO DELLA PORTA, called FRA BARTOLOMMEO DI S. MARCO, a celebrated historical and portrait painter, was born at Savignano, near Florence, in 1469, and died in 1517.

BACH, JOHANN-SEBASTIAN, was born at Eisenach in Thuringia, on March 21, 1685, the same year which gave birth to his great contemporary Handel. His father held a musical appointment from the town council, being himself descended from a musician. The family of the Bachs, like those of some of the great Italian painters, may be cited as one of the most striking instances of hereditary artistic genius. Through four consecutive generations they followed the same calling, counting among their number no less than fifty musicians of more or less remarkable gifts. Johann-Sebastian's parents died before he had reached his tenth year, and he was left to the care of his elder brother, an organist at Ohrdruf, from whom he received his rudimentary musical education. In 1698 his brother died, and Bach, at the age of fourteen, saw himself thrown on his own resources for his further means of support. He went to Lüneburg, where his beautiful soprano voice obtained him an appointment as chorister at the school of St. Michael. In this manner he became practically acquainted with the principal works of vocal music, continuing at the same time his practice on the organ and pianaforte. A special teacher of any of these instruments, or, indeed, of the theory of music, Bach seems never to have had, at least not to our knowledge, and his style shows little affinity to the modes of expression in use before him.

At the age of eighteen Bach returned to Thuringia, where his executive skill on the organ and pianoforte attracted universal attention, and even obtained him various musical appointments, of which we mention as the most important that of court organist to the duke of Weimar. One, and not the least welcome, of his official duties was the composition of sacred music. One of his most beautiful sacred cantatas, *Ich hatte viel Bekümmerniss*, was composed during his stay at Weimar. In 1723 he removed to Leipsic, where the position of cantor at the celebrated "Thomasschule," combined with that of organist at the two principal churches of Leipsic, was offered to him. It was here that the greater part of his works were composed, mostly for the immediate requirements of the moment. Several of them he engraved himself, with the assistance of his favorite son, Friedemann. The further course of his life ran smoothly, only occasionally ruffled by his altercations with his employers, the town-councilors of Leipsic, who, it is said, were shocked by the "unclerical" style of Bach's compositions, and by his independent bearing generally. He was married twice, and had by his two wives a family of eleven sons and nine daughters. In 1747 Bach made a journey to Potsdam by the invitation of Frederick the Great, who, himself a musical amateur, received the master with distinguished marks of regard. He had to play on the numerous pianofortes of the king, and also to try the organs of the churches of Potsdam. Two years after this event his sight began to fail, and before long he became perfectly blind, a circumstance which again coincides with the fate of his great contemporary, Handel. Bach died of apoplexy on the 28th July 1750. His loss was deplored as that of one of the greatest organists and pianoforte players of his time. Particularly his powers of improvisation are described as unrivalled by any of his contemporaries. Of his compositions comparatively little was known. His MS. works were at his death divided amongst his sons, and many of them have been lost in the course of time; only about one-half of his greater works were recovered, when, after the lapse of nearly a century, the verdict of his neglectful contemporaries was reversed by an admiring posterity.

The history of this Bach revival is closely connected with the name of Mendelssohn, who was amongst the first to proclaim by word and deed the powers of a genius almost too gigantic to be grasped by the receptivity of one generation. By the enthusiastic endeavours of Mendelssohn, Schumann, and others, the circle of Bach's worshippers has increased rapidly. In 1850, a century after his death, a society was started for the correct publication of all of Bach's remaining works, to which music owes the rescue from oblivion of some of its sublimest emanations. Amongst those who have vastly contributed to establish the *rapport* between our master's genius and modern lovers of art, we also mention Dr Robert Franz, himself one of Germany's greatest lyrical composers, who has edited and adapted to the resources of the modern orchestra several of Bach's most beautiful works. It remains to add a few words about Bach's position in the

history of musical development. By Marx, a well-known critical writer, he has been called the "Founder and Father of German Music;" and it cannot be denied that no other German composer before him had attained a specifically national type of musical utterance as distinguished from that of other nations. This applies both to matter and manner. Bach has frequently founded his grandest conceptions on the simplest tune of old chorales, that is, of purely popular effusions of pious fervor, such as had survived in the living memory of the nation from the time of Luther and his great revival of religious feeling. Sometimes these tunes were adapted for religious purposes from still older songs of a secular character, being thus thoroughly interwoven with the inmost feeling of the German people. In raising these simple creations of popular growth to the higher sphere of art, Bach has established his claim to the name of the creator of the *Germanic* as opposed to the *Romance* phase of musical art. This spirit of German, or to speak more accurately, North German nationality, thoughtful yet *naïve*, earnest yet tender, has also reacted on the form of Bach's creations. Bach's counterpoint, compared with the polyphonous splendour of Palestrina or Orlando di Lasso, is as it were, of a more intense, more immediately personal kind. In his sacred cantatas the alternate exclamations of the voices sometimes rise to an almost passionate fervor of devotion, such as is known only to the more individualised conception of human relations to the Deity peculiar to Protestant worship, — applying that term in a purely emotional, that is, entirely unsectarian sense. It is thus that Bach has vivified the rigid forms of the fugue with the fire of individual passion. About the peculiarities of his style, from a technical point of view, we can speak no further. How his style and his genius, neglected by his contemporaries, and obscured by other masters, like Hayden and Mozart, starting from a different basis and imbued with a different spirit, have ultimately been destined to exercise a potent spell on modern art, we have indicated already.

BACH, KARL PHILIPP EMMANUEL, second son of the above, was born at Weimar on the 14th March 1714, and died at Hamburg on the 14th September 1788. He was perhaps the most highly gifted musician of the eleven brothers, and his influence on the development of certain musical forms gives him a prominent place in the history of the art. He studied at the Thomasschule and afterwards at the university of Leipsic, devoting himself, like several of his brothers, to jurisprudence. In 1738 he took up his residence in Berlin, where he was soon afterwards appointed chamber musician to Frederick the Great. In 1767 he was allowed, after considerable negotiation, to relinquish his situation at court in order to accept the post of kapellmeister at Hamburg, where he passed the last twenty-one years of his life.

BACHE, ALEXANDER DALLAS, a distinguished American physicist, who has gained a wide reputation as superintendent of the great American Coast Survey, was a great-grandson of Benjamin Franklin, and was born at Philadelphia, 19th July 1806. In 1821 he entered the military academy at West Point, and graduated there with the highest honors in 1825. For some time he acted as assistant professor in the academy, holding at the same time a commission as lieutenant of engineers, in which capacity he was engaged for a year or two in the erection of coast fortifications. He occupied the post of professor of mathematics in the university of Pennsylvania from 1827 to 1836, and was then made president of the newly-instituted Girard College. In this capacity he undertook a journey through some of the principal countries of Europe, in order to examine their systems of education, and on his return published a very valuable report. In 1843, on the death of Professor Hassler, he was appointed by Government to the office of superintendent of the coast survey. He succeeded in impressing Congress with a sense of the great value of this work, and by means of the liberal aid it granted, he carried out a singularly comprehensive plan with great ability and most satisfactory results. By a skillful division of labor, and by the erection of numerous observing stations, the mapping out of the whole coast proceeded simultaneously under the eye of the general director. Nor were the observations confined to mere description of the coast-line; the several stations were well supplied with instruments, and a vast mass of magnetic and meteorological observations was collected, such as must infallibly prove of infinite service in the future progress of physical science. The annual reports issued by the superintendent were admirable specimens of such summaries, and secured for him a high reputation among European savants. Professor Bache contributed numerous papers to scientific journals and transactions, and labored earnestly to raise the position of physical science in America. For some months before his death, which took place at Newport, 17th February 1867, he was afflicted with softening of the brain, caused, perhaps, by intense and long-continued mental exertion.

BACHELOR, a word of various meaning, and of exceedingly obscure origin. In modern times the most common significations of it are — (1), an unmarried person; (2), one who has taken the lowest degree in any of the faculties at a university. At various times, however, it has signified either a young man in general, from which the first of the modern meanings was easily developed; or a knight who was unable to lead a body of retainers in the field, *i.e.*, to use the technical phrase, was not able *lever bannière;* or, finally, an ecclesiastic at the lowest stage of his course of training. It has also been pointed out that *bacheleria*, which meant the body of aspirants to knighthood, came to be used as synonymous with *gentry*.

Bachelors, or unmarried persons have in many countries been subjected to penal laws. The best-known examples of such legislation are those of Sparta and Rome. At Sparta, citizens who remained unmarried after a certain age were subjected to a species of *ἀτιμία*. They were not allowed to witness the gymnastic exercise of the maidens; and during winter they were compelled to march naked round the market place, singing a song composed against themselves, and expressing the justice of their punishment. The usual respect of the young to the old was not paid to bachelors.

BACHIAN, one of the East Indian islands belonging to the group of the northern Moluccas, situated immediately south of the equator. It is of an irregular form, consisting of two distinct mountainous parts, united by a low isthmus, which a slight subsidence would submerge. The area is estimated at 600 geographical square miles.

BACKGAMMON, a game played with dice, said to have been invented about the 10th century.

Backgammon is played by two persons, having between them a *backgammon board*. The board is divided into *tables*, each table being marked with six *points*, colored alternately white and black. The inner and outer tables are separated from each other by a projecting *bar*.

Two *dice* boxes are required, one for each player, and a pair of dice, which are used by both players. The dice are marked with numbers on each face from one to six, number one being called *ace;* two, *deuce;* three, *trois* (pronounced threy); four, *quatre* (katre); five, *cinque;* and six, *six* (size).

The board being arranged, each player throws one die; the one who throws the higher number has the right of playing first; and he may either adopt the throw originally made by the two players, each throwing one die; or he may throw again, using both dice.

Each player moves his own men from point to point, the moves being determined by throws of the dice made by the players alternately. A player may move any of his men a number of points corresponding to the numbers thrown by him, provided the board is not *blocked* by two or more of his adversary's men occupying the point to which he wishes to move. Thus, suppose white throws cinque, six, he may move one of his men from the left-hand corner of the black's inner table to the left-hand corner of black's outer table for six; he may, again, move the same man five points further on, viz., to the right-hand point of the same table for five, when his move is completed; or he may leave the man first moved six, and move any other man five points, where the board is open. But white cannot move a man for five from the ace point in black's inner table, because the six point in that table (*i.e.*, the fifth point from where white moves) is blocked by the black men. Any part of the throw which cannot be moved is of no effect; but it is compulsory for a player to move the whole throw if he can. Thus, if the men were differently placed, and white could move a six, and having done so could not move a five, his move is completed. If, however, by moving the five first, he can afterwards move a six, he may be required to make the move in that manner. All white's moves must be in the direction indicated, viz., from black's inner table to black's outer, and from this to white's outer table, and so on to white's inner table; and all black's moves must be in the contrary direction. Of course, where men are originally placed part of the way home, they only have to traverse the remainder of the distance.

A player in moving must not skip a point which is blocked by his adversary's men. Thus, suppose white's first throw is fives, he cannot move a man from the ace point of black's inner table to the cinque point of black's outer, although that is free; because in moving the first cinque he comes to a point which is occupied by black.

When two similar numbers are thrown (called *doublets*), the player has a double move. Thus, if he throws aces he has to move four aces instead of two, and so on for the other numbers.

When a player moves his men so as to occupy a point with two men, it is called *making a point*. Thus, if ace, trois are thrown and white moves one man from the three in his outer table to the cinque point in his inner table, for trois, and then moves a man from the six point to the cinque point of his inner table, for ace, he makes a point there.

If a player leaves only a single man on a point, or places a single man on an unoccupied point, it is called *leaving a blot*. Thus, if the first throw is six, cinque, and white carries a man from black's inner table as far as he will go, white leaves a blot on the ace point of his opponent's home table.

When a blot is left the man may be taken up, or the blot may be *hit*, if, while it remains, the adversary throws a number which will enable him to place a man on that point. For example, if a blot is left on black's ace point, as in the case previously supposed, and black throws a five, or numbers that make up five, he can hit the blot from his six point; or similarly, if he throws seven, or numbers that make up seven, he can hit the blot from the three men posted in his outer table. The man hit is placed on the bar, and has to *enter* black's inner table again at white's next throw.

It will be observed that black in taking up white leaves a blot himself, which subjects him to be taken up if white enters with an ace. If this should occur, black's man is placed on the bar, and has at his next throw to enter white's inner table, whence he has to start his journey home. Suppose white to have a blot as before on black's ace point, and black to throw sixes, black could then move two men from white's outer table to his own bar point (so called because it is close to the bar), and thence again to his own ace point, when he would hit white without leaving a blot.

The point in which a man is entered must not be blocked by two or more men belonging to the adversary. Thus, to carry on the illustration, if white now throws aces, or sixes, or six ace, he cannot enter at all. He is not allowed to move any man while he has one to enter; consequently his throw is null and void, and black throws again. It sometimes happens that one player has a man up, and that his adversary occupies all the points on his own home table with two or more men (called having his table *made up*). In this case, the player with a man up cannot enter; and as it is useless for him to throw, his adversary continues throwing until he is obliged to open a point on his inner table.

Two blots may be taken up at once if the adversary throws numbers that will hit them both. It is possible with doublets to take up four blots at once, but this could scarcely happen in a game between players of any proficiency.

The game proceeds by moving the men round towards home, or by hitting blots and sending them back, until one of the players gets all his men into his inner table or home. As soon as this stage is reached, the player who has accomplished it begins to take his men off the board or to *bear* them. Thus, suppose he has several men on every point of his table, and throws six, quatre; he bears one man from his six point, and one from his quatre point. If his six point is unoccupied, he can bear a six from his cinque point, or from the highest point which is occupied, and so on with smaller numbers, provided the numbers thrown are higher than the points occupied; if lower, the throw must be moved. A player has the option of moving a man when he can, instead of bearing it. Thus, in the case originally given the six must be borne, because a six cannot be moved; but the quatre may be moved if preferred, by moving a man from the six point to the deuce point, or from cinque point to the ace point. Doublets entitled to bear or move four men in accordance with the previous rules. The adversary similarly bears his men as soon as he gets them all home. If, after a player has commenced bearing his men, he should be hit on a blot, he must enter on his adversary's inner table, and must bring the man taken up into his own inner table before he can bear any more.

Whoever first bears all his men wins the game:—a single game or *hit* if his adversary has borne any of his men; a double game or *gammon* if the adversary has not borne a man; and a triple game or *backgammon*, if, at the time the winner bears his last man, his adversary, not having borne a man, has one in the winner's inner table.

When a series of games is played, the winner of a hit has the first throw in the succeeding game; but if a gammon is won, the players each throw a single die to determine the first move of the next game.

BACON, Francis, Baron Verulam, Viscount St. Alban, was born at York House in the Strand, London, on the 22d January 1561. He was the youngest son of Sir Nicholas Bacon, the celebrated lawyer and statesman, who for twenty years of Elizabeth's reign held the seals as lord keeper. His mother, the second wife of Sir Nicholas, was a daughter of Sir

Anthony Cooke, formerly tutor to Edward VI. She was a woman of considerable culture, well skilled in the classical studies of the period, and a warm adherent of the Reformed or Puritan Church. In April 1573 he was entered at Trinity College, Cambridge, where for three years he resided with his brother Anthony. Our information with regard to these important years is singularly scanty. We know only that Bacon at Cambridge, like Descartes at La Flêche, applied himself diligently to the several sciences as then taught, and came to the conclusion that the methods employed and the results attained were alike worthless and erroneous. Although he preserved a reverence for Aristotle (of whom, however, he seems to have known but little), he learned to despise the Aristotelian philosophy. It yielded no fruit, was serviceable only for disputation, and the end it proposed to itself was a mistaken one. Philosophy must be taught its true business, and to attain its new aim a new method must be devised. With the first germs of this great conception in his mind, Bacon left the university in 1576.

In the same year he and his brother Anthony were entered *de societate magistrorum* at Gray's Inn, and a few months later he was sent abroad with Sir Amyas Paulet, the English ambassador at Paris. He spent some time in that city, and travelled through several of the French provinces. The disturbed state of government and society in France at that time must have afforded him much valuable political instruction; and it has been commonly supposed that certain *Notes on the State of Christendom*, usually printed in his works, contain the results of his observations. But Mr. Spedding has shown that there is no reason for ascribing these "Notes" to him, and that they may be attributed with more probability to one of his brother Anthony's correspondents.

The sudden death of his father in February 1579 necessitated Bacon's return to England, and exercised a very serious influence on his fortunes. A considerable sum of money had been laid up by Sir Nicholas in order to purchase an estate for his youngest son, the only one otherwise unprovided for. Owing to his sudden death, this intention was not carried out, and but a fifth part of the money descended to Francis, who thus began his career in comparative poverty. It was one of the gravest misfortunes of his life; he started with insufficient means, acquired a habit of borrowing, and was never afterwards out of debt. As it had become absolutely necessary that he should adopt some profession by which an adequate income would be yielded, he selected that of law, and took up his residence at Gray's Inn in 1579.

Nothing throws so clear a light on the career of any great man as a knowledge of his character and aims when he made the first step into the world. We learn from this how he himself desired to shape his course, and at every point can see how far his actions correspond to the end he had placed before him. His grand and comprehensive aim, the production of good to the human race through the discovery of truth, was combined in him with the more practical desire to be of service to his country, service for which he felt himself by birth and education eminently fitted. He purposed, therefore, to obtain, if possible, some honorable post in the state which would give him the means of realising, so far as in him lay, these two great projects, and would at the same time enable him to do somewhat for the church, the third of the objects whose good he had at heart. The constant striving after these three ends is the key to Bacon's life. His qualifications for accomplishing the task he thus set before him were not small. His intellect was far-seeing and acute, quick and yet cautious, meditative, methodical, and free from prejudice. If we add to this account what Bacon himself does not tell us — that he seems to have been of an unusually sweet temper and amiable disposition — we shall have a fairly complete picture of his mental character at the critical period of his entry into the world.

In 1580 he appears to have taken the first step in his projected career by applying, through his uncle, Burghley, for some post at court. His suit, though well received by the queen and the lord treasurer, was unsuccessful: the particulars of it are totally unknown. For two years after this disappointment he worked quietly at Gray's Inn, and in 1582 was admitted an outer barrister. In 1584 he took his seat in Parliament for Melcombe in Dorsetshire, but the notes for the session do not disclose what part he took or what reputation he gained. About the same time he made another application to Burghley, apparently with a view to expediting his progress at the bar. His uncle, who appears to have "taken his zeal for ambition," wrote him a severe letter, taking him to task for arrogance and pride, qualities which Bacon vehemently disclaimed. It is uncertain what success attended this suit; but as his advancement at the bar was unusually rapid, his uncle's influence may not improbably have been exerted in his behalf. Some years later, in 1589, he received the first substantial piece of patronage from his powerful kinsman, the reversion of the clerkship of the Star Chamber being granted to him. The office was valuable, worth about £1600 a year; but it did not become vacant for nearly twenty years, and was thus, as Bacon used to say, "like another man's ground buttailing upon his house, which might mend his prospect, but did not fill his barn." A considerable period of his life had thus slipped away, and his affairs had not prospered. He had written on the condition of parties in the church; he had set down his thoughts on philosophical reform in the lost tract, *Temporus Partus Maximus;* but he had failed in obtaining the position which he looked upon as an indispensable condition of success. A long and eloquent letter to Burghley, written under these circumstances, gives a vivid picture of his mental state, throws additional light upon his character and aims, and at the same time gives a slight hint as to the cause of his uncle's slackness in promoting him.

Some time before this, perhaps as early as 1588, Bacon appears to have become acquainted with Essex, the impetuous and headstrong favorite of Elizabeth's later years. At the close of 1591 he was acting as the earl's confidential adviser, and in the following year Anthony Bacon, returning from the Continent, was also introduced to the young nobleman, and the two brothers exerted themselves diligently in his service. In Feb. 1593 Parliament was called, and Bacon took his seat as member for Middlesex. The special occasion for which the House had been summoned was the discovery of one of the numerous Popish plots that distracted Elizabeth's reign. The conspiracy seemed to be formidable, and Government felt the necessity for increased supplies. As Bacon's conduct in this emergency seriously affected his fortunes, and has been much misunderstood, it is necessary to state, as briefly as possible, the whole facts of the case. The House having been duly informed of the state necessities, assented to a double subsidy, and appointed a committee to draw up the requisite articles. Before this was completed, a message arrived from the House of Lords requesting a conference, which was granted. The committee of the Commons were then informed that the crisis demanded a triple subsidy to be collected in a shorter time than usual, that the Lords could not assent to less than this, and that they desired to confer on the matter. This proposal of the Lords

to discuss supply infringed upon the privileges of the Commons; accordingly, when the report of committee was read to the lower House, Bacon stood up and spoke against the proposed conference, pointing out at the same time that a communication from the Lords might be received, but that the actual deliberation on it must be taken by themselves alone. His motion, after some delay, was carried, and the conference was rejected. The Lords upon this lowered their demands, and desired merely to make a communication, which, being legitimate, was at once assented to. The House had then before them the proposal for a triple subsidy, to be collected in three, or, as the motion ultimately was shaped, in four years, instead of in six, as the ordinary custom would have been. Bacon, who approved of the increased subsidy, was opposed to the short period in which it was proposed to be raised. He suggested that it would be difficult or impossible for the people to meet such heavy demands, that discontent and trouble would arise, and that the better method of procedure was to raise money by levy or imposition. His motion appears to have received no support, and the four years' subsidy was passed unanimously. Bacon, as it turned out, had been mistaken in thinking that the country would be unable to meet the increased taxation, and his conduct, though prompted by a pure desire to be of service to the queen, gave deep and well-nigh ineradicable offence. He was accused of seeking popularity, and was for a time excluded from the court. His letter to Burghley, who had told him of the queen's displeasure with his speech, offers no apology for what he had said, but expresses regret that his motives should have been misunderstood, and that any offence should have been taken. He soon felt that the queen's anger was not to be appeased by such a justification. The attorney-generalship had fallen vacant, and Bacon became a candidate for the office, his most formidable rival being his life-long antagonist, Coke, who was then solicitor. Essex warmly espoused Bacon's cause, and earnestly pressed his claims upon the queen; but his impetuous, pettish pleading tended rather to retard than advance the cause. Burghley, on the other hand, in no way promoted his nephew's interest; he would recommend him for the solicitorship, but not for the attorney-generalship; and it is not improbable that Sir Robert Cecil secretly used his influence against his cousin. The queen delayed the appointment, and Bacon's fortunes, as they then stood, could ill brook delay. He was harassed with debt, and at times so disheartened that he contemplated retirement from public life and devotion to abstract studies. In March 1594 it was at last understood that Coke was to be attorney-general. Essex though bitterly mortified, at once threw all his energies into the endeavor to procure for Bacon the solicitorship; but in this case also, his method of dealing, which was wholly opposed to Bacon's advice, seemed to irritate, instead of conciliating the queen. The old offence was not yet forgiven, and after a tedious delay, the office was given, in Oct. 1595, to Sergeant Fleming. Burghley and Puckering seem to have assisted Bacon honestly, if not overwarmly, in this second application; but the conduct of Cecil had roused suspicions which were not perhaps without foundation. Essex, to compensate in some degree for Bacon's disappointment, insisted upon presenting him with a piece of land, worth about £1800, and situated probably near Twickenham Park. Nor did his kindness cease there; before sailing on the expedition to Cadiz, in the beginning of 1596, he addressed letters to Buckhurst, Fortescue, and Egerton, earnestly requesting them to use their influence toward procuring for Bacon the vacant office of master of the rolls. Before anything came of this application, the Cadiz expedition had resulted in a brilliant success, and Essex became the idol of the army and the people. Bacon saw clearly that such a reputation would assuredly alienate the affections of the queen, who loved not to have a subject too powerful or too popular. He therefore addressed an eloquent and imploring letter to the earl, pointing out the dangers of his position, and urging upon him what he judged to be the only safe course of action, to seek and secure the favor of the queen alone; above all things dissuading him from the appearance of military popularity. His advice, however, was unpalatable and proved ineffectual. The earl still continued his usual course of dealing with the queen, depending solely upon her supposed affection for him, and insanely jealous of any other whom she might seem to favor. His unskilful and unlucky management of the sea expedition to Ferrol and the Azores in no way lowered his popularity with the people, but undoubtedly weakened his influence with the queen.

Bacon's affairs in the meantime had not been prospering. He had increased his reputation by the publication, in 1597, of his *Essays*, along with which were the *Colors of Good and Evil* and the *Meditationes Sacræ*; but his private fortunes were in a bad condition. No public office apparently could be found for him; he failed in the endeavor to retrieve his position by marriage with the wealthy widow, Lady Hatton, and in 1598 he was arrested for debt. He seems, however, to have been growing in favor with the queen. Some years previously (perhaps about 1594), he had begun to be employed by her in crown affairs, and he gradually acquired the standing of one of the learned counsel, though he held no commission or warrant, and received no salary. At the same time he was no longer on the former friendly terms with Essex, a certain estrangement having sprung up between them, caused no doubt by the earl finding his friend's advice distasteful. The earl's affairs were then at a somewhat critical stage, and as our judgment upon a most important episode in Bacon's life depends upon our knowledge of the events of the ensuing year, it will be requisite to enter more minutely than would otherwise be necessary into proceedings with which Bacon himself had nothing to do.

Ireland was then in a rebellious and discontented condition, and it was somewhat difficult for the English Government to decide either on a definite course of policy with regard to it, or on a leader by whom that policy might be carried out. Upon this subject a violent quarrel took place between the queen and Essex, who for some months retired from court, and refused to be reconciled. At last he came forth from his seclusion, and it was soon understood that he was in person to undertake the subjugation of the rebels in Ireland, with a larger force than had ever before been sent into that country. Into the obscure details of this unhappy campaign it is unnecessary to enter; one fact stands out clearly, that Essex endeavored to carry out a treasonable design. His jealousy and ill temper had been so roused that the only course open to him seemed to be the obtaining a powerful military force, the possession of which would compel the queen to reinstate him in her favor. Whether or not this plan was in contemplation before he undertook the Irish expedition is not evident, though even outsiders at that time entertained some suspicions, but there can be no doubt of the treasonable character of the negotiations carried on in Ireland. His plans, probably not very definite, were disturbed by an imperative message from the queen, ordering him not to return to England without her permission. He at once set off, and, trusting apparently to her affection for him, presented himself suddenly before her. He was, for the moment, received kindly, but

was soon afterwards ordered to keep his chamber, and was then given into the custody of the lord keeper at York House, where he remained till March 1600. His great popularity, and the general ignorance of the reasons for his imprisonment, stirred up a strong feeling against the queen, who was reported to be influenced by Bacon, and such indignation was raised against the latter, that his friends feared his life would be in danger. The groundless character of this accusation shows how little confidence should be reposed in popular versions of obscure occurrences. It was at last felt necessary that the queen should in some way vindicate her proceedings, and this she at first did, contrary to Bacon's advice, by a declaration from the Star Chamber. This, however, gave little or no satisfaction, and it was found expedient to do what Bacon had always recommended, to have a fair trial, yet not one in which the sentence must needs be damaging to the earl. The trial accordingly took place before a body of her majesty's councillors, and Bacon had a subordinate and unimportant part in the accusation. Essex does not seem to have been at all hurt by his action in this matter, and shortly after his release they were again on friendly terms, Bacon drawing up letters as if to or from the earl with the design of having them brought before the queen. But Bacon did not know the true character of the transactions in which Essex had been engaged. The latter had been released from all custody in August, but in the meantime he had been busily engaged in treasonable correspondence with James of Scotland, and was counting on the Irish army under his ally, Montjoy, the new deputy. But Montjoy had apparently come to see how useless the attempt would be to force upon the queen a settlement of the succession, and declined to go further in the matter. Essex was thus thrown upon his own resources, and his anger against the queen being aroused afresh by the refusal to renew his monopoly of sweet wines, he formed the desperate project of seizing her person and compelling her to dismiss from her council his enemies Raleigh, Cobham, and Cecil. As some pretext, he intended to affirm that his life was in danger from these men, who were in league with the Spaniards. The plot was forced on prematurely by the suspicions excited at court, and the rash attempt to rouse the city of London (8th February 1601) proved a complete *fiasco*. The leaders were arrested that night and thrown into prison. Although the actual rising might have appeared a mere outburst of frantic passion, the private examinations of the most prominent conspirators disclosed to the Government a plot so widely spread, and involving so many of the highest in the land, that it would have been perilous to have pressed home accusations against all who might be implicated. Essex was tried along with the young earl of Southampton, and Bacon, as one of her majesty's counsel, was present on the occasion. Coke, who was principal spokesman, managed the case with great want of skill, incessantly allowing the thread of the evidence to escape, and giving the prisoners opportunity to indulge in irrelevant justifications and protestations which were not ineffectual in distracting attention from the real question at issue. On the first opportunity Bacon rose and briefly pointed out that the earl's plea of having done nothing save what was absolutely necessary to defend his life from the machinations of his enemies was weak and worthless, inasmuch as these enemies were purely imaginary; and he compared his case to that of Pisistratus, who had made use of a somewhat similar stratagem to cloak his real designs upon the city of Athens. He was thereupon interrupted by the earl, who proceeded to defend himself, by declaring that in one of the letters drawn up by Bacon, and purporting to be from the earl to Anthony Bacon the existence of these rumors, and the dangers to be apprehended from them, had been admitted; and he continued, "If these reasons were then just and true, not counterfeit, how can it be that now my pretences are false and injurious?" To this Bacon replied, that "the letters, if they were there, would not blush to be seen for anything contained in them, and that he had spent more time in vain in studying how to make the earl a good servant to the queen than he had done in anything else." It seems to be forgotten in the general accounts of this matter, not only that Bacon's letters bear out what he said, but that the earl's excuses *were* false. A second time Bacon was compelled to interfere in the course of the trial, and to recall to the minds of those present the real question at issue. He animadverted strongly upon the puerile nature of the defence, and in answer to a remark by Essex, that if he had wished to stir up a rebellion he would have had a larger company with him, pointed out that his dependence was upon the people of London, and compared his attempt to that of the duke of Guise at Paris. To this the earl made little or no reply. Bacon's use of this illustration, and of the former one of Pisistatus, has been much commented on, and in general it seems to have been thought that had it not been for his speeches Essex might have escaped, or, at all events, have been afterwards pardoned. But this view of the matter depends on the supposition that Essex was guilty only of a rash outbreak. That this was not the case was well known to the queen and her council. Unfortunately, prudential motives hindered the publication of the whole evidence; the people, consequently, were still ignorant of the magnitude of the crime, and, till recently, biographers of Bacon have been in like ignorance. The earl himself, before execution, confessed his guilt and the thorough justice of his sentence, while, with singular lack of magnanimity, he incriminated several against whom accusations had not been brought, among others his sister Lady Rich. After his execution it was thought necessary that some account of the facts should be drawn up and circulated, in order to remove the prejudice against the queen's action in the matter. This was intrusted to Bacon, who drew up a *Declaration of the Practices and Treasons attempted and committed by Robert, late Earl of Essex*, his first draft being extensively altered and corrected by the queen and council. Nothing is known with certainty of the reception given to this official explanation, but the ill feeling against Bacon was not wholly removed, and some years later, in 1604, he published, in the form of a letter to Montjoy, an *Apology* for his action in the case. This *Apology* gives a most fair and temperate history of the relations between Bacon and Essex, shows how the prudent counsel of the one had been rejected by the other, and brings out very clearly what we conceive to be the true explanation of the matter. Everything that Bacon could do was done by him, until the real nature of Essex's design was made apparent, and then, as he had repeatedly told the earl, his devotion and respect were for the queen and state, not for any subject; friendship could never take rank above loyalty. Those who blame Bacon must acquit Essex of all wrong-doing.

Bacon's private fortunes, during the period after the death of Essex, were not in a flourishing condition. He had obtained a grant of £1200 from the fines imposed on Catesby, one of the conspirators, but his debts were sufficient to swallow up this and much more. And, though he was trusted by Elizabeth, and on good terms with her, he seems to have seen that he had no chance of advancement. But her death in 1603, followed by the undisputed succession of James, gave him

new hopes; to use his own expression, he found himself "as one awaked out of sleep." It appeared to him that at length the abilities he was conscious of possessing would obtain recognition; he thought that "the canvassing world" had gone, and the "deserving world" had come. He used every means in his power to bring himself under James' notice, writing to all his friends at the Scottish court and to the king himself. He managed to obtain a personal interview with the king but does not seem to have been much satisfied with it. In fact, while the king confirmed in their situations, those who had held crown offices under Elizabeth, Bacon, not holding his post by warrant, was practically omitted. He was, however, continued, by special order of the king, as learned counsel extraordinary, but little or no law business appears to have been intrusted to him. He procured, through his cousin Cecil, the dignity of knighthood, which, contrary to his inclination, he received along with about 300 others, on the 23d July 1603. Between this time and the opening of James' first Parliament he was engaged in literary work, and sent to the king two pamphlets — one on the Union, the other on measures for the pacification of the church. What opinion was formed of them by James is unknown. Shortly after he published his *Apology;* the reception it met with is equally uncertain. In March 1604 Parliament met, and during their short session Bacon's hands seem to have been full of work, It was a busy and stirring time, and events occurred during it which carried within them the seeds of much future dissension. Prerogative and privilege came more than once into collision, the abuses of purveyance and wardship were made matters of conference, though the thorough discussion of them was deferred to a succeeding session; while James' temper was irritated by the objections brought against his favorite scheme of the Union, and by the attitude taken up by the House with regard to religious affairs. The records are barely full enough to enable us to judge very accurately of the share taken by Bacon in these discussions; his name generally appears as the reporter of the committees on special subjects. We can occasionally, however, discern traces of his tact and remarkable prudence; and, on the whole, his attitude, particularly with regard to the Union question, recommended him to James. He was shortly afterwards formally installed as learned counsel, receiving the salary of £40, and at the same time a pension of £60 yearly. He was also appointed one of the commission to treat of the conditions necessary for the Union; and the admirable manner in which the duties of that body were discharged must be attributed mainly to his influence and his complete mastery of the subject. During the recess he published his *Advancement of Learning*, dedicated to the king.

He was now fairly brought into relations with James, and his prospects began to look a little brighter. It is important for us to know what were his ideas upon government, upon parliaments, prerogative, and so forth, since a knowledge of this will clear up much that would seem inexplicable in his life. It seems quite evident that Bacon, from position, early training, and, one might almost think, natural inclination, held as his ideal of government the Elizabethan system. The king was the supreme power, the centre of law and justice, and his prerogative must not be infringed. Parliament was merely a body called to consult with the king on emergencies (*circa ardua regni*) and to grant supplies. King and parliament together make up the state, but the former is first in nature and importance. The duty of a statesman was, therefore, to carry out the royal will in as prudent a manner as possible; he was the servant of the king, and stood or fell according to his pleasure. It is hard to put ourselves at this point of view, and we can with difficulty understand how such a man as Bacon held a theory which seems now so inadequate. But he was not singular in his opinions, and he was undoubtedly sincere; and it is only by keeping them constantly in mind that we can understand his after relations with the king.

In the second Parliament there was not so much scope for the exercise of his powers. The Gunpowder Plot had aroused in the Commons warmer feelings towards the king; they passed severe laws against recusants, and granted a triple subsidy. At the same time they continued the collection of the grievances concerning which they were to move. In the course of this session Bacon married Alice Barnham, "the alderman's daughter, an handsome maiden, to my liking," of whom he had written some years before to his cousin Cecil. Little or nothing is known of their married life.

The third Parliament was chiefly occupied with the commercial and legal questions rising out of the proposed Union, in particular, with the dispute as to the naturalisation of the *Post Nati*. Bacon argued ably in favor of this measure, but the general feeling was against it. The House would only pass a bill abolishing hostile laws between the kingdoms; but the case of the *Post Nati*, being brought before the law courts, was settled as the king wished. Bacon's services were rewarded in June 1607 by the office of solicitor; he had at last gained a step upon the ladder of advancement. His promotion, however, was not rapid; several years passed before he gained another step. Meantime, though circumstances had thrown him too much into active life, he had not forgotten his cherished project of reorganising science. A survey of the ground had been made in the *Advancement*, and some short pieces not published at the time were probably written in the subsequent two or three years. Towards the close of 1607 he sent to his friends a small tract, entitled *Cogitata et Visa*, probably the first draft of what we have under that title. In 1609 he wrote the noble panegyric, *In felicem memoriam Elizabethæ*, and the curiously learned and ingenious work *De Sapientia Veterum;* and completed what seems to have been the *Redargutio Philosophiarum*, or treatise on the idols of the theatre.

In 1610 the famous fourth Parliament of James met. It is not possible to enter minutely into the important occurrences of this short session. Prerogative, despite Bacon's advice and efforts, clashed more than once with liberty; Salisbury's bold schemes for relieving the embarrassment caused by the reckless extravagance of the king proved abortive, and the House was dissolved in February 1611. Bacon took a considerable share in the debates, consistently upheld the prerogative, and seemed yet to possess the confidence of the Commons. The death of Salisbury, occurring soon after, opened a position in which Bacon thought his great political skill and sagacity might be made more immediately available for the king's service. How far he directly offered himself for the post of secretary is uncertain, but we know that his hopes were disappointed, the king himself undertaking the duties of the office. About the same time he made two ineffectual applications for the mastership of the wards; the first, on Salisbury's death, when it was given to Sir George Carey; the second, on the death of Carey. It is somewhat hard to understand why so little favor was shown by the king to one who had proved himself able and willing to do good service, and who, in spite of his disappointments, still continued zealously to offer advice and assistance. At last, in 1613, a fair opportunity for promotion occurred. The death of Sir Thomas Fleming made a vacancy in the chief-justice-

ship of the King's Bench, and Bacon, after some deliberation, proposed to the King that Coke should be removed from his place in the Court of Common Pleas and transferred to the King's Bench. He gives several reasons for this in his letter to the king, but in all probability his chief motive was that pointed out by Mr. Spedding, that in the Court of King's Bench there would be less danger of Coke coming into collision with the king on questions of prerogative, in handling which Bacon was always very circumspect and tender. The vacancy caused by Coke's promotion was then filled up by Hobart, and Bacon, finally, stepped into the place of attorney-general. The fact of this advice being offered and followed in all essentials, illustrates very clearly the close relations between the king and Bacon, who had become a confidential adviser on most occasions of difficulty. That his adherence to the royal party was already noticed and commented on appears from the significant remark of Chamberlain, who, after mentioning the recent changes among the law officials, says, "There is a strong apprehension that little good is to be expected by this change, and that Bacon may prove a dangerous instrument."

Further light is thrown upon Bacon's relations with James, and upon his political sympathies, by the letter to the king advocating the calling of a parliament, and by the two papers of notes on which his letter was founded. These documents, even after due weight is given to all considerations urged in their favor, seem to confirm the view already taken of Bacon's theory of government, and at the same time to show that his sympathies with the royal party tended to blind him to the true character of certain courses of action, which can only be justified by a straining of political ethics. The advice he offered, in all sincerity, was most prudent and sagacious, and *might* have been successfully carried out by a man of Bacon's tact and skill; but it was intensely one-sided, and exhibited a curious want of appreciation of what was even then beginning to be looked on as the true relation of king, parliament, and people. Unfortunately for James, he could neither adopt nor carry out Bacon's policy. The Parliament which met in April 1614 and was dissolved in June, after a stormy session, was by no means in a frame of mind suitable for the king's purposes. The House was enraged at the supposed project (then much misunderstood) of the "Undertakers;" objection was taken to Bacon being elected or serving as a member while holding office as attorney-general; and, though an exception was made in his favor, it was resolved that no attorney-general should in the future be eligible for a seat in Parliament. No supply was granted, and the king's necessities were increased instead of diminished. The emergency suggested to some of the bishops the idea of a voluntary contribution, which was eagerly taken up by the noblemen and crown officials. The scheme was afterwards extended so as to take in the whole kingdom, but lost something of its voluntary character, and the means taken to raise the money, which were not what Bacon would have recommended, were calculated to stir up discontent. The general dissatisfaction received a somewhat unguarded and intemperate expression in a letter sent to the justices of Marlborough by a gentleman of the neighborhood, named St. John, in which he denounced the attempt to raise funds in this way as contrary to law, reason, and religion, as constituting in the king personally an act of perjury, involving in the same crime those who contributed, and thereby subjecting all parties to the curses levelled by the church at such offences. St. John was summoned before the Star Chamber for slander and treasonable language, and Bacon, *ex officio*, acted as public prosecutor. The sentence pronounced (a fine of £5000 and imprisonment for life) was severe, but it was not actually inflicted, and probably was not intended to be carried out, the success of the prosecution being all that was desired. St. John remained a short time in prison, and was then released, after making a full apology and submission. The fine was remitted. It seems incredible that Bacon's conduct on this occasion should have been censured by his biographers. The offence was clear; the law was undoubted; no particular sympathy was excited for the culprit; the sentence was not carried out; and Bacon did only what any one in his place would naturally and necessarily have done. The nature of his office involved him in several trials for treason occurring about the same time, and one of these is of interest sufficient to repay a somewhat longer examination. Edmund Peacham, a clergyman in Somersetshire, had been committed to custody for a libel on his superior, the bishop of Bath and Wells. In searching his house for certain papers, the officers came upon some loose sheets stitched together in the form of a sermon, the contents of which were of such a nature that it was judged right to lay them before the council. As it was at first suspected that the writing of this book had been prompted by some disaffected persons, Peacham was interrogated, and after he had declined to give any information, was subjected to torture. Bacon, as one of the learned counsel, was ordered by council to take part in this examination, which was undoubtedly warranted by precedent, whatever may now be thought of it. Nothing, however, was extracted from Peacham in this way, and it was resolved to proceed against him for treason. Now, in the excited state of popular feeling at that period, the failure of Government to substantiate an accusation of treason would have been a serious matter. The king, with whom the council agreed, seems therefore to have thought it desirable to obtain beforehand the opinions of the four chief judges as to whether the alleged offence amounted to treason. In this there was nothing unusual or illegal, and no objection would at that time have been made to it, but James introduced a certain innovation; he proposed that the opinions of the four judges should be given separately and in private. It may be reasonably inferred that his motive for this was the suspicion, or it may be the knowledge, that Coke did not consider the matter treasonable. At all events when Coke, who as a councillor already knew the facts of the case, was spoken with regarding the new proposal of the king, he at once objected to it, saying that "this particular and auricular taking of opinions" was "new and dangerous," and "not according to the custom of the realm." He at last reluctantly assented, and proposed that Bacon should consult with him, while the other law officers addressed themselves to the three puisne judges. By Bacon's directions, the proposal to the three judges to give their opinions separately was made suddenly and confidently, and any scruples they might have felt were easily overcome. The first step was thus gained, and it was hoped that if "infusion" could be avoided, if the papers bearing on the case were presented to the judges quickly, and before their minds could be swayed by extraneous influence, their decision on the case would be the same as that of the king. It is clear that the extraneous influence to be feared was Coke, who, on being addressed by Bacon, again objected to giving his opinion separately, and even seemed to hope that his brother judges after they had seen the papers would withdraw their assent to giving their decisions privately. Even after the discussion of the case with Bacon, he would not give his opinion until the others had handed in theirs. What the other judges thought is not definitely known, but Bacon

appears to have been unable to put in operation the plan he had devised for swaying Coke's judgment, by putting him in some dark manner in doubt that he should be left alone; or if he did attempt this, he was unsuccessful, for Coke finally gave an opinion consistent with what he seems to have held at first, that the book was not treasonable, as it did not disable the king's title. Although the opinions of the judges were not made public, yet as we learn, not only from Bacon, but from a sentence in one of Carleton's letters, a rumor had got about that there was doubt as to the book being treasonable. Under these circumstances, Bacon, who feared that such a report might incite other people to attempt a similar offence, proposed to the king that a second rumor should be circulated in order to destroy the impression caused by the first. "I do not think it necessary," he says, "that because we live in an age in which no counsel is kept, and that it is true there is some bruit abroad that the judges of the King's Bench do doubt of the case that it should not be treason, that it be given out constantly, and yet as it were in secret, and so a fame to slide, that the doubt was only upon the publication, in that it was never published. For that (if your majesty marketh it) taketh away or at least qualifieth the danger of the example; for that will be no man's case." Bacon's conduct in this matter has been curiously misrepresented. He has been accused of torturing the prisoner, and of tampering with the judges by consulting them before the trial; nay, he is even represented as selecting this poor clergyman to serve for an example to terrify the disaffected, as breaking into his study and finding there a sermon never intended to be preached, which merely encouraged the people to resist tyranny. All this lavish condemnation is wide of the mark, and rests on a complete misconception of the case. If any blame attaches to him, it must arise either from his endeavor to force Coke to a favorable decision, in which he was in all probability prompted by a feeling, not uncommon with him, that a matter of state policy was in danger of being sacrificed to some senseless legal quibble or precedent, or from his advice to the king that a rumor should be set afloat which was not strictly true. We do not imagine that in any other politician either of these actions would meet with very severe condemnation.

Meanwhile, his great rival Coke, whose constant tendency to limit the prerogative by law and precedent had made him an object of particular dislike to James, had on two points come into open collision with the king's rights. The first case was an action of *præmunire* against the Court of Chancery, evidently instigated by him, but brought at the instance of certain parties whose adversaries had obtained redress in the chancellor's court after the cause had been tried in the Court of King's Bench. With all his learning and ingenuity, Coke failed in inducing or even forcing the jury to bring in a bill against the Court of Chancery, and it seems fairly certain that on the technical point of law involved he was wrong. Although his motive was, in great measure, a feeling of personal dislike toward Ellesmere, yet it is not improbable that he was influenced by the desire to restrict in every possible way the jurisdiction of a court which was the direct exponent of the king's wishes. The other case, that of *commendamus*, was more important in itself and in the circumstances connected with it. The general question involved in a special instance was whether or not the king's prerogative included the right of granting at pleasure livings *in commendam*, *i. e.*, to be enjoyed by one who was not the incumbent. Bacon, as attorney-general, delivered a speech, which has not been reported, but the king was informed that the arguments on the other side had not been limited to the special case, but had directly impugned the general prerogative right of granting livings. It was necessary for James, as a party interested, at once to take measures to see that the decision of the judges should not be given on the general question without due consultation. He accordingly wrote to Bacon, directing him to intimate to the judges his pleasure that they should delay judgment until after discussion of the matter with himself. Bacon communicated first with Coke, who in reply desired that similar notice should be given the other judges. This was done by Bacon, though he seems to hint that in so doing he was going a little beyond his instructions. The judges took no notice of the intimation, proceeded at once to give judgment, and sent a letter in their united names to the king, announcing what they had done, and declaring that it was contrary to law and to their oath for them to pay any attention to a request that their decision should be delayed. The king was indignant at this encroachment, and acting partly on the advice of Bacon, held a council on the 6th June 1616, at which the judges attended. James then entered at great length into the case, censuring the judges for the offensive form of their letter, and for not having delayed judgment upon his demand, which had been made solely because he was himself a party concerned. The judges, at the conclusion of his speech, fell on their knees, and implored pardon for the manner of their letter; but Coke attempted to justify the matter contained in it, saying that the delay required by his majesty was contrary to law. The point of law was argued by Bacon, and decided by the chancellor in favor of the king, who put the question to the judges individually, "Whether, if at any time, in a case depending before the judges, which his majesty conceived to concern him either in power or profit, and thereupon required to consult with them, and that they should stay proceedings in the meantime, they ought not to stay accordingly?" To this all gave assent except Coke, who said that "when the case should be, he would do that should be fit for a judge to do." No notice was taken by the king of this famous, though somewhat evasive, reply, but the judges were again asked what course they would take in the special case now before them. They all declared that they would not decide the matter upon general grounds affecting the prerogative, but upon special circumstances incident to the case; and with this answer they were dismissed. Bacon's conduct throughout the affair has been blamed, but apparently on wrong grounds. As attorney he was merely fulfilling his duty in obeying the command of the king; and in laying down the law on the disputed point, he was, we may be sure, speaking his own convictions. Censure might more reasonably be bestowed on him, because he deliberately advised a course of action than which nothing can be conceived better calculated to strengthen the hands of an absolute monarch. This appeared to Bacon justifiable and right, because the prerogative would be defended and preserved intact. Coke certainly stands out in better light, not so much for his answer, which was rather indefinite, and the force of which is much weakened by his assent to the second question of the king, but for the general spirit of resistance to encroachment exhibited by him. He was undeniably troublesome to the king, and it is no matter for wonder that James resolved to remove him from a position where he could do so much harm. On the 26th June he was called before the council to answer certain charges, one of which was his conduct in the *præmunire* question. He acknowledged his error on that head, and made little defence. On the 30th he was suspended from council and bench, and ordered to employ his leisure in revising certain obnoxious opinions in his

reports. He did not perform the task to the king's satisfaction, and a few months later he was dismissed from office.

Bacon's services to the king's cause had been most important; and as he had, at the same time, acquired great favor with Villiers, his prospects looked brighter than before. According to his custom, he strove earnestly to guide by his advice the conduct of the young favorite. His letters, in which he analyses the various relations in which such a man must stand, and prescribes the course of action suitable for each, are valuable and deserving of attention. Very striking, in view of future events, are the words in which he gives him counsel as to his dealing with judges: "By no means be you persuaded to interpose yourself by word or letter in any cause depending, or like to be depending, in any court of justice, nor suffer any man to do it where you can hinder it; and by all means dissuade the king himself from it, upon the importunity of any, either for their friends or themselves. If it should prevail, it perverts justice; but if the judge be so just, and of so undaunted a courage (as he ought to be) as not to be inclined thereby, yet it always leaves a taint of suspicions and prejudice behind it." It is probable that Villiers at this time had really a sense of the duties attaching to his position, and was willing to be guided by a man of approved wisdom. It was not long before an opportunity occurred for showing his gratitude and favor. Ellesmere resigned the chancellorship on the 5th March 1617, and on the 7th the great seal was bestowed upon Bacon, with the title of Lord Keeper. Two months later he took his seat with great pomp in the Chancery Court, and delivered a weighty and impressive opening discourse. He entered with great vigor on his new labors, and in less than a month he was able to report to Buckingham that he had cleared off all outstanding Chancery cases. He seemed now to have reached the height of his ambition; he was the first law officer in the kingdom, the accredited minister of his sovereign, and on the best terms with the king and his favorite. His course seemed perfectly prosperous and secure, when a slight storm arising opened his eyes to the frailty of the tenure by which he held his position.

Coke was in disgrace but not in despair; there seemed to be a way whereby he could reconcile himself to Buckingham, through the marriage of his daughter, who had an ample fortune, to Sir John Villiers, brother of the marquis, who was penniless or nearly so. The match was distasteful to Lady Hatton and to her daughter; a violent quarrel was the consequence, and Bacon, who thought the proposed marriage most unsuitable, took Lady Hatton's part. His reasons for disapproval he explained to the king and Buckingham, but found to his surprise that their indignation was strongly roused against him. He received from both bitter letters of reproof; it was rumored that he would be disgraced, and Buckingham was said to have compared his present conduct to his previous unfaithfulness to Essex. Bacon, who seems to have acted from a simple desire to do the best for Buckingham's own interests, at once changed his course, advanced the match by every means in his power, and by a humble apology appeased the indignation that had been excited against him. It had been a sharp lesson, but things seemed to go on smoothly after it, and Bacon's affairs prospered. In January 1618 he received the higher title Lord Chancellor; in July of the same year he was made Baron Verulam; and in January 1621 he was created Viscount St. Alban. His fame, too, had been increased by the publication in 1620 of his most celebrated work, the *Novum Organum*. He seemed at length to have made satisfactory progress towards the realisation of his cherished aims; the method essential for his Instauration was partially completed; and he had attained as high a rank in the state as he had ever contemplated. But history too clearly tell us that his actions in that position were not calculated to promote the good of his country.

Connected with the years during which he held office is one of the weightiest charges against his character. Buckingham, notwithstanding the advice he had received from Bacon himself, was in the habit of addressing letters to him recommending the causes of suitors. In many cases these seem nothing more than letters of courtesy, and from the general tone, it might fairly be concluded that there was no intention to sway the opinion of the judge illegally, and that Bacon did not understand the letters in that sense. This view is supported by consideration of the few answers to them which are extant. One outstanding case, however, that of Dr. Steward, casts some suspicion on all the others. The terms of Buckingham's note concerning it might easily have aroused doubts; and we find that the further course of the action was to all appearances exactly accommodated to Dr. Stewart, who had been so strongly recommended. It is, of course, dangerous to form an extreme judgment on an isolated and partially understood case, of which also we have no explanation from Bacon himself, but if the interpretation given by Mr. Heath be the true one, Bacon certainly suffered his first, and so far as we can see, just judgment on the case to be set aside, and the whole matter to be reopened in obedience to a request from Buckingham.

It is somewhat hard to understand Bacon's position with regard to the king during these years. He was the first officer of the crown, the most able man in the kingdom, prudent, sagacious, and devoted to the royal party. Yet his advice was followed only when it chimed in with James's own will; his influence was of a merely secondary kind; and his great practical skill was employed simply in carrying out the measures of the king in the best mode possible. We know indeed that he sympathised cordially with the home policy of the Government; he had no objection to such monopolies or patents as seemed advantageous to the country, and for this he is certainly not to be blamed. The opinion was common at the time, and the error was merely ignorance of the true principles of political economy. But we know also that the patents were so numerous as to be oppressive, and we can scarcely avoid inferring that Bacon more readily saw the advantages to the Government than the disadvantages to the people. In November, 1620, when a new parliament was summoned to meet on January following, he earnestly pressed that the most obnoxious patents, those of alehouses and inns, and the monopoly of gold and silver thread, should be given up, and wrote to Buckingham, whose brothers were interested, advising him to withdraw them from the impending storm. This prudent advice was unfortunately rejected. But while he went cordially with the king in domestic affairs, he was not quite in harmony with him on questions of foreign policy. Not only was he personally in favor of a war with Spain for the recovery of the Palatinate, but he foresaw in such a course of action the means of drawing together more closely the king and his Parliament. He believed that the royal difficulties would be removed if a policy were adopted with which the people could heartily sympathise, and if the king placed himself at the head of his Parliament and led them on. But his advice was neglected by the vacillating and peace-loving monarch, his proffered proclamation was put aside, and a weak, featureless production substituted in its place. Nevertheless the new Parliament seemed at first more responsive than might have been looked for. A double subsidy was granted, which was expressly

stated to be "not on any consideration or condition for, or concerning the Palatinate." The session, however, was not far advanced when the question of patents was brought up; a determined attack was made upon the very ones of which Bacon had been in dread, and it was even proposed to proceed against the referees (Bacon and Montagu) who had certified that there was no objection to them in point of law. This proposal, though pressed by Coke, was allowed to drop; while the king and Buckingham, acting under the advice of Williams, afterwards lord keeper, agreed to give up the monopolies. It was evident, however, that a determined attack was about to be made upon Bacon, and that the proceeding against the referees was really directed against him. It is probable that this charge was dropped because a more powerful weapon had in the meantime been placed in his enemies' hands. This was the accusation of bribery and corrupt dealings in Chancery suits, an accusation apparently wholly unexpected by Bacon, and the possibility of which he seems never to have contemplated until it was actually brought against him. At the beginning of the session a committee had been appointed for inquiring into abuses in the courts of justice. Some illegal practices of certain Chancery officials had been detected and punished by the court itself, and generally there was a disposition to overhaul its affairs, while Coke and Cranfield directly attacked some parts of the chancellor's administration. But on March 14th one Aubrey appeared at the bar of the House, and charged Bacon with having received from him a sum of money while his suit was going on, and with having afterwards decided against him. Bacon's letter on this occasion is worthy of serious attention; he evidently thought the charge was but part of the deliberate scheme to ruin him which had already been in progress. A second accusation (Egerton's case) followed immediately after, and was investigated by the House, who, satisfied that they had just matter for reprehension, appointed the 19th for a conference with the Lords. On that day Bacon, as he had feared, was too ill to attend. He wrote to the Lords excusing his absence, requesting them to appoint a convenient time for his defense and cross-examination of witnesses, and imploring them not to allow their minds to be prejudiced against him, at the same time declaring that he would not "trick up an innocency with cavilations, but plainly and ingenuously declare what he knew or remembered." The charges rapidly accumulated, but Bacon still looked upon them as party moves, and was in hopes of defending himself. Nor did he seem to have lost his courage, if we are to believe the common reports of the day, though certainly they do not appear worthy of very much credit.

The notes bearing upon the interview which he obtained with the king, show that he had begun to see more clearly the nature and extent of the offences with which he was charged, that he now felt it impossible altogether to exculpate himself, and that his hopes were directed towards obtaining some mitigation of his sentence. The long roll of charges made upon the 19th April finally decided him; he gave up all idea of defence, and wrote to the king begging him to show him favor in this emergency. The next day he sent in a general confession to the Lords, trusting that this would be considered satisfactory. The Lords, however, decided that it was not sufficient as a ground for their censure, and demanded a detailed and particular confession. A list of twenty-eight charges was then sent him, to which an answer by letter was required. On the 30th April his "confession and humble submission" was handed in. In it, after going over the several instances, he says, "I do again confess, that on the points charged upon me, although they should be taken as myself have declared them, there is a great deal of corruption and neglect; for which I am heartily and penitently sorry, and submit myself to the judgment, grace, and mercy of the court." On the 3d May after considerable discussion, the Lords decided upon the sentence, which was, That he should undergo fine and ransom of £40,000; that he should be imprisoned in the tower during the king's pleasure; that he should be for ever incapable of any office, place, or employment in the state or commonwealth; that he should never sit in parliament; or come within the verge of the court. This heavy sentence was only partially executed. The fine was in effect remitted by the king; imprisonment in the tower lasted for about four days; a general pardon (not of course covering the parliamentary censure) was made out, and though delayed at the seal for a time by Lord Keeper Williams, was passed probably in November 1621. The cause of the delay seems to have lain with Buckingham, whose friendship had cooled, and who had taken offence at the fallen chancellor's unwillingness to part with York House. This difference was finally smoothed over, and it was probably through his influence that Bacon received the much-desired permission to come within the verge of the court. He never again set in parliament.

So ends this painful episode, which has given rise to the most severe condemnation of Bacon, and which still presents great and perhaps insuperable difficulties. On the whole, the tendency of the most recent and thorough researches has been towards the opinion that Bacon's own account of the matter (from which, indeed, our knowledge of it is chiefly drawn) is substantially correct. He distinguishes three ways in which bribes may be given, and ingenuously confesses that his own acts amounted to corruption and were worthy of condemnation. Now, corruption strictly interpreted would imply the deliberate sale of justice, and this Bacon explicitly denies, affirming that he never "had bribe or reward in his eye or thought when he pronounced any sentence or order." When we analyse the specific charges against him, with his answers to them, we find many that are really of little weight. The twenty-eighth and last, that of negligence in looking after his servants, though it did him much harm, may fairly be said to imply no moral blame. The majority of the others are instances of gratuities given after the decision, and it is to be regretted that the judgment of the peers gives us no means of determining how such gifts were looked upon, whether or not the acceptance of them was regarded as a "corrupt" practice. In four cases specifically, and in some others by implication, Bacon confesses that he had received bribes from suitors *pendente lite*. Yet he affirms, as we said before, that his intention was never swayed by a bribe; and so far as any of these cases can be traced, his decisions, often given in conjunction with some other official, are to all appearance thoroughly just. In several cases his judgment appears to have been given against the party bestowing the bribe, and in at least one instance, that of Lady Wharton, it seems impossible to doubt that he must have known when accepting the present that his opinion would be adverse to her cause. Although, then, he felt that these practices were really corrupt, and even rejoiced that his own fall would tend to purify the courts from them, he did not feel that he was guilty of perverting justice for the sake of reward. How far, then, is such defence or explanation admissible and satisfactory? It is clear that two things are to be considered: the one the guilt of taking bribes or presents on any consideration, the other the moral guilt depending upon the wilful perversion of justice.

The attempt has sometimes been made to defend the whole of Bacon's conduct on the ground that he did nothing that was not done by many of his contemporaries. Bacon himself disclaims a defence of this nature, and we really have no direct evidence which shows to what extent the offering and receiving of such bribes then prevailed. That the practice was common is indeed implied by the terms in which Bacon speaks of it, and it is not improbable that the fact of these gifts being taken by officials was a thing fairly well known, although all were aware of their illegal character, and it was plain that any public exposure of such dealings would be fatal to the individual against whom the charge was made out. Bacon knew all this; he was well aware that the practice was in itself indefensible, and that his conduct was therefore corrupt and deserving of censure. So far, then, as the mere taking of bribes is concerned, he would permit no defence, and his own confession and judgment on his actions contain as severe a condemnation as has ever been passed upon him. Yet in the face of this he does not hesitate to call himself "the justest chancellor that hath been in the five changes since Sir Nicholas Bacon's time"; and this on the plea that his intentions had always been pure, and had never been affected by the presents he received. His justification has been set aside by modern critics, not on the ground that the evidence demonstrates its falsity, but because it is inconceivable or unnatural that any man should receive a present from another, and not suffer his judgment to be swayed thereby. It need hardly be said that such an *a priori* conviction is not a sufficient basis on which to found a sweeping condemnation of Bacon's integrity as an administrator of justice. On the other hand, even if it be admitted to be possible and conceivable that a present should be given by a suitor simply as seeking favorable consideration of his cause, and not as desirous of obtaining an unjust decree, and should be accepted by the judge on the same understanding, this would not entitle one absolutely to accept Bacon's statement. Further evidence is necessary in order to give foundation to a definite judgment either way; and it is extremely improbable, nay, almost impossible, that such can ever be produced. In these circumstances, due weight should be given to Bacon's own assertions of his perfect innocence and purity of intention; they ought not to be put out of court unless found in actual contradiction to the facts; and the reverse of this is the case, so far as has yet appeared.

The remainder of his life, though still harassed by want of means, for James was not liberal, was spent in work far more valuable to the world than anything he had accomplished in his high office. In March 1622 he presented to Prince Charles his *History of Henry VII.;* and immediately, with unwearied industry, set to work to complete some portions of his great work. In November 1622 appeared the *Historia Ventorum;* in January 1623, the *Historia Vitæ et Mortis;* and in October of the same year, the *De Augmentis Scientiarum*, a Latin translation, with many additions of the *Advancement*. Finally, in December 1624, he published his *Apophthegms*, and *Translations of some of the Psalms;* and, in 1625, a third and enlarged edition of the *Essays*.

Busily occupied by these labors, his life now drew rapidly to a close. In March 1626 he came to London, and when driving one day near Highgate, was taken with a desire to discover whether snow would act as an antiseptic. He stopped his carriage, got out at a cottage, purchased a fowl, and with his own hands assisted to stuff it with snow. He was seized with a sudden chill, and became so seriously unwell that he had to be conveyed to Lord Arundel's house, which was near at hand. Here his illness increased, the cold and chill brought on bronchitis and he died, after a few days' suffering, on the 9th April 1626.

Bacon's Works and Philosophy.

A complete survey of Bacon's works and an estimate of his place in literature and philosophy are matters for a volume.

An attempt has been made to substantiate the opinion held by some that Bacon was the author of the works ascribed to Shakespeare. The strongest writer on the subject, Ignatius Donnelly (Minnesota) claims to have discovered a cypher running through the poems which prove their Baconian origin. Mr. Donnelly is certainly ingenious and daring in his conception and argument.

Putting aside the letters and occasional writings, we may conveniently distribute the other works into three classes, *Professional*, *Literary*, *Philosophical*. Of the Professional works, which include the *Reading on the Statute of Uses*, the *Maxims of Law*, and the treatise (possibly spurious) on the *Use of the Law*, only experts can speak with confidence; and their opinion, so far as it has yet been given, coincides to some extent with Bacon's own estimate of his powers as a lawyer. "I am in good hope," he says, "that when Sir Edward Coke's reports and my rules and decisions shall come to posterity, there will be (whatsoever is now thought) question who was the greater lawyer." If Coke's reports show completer mastery of technical details, greater knowledge of precedent, and more of the dogged grasp of the letter than do Bacon's legal writings, there can be no dispute that the latter exhibit an infinitely more comprehensive intelligence of the abstract principles of jurisprudence, with a richness and ethical fulness that more than compensate for their lack of dry legal detail. Bacon seems indeed to have been a lawyer of the first order, with a keen scientific insight into the bearings of isolated facts, and a power of generalisation which admirably fitted him for the self-imposed task, unfortunately never completed, of digesting or codifying the chaotic mass of English law.

Among the literary works are included all that he himself designated moral and historical pieces, and to these may be added some theological and minor writings, such as the *Apophthegms*. Of the moral works the most valuable are the *Essays*. It is impossible to praise too highly writings which have been so widely read and universally admired. The matter is of the familiar practical kind, that "comes home to men's bosoms." The thoughts are weighty, and even when not original, have acquired a peculiar and unique tone or cast by passing through the crucible of Bacon's mind. A sentence from the *Essays* can rarely be mistaken for the production of any other writer. The short, pithy sayings:

> "Jewels, five words long,
> That on the stretched forefinger of all time,
> Sparkle for ever,"

have become popular mottoes and household words. The style is quaint, original, abounding in allusions and witicisms, and rich, even to gorgeousness, with piled-up analogies and metaphors. The first edition contained only ten essays, but the number was increased in 1612 to thirty-eight, and in 1625 to fifty-eight. The short tract, *Colors of Good and Evil*, which with the *Meditationes Sacræ* originally accompanied the *Essays*, was afterwards incorporated with the *De Augmentis*. Along with these works may be classed the curiously learned piece, *De Sapientia Veterum*, in which he works out a favorite idea, that the mythological fables of the Greeks were allegorical and concealed the deepest truths of their philosophy. As a scientific explanation

of the myths the theory is of no value, but it affords fine scope for the exercise of Bacon's unrivalled power of detecting analogies in things apparently most dissimilar. The *Apophthegms*, though hardly deserving Macaulay's praise of being the best collection of jests in the world, contain a number of those significant anecdotes which Bacon used with such effect in his other writings. Of the historical works, besides a few fragments of the projected history of Britain, there remains the *History of Henry VII.*, a valuable work, giving a clear and animated narrative of the reign, and characterising Henry with great skill. The style is in harmony with the matter, vigorous and flowing, but naturally with less of the quaintness and richness suitable to more thoughtful and original writings. The series of the literary works is completed by the minor treatises on theological or ecclesiastical questions. Some of the latter, included among the occasional works, are admirably sagacious and prudent, and deserve careful study. Of the former, the principal specimens are the *Meditationes Sacræ* and the *Confession of Faith*. The *Paradoxes* (Characters of a believing Christian in paradoxes, and seeming contradictions), which was often and justly suspected, has been conclusively proved by Mr. Grosart not to be the work of Bacon.

Philosophical Works.— The great mass of Bacon's writings consists of treatises or fragments, which either formed integral parts of his grand comprehensive scheme, or were closely connected with it. More exactly they may be classified, as is done by the most recent editors, under three heads: — A. Writings which actually formed part of the *Instauratio Magna;* B. Writings originally intended to form parts of the *Instauratio*, but which were afterwards superseded or thrown aside; C. Works connected with the *Instauratio*, but not directly included in its plan.

To begin with the second of these classes, we have under it some important tracts, which certainly contain little, if anything, that is not afterwards taken up and expanded in the more elaborate works, but which are not undeserving of attention, from the difference in the point of view and method of treatment. The most valuable of them are: — (1.) The *Advancement of Learning*, of which no account need be given, as it is completely worked up into the *De Augmentis*, and takes its place at the first part of the *Instauratio.* (2.) *Valerius Terminus*, a very remarkable piece, composed probably about 1603, though perhaps retouched at a later period. It contains a brief and somewhat obscure outline of the first two parts in the *Instauratio*, and is of importance as affording us some insight into the gradual development of the system in Bacon's own mind. (3.) *Temporis Partus Masculus*, another curious fragment, remarkable not only from its contents, but from its style, which is arrogant and offensive, in this respect unlike any other writings of Bacon's. The adjective *masculus* points to the power of bringing forth fruit possessed by the new philosophy, and perhaps indicates that all previous births of time were to be looked upon as feminine or imperfect; it is used in a somewhat similar sense in *Letters and Life*, vi. 183, "*In verbis masculis*, no flourishing or painted words, but such words as are fit to go before deeds." (4.) *Redargutio Philosophiarum*, a highly finished piece in the form of an oration, composed probably about 1608 or 1609, containing in pretty full detail much of what afterwards appears in connection with the *Idola Theatri* in book i. of the *Novum Organum.* (5.) *Cogitata et Visa*, perhaps the most important of the minor philosophical writings, dating from 1607 (though possibly the tract in its present form may have been to some extent altered), and containing in weighty and sonorous Latin the substance of the first book of the *Organum.* (6.) The *Descriptio Globi Intellectualis*, which is to some extent intermediate between the *Advancement* and the *De Augmentis*, goes over in detail the general classification of the sciences, and enters particularly some points of minor interest. (7.) The brief tract *De Interpretatione Naturæ Sententiæ Duodecim* is evidently a first sketch of part of the *Novum Organum*, and in phraseology is almost identical with it. (8.) A few smaller pieces, such as the *Inquisitio de Motu*, the *Calor et Frigus*, the *Historia Soni et Auditus*, and the *Phænomena Universi*, are early specimens of his *Natural History*, and exhibit the first tentative applications of the new method.

The third great division of the philosophical works consists of treatises of subjects connected with the *Instauratio*, but not forming part of it. It is not necessary to characterise these at any length. The most interesting, and in many respects the most remarkable, is the philosophic romance, the *New Atlantis*, a description of an ideal state in which the principles of the new philosophy are carried out by political machinery, and under state guidance, and where many of the results contemplated by Bacon are in imagination attained. The work was to have been completed by the addition of a second part, treating of the laws of a model commonwealth, which was never written. Another important tract is the *De Principiis atque Originibus secundum Fabulas Cupidinis et Cœli*, where, under the disguise of two old mythological stories, he (in the manner of the *Sapientia Veterum*) finds the deepest truths concealed. The tract is unusually interesting, for in it he discusses at some length the limits of science, the origin of things, and the nature of primitive matter, giving at the same time full notices of Democritus among the ancient philosophers and of Telesius among the modern. Deserving of attention are also the *Cogitationes de Natura Rerum*, probably written early, perhaps in 1605, and the treatise on the theory of the tides, *De Fluxu et Refluxu Maris*, written probably about 1616.

The philosophical works which form part of the *Instauratio* must of course be classed according to the positions which they respectively hold in that scheme of the sciences. Before entering on an account of Bacon's object and method, it is necessary to give the general outline of his arrangement.

The great work, the reorganisation of the sciences, and the restoration of man to that command over nature which he had lost by the fall, consisted in its final form of six divisions.

I. *Partitiones Scientiarum*, a survey of the sciences, either such as then existed or such as required to be constructed afresh — in fact, an inventory of all the possessions of the human mind. The famous classification on which this survey proceeds is based upon an analysis of the faculties and objects of human knowledge. This division is represented by *De Augmentis Scientiarum.*

II. *Interpretatio Naturæ.*— After the survey of all that has yet been done in the way of discovery or invention, comes the new method, by which the mind of man is to be trained and directed in its progress towards the renovation of science. This division is represented, though only imperfectly, by the *Novum Organum*, particularly book ii.

III. *Historia Naturalis et Experimentalis.*— The new method is valueless, because inapplicable, unless it be supplied with materials duly collected and presented — in fact, unless there be formed a competent natural history of the *Phænomena Universi.* A short introductory sketch of the requisites of such a natural his-

tory, which, according to Bacon, is essentially necessary, the *basis totius negotii*, is given in the tract *Parasceve*, appended to the *Novum Organum*. The principal works intended to form portions of the history, and either published by himself or left in manuscript, are *Historia Ventorum*, *Historia Vitæ et Mortis*, *Historia Densi et Rari*, and the extensive collection of facts and observations entitled *Sylva Sylvarum*.

IV. *Scala Intellectus*.—It might have been supposed that the new philosophy could now be inaugurated. Materials had been supplied, along with a new method by which they were to be treated, and naturally the next step would be the finished result. But for practical purposes Bacon interposed two divisions between the preliminaries and the philosophy itself. The first was intended to consist of types or examples of investigations conducted by the new method, serviceable for keeping the whole process vividly before the mind, or as the title indicates, such that the mind could run rapidly up and down the several steps or grades in the process. Of this division there seems to be only one small fragment, the *Filum Labyrinthi*, consisting of but two or three pages.

V. *Prodromi*, forerunners of the new philosophy. This part, strictly speaking, is quite extraneous to the general design. According to the *Distributio Operis*, it was to contain certain speculations of Bacon's own, not formed by the new method, but by the unassisted use of his understanding. These, therefore, form temporary or uncertain anticipations of the new philosophy. There is extant a short preface to this division of the work, and according to Mr. Spedding, some of the miscellaneous treatises, such as *De Principiis*, *De Fluxu et Refluxu*, *Cogitationes de Natura Rerum*, may probably have been intended to be included under this head. This supposition receives some support from the manner in which the fifth part is spoken of in the *Novum Organum*, i. 116.

VI. The new philosophy, which is the work of future ages, and the result of the new method.

BACON, John, who may be considered the founder of the British school of sculpture, was born Nov. 24, 1740. He was the son of Thomas Bacon, cloth-worker in Southwark, whose forefathers possessed a considerable estate in Somersetshire. At the age of fourteen he was bound apprentice in Mr. Crispe's manufactory of porcelain at Lambeth, where he was at first employed in painting the small ornamental pieces of china, but by his great skill in moulding he soon attained the distinction of being modeller to the work. The produce of his labor he devoted to the support of his parents, then in somewhat straitened circumstances. While engaged in the porcelain works he had an opportunity of seeing the models executed by different sculptors of eminence, which were sent to be burned at an adjoining pottery. An observation of these productions appears to have immediately determined the direction of his genius; he devoted himself to the imitation of them with so much success, that in 1758 a small figure sent by him to the Society for the Encouragement of Arts received a prize, and the highest premiums given by that society were adjudged to him nine times between the years 1763 and 1776. During his apprenticeship he also improved the method of working statues in artificial stone, an art which he afterwards carried to perfection. Bacon first attempted working in marble about the year 1763, and, during the course of his early efforts in this art, was led to improve the method of transferring the form of the model to the marble (technically called *getting out the points*), by the invention of a more perfect instrument for the purpose, which has since been adopted by many sculptors both in England and other countries. This instrument possesses many advantages above those formerly employed; it is more exact, takes a correct measurement in every direction, is contained in a small compass, and can be used upon either the model or the marble. In the year 1769 he was adjudged the first gold medal given by the Royal Academy, and in 1770 was made an associate of that body. He shortly afterwards exhibited a figure of Mars, which gained him considerable reputation, and he was then engaged to execute a bust of George III., intended for Christ Church College. He secured the king's favor, and retained it throughout life. His great celebrity now procured him numerous commissions, and it is said, that of sixteen different competitions in which he was engaged with other artists, he was unsuccessful in one case only. Considerable jealousy was entertained against him by other sculptors, and he was commonly charged with ignorance of classic style. This charge he repelled by the execution of a noble head of Jupiter Tonans, and many of his emblematical figures are in perfect classical taste. On the 4th of August 1799 he was suddenly attacked with inflammation, which occasioned his death in little more than two days, in the 59th year of his age. He left a widow, his second wife, and a family of six sons and three daughters. On his merit as a sculptor, the universal reputation of his works affords decisive proof, and his various productions which adorn St. Paul's Cathedral, London, Christ Church and Pembroke Colleges, Oxford, the Abbey Church, Bath, and Bristol Cathedral, give ample testimony to his powers. Perhaps his best works are to be found among the monuments in Westminster Abbey. (See *Memoir of the late John Bacon, R.A.*, by the Rev. Richard Cecil: London, 1811.)

BACON, Sir Nicholas, lord keeper of the great seal in the reign of Queen Elizabeth, was born at Chislehurst in Kent in 1510, and educated at the university of Cambridge, after which he traveled in France, and made some stay at Paris. Very early in the reign of Elizabeth he was knighted; and in 1558 he succeeded Nicholas Heath, archbishop of York, as keeper of the great seal of England; he was at the same time made one of the queen's privy council. As a statesman, he was remarkable for the clearness of his views and the wisdom of his counsels, and he had a considerable share in the settling of ecclesiastical questions. That he was not unduly elated by his preferments, appears from the answer he gave to Queen Elizabeth when she told him his house at Redgrave was too little for him, "Not so, madam," returned he, "but your majesty has made me too great for my house." He died on the 26th of February 1579, having held the great seal more than twenty years, and was buried in St. Paul's, London, where a monument, destroyed by the great fire of London in 1666, was erected to his memory.

BACON, Roger. The 13th century, an age peculiarly rich in great men, produced few, if any, who can take higher rank than Roger Bacon. He is in every way worthy to be placed beside such thinkers as Albertus Magnus, Bonaventura, and Thomas Aquinas. These had an infinite wider renown in their day, while he was ignored by his contemporaries and neglected by his successors; but modern criticism has restored the balance in his favor, and is even in danger of going equally far in the opposite direction. Bacon, it is now said, was not appreciated by his age because he was so completely in advance of it; he is a 16th or 17th century philosopher, whose lot has been by some accident cast in the 13th century; he is no schoolman, but a modern thinker, whose conceptions of science are more just and clear than are even those of his more celebrated namesake. In this view there is certainly a

considerable share of truth, but it is much exaggerated. As a general rule, no man can be completely dissevered from his national antecedents and surroundings, and Bacon is not an exception. Those who take up such an extreme position regarding his merits have known too little of the state of contemporary science, and have limited their comparison to the works of the scholastic theologians. We never find in Bacon himself any consciousness of originality; he has no fresh creative thought or method to introduce whereby the face of science may be changed; he is rather a keen and systematic thinker, who is working in a well-beaten track, from which his contemporaries were being drawn by the superior attractions of theology and metaphysics.

Roger Bacon was born in 1214, near Ilchester, in Somersetshire. His family appears to have been in good circumstances, for he speaks of his brother as wealthy, and he himself expended considerable sums on books and instruments; but in the stormy reign of Henry III. they suffered severely, their property was despoiled, and several members of the family were driven into exile. Roger completed his studies at Oxford, though not, as current traditions assert, at Merton or at Brazenose, neither of these colleges having then been founded. His great abilities were speedily recognised by his contemporaries, and he came to be on terms of close intimacy with some of the most independent thinkers of the time. Of these the most prominent were Adam de Marisco and Robert Grosseteste (*Cupito*), afterwards bishop of Lincoln, a man of liberal mind and wide attainments, who had especially devoted himself to mathematics and experimental science.

The scientific training which Bacon had received, partly by instruction, but more from the study of the Arab writers, made patent to his eyes the manifold defects in the imposing systems reared by these doctors. It disgusted him to hear from all around him that philosophy was now at length complete, that it had been reduced into compact order, and was being set forth by a certain professor at Paris. Even the great authority on which they reposed, Aristotle, was known but in part, and that part was rendered well-nigh unintelligible through the vileness of the translations; yet not one of those professors would learn Greek so that they might arrive at a real knowledge of their philosopher. The Scriptures, if read at all in the schools, were read in the erroneous versions; but even these were being deserted for the *Sentences* of Peter Lombard. Physical science, if there was anything deserving that name, was cultivated, not by experiment in the true Aristotelian way, but by discussion and by arguments deduced from premises resting on authority or custom. Everywhere there was a show of knowledge covering and concealing fundamental ignorance. Bacon, accordingly, who knew what true science was, and who had glimpses of a scientific method, withdrew from the usual scholastic routine, and devoted himself to languages and experimental researches. Among all the instructors with whom he came in contact in Paris, only one gained his esteem and respect; this was an unknown individual, Petrus de Maharncuria Picardus, or of Picardy. The contrast between the obscurity of such a man and the fame enjoyed by the fluent young doctors of the schools seems to have roused Bacon's indignation.

It is probable that Bacon, during his stay in Paris, acquired considerable renown. He took the degree of doctor of theology, and seems to have received from his contemporaries the complimentary title of *doctor mirabilis*. In 1250 he was again at Oxford, and probably about this time, though the exact date cannot be fixed, he entered the Franciscan order. His fame spread very rapidly at Oxford, though it was mingled with suspicions of his dealings in magic and the black arts, and with some doubts of his orthodoxy. About 1257, Bonaventura, general of the order, interdicted his lectures at Oxford, and commanded him to leave that town and pleace himself under the superintendence of the body at Paris. Here for ten years he remained under constant supervision, suffering great privations, and strictly prohibited from writing anything which might be published. But during the time he had been at Oxford his fame had reached the ears of the Papal legate in England, Guy de Foulques, a man of culture and scientific tastes, who in 1265 was raised to the papal chair as Clement IV. In the following year he wrote to Bacon, who had been already in communication with him, ordering him, notwithstanding any injunctions from his superiors, to write out and send to him a treatise on the sciences which he had already asked of him when papal legate. Bacon, who in despair of being ever able to communicate his results to the world, had neglected to compose anything, and whose previous writings had been mostly scattered tracts, *capitula quædam*, took fresh courage from this command of the Pope. Relying on his powerful protection, he sat at naught the many obstacles thrown in his way by the jealousy of his superiors and brother friars, and despite the want of funds, instruments, materials for copying, and skilled copyists, completed in about eighteen months three large treatises, the *Opus Majus*, *Opus Minus*, and *Opus Tertium*, which, with some other tracts, were despatched to the Pope by the hands of one Joannes, a young man trained and educated with great care by Bacon himself.

The composition of such extensive works in so short a time is a marvellous feat. We do not know what opinion Clement formed of them, but before his death he seems to have bestirred himself on Bacon's behalf, for in 1268 the latter was released and permitted to return to Oxford. Here he continued his labors in experimental science, and also in the composition of complete treatises. The works sent to Clement he regarded as mere preliminaries, laying down principles which were afterwards to be applied to the several sciences. The first part of an encyclopædic work probably remains to us in the *Compendium Studii Philosophiæ*, belonging to the year 1271. In this work Bacon makes a vehement attack upon the ignorance and vices of the clergy and monks, and generally upon the insufficiency of the existing studies. In 1278 he underwent the punishment which seems to have then been the natural consequence of outspoken opinions. His books were condemned by Jerome de Ascoli, general of the Franciscans, a gloomy bigot, who afterwards became Pope, and the unfortunate philosopher was thrown into prison, where he remained for fourteen years. During this time, it is said, he wrote the small tract *De Retardandis Senectutis Accidentibus*, but this is merely a tradition. In 1292, as appears from what is probably his latest composition, the *Compendium Studii Theologiæ*, he was again at liberty. The exact time of his death cannot be determined; 1294 is probably as accurate a date as can be fixed upon.

BACONTHORPE, or BACON, JOHN, called The Resolute Doctor, a learned monk, born toward the end of the thirteenth century, at Baconthorpe, a village in Norfolk. He died in London in 1346.

BACSANYI, JANOS, a Hungarian poet, was born at Tapoleza, May 11, 1763, and died at Linz, May 12, 1845.

BACTERIA (plural of the late Lat. *bacterium*, Gr. *bakterion*, dimin. of *baktron*, stick, staff,) microscopic infusoria which generate in stagnant water. These bacteria multiply with extraordinary rapidity by cross division. Whenever organic matter is in process of decomposition, in infusion as above indicated, or in disease or death, or within the living and healthy organism,

there these bacteria are to be found. So abundant are they, that in spite of their minuteness they did not escape the enthusiastic observation of the early workers with the microscope. Not much progress was made however, till about 1838, when Ehrenberg and Dujardin included bacteria in their investigation of minute organisms. They referred the forms which they described to the animal series among Infusorians, and united a large number under the general title *Vibrionia*. To Cohn (1853) is due the merit of having established, on grounds of structure and life-history (morphology and development), the fact that bacteria are plants, and all succeeding research has confirmed his conclusion, which Nägeli (1857) corrected in detail, however, by referring the bacteria or schizomycetes not to algæ, but to the parallel class of fungi.

Bacteria are found practically everywhere, but especially where there is disease, death, or decomposition. To speak of the "omnipresent bacillus" is hardly an exaggeration.

Even pure water contains many bacteria, and always more than occur in air. The minimum occurs in condensed water-vapor (900 to the litre), the maximum (80 millions per litre, 1¾ pint), of course, in sewer water, especially if there be the least stagnation.

Nor is soil free from bacteria. Spring-water fresh from the source carries a cargo of these micro-organisms. Pasteur found that the germ of splenic fever (*Bacillus anthracis*) occurred in great abundance in the earth round about the pits in which diseased cattle had been buried.

The rancidity of butter, the putrefaction of cheese, the game-flavor and high odor of meat, the yellowness and blueness of milk kept in imperfectly scalded vessels, the excessive staleness of bread, and a crowd of other unhealthy conditions in food, are largely due to the presence of bacteria. Bloody stains on bread, meat, paste, etc., have also been traced to the presence of a brightly-colored micrococcus. In the same way the bitterness, ropiness, etc., of bad wine are due to the same organisms.

A large number of bacteria are known to occur in direct association with pathological processes of decomposition in plants and animals, without apparently having any direct connection with the decomposition. These are saprophytes, like fungi generally. Others, however, have been proved in many cases to be the causes of pathological conditions in men and animals, a profound fact fundamental to the germ theory of disease.

As regards the shape of the individual units, four principal forms may be distinguished—viz., spherical, elliptical, rod-like, and spirally curved.

BACTRIA, or BACTRIANA, an ancient country of Central Asia, lying to the south of the river Oxus, and reaching to the western part of the Paropamisan range, or Hindu Kush. It was sometimes regarded as including the district of Margiana, or Merv, which was more frequently considered as distinct.

BACUP, a town of England, in Lancashire, twenty miles north from Manchester. It is situated in a beautiful valley on the River Speddon, and is a station on the East Lancashire railway. It is chiefly important for its factories, foundries, and mills, as well as for the coal-mines in the neighborhood. Population (1890), about 20,000.

BADAJOS, a province of Spain, forming, by the division of 1833, the southern half of the old province of Estremadura, or what is generally called Lower Estremadura. It is bounded on the north by Caceres, east by Ciudad Real, south and southeast by Cordova, Seville, and Huelva, and west by Portugal, embracing an area of 8,687 square miles. Population (1891) 520,000.

BADAJOS, the capital of the above province, is a fortified city, and the see of a bishop. It is is situated about five miles from the Portuguese frontier, on a slight elevation near the left bank of the Guadiana, and is one of the principal stations on the railway between Madrid and Lisbon. The population (1890) is estimated at 23,000.

BADAKHSHAN, a country of Central Asia, situated in the upper valley of the Kokcha river, one of the principal head streams of the Oxus. Its extent from east to west is about 200 miles, and from north to south about 150 miles. On the north it is bounded by Kulab and Darwaz; on the east by the lofty table-land of Pamir; on the south by the Hindu Kush range and on the west by Kunduz.

Badakhshan was visited by Hwen Thsang in 630 and 644. The Arabian geographers of the 10th century speak of its mines of ruby and azure, and give notices of the flourishing commerce and large towns of Waksh and Khotl, regions which appear either to have in part corresponded with or to have lain close to Badakhshan. In 1272–73 Marco Polo and his companions stayed for a time in Badakhshan. During this and the following centuries the country was governed by kings who claimed to be descendants of Alexander the Great. The last of these kings was Shah Mahomet, who died in the middle of the 15th century, leaving only his married daughters to represent the royal line. Early in the middle of the 16th century the Uzbeks obtained possession of Badakhshan, but were soon expelled, and then the country was generally governed by descendants of the old royal dynasty by the female line. About the middle of the 18th century the present dynasty of Mírs established its footing in place of the old one which had become extinct. In 1765 the country was invaded and ravaged by the ruler of Cabul. During the first three decades of the present century it was overrun and depopulated by Kokan Beg and his son Murad Beg, chiefs of the Kataghan Uzbeks of Kundus. The country was still suffering from the disasters when Wood visited it in 1837. When Murad Beg died, the power passed into the hands of another Uzbek, Mahomet Amir Khan. In 1859 the Kataghan Uzbeks were expelled; and Mír Jahander Shah, the representative of the modern royal line, was reinstated at Faizábád under the supremacy of the Afghans. In 1867 he was expelled by the Afghans and replaced by the present ruler, Mír Mahomet Shah, and other representatives of the same family. According to the latest accounts the country was reviving from its past misfortunes, and the towns were again rising.

BADALOCCHIO, SISTO, surnamed ROSA, a painter and engraver, was born at Parma in 1581, and died in 1641 or 1647.

BADEN, THE GRAND DUCHY OF, is situated in the S.W. of Germany. It is bounded on the N. by Bavaria and Hesse-Darmstadt; W. by Rhenish Bavaria, Alsace, and Lorraine; S. by Switzerland; E. by Würtemberg and part of Bavaria. At the commencement of the present century Baden was only a margraviate, with an area little exceeding 1300 square miles, and a population of 210,000. Since then it has from time to time acquired additional territory, so that its area now amounts to upwards of 5800 square miles, and its population to 1,601,255 (1890).

It consists of a considerable portion of the eastern half of the fertile valley of the Rhine, and of the mountains which form its boundary. The mountainous part is by far the most extensive, forming, indeed, nearly 80 per cent of the whole area. From the Lake of Constance in the south to the River Neckar is a portion of the so-called Black Forest or *Schwarzwald*, which is divided by the valley of the Kinzig into two districts of

different elevation. To the south of the Kinzig the mean height is 3100 feet, and the loftiest summit, the Feldberg, reaches about 4780 feet; while to the north the mean height is only 2100 feet, and the Belchen, the culminating point of the whole, does not exceed 4480. To the north of the Neckar is the Odenwald range, with a mean of 1440 feet, and, in the Kàtzenbuckel, an extreme of 1980. Lying between the Rhine and the Dreisam is the Kaiserstuhl, an independent volcanic group, nearly 10 miles in length and 5 in breadth, the highest point of which is 1760 feet.

The greater part of Baden belongs to the basin of the Rhine, which receives upwards of twenty tributaries from the highlands of the duchy alone; a portion of the territory is also watered by the Main and the Neckar. A part, however, of the eastern slope of the Black Forest belongs to the basin of the Danube, which there takes its rise in a number of mountain streams. Among the numerous lakes which belong to the duchy are the Mummel, Wilder, Nonnenmattweiher, Titti, Eichener, Schluch, &c., but none of them are of any size. The Lake of Constance, or Boden See, belongs partly to Bavaria and Switzerland.

From 1819 to 1832 Baden was divided into six circles, which were reduced in the latter year to the four following:—The Lake Circle or Constance, the Upper Rhine or Freiburg, the Middle Rhine or Carlsruhe, and the Lower Rhine or Manheim. This division, though still employed, has been legally supplanted by one into the eleven circles of Constance, Villingen, Waldshut, Freiburg, Lörrach, Offenburg, Baden, Carlsruhe, Manheim, Heidelberg, and Mosbach. The capital of the duchy is Carlsruhe, which in 1889 had a population of 61,074; the other principal towns are Manheim (39,614), Freiburg (24,599), Heidelberg (19,988), Pforzheim (19,801), Rastadt (11,559), Baden (10,083), Constance (10,052), Bruchsal (9786), and Lahr (6710). The population is most thickly clustered in the north and in the neighborhood of the Swiss town of Basel.

The inhabitants of Baden are of various origin,—those to the N. of the Murg being descended from the Alemanni, and those to the S. from the Franks, while the Swabian plateau derives its name and its population from another race. This distinction is still marked in the manners, the language, and the dress of the different districts. The majority of the people are engaged in agricultural and pastoral pursuits, for which much of the country is well adapted. In the valleys the soil is particularly fertile, yielding luxuriant crops of wheat, maize, barley, spelt, beans, potatoes, flax, hemp, hops, beet-root, and tobacco; and even in the more mountainous parts rye, wheat, and oats are extensively cultivated. There is a considerable extent of pasture land, and the rearing of cattle, sheep, pigs, and goats is largely attended to. The culture of the vine has recently been increasing, and the wines, which are characterised by a mildness of flavor, are in good demand. The gardens and orchards supply abundance of fruits, especially almonds and walnuts; and the keeping of bees is common throughout the country. A greater proportion of Baden than of any other of the South German states is occupied by forests. In these the predominant species are the fir and pine, but many others, such as the chestnut are well represented. A third, at least, of the annual supply of timber is exported, the chief consumer being Holland, though of late years Paris has derived a considerable supply from this source.

The exports of Baden, which coincide largely with the industries just mentioned, are of considerable importance, but the bulk of its trade consists in the transit of goods. The country is well furnished with roads and railways, the greater proportion of the latter being in the hands of the state. A line runs the whole length of the land, for the most part parallel with the Rhine, while branches cross obliquely from east to west.

The educational institutions of Baden are numerous and flourishing, and public instruction is largely subsidised by the Government. There are two universities, the Protestant one at Heidelberg, founded in 1386, and the Catholic one at Freiburg, founded in 1457. The library at Heidelberg numbers 150,000 volumes, and that at Freiburg 100,000, while there is another of almost equal size at Carlsruhe. There are also lyceums at Carlsruhe, Constance, Freiburg, Heidelberg, Manheim, Rastadt and Wertheim; several gymnasiums; normal schools at Carlsruhe, Ettlingen, and Meersburg, besides upwards of 2000 common schools established throughout the country. There is an institution in Pforzheim for the deaf and dumb, and one in Freiburg for the blind. The polytechnic school at Carlsruhe is among the most efficient institutions of the kind in Germany. The preparatory course extends over three years, and includes French, German, English, special history, mathematics, drawing, modelling, chemistry, mineralogy and geology, mechanics, &c. The special courses are engineering, architecture, forestry, chemistry, mechanics, commerce, and post-office service, and extend over from one to four years. The ducal family of Baden belong to the Protestant section of the Church, but the majority of the population are Roman Catholics. The returns of the census of 1889 are as follows:—Catholics, 942,560; Protestants, 491,008; other sects, 2265; and Jews, 25,703. The district where the Roman Catholic preponderance was greatest was Constance, while the Protestants were slightly more numerous in the district of Manheim.

The government of Baden is an hereditary monarchy, with the executive power vested in the grand duke, and the legislative authority in a Parliament consisting of two Chambers. The upper Chamber is composed of all the princes of the reigning line who are of age, the chiefs of ten noble families, the possessors of hereditary landed estates worth £25,000, the Roman Catholic archbishop of Freiburg, the president of the Protestant Church, a deputy from each of the universities, and eight nominees of the duke. The lower Chamber consists of 63 representatives, of whom 22 are elected by the burgesses of certain towns, and 41 by the inhabitants of the bailiwicks. The parliamentary candidate must possess tax-paying property of the value of 10,000 florins (£833), or derive a salary of at least £125 from a public office. Every citizen, if neither criminal nor pauper, has the right of voting, but only in the choice of deputy-electors, by whom the real election of the representatives is decided. The members of the lower House are elected for eight years, and meetings of Parliament must take place every two years.

By the treaty of Lunéville in 1801, Baden acquired a considerable addition of territory; in 1803 the margrave received the title of Elector; and by the treaty of Presburg in 1805 his domains were still further increased by the accession of Breisgau. On the dissolution of the empire in 1806, the elector joined the Confederation of the Rhine, and received the title of Grand Duke, with 1950 square miles of additional territory. In 1821 the union of the two Protestant churches in Baden was brought about. Other questions of importance, such as trial by jury, freedom of the press, abolition of tithes, and extension of education, became subjects of interest and debate; but unfortunately, the influence of the French revolution of 1830 led the democratic party to excesses, which the Government met with acts of ill-advised repression. Matters were beginning to readjust themselves when the Revolution of 1848 again aroused

the opposing forces. In 1849 the duke was constrained to flee, and Bretano, the democratic leader, took possession of Carlsruhe in the name of the national committee. By the 25th of June, however, the Prussian forces, after several severe engagements with the revolutionists, effected the restoration of the duke, who returned to his capital on 18th August; and it was not long before the country began to recover from the effects of the outbreak. Not, indeed, that it became quiescent; for Baden has had its full share in the political and ecclesiastical disputes that have been so rife throughout Germany during recent years. The Roman Catholic clergy, with the bishop of Freiburg at their head, have maintained an obstinate struggle with the Liberal party, which is now predominant. The separation of church and state has been established; the Jews have been admitted to full civic rights; freedom of trade has been promulgated, and a number of minor reforms successfully carried through. In the German war of 1866 Baden sided against Prussia; but in 1870 it joined in the formation of the new German empire, and its troops are incorporated in the 14th corps of the imperial army.

BADEN (or BADEN-BADEN, to distinguish it from other places of the name), a town and celebrated watering-place of Germany, in the grand duchy of Baden. It stands on the side of a hill, near the Oos or Oel, in a beautiful valley of the Black Forest, 18 miles S.W. of Carlsruhe; and it is connected by a branch with the Manheim and Basel railway. The superiority of its situation, its extensive pleasure-grounds, gardens, and promenades, and the brilliancy of the life that is led during the season, have for a long series of years continued to attract crowds of visitors from all parts of the world. The resident population amounts to about 10,000, but that number is frequently augmented fourfold. The prevailing nationality is, or rather was, the French, but Americans, Russians, and English are all numerously represented. The hot springs, which are among the earliest attractions of the place, are twenty-nine in number, and vary in temperature from 37° to 54° R., *i.e.*, from 115° to 153° Fahr. They flow from the castle rock at the rate of 90 gallons per minute, and the water is conveyed through the town in pipes to supply the different baths. The town proper is on the right bank of the Oos, but the principal resorts of the adventitious population are on the other side. A *Conversationshaus* and a *Trinkhalle* or pump-room (1842), a theatre (1861), and a picture-gallery, are among the chief fashionable buildings, to which may be added the library and reading-room. The gaming-tables, which for so many years were a striking feature of Baden-Baden, are now abolished. The only building of much antiquarian interest, with the exception of the castles, is the parish church, which dates from the 15th century, and contains the tombs of several of the margraves. There is a Protestant church a short distance to the east of Leopoldsplatz, and not far off a small Episcopalian church; while on the Michaelsberg is the Greek chapel, with its gilded dome, which was erected over the tomb of the Roumanian prince, Michael Stroudza, who died at Baden in 1863.

BADEN, Switzerland, a small town in the canton of Aargau, on the Limmat, fourteen miles northwest of Zurich. It is much frequented on account of its warm medicinal springs, which are about twenty in number, and vary in temperature from 98° to 126° Fahr. About 15,000 persons visit the place annually. Tacitus, in the first book of his *Histories*, incidentally speaks of it, and numerous remains of pillars and inscriptions, coins, and other antiquities confirm his description

BADEN, the chief town of a circle in Lower Austria, about 12 miles S. of Vienna on the railway to Gratz. It is beautifully situated at the mouth of the romantic *Helenenthal*, near the banks of the Schwachat, a rapid stream with several waterfalls, and has become a favorite summer resort with the inhabitants of the neighboring capital. The warm baths, which give name to the town, are thirteen in number, and vary in temperature from 72° to 97° Fahr. Population, 6,500.

BADGER (*Meles*), a family of Plantigrade Carnivora, possessing greatly elongated bodies and short limbs, each of the latter furnished with five toes, provided at their extremities with long, powerful claws, by means of which they form deep burrows in the earth. The carnassial tooth, which in the bears is wholly tuberculate, is in the badgers provided also with a cutting edge, their whole dentition being specially adapted to the partly vegetable, partly animal diet on which they subsist. The badger differs from all other mammals in having the lower jaw so articulated to the upper, by means of a transverse condyle firmly locked into a long cavity of the cranium, that dislocation of the jaw is all but impossible, and this enables those creatures to maintain their hold with the utmost tenacity. The European badger (*Meles Taxus*) may be taken as typical of the entire family. It is nowhere abundant, but is found over the entire northern parts of Europe and Asia. It is a quiet, inoffensive animal, nocturnal and solitary in its habits, sleeping by day in its burrow, and issuing forth at night to feed on roots, beech-mast, fruits, the eggs of birds, some of the smaller quadrupeds, frogs, and insects. It is said also to dig up the nests of wasps in order to eat the larvæ, as the ratel — a closely allied South African form — is said to rob the bees of their honey. The male and female are seldom seen together, and are supposed to trace each other by means of the odor of the secretion contained in a glandular pouch beneath the tail. Although the badger does not seek to attack, yet, when driven to bay, its great muscular power and tough hide renders it a formidable antagonist, as was often seen in the days, now happily gone by, when badger-baiting was a favorite amusement of the English peasantry.

BADIA Y LEBLICH, DOMINGO, a celebrated Spanish traveller, better known under his assumed name of Ali Bey, was born in Biscay in the year 1766. Under the name of Ali Bey and in Mussulman costume, he visited Egypt, Marocco, Tripoli, Arabia, and Syria, and was received as a person of high rank wherever he appeared. On his return to Europe in 1807 he declared himself a Bonapartist, and was made Intendant, first of Segovia, and afterwards of Cordova. When the French were driven from Spain, Badia was compelled to take refuge in France, and there, in 1814, published an account of his travels. A few years later he set out again for Syria, under the assumed name of Ali Othman and, it is said, accredited as a political agent by the French Government. He only reached Aleppo, and there died, 30th August 1818, not without suspicion of having been poisoned.

BADIUS, JODOCUS or JOSSE, sometimes called BADIUS ASCENSIUS, from the village of Asche, near Brussels, where he was born in 1462, was an eminent printer at Paris, whose establishment was celebrated under the name of *Prelum Ascensianum*. He died in 1535.

BADMINTON, a game of recent introduction. It may be played in or out of doors, by any number of persons from two to eight. It is played with battledores and shuttlecocks.

BADRINATH, a town and celebrated temple in Hindustán, in the British district of Garhwal, situate on the right bank of the Vishnugangá, a tributary of the Alaknandá River, in the middle of a valley nearly 4 miles in length and 1 in breadth. The town is small

containing only twenty or thirty huts, in which reside the Bráhmans and the attendants on the temple. The building, however, which is considered a place of high sanctity, by no means corresponds to its great celebrity.

BAENA, a town of Spain, in the province of Cordova, 8 leagues S.E. of the city. It is picturesquely situated, near the River Marbello, on the slope of a hill crowned with a castle, which formerly belonged to Gonsalo de Cordova, and is now the property of the Altamira family.

BAEZA (ancient *Beatia*), a city of Spain, in the province of Jaen. It stands on a considerable elevation, about 3 miles from the right bank of the Guadalquivir.

BAFFIN, WILLIAM, an able and enterprising English seaman, born in 1584. Nothing is known of his early life, and his fame rests entirely on the voyages undertaken by him during the years 1612 to 1616. In 1612 he accompanied Captain James Hall on his fourth voyage in search of the north-west passage, and in 1613 he commanded one of the English vessels engaged in the Greenland fisheries. In 1615 and 1616 Baffin made two voyages in the "Discovery" under Bylot, and on the second of them explored the large inlet, afterwards called Baffin's Bay.

BAFFIN'S BAY, or BAFFIN'S SEA, is properly neither a bay nor a sea, but part of the long strait or inlet which separates Greenland from the N.E. coast of America.

BAGATELLE is an indoor game, probably derived from the old English shovel-board, described by Cotton in his *Compleat Gamester* (1674), though many consider that its invention is due to the French. Like billiards, chess, and draughts, its origin is not certainly known; but whatever its genesis, its name is undoubtedly French. Bagatelle games are played on the oblong board, usually from six to ten feet in length, by a foot and a half to three feet in width. The bed of the table, which is ordinarily of slate or mahogany, is covered with fine green cloth; and at the upper end, which is rounded, there are nine holes or cups, numbered from 1 to 9.

Into these holes ivory balls are driven by a cue in all respects similar to the instrument used in BILLIARDS, which see. The sides and circular end of the table are furnished with elastic cushions; and in some of the newer tables there is also a pocket on each side. Nine balls — eight white, and one red or black (sometimes four white, four red, and one black) — are used in the most popular of the several bagatelle games.

BAGGESEN, JENS EMMANUEL, the most prominent literary figure in Denmark during the latter part of last century, was born on the 15th of February 1765, at Korsör. His parents were very poor, and before he was twelve he was sent to copy documents at the office of the clerk of the district. By dint of indomitable perseverance, he managed to gain an education, and in 1782 entered the university of Copenhagen. His success as a writer was coeval with his earliest publication; his *Comical Tales* in verse, poems that recall the *Broad Grins* that Colman the younger brought out a decade later, took the town by storm, and the struggling young poet found himself a popular favorite at twenty-one. He then tried serious lyrical writing, and his tact, elegance of manner, and versatility, gained him a place in the best society. This sudden success received a blow in 1788, when a very poor opera he had produced was received with mockery, and a reaction against him set in. He left Denmark in a rage, and spent the next years in Germany, France, and Switzerland. In the country last mentioned he married, began to write in German, and published in that language his next poem, *Alpenlied*. In 1790 he returned to his mother-country, bringing with him as a peace-offering his fine descriptive poem, the *Labyrinth*, in Danish, and was received with unbounded homage. The next twenty years were spent in incessant restless wanderings over the north of Europe, Paris latterly becoming his nominal home. He continued to publish volumes alternately in Danish and German. In 1811 he returned to Copenhagen to find the young Ohlenschläger installed as the great poet of the day, and he himself beginning to lose his previously unbounded popularity. Until 1820 he resided in Copenhagen, in almost unceasing literary feud with some one or other, abusing and being abused, the most important feature of the whole being Baggesen's determination not to allow Ohlenschläger to be considered a greater poet than himself. He then went back to his beloved Paris, where he lost his wife and youngest child, and fell at last into a state of hopeless melancholy madness. In 1826, having slightly recovered, he wished to see Denmark once more, but died at Hamburg on his way, on the 3d of October, and was buried at Kiel.

BAGHDAD, a Turkish pashalic or government of Asia, computed to have an area of above 100,000 square miles. It stretches in a N.W. direction, from the mouth of the Shatt-el-Arab at Bussorah, to Merdin, situated near the source of the Tigris; and from the confines of Persia to the banks of the Khabour, which separates it from the pashalic of Diarbekir. Its general boundaries are the Euphrates and the Arabian desert of Nejd to the W. and S., Kusistan and Mount Zagros to the E., the pashalic of Diarbekir to the N.W., and Armenia with the territories of the Kurdish chief of Julamerick to the N. This great tract comprehends ancient Babylonia and the greatest part of Assyria proper. The first includes the space enclosed by the Tigris and the Euphrates, which is also known under the general appellation of Mesopotamia; and the second, that which is beyond the Tigris, commonly called Lower Kurdistan. This tract of country is an extensive and very fertile plain, and is watered by the Tigris and Euphrates, which at Baghdad approach within 25 miles of each other, and afford an inexhaustible supply of the finest water. Only some parts of these fertile districts, however, are cultivated, as the population consists in many places of wandering Arabs, who are averse to agriculture, and who, in their vagrant life of idleness and rapine, neglect all the natural advantages of the country. The most productive portion of the pashalic is on the banks of the Shatt-el-Arab, in the neighborhood of Bussorah. This tract, for upward of 30 miles below that city, is well cultivated and yields vast quantities of dates, wheat, barley, and various kinds of fruits. The banks of the Euphrates produce abundant crops of dry grain. Higher up the Euphrates, the country which is possessed by the Arabs is a low marshy tract, formed by the expansion of the Euphrates, and is famed for plentiful crops of rice. Among the mountainous districts of the Upper Euphrates the country is highly picturesque and beautiful; it is watered by the River Mygdonius (the Gozan of Scripture), and is in a tolerable state of cultivation. It produces in abundance the finest fruits, such as grapes, olives, figs, pomegranates, which are considered the most delicious in the east; apples, pears, apricots of an inferior quality; and the finest dates, on which the inhabitants, as in other parts of Asia, depend in many cases for subsistence. The domestic animals are, the horse, for which the country has long been famed, the ass, camel, dromedary, buffalo and mule. Of the wild animals, the lion, the hyena, the jackal, the wolf, and the wild boar, are common; and antelopes are very numerous. Hares are plentiful, but foxes are seldom seen. All sorts of poultry are bred except the

turkey. On the cultivated lands, and on the borders of the rivers, the black partridge is met with in great numbers. Snipes and almost every species of wild fowl may be found in the marshes, and pelicans on the banks of the Euphrates and Tigris. In addition to these two rivers the country is watered by the Khabour or Chaboras, formed by the junction of several small streams about ten miles to the S.W. of Merdin, and by the Mygdonius, or Gozan, the Hermas of the Arabs, which used formerly to discharge a part of its waters into the Euphrates through the Khabour, and a part into the Tigris through the Thirthar, passing by Hatra, but which is now entirely lost in a salt marsh at the foot of the Singar hills.

In ancient times the plain of Mesopotamia was occupied by the great and wealthy cities of Nineveh, Babylon, Seleucia, Ctesiphon, &c., and was in a high state of cultivation. It was intersected by many well-constructed canals and other works, which, in dispersing over the country the superfluous waters of the Tigris and Euphrates, proved extremely useful to agriculture. These works are now all ruined, and not a vestige remains of many of the canals, while the course of others can only be faintly traced in their imperfect remains. One canal, however, called El-Hye, still exists; it connects the Euphrates and the Tigris exactly half-way between Bussorah and Baghdad, and is navigable in spring for large boats.

BAGHDAD, a city of Asia, formerly the capital of the empire of the caliph, and long renowned for its commerce and its wealth, is situated on an extensive and desert plain, which has scarcely a tree or village throughout its whole extent; and though it is intersected by the Tigris, it stands mostly on its eastern bank, close to the water's edge. The town has been built without the slightest regard to regularity. The streets are even more intricate and winding than those in most other Eastern towns; and, with the exception of the bazaars and some open squares, the interior is little else than a labyrinth of alleys and passages. The streets are unpaved, and in many places so narrow that two horsemen can scarcely pass each other; and as it is seldom that the houses have windows facing the great public thoroughfares, and the doors are small and mean, they present on both sides the gloomy appearance of dead walls. All the buildings, both public and private, are constructed of furnace-burnt bricks, of a yellowish-red color, taken chiefly from the ruins of other edifices, as their rounded angles evidently show.

The principal public buildings in Baghdad are the mosques, the khans or caravanserais, and the serai or palace of the pasha. The palace, which is situated in the north-western quarter of the town, not far from the Tigris, is distinguished rather for extent than grandeur. It is a comparatively modern structure, built at different periods, and forming a large and confused pile, without proportion, beauty, or strength. There are no remains of the ancient palace of the caliphs.

In all Mahometan cities the mosques are conspicuous objects. The number in Baghdad is above 100; but of these not more than thirty are distinguished by the characteristic minarets or steeples, the rest being merely chapels and venerated places of prayer. The most ancient of these mosques was erected in the year of the Hegira 633, or 1235 of the Christian era, by the Caliph Mustansir.

There are about thirty khans or caravanserais in Baghdad, all of the inferior construction to those in the other large towns of Turkey. The only remarkable building of this class is called *Khan-el-Aourtmeh*, and adjoins the Merjaneeah mosque, to which it formerly belonged.

The only other Mahometan remains which it is necessary to mention are — 1. The Tekiych, or shrine of the Bektash dervishes, on the western bank of the river. The shrine is in ruins, but it contains a fine Cufic inscription now mutilated, which bears the date of 333 A.H. (or 944 A.D.) 2. The tomb of the famous Maaruf-el-Kerkhi, in the immediate vicinity, dating from 1215 A.D. 3. In Eastern or New Baghdad the college of Mustansir, near the bridge, now in ruins, but bearing a fine inscription dated 630 A.H. (or 1233 A.D.) 4. The shrine of the famous Saint Abdel Kadir, which is visited by pilgrims from all parts of the Mahometan world.

Baghdad has much declined from its ancient importance. It was formerly a great emporium of Eastern commerce; and it still receives, by way of Bussorah, from Bengal the manufactures and produce of India, which are distributed over Arabia, Syria, Kurdistan, Armenia, and Asia Minor. At the same time the inland trade from Persia and the East has fallen off. The productions and manufactures of Persia, which were intended for the Syrian, Armenian, and Turkish markets, and were sent to Baghdad as a central depôt, now reach Constantinople by the more direct route of Erzeroum and Tocat. Wealth, indeed, appears to be deficient among all classes, and Baghdad has many symptoms of a decayed city.

The population is a mixture of nations from various quarters of the East. The chief officers of Government, whether civil or military, are of the families of Constantinoplian Turks, though they are mostly natives of the city; the merchants and traders are almost all of Persian or Arabian descent; while the lower classes consist of Turks, Arabs, Persians, and Indians.

Baghdad is governed by a pasha, assisted by a council. He was formerly chosen from the ranks of the Georgian Mamelukes, but is now always selected from among the highest officers of the Constantinople court, his term of office being usually for four or five years. He is also governor-general of Irak, and possesses supreme authority from Diarbekir to Bahrein, though he does not under ordinary circumstances interfere with the subordinate governments of Mosul and Kurdistan.

The East India Company used to maintain a resident in Baghdad with a large establishment, and his post is now replaced by that of a consul-general and political agent. A French consul is also regularly appointed.

Until recently Baghdad was supposed to be entirely a Mahometan city, dating from the time of Al Mansúr; but Sir H. Rawlinson discovered in 1848, during an unusually dry season, when the rivers had fallen six feet below the ordinary low-water mark, that the western bank of the Tigris was lined with an embankment of solid brick-work, dating from the time of Nebuchadnezzar, as the bricks were each stamped with his name and titles; and it has been since remarked that in the Assyrian geographical catalogues of the time of Sardanapalus, one of the Babylonian cities bears the name of *Bagdad*, and may thus very possibly represent the after site of the capital of the caliphs. According to the Arabian writers, however, there were no traces of former habitation when Al Mansúr laid the foundation of the new city. It was adorned with many noble and stately edifices by the magnificence of the renowned Haroun al Raschid, who also built on the eastern side of the river, connecting the two quarters of the town by a bridge of boats. Under the auspices of Zobeide, the wife of that prince, and Jaffer the Barmecide, his favorite, the city may be said to have attained its greatest splendor. It continued to flourish and increase, and to be the seat of elegance and learning, until the 656th year of the Hegira (1277 A.D.), when Hulaku the Tatar,

the grandson of Genghis Khan, took it by storm, and extinguished the dynasty of the Abassides.

BAGHERMI, or BAGIRMI, a district or kingdom of Central Africa, lying to the S. of Lake Chad and S.W. of Bornu. It extends about 240 miles from N. to S., and has a breadth of barely 150 miles. The surface is almost flat, with a slight inclination to the N., and the general elevation is about 950 feet above sea-level. The Shari, a large and always navigable river, forms the western boundary, and throws out an important effluent called the Bachikam, which passes through the heart of the country. The soil consists partly of lime and partly of sand, and is by no means unfertile. In many parts not a stone is to be seen. Negra-millet, sesamum, and sorghum are the principal grains in cultivation, but rice grows wild, and several kinds of grass or *poa* are used as food by the natives. Cotton and indigo are grown to a considerable extent, especially by Bornu immigrants. Among the trees the most important are the tamarind, the deleb-palm, the dum-palm, the hajilij or *Balanites ægyptiaca*, the sycamore, and the cornel. The country often suffers from drought, and is greatly plagued with worms and insects, especially ants of all kinds, red, black, and white.

BAGHMATI, a river of Hindustán, which has its source in the hills to the north of Kátmandu, the capital of Nepál, whence it flows in a southerly direction through the district of Tirhut in the province of Behar, and, receiving the waters of the Buchiá on its north bank, and of Burá Gandak on its south bank, joins the Ganges, after a course of 285 miles.

BAGLIVI, GIORGIO, an illustrious Italian physician, descended from a poor persecuted Armenian family, was born at Ragusa in 1769, and assumed the name of his adoptive father, Pietro Angelo Baglivi, a wealthy physician of Lecce. He studied successively at the universities of Salerno, Padua, and Bologna; and after travelling over Italy, he went in 1602 to Rome, where, through the influence of the celebrated Malpighi, he was elected professor of anatomy in the college of Sapienza. He died at Rome in 1707, at the early age of thirty-eight.

BAGNACAVALLO, BARTOLOMMEO, an Italian painter, who flourished about the beginning of the sixteenth century and died in 1542.

BAGNÈRES-DE-BIGORRE (the *Vicus Aquensis* of the Romans), the capital of an arrondissement in the department of Hautes-Pyrénées, is situated on the left bank of the Adour, 13 miles S.E. of Tarbes. It is one of the principal watering-places in France, and is much admired for its picturesque situation and the beauty of its environs, particularly the valley of Campan, which abounds with beautiful gardens and handsome villas. Population, 10,000.

BAGNÈRES-DE-LUCHON, a small well-built town of France, department of Haute-Garonne, pleasantly situated in the valley of the Luchon, at the foot of the Pyrenees. It is celebrated for its sulphurous thermal springs, which vary in temperature from 88° to 180° Fahr. Resident population, 4,000.

BAGPIPE, a musical instrument of unknown antiquity which seems to have been at one time or other in common use among all the nations of Europe, and still retains its place in many Highland districts, such as Calabria, the Tyrol, and the Highlands of Scotland. The wind is generally supplied by a blowpipe, though in some cases bellows are used. These, and other slight variations, however, involve no essential difference in character or construction, and a description of the great bagpipe of the Highlands of Scotland will serve to indicate the leading features of the instrument in all its forms. It consists of a large wind-bag made of greased leather covered with woolen cloth; a mouth-tube, valved, by which the bag is inflated with the player's breath; three reed drones; and a reed chanter with finger-holes, on which the tunes are played. Of the three drones, one is long and two are short. The longest is tuned to A, an octave below the lowest A of the chanter, and the two shorter drones are tuned each an octave above the A of the longest drone; or, in other words, in unison with the lowest A of the chanter. The scale of the chanter has a compass of nine notes, all natural, extending from G on the second line of the treble stave up to A in alt.

BAGRATION, PETER, PRINCE, a distinguished Russian general, descended from the noble Georgian family of the Bagratides, was born in 1765. In 1782 he entered the Russian army and served for some years in the Caucasus. In 1788 he was engaged in the siege of Oczacow, and afterwards accompanied Suwaroff, by whom he was highly esteemed, through all his Italian and Swiss campaigns. He particularly distinguished himself in 1799 by the capture of the town of Brescia. He was mortally wounded in the bloody battle of Borodino, 7th Sept. 1812, and died one month later.

BAHAMAS, or LUCAYAS, a very numerous group of islands, cays, rocks, and reefs, comprising an area of 3021 square miles, lying between 21° 42′ and 27° 34′ N. lat. and 72° 40′ and 79° 5′ W. long. They encircle and almost enclose the Gulf of Mexico, stretching more than 600 miles from the eastern coast of Florida to the northern coast of St. Domingo, and are traversed by only three navigable channels — 1st, the Florida Channel to the N., which runs along the coast of the United States and lies to the westward of the whole Bahama group; 2d, the Providence Channels, passing through the group to the N., and separating the Great and Little Banks; and 3d, the old Bahama Channel, which passes to the S. of the Great Bahama Bank, between it and Cuba. The islands lie for the most part on the windward edge of the Great and Little Banks, or of the ocean sounds or tongues which pierce them. The total number of islands is 29, while the cays are reckoned at 661, and the rocks at 2387. The principal islands are New Providence (which contains the capital Nassau), Abaco, Harbor Island, Eleuthera, Inagua, Mayaguana, St. Salvador, Andros Island, Great Bahama, Ragged Island, Rum Cay, Exuma, Long Island, Crooked Island, Acklin Island, Long Cay, Watling Island, the Berry Islands, and the Biminis. Turk's Island and the Caicos, which belong geographically to the Bahama group, were separated politically in 1848. The formation of all the islands is the same, — calcareous rocks of coral and shell hardened into limestone, honeycombed and perforated with innumerable cavities, without a trace of primitive or volcanic rock; the surface is as hard as flint, but underneath it gradually softens and furnishes an admirable stone for building, which can be sawn into blocks of any size, these hardening on exposure to the atmosphere. The shores are generally low, the highest hill in the whole range of the islands being only 230 feet high. The soil, although very thin, is very fertile. On Andros Island and on Abaco there is much large timber, including mahogany, mastic, lignum vitæ, iron, and bullet woods, and many others. Unfortunately the want both of labor and of roads renders it impossible to turn this valuable timber to useful account. The fruits and spices of the Bahamas are very numerous, — the fruit equalling any in the world. The produce of the islands includes tamarinds, olives, oranges, lemons, limes, citrons, pomegranates, pine-apples, figs, sapodillas, bananas, sowersops, melons, yams, potatoes, gourds, cucumbers, pepper, cassava, prickly pears, sugar cane, ginger, coffee, indigo, Guinea corn and pease. Tobacco and cascarilla

bark also flourish; and cotton is indigenous, and was woven into cloth by the aborigines.

It is a remarkable fact that except in the island of Andros, no streams of running water are to be found in the whole group. The inhabitants derive their water supply from wells, the rain-water in which appears to have some connection with the sea, as the contents of the wells rise and fall with the tide upon the neighboring shore. The Bahamas are far poorer in their fauna than in their flora. It is said that the aborigines had a breed of dogs which did not bark, and a small coney is also mentioned. The guana also is indigenous to the islands. Oxen, sheep, horses, and other live stock introduced from Europe, thrive well, but of late years very little attention has been paid to stock rearing, and Nassau has been dependent upon Cuba for its beef, and on the United States or Nova Scotia for its mutton. There are many varieties of birds to be found in the woods of the Bahamas; they include flamingoes and the beautiful humming-bird, as well as wild geese, ducks, pigeons, hawks, green parrots, and doves. The waters of the Bahamas swarm with fish, and the turtle procured here is particularly fine. In the southerly islands there are salt ponds of great value.

The story of the Bahamas is a singular one, and bears principally upon the fortunes of New Providence, which, from the fact that it alone possesses a perfectly safe harbor for vessels drawing more than 9 feet, has always been the seat of Government, when it was not the headquarters of lawless villainy. St. Salvador (Cat Island, or as some suppose, Watling Island), however, claims historical precedence as the landfall of Columbus on his memorable voyage. He passed through the islands, and in one of his letters to Ferdinand and Isabella he said, "This country excels all others as far as the day surpasses the night in splendor; the natives love their neighbors as themselves; their conversation is the sweetest imaginable; their faces always smiling; and so gentle and so affectionate are they, that I swear to your highness there is not a better people in the world." But the natives, innocent as they appeared, were doomed to utter destruction. Ovando, the governor of Hispaniola, who had exhausted the labor of that island, turned his thoughts to the Bahamas, and in 1509 Ferdinand authorised him to procure laborers from these islands. It is said that reverence and love for their departed relatives was a marked feature in the character of the aborigines, and that the Spaniards made use of this as a bait to trap the unhappy natives. They promised to convey the ignorant savages in their ships to the "heavenly shores," where their departed friends now dwelt, and about 40,000 were transported to Hispaniola to perish miserably in the mines. From that date until after colonisation of New Providence by the English, there is no record of a Spanish visit to the Bahamas, with the exception of the extraordinary cruise of Juan Ponce de Leon, the conqueror of Porto Rico, who passed months searching the islands for "Bimini," which was reported to contain the miraculous "Fountain of Youth."

The deserted islands were first visited by the English in 1629, and a settlement formed in New Providence, which they held till 1641, when the Spaniards expelled them but made no attempt to settle there themselves. The English again took possession in 1667, and in 1680 Charles II. made a grant of the islands to George, Duke of Albemarle; William, Lord Craven; Sir George Carteret; John, Lord Berkeley; Anthony, Lord Ashley: and Ser Peter Colleton. Governors were appointed by the lords proprietors, and there are very copious records in the state papers of the attempts made to develop the resources of the island; but the repeated attacks of the Spaniards, and the tyranny and mismanagement of the governors, proved great obstacles to success. In July 1703 the French and Spaniards made a descent on New Providence, blew up the fort, spiked the guns, burnt the church, and carried off the governor, with the principal inhabitants, to the Havannah; and in October the Spaniards made a second descent, and completed the work of destruction. It is said that when the last of the governors appointed by the lords proprietors, in ignorance of the Spanish raid, arrived in New Providence, he found the island without an inhabitant. It soon, however, became the resort of pirates, and the names of many of the worst of these ruffians is associated with New Providence, the notorious Blackbeard being chief among the number. At last matters became so intolerable that the merchants of London and Bristol petitioned the Crown to take possession and restore order, and Captain Woods Rogers was sent out as the first Crown governor, and arrived at New Providence in 1718. Many families of good character now settled at the Bahamas, and some progress was made in developing the resources of the colony, although this was interrupted by the tyrannical conduct of some of the governors who succeeded Captain Woods Rogers. At this time the pine-apple was introduced as an article of cultivation at Eleuthera; and a few years subsequently, during the American war of independence, colonists arrived in great numbers, bringing with them wealth and also slave labor. Cotton cultivation was now attempted on a large scale. In 1783, at Long Island, 800 slaves were at work, and nearly 4000 acres of land under cultivation. But the usual bad luck of the Bahamas prevailed; the red bug destroyed the cotton crops in 1788, and again in 1794, and by the year 1800 cotton cultivation was almost abandoned, There were also other causes that tended to retard the progress of the colony. In 1776 Commodore Hopkins, of the American navy, took the island of New Providence; he soon, however, abandoned it as untenable, but in 1782 it was retaken by the Spanish governor of Cuba. The Spaniards retained nominal possession of the Bahamas until 1783, but before peace was notified New Providence was recaptured by a loyalist, Colonel Devaux, of the South Carolina militia, in June 1783. In 1787, the descendants of the old lords proprietors received each a grant of £2000 in satisfaction of their claims, and the islands were formally reconveyed to the Crown. The Bahamas began again to make a little progress, until the separation of Turks and Caicos Islands in 1848, which had been hitherto the most productive of the salt-producing islands, unfavorably affected the finances. Probably the abolition of the slave trade in 1834 was not without its effect upon the fortunes of the landed proprietors.

The next event of importance in the history of the Bahamas was the rise of the blockade-running trade, consequent on the closing of the southern ports of America by the federals in 1861. At the commencement of 1865 this trade was at its highest point. In January and February 1865 no less than 20 steamers arrived at Nassau, importing 14,182 bales of cotton, valued at £554,675. The extraordinary difference between the normal trade of the islands and that due to blockade-running, will be seen by comparing the imports and exports before the closing of the southern ports in 1860 with those of 1864. In the former year the imports were £234,029, and the exports £157,350, while in the latter year the imports were £5,346,112, and the exports, £4,672,398. The excitement, extravagance, and waste existing at Nassau during the days of blockade-running exceed belief. Individuals may have profited largely, but the Bahamas probably benefited little The Government managed to pay its debt amounting to

£43,786, but crime increased, and sickness became very prevalent. The cessation of the trade was marked, however, by hardly any disturbance; there were no local failures, and in a few months the steamers and their crews departed, and New Providence subsided into its usual state of quietude. This, however, was not fated to last long, for in October 1866 a most violent hurricane passed over the island, injuring the orchards, destroying the fruit-trees, and damaging the sponges, which had proved hitherto a source of profit. The hurricane, too, was followed by repeated droughts, and the inhabitants of the out-islands were reduced to indigence and want. There was an increase, however, in the production of salt. The exports as a whole fell off. The rainfall is heavy from May to October. During the winter months it is small, and from the month of November up to April the climate of New Providence is most agreeable. Advantage has been taken of this for many years by the inhabitants of the mainland of America, who can escape by a four days' voyage from the icy winter of New York to the perpetual summer of the Bahamas. New Providence has gained a name as a resort for the consumptive, and perhaps justly so far as the Anglo-Saxon race is concerned, but the Africans and colored races suffer greatly from diseases of the lungs, and the black troops stationed at Nassau have always been notorious for the proportion of men invalided. Population, 40,000.

BAHAWALPUR, capital of an Indian native State in political connection with the Punjab, lies near the left bank of the Sutlej. Population (1881), 13,635. The great majority of the inhabitants are Mohammedans.

BAHIA, a province of the Brazilian empire, situated on the S.E. coast, and extending from the Rio Grande do Belmonte in the S. to the Rio Real in the N. It is bounded by Sergipe and Pernambuco on the N., by Piauhi on the N.W., by Goyaz on the W., and on the S. by Minas Geraes and Espirito Santo. It has an area of 202,272 square miles, and its population is stated at 1,450,000. Bahia sends 14 deputies to the general assembly of the empire, and 7 senators to the upper house, while its own legislative assembly consists of 36 members. Besides Bahia the capital, Olivença, Branca, Jacobina, and Joazeira are important towns. A chain of mountains, broken into numerous sierras, runs from N. to S. through the province at the distance of 200 miles from the coast, while the intermediate district gradually rises in successive terraces. The maritime region, the so-called *Reconcavo*, is remarkably fertile, and is studded with thriving towns and villages, but the interior is often very dry and barren, and is only thinly peopled in many places with wandering Botacudos. The main sources of wealth of the province are cotton, coffee, sugar, and tobacco, all of which are cultivated with the greatest success. Mandioc, rice, beans, and maize are grown; also jalap, ipecacuanha, and saffron, as well as oranges, mangoes, and various other fruits. A large portion is still covered with primeval forest, but the woodman is rapidly diminishing the extent. The mineral wealth of the province is but partially explored and still more partially utilized. In 1844 diamond mines were discovered to the N. of the River Peraguass, and, till the deposits near the Cape of Good Hope were brought to light, afforded employment to a large number of *garimpeiros* or "washers."

BAHIA, or, in full, SAN SALVADOR DA BAHIA DE TODOS OS SANTOS, a large city, and, till 1763, the capital of Brazil, is situated on the S.E. coast on the Bay of All Saints, from which it takes its name, in 13° S. lat., and 38° 20′ W. long. Built partly along the foot and partly on the top of a steep hill, it consists of an upper and lower town, communication between the two being effected by large flights of steps, and since 1873 by a powerful hydraulic elevator. The carrying of goods and passengers up and down these stairway-streets affords employment to a large number of negro porters and chairmen. The lower town, or Praya, consists mainly of one long and narrow street, with still narrower and more tortuous lanes. The houses are built of stone, and many of them are several stories high. This is the business part of the city, where are situated the quays, docks, warehouses, custom-houses, exchange, and arsenal; and here the sailors, porters, and lower classes generally reside. The church of *Nostra Señora da Praya* is remarkable as having been built of stones that were hewn in Lisbon and shipped across the ocean. The upper city has wide and well-paved streets, open squares, and pleasant promenades, adorned with orange trees and bananas. The most important is the *Passeio Publico*, which was open in 1814, and overlooks the beautiful bay. There is no city in Brazil that can vie with Bahia in the number and splendor of its ecclesiastical buildings, among which the Jesuits' college, now used as a hospital, and the cathedral, which is built of marble, are pre-eminent. There are likewise numerous educational institutions, including a lyceum (in which Latin, Greek, French, and English, mathematics, philosophy, &c., are taught), a theological seminary, and a medical academy, which is supported by the imperial Government, and has about 400 students. The museum and public library also deserve mention. Among the buildings connected with the civic and commercial activity of the city are the government-house, the court-house, the mint, and the town-house; also the *Alfandega*, where all foreign importations have to be entered, and the *Consolado*, where all native productions are registered for exportation. There are likewise a number of banks and commercial associations of various kinds. Bahia has long been a place of great traffic.

Bahia was visited in 1503 by Amerigo Vespucci. The first settlement was founded and called San Salvador by Diego Alvarez Correa, who had been shipwrecked on the coast; but the Portuguese governor who gave formal existence to the city was Thomas de Souza, who landed in 1549. It owed its increase to the Jesuits, who defended it against the English in 1588. In 1623 it fell into the hands of the Dutch, who held it for two years. In 1823 it was surrended by the Portuguese to the Brazilian nationality. A revolution, which broke out in the city in 1837, was suppressed by the imperial government. The first printing-press was introduced in 1811, and the first sugar-mill in 1823. In 1858 railway communication was established to Joazeiro.

BAHRDT, KARL FRIEDRICH, a German theologian, distinguished for his extreme rationalism and his erratic life, was born in 1741 at Bischofswerda, of which place his father, afterwards professor of theology at Leipsic, was for some time pastor. His numerous works, including a translation of the New Testament, are comparatively worthless, and are written in an offensive tone. He has been well called by Herzog a caricature of the rationalism of the 18th century.

BAHREIN, the principal island of a cluster in the Persian Gulf, in an indentation of the Arabian coast. It is about 70 miles long and nearly 25 broad, and is very flat and low except towards the east, where a range of hills attain an elevation of 800 or 900 feet. The climate is mild, but humid, and rather unhealthy. The soil is for the most part fertile, and produces rice, pot herbs, and fruits, of which the citrons are especially good. Water is abundant, but frequently brackish. Fish of all kinds abound off the coast, and are very cheap in the markets. The inhabitants are a mixed race of Arab, Omanite, and Persian blood, slender

and small in their physical appearance; they possess great activity and intelligence, and are known in all the ports of the Persian Gulf for their commercial and industrial ability.

BAIÆ, an ancient town of Campania, Italy, situated between the promontory of Misenum and Puteoli, on the Sinus Baianus, and famous for its warm springs and baths, which served the wealthier Romans for the purposes both of health and pleasure. The variety of these baths, the mildness of the climate, and the beauty of the landscape, captivated the minds of the opulent nobles. It flourished till the days of Theodoric the Goth; but its destruction followed quickly upon the irruption of the northern conquerors. When the guardian hand of man was withdrawn, the sea reclaimed its old domain; moles and buttresses were washed away; and promontories, with the proud towers that once crowned their brows, were undermined and tumbled into the deep. Innumerable ruins, heaps of marble, mosaics, and other relics of the past, attest the ancient splendor of the city.

BAIBURT, a town of Asiatic Turkey, in the pashalic of Erzeroum, and 65 miles W.N.W. from that city. Population of town about 6000.

BAÏF, JEAN ANTOINE DE, poet of the French Renaissance and member of the Pleiad, was the natural son of Lazare de Baïf and an Italian girl. He was born in 1532 at Venice, where his father was residing as French ambassador. Thanks, perhaps, to the surroundings of his childhood, he grew up a fanatic for the fine arts, and surpassed in zeal all the leaders of the Renaissance in France. Besides writing an immense number of short poems of an amorous or congratulatory kind, he translated or paraphrased various pieces from Bion, Moschus, Theocritus, Anacreon, Catullus, and Martial. He resided in Paris, enjoyed the continued favor of the court, and founded the Académie Royale de Musique; his house became famous for the charming concerts which he gave, entertainments at which Charles IX. and Henry III. frequently flattered him with their presence. He was a dear friend of Ronsard and the other members of the Pleiad.

BAIKAL (*i.e.*, *Baïakhal*, or Abundant Water), a great fresh-water lake of Siberia, in the government of Irkutsk, 397 miles in length from S.W. to N.E., and from 13 to 54 miles in breadth, with an area of about 12,500 square miles. This vast reservoir is situated 1360 feet above the level of the sea, in the midst of steep mountain ranges, that often rise sheer from the water's edge in lofty walls of syenite, gneiss, or conglomerate, while elsewhere their sloping flanks are thickly clad with dark forests of coniferous trees. The lake is fed by several rivers,— the Upper Angara, the Selenga, which descends from the basin of Lake Kossogol, the Barguzin, and others; while the only visible outlet is by the Lower Angara, a tributary of the Yenisei. The water is excellent, and is extremely clear, so that the bottom can be seen at the depth of 8 fathoms. The depth of the lake varies from 22 to upwards of 300 fathoms. It yields abundance of salmon, and there is a profitable fishery of seals on its shores during the whole summer. The climate is extremely severe; and the lake, which is frozen over from November to May, is almost perpetually swept by the wind. It facilitates, however, the Russian trade with China, and that between Irkutsk and Dauria. It is navigated by the Russians in summer, and in winter they cross it on the ice.

BAIKIE, WILLIAM BALFOUR, M.D., eldest son of Captain John Baikie, R.N., was born at Kirkwall, Orkney, on the 21st August 1824. He studied at Edinburgh, and, on obtaining his degree, joined the royal navy. He early attracted the notice of Sir Roderick Murchison, through whom he was appointed surgeon and naturalist to the Niger Expedition of 1854. The death of the senior officer occurring at Fernando Po, Dr. Baikie succeeded to the command. The results of the voyage are given in his own and other narratives. Ascending the river about 250 miles beyond the point reached by former explorers, the little steamer *Pleiad* returned and reached the mouth after a voyage of 118 days without the loss of a single man. The second expedition started in March 1857. After two years passed in exploring, the navigating vessel was wrecked in passing through some of the rapids of the river, and Dr. Baikie was unable longer to keep his party together. All returned home but himself; no way daunted, he determined single-handed to carry out the purposes of the expedition. Landing from a small boat with one or two native followers at the confluence of the Quorra and Benue, he here chose the old model farm ground as the base of his future operations — a spot memorable from the disasters of the exploring party of 1841. After purchasing the site, and concluding a treaty with the native chief, he proceeded to clear the ground, build houses, form enclosures, and pave the way for a future city. Numbers flocked to him from all parts round, and in his settlement were representatives of almost all the tribes of Central Africa. To the motley commonwealth thus formed he acted not merely as ruler, but also as physician, teacher and priest. Before five years he had opened up the navigation of the Niger, made roads, and established a market, to which the native produce was brought for sale and barter. He had also collected vocabularies of nearly fifty African dialects, and translated portions of the Bible and prayer-book into Housa. Once only during his residence had he to employ armed force against the surrounding tribes. He died on his way home, at Sierra Leone, in November 1863, aged thirty-nine years. An appropriate monument has been erected to his memory within the nave of the ancient cathedral of St. Magnus.

BAIL (*Ballium*) is used in common law for the freeing or setting at liberty of one arrested or imprisoned upon any action, either civil or criminal, on surety taken for his appearance on a certain day or place.

BAILEN, a town of Spain, in the province of Jaen, 24 miles N.N.W. of Jaen. It seems to correspond to the ancient Bæcula, where Scipio gained signal victories over Hasbrubal, 209 B.C., and over Mago and Masinissa, 206 B.C. In the neighborhood also, in 1212, was fought the great battle of Navas de Tolosa, where Alphonso VIII. is said to have left 200,000 Moors dead on the field, with the loss of only 25 Christians. Here again, on the 23d of July 1808, the French general Dupont, after a bloody contest of several days, signed the capitulation of Bailen. Population, 8,000.

BAILEY, or BAILY, NATHANAEL or NATHAN, an eminent English philologist and lexicographer, whose *Etymological English Dictionary*, published apparently in 1721, was a great improvement on all previous vocabularies, and really formed the basis of Johnson's great work. Bailey died in 1742.

BAILEY, PHILIP JAMES, poet, was born at Basford, England, April 22, 1816. *Festus*, the poem by which he is best known, was published in 1839.

BAILEY, SAMUEL, an able writer on philosophical and literary subjects, was born at Sheffield in 1791. In 1852 he published *Discourses on various Subjects;* and finally summed up his philosophic views in the *Letters on the Philosophy of the Human Mind* (three series, 1855, 1858, 1863), which is at once the most considerable and the most valuable of his contributions to mental science.

The *Letters* contain, in clear and lively language, a

very fresh discussion of many of the principal problems in philosophy, or rather in psychology. Bailey can hardly be classed as belonging either to the strictly empirical or to the idealist school, but his general tendency is toward the former. He died in 1870.

BAILIFF (Scotch *bailie*, Fr. *bailli*, Ital. *balio;* all from late Lat. *bajulivus*, an adj. from *bajulus*, a carrier, then a manager), an officer with public authority in a certain district. In the United States the term bailiff is seldom used except sometimes to designate a sheriff's deputy or constable, or a party liable to account to another for the rents and profits of real estate, as in some cases a tenant in common who receives more than his share. The duties of a bailiff are performed by a deputy-sheriff, constable or tipstaff, who are officers acting under the orders of the sheriff or magistrate, or under the immediate supervision of the court.

BAILIWICK legally means the county or district within which the sheriff, as bailiff of the king, may exercise jurisdiction. It is often applied by English writers to foreign towns or districts under a *vogt* or *bailli.*

BAILLET, ADRIEN, a French writer and critic, was born in June, 1649, at the village of Neuville, near Beauvais, in Picardy, and died in January, 1706.

BAILLEUL, an ancient town of France, in the department of Nord, near the Belgian frontier, situated on a rising ground to the north of the River Lys. It was formerly a place of great strength, and is now a busy industrial town, with manufactures of lace, thread black soap, pottery, woolen stuffs and ribbons, brandy leather, and cheese. Population, 12,896.

BAILLIE, JOANNA, poet and dramatist, was born at the manse of Bothwell, on the banks of the Clyde (Scotland), in 1762. She and her sister were left a small competence by their uncle, Dr. William Hunter, and took up their residence at Hampstead, on the outskirts of London, where they passed the remainder of their lives. Miss Baillie died February 23, 1851, at the advanced age of eighty-nine, her faculties remaining unimpaired to the last. Her gentleness and sweetness of disposition made her a universal favorite, and her little cottage at Hampstead was the centre of a brilliant literray society. Miss Baillie had received an excellent education, and probably cultivated very early her faculty of poetical composition, but it was not till 1798 that she published the first volume of her *Plays on the Passions.* The success of the first volume was very considerable, and a second edition was soon called for. A second volume followed in 1802, a third in 1812, and three more in 1836. Some miscellaneous dramas were published in 1804, and the *Family Legend* appeared in 1810. Miss Baillie herself intended her plays not for the closet but for the stage. The *Family Legend*, brought out at Edinburgh under the enthusiastic patronage of Sir Walter Scott, had a brief though brilliant success: *De Monfort* had a short run in London, mainly through the acting of Kemble and Mrs. Siddons; *Henriquez* and *The Separation* were coldly received.

BAILLIE, DR. MATTHEW, anatomist and physician, was born in Lanarkshire, Scotland, in 1761. He came of a highly gifted family; his father, the Rev. James Baillie, was successively clergyman of the parishes of Shotts, Bothwell, and Hamilton, in Lanarkshire, and afterward professor of divinity in the university of Glasgow; his mother was Dorothea, sister of the celebrated William and John Hunter; and his sister Joanna was the poet. Dr. Baillie was for several years a student in the university of Glasgow, where he heard the lectures of Dr. Reid on moral philosophy. His professional career was determined by the advice of his uncle, Dr. William Hunter, who undertook to superintend his education. Dr. Hunter, at his death, bequeathed the use of his magnificent collections to his nephew, together with the lecture-rooms in Windmill Street, an annuity of $600 a year, and a small family estate in Scotland. In 1795 he published his *Morbid Anatomy*, a work which was speedily translated into French, Italian, and German. Dr. Baillie died in 1823.

BAILLIE, ROBERT, a prominent Scotch Presbyterian of the seventeenth century, was born at Glasgow in 1602. He graduated in 1620 at the university of that town, and then applied himself to the study of divinity. In 1638 he was a member of the famous Glasgow Assembly, and soon after he accompanied Leslie and the Scotch army as chaplain or preacher. He continued to take an active part in all the minor disputes of the church, and in 1661, after the ejection of Gillespie, he was made principal of the Glasgow University. He died in August of the following year,—his death being probably hastened by his mortification at the apparently firm establishment of Episcopacy in Scotland. Baillie was a man of learning and ability.

BAILLY, JEAN SYLVAIN, a French astronomer and orator, was born at Paris on September 15, 1736. His acquaintance and friendship with the celebrated mathematician Lacaille, and perhaps the example of his brilliant young contemporary Clairaut, decided the direction of his studies, which were then entirely devoted to science and scientific investigation. The first of his labors was a calculation of the comet which appeared in the year 1759. In 1763 he was admitted a member of the Academy of Sciences; and in the same year he published a reduction of the observations made by Lacaille in 1760 and 1761 on the zodiacal stars, a compilation of great labor and utility. In 1764 he competed for the prize offered by the Academy for a dissertation on the theory of Jupiter's satellites. Lagrange, who was a complete master of the most powerful analysis, was the successful competitor; but Bailly's memoir, which was published in an expanded form in 1766, showed great ability, and at once established the author's reputation as a physical astronomer. He followed up his dissertation in 1771 with an able and important memoir on the *Light of the Satellites*, in which he expounded some novel and elegant methods of observation.

In the year 1775 he published the first volume of his most extensive work, *History of Astronomy*, which contained the history from its origin down to the foundation of the Alexandrian school. This was followed by three volumes on *Modern Astronomy*, published between 1776 and 1783.

The quiet course of Bailly's life, hitherto devoted to literature and science, was now broken in upon by that great convulsion, the French Revolution, of which he was one of the first and most zealous promoters. In the part which he acted, he has had the singular good fortune to be well spoken of by opposite factions, and has never been charged either with want of integrity or with selfish designs. When the states-general of France were assembled in 1789, he was elected a deputy to the *tiers-état*, of which he was afterwards chosen president; and when the national assembly had been constituted, he continued in the chair, and officiated as president at the time the king's proclamation was issued ordering that body to disperse. During the struggle which took place between the national assembly and the court, Bailly was amongst the most forward in asserting those popular rights which were then new in France; and it was he who dictated the famous oath to the members of the *tiers-état*, by which they pledged themselves "to resist tyrants and tyranny, and never to separate till they had obtained a free constitution." On the 14th of July following, the day on which the Bastille was stormed and taken by the people, he was by universal consent appointed

mayor of Paris. In this high office he is allowed to have acted with great integrity, courage, and moderation, and to have discharged its arduous and sometimes perilous duties in a highly honorable manner, and during its course he was instrumental in promoting the various measures by which the popular party at length prevailed over that of the court; for which, as well as for his conduct in other respects, he obtained a high degree of popularity. But the multitude, newly unshackled from the fetters of despotism, greedy of novelty, fired with enthusiastic and unsettled notions of freedom, and daily panting for change, would brook no opposition to their wild schemes. Bailly, who probably saw too late the general disposition of the people to anarchy, still wished the laws to be respected, and hoped by the vigorous enforcement of them to restore and maintain tranquility. He ordered some deputies from the military insurgents of Nancy to be arrested, and firmly opposed the rash proceedings of Murat and Hebert; he ceased to be a member of the Jacobin club; and he exerted himself strongly to persuade the populace to permit the king and royal family to depart to St. Cloud. By these measures, which were very distasteful to the fickle and infuriated people, he lost their confidence and favor; and his popularity was finally destroyed by his conduct on the occasion of the tumultuous meeting of the populace on the 17th of July 1791, to demand the abolition of monarchy; for, when called on by the national assembly to disperse the mob, who had assaulted the soldiery, he ordered the latter to fire, by which means 40 persons were killed and above 100 wounded. Finding himself after this an object of hatred and suspicion to the people, whom he had faithfully served, he resigned his office at the dissolution of the constituent assembly in the end of the year 1791, and retired to Nantes. From there he wrote to Laplace, who was residing at Melun, and proposed, if it were safe, to join him. Laplace, finding that a detachment of revolutionary troups had been ordered to Melun, advised Bailly not to venture, but his advise was neglected. The ex-mayor was recognised by one of the soldiers, arrested, and thrown into prison. Arraigned on 10th November 1793 before a sanguinary tribunal, he was on the 11th condemned to death as a conspirator, and executed the day following, near the spot where he had given the order for the military to fire on the people. He met his death with the greatest calmness and courage.

BAILY, EDWARD HODGES, a distinguished sculptor, was born at Bristol, 10th March 1788, and died at London 22d May 1867.

BAILY, FRANCIS, an English astronomer, was born in Berkshire in the year 1774, and for many years carried on business as a stockbroker in London. While amassing a large fortune by his business, he applied the profound mathematical knowledge for which he was distinguished to the doctrine of probabilities, and published several interesting works on that subject. Baily was extremely patient and methodical, and these qualities enabled him to effect, in the last twenty years of his career, a greater number of researches than most other philosophers have accomplished during a whole lifetime. He died August 30, 1844.

BAINBRIDGE, DR. JOHN, physician and astronomer, was born at Ashby-de-la-Zouche, in Leicestershire, in the year 1582. He taught a grammar school for some years, and practised physic, employing his leisure hours in astronomy, which was his favorite study. After removing to London he was admitted a Fellow of the College of Physicians, and gained considerable reputation by his description of the comet in 1618. The next year Sir Henry Saville appointed Bainbridge his first professor of astronomy at Oxford; and the masters and fellows of Merton College made him first junior, and then superior reader of Linacre's lecture. He died in 1643.

BAINES, EDWARD, for many years proprietor and editor of the *Leeds Mercury*, and M.P. for Leeds from 1834 to 1841, was born in 1774 at Walton-le-Dale, a village distant a little way from Preston, in Lancashire. In 1801 the assistance of friends enabled him to purchase the copyright of the *Leeds Mercury*. Provincial newspapers did not at that time possess much influence; the editorial province was not extended to the composition of what are now called leading articles, and the system of reporting was defective. In both respects Baines made a complete change in the *Mercury*. The ability of his political articles gradually caused the paper to be looked upon as the organ of Liberal opinion in Leeds, and it contributed not a little to the spread of sound doctrines on practical questions in the north of England. He strongly advocated the separation of church and state, and opposed Government interference in national education. His letters to Lord John Russell on the latter question (1846) had a powerful influence in determining the action of the Government. He died in 1848.

BAINES, MATTHEW TALBOT, eldest son of the above, was born in 1799, and died in 1860. He was educated at Cambridge, and entered the bar.

BAINI, GIUSEPPE, a learned musical critic and composer of church music, was born at Rome in 1775, and died there in 1844.

BAIRAM, a Turkish or Persian word meaning *feast*, is the name applied to the two great Mahometan festivals. The first of these, called generally, though, according to some authorities, incorrectly, the Greater Bairam, is the day following the Ramadan, or Month of fasting. It lasts strictly for only one day, though the common people generally extend it to three, and is a period of great animation and enjoyment. What is called commonly the Lesser Bairam follows the first at an interval of sixty days. It is the feast of sacrifices, at which all Mahometans imitate the offerings of animals which are then being made at Mecca to commemorate Abraham's offering of Isaac. It lasts for four days, and is not of so sacred a character as the first Bairam.

BAIRD, GENERAL SIR DAVID, Bart., was born at Newbyth in Aberdeenshire, in December 1757. He entered the British army in 1773, and was sent to India with the 73d Highlanders in 1779. In the following year he had the misfortune to fall into the hands of Hyder Ali, in the Mysore chief's perfidious attack on a handful of British troops at Perambucum. The prisoners, were most barbarously treated. Baird survived his captivity; and on his release, visited his native country, but returned to India in 1791 as a lieutenant-colonel. In 1804 he was knighted, and in the following year commanded the expedition against the Cape of Good Hope, and captured Cape Town; but here again his usual ill-luck attended him, for he was recalled before he had organised his conquest, for having sanctioned the expedition of Sir Home Popham against Buenos Ayres. He served again in 1807 in the expedition against Copenhagen, and in the following year commanded the considerable force which was sent to Spain to co-operate with Sir John Moore. In the battle of Coruña, where, after the death of Moore, he held supreme command, a grape-shot shattered his left arm, so that it had to be amputated at the shoulder-joint. He again obtained the thanks of Parliament for his gallant services, and was rewarded with the decoration of the order of the Bath, and the rank of a baronet. He died on the 18th August 1829. (See Hook's *Life of Sir David Baird.*)

BAIREUTH, or BAYREUTH, the capital of the circle of Upper Franconia, in Bavaria, is pleasantly situated in a valley on the left bank of the Red Maine, 40 miles N.N.E. of Nuremberg. It is well built, with broad, regular, and well-paved streets, and is partially surrounded by old walls. The river is crossed here by two bridges. Most of the buildings are of comparatively modern date, the city having suffered severely from the Hussites in 1430, and from a conflagration in 1621. Baireuth has been chosen by Richard Wagner as the scene of his musical festivals, and a theatre has been erected for his special use. Population, 17,841.

BAJA, a market-town of Hungary, in the county of Bacs, on the left bank of the Danube, 90 miles S. of Pesth. It was burned down in 1807, but has since been well built. Population, 18,110.

BAJAZET I., sultan of the Turks, commenced to reign in 1389, and died in 1403. The well-known story of the iron cage, in which this monarch was said to have been carried about by his conqueror Timur, has no authority, and probably originated in a mistake as to the word for a *litter*, in which Bajazet was carried.

BAJAZET II., son of Mahomet II., succeeded his father as sultan in 1481, and died in 1512, at the age of 66 years.

BAJUS, or DE BAY, MICHAEL, a celebrated theologian, was born in Hainaut in 1513, and died in 1589.

BAJZA, ANTON, a distinguished Hungarian poet and critic, was born at Szücsi in 1804. His earliest contributions were made to Kisfaludy's *Aurora*, a literary paper of which he was editor from 1830 to 1837. He also wrote largely in the *Kritische Blätter*, the *Athenæum*, and the *Figyelmező*, or *Observer*. His criticisms on dramatic art were considered the best of these miscellaneous writings. He died in 1858.

BÁKARGANJ, a district of British India in the Dacca division, under the Lieutenant-Governor of Bengal, is bounded on the N. by the districts of Dacca and Farídpur, from which it is separated by the Padmá and Mainákátíkhál ; on the E. by the Meghná and Sháhbázpur rivers, and by the Bay of Bengal, which separates it from Noákháli and Tipperah; on the S. by the Bay of Bengal; and on the W. by Jessor and Farídpur districts. Area, 4935 square miles ; population, 2,377,433. The general aspect of the district is that of a flat even country, dotted with clusters of bamboos and betel-nut trees, and intersected by a perfect network of dark-colored and sluggish streams. There is not a hill or hillock in the whole district, but it derives a certain picturesque beauty from its wide expanses of cultivation, and the greenness and freshness of the vegetation. This is especially conspicuous in the rains, but at no time of the year does the district present a dried or burnt-up appearance. The villages, which are always walled round by groves of bamboos and betel-nut palms, have often a very striking appearance ; and Bákarganj has many beauties of detail which strike a traveller in passing through the country. The level of the country is low, forming as it does a part of the great Gangetic Delta; and the rivers, streams, and water-courses are so numerous that it is very difficult to travel except by boat at any season of the year. Every natural hollow is full of water, around the margin of which long grasses, reeds, and other aquatic plants grow in the greatest profusion, often making it difficult to say where the land ends and where the water begins. Towards the north-west the country is very marshy, and nothing is to be seen for miles but tracts of unreclaimed swamps and rice lands, with a few huts scattered here and there, and raised on mounds of earth. In the south of the district, along the sea face of the Bay of Bengal, lie the forest tracts of the Sundarbans, the habitation of tigers, leopards, and other wild beasts.

BAKER CITY, the county seat of Baker county, Ore., is situated on the Powder river, 300 miles east of Salem, the capital of the State. It contains several churches and schools and an academy, and has some trade. Population, 4,500.

BAKER, HENRY, a distinguished naturalist, was born in London in 1698, and died in 1774.

BAKER, SIR RICHARD, author of the *Chronicle of the Kings of England*, was born at Sissinghurst, in Kent, about the year 1568. He was educated at Oxford, took the degree of Master of Arts, and in 1603 received the honor of knighthood. In 1620 he was made high sheriff of Oxfordshire; but having engaged to pay some debts of his wife's family, he was reduced to poverty, and obliged to betake himself for shelter to the Fleet prison, where he died, February 18, 1645. During his confinement he composed numerous works, historical, poetical, and miscellaneous.

BAKER, THOMAS, a learned antiquary, descended from an ancient family distinguished by its loyalty, was born in England in 1656, and died in 1740.

BAKEWELL, a market town in Derbyshire, on the River Wye, 152 miles from London. Its fine old church contains monuments of the families of Vernon and Manners. The inhabitants are supported by the working of the coal, lead, and zinc mines, and the stone and marble quarries in the neighborhood. Population, 3,000.

BAKHCHISARAI (Turkish, *the Garden Palace*), a town of Russia in the government of Taurus, situated in a narrow gorge on the banks of a small stream called the Chiryuk-Su, about 10 miles S.S.W. of Simpheropol. Of unknown origin, it became towards the close of the 15th century the residence of the Tatar khans; and its chief objects of interest are the remains of its splendor under the Tartar dynasty. The population still consists for the most part of Tatars, Catherine II. in 1783 having granted them the exclusive right of habitation in the city. The remainder consists of Russians, Greeks, Armenians, and Jews, 10,000 in all.

BAKHMUT, a town of Russia in the government of Ekaterinoslav, near the river from which it derives its name. Population, 17,000.

BAKING. The art of baking consists in heating anything in an oven or fire so as to harden it, and in this sense the term is used when applied to the manufacture of bread, porcelain, pottery, and bricks. It is also applied to certain modes of dressing or cooking animal food; thus we speak of baked meats, pies, &c. In the present article the baking of flour or meal for use as human food will alone be treated of.

The origin of baking, as of most arts of primary importance, precedes the period of history, and is involved in the obscurity of the early ages of the human race. Excavations conducted on the site of some of the numerous lake dwellings of Switzerland have resulted in the discovery of abundant evidence that the art of making bread was practised by our prehistoric ancestors as early as the Stone Period. Not only have stones for grinding meal and baking bread been discovered, but bread itself in large quantities has been disinterred, preserved by being carbonised in the fires which frequently destroyed the pile-dwellings of the primitive inhabitants of the world. At Robenhausen, Meisskomer discovered 8 pounds of bread, a weight which would correspond with about 40 pounds of newly-baked bread. At Wangen there has been discovered "actual baked bread or cake made of the crushed corn, precisely similar to that found about the same time by Mr. Meisskomer at Robenhausen. Of course, it has been burned or charred, and thus these interesting specimens have been preserved to the present day. The form of these cakes is somewhat round, and about an inch to an inch

and a half in diameter. The dough did not consist of meal, but of grains of corn more or less crushed. In some specimens the halves of grains of barley are plainly discernible. The under side of these cakes is sometimes flat, sometimes concave, and there appears no doubt that the mass of dough was baked by being laid on hot stones and covered over with glowing ashes."

The very early mention of bread in written history further bears out the great antiquity of the art of baking. Bread is first specifically mentioned in Genesis xviii. 5, when Abraham, wishing to entertain the three angels on the plains of Mamre, offered to "fetch a morsel of bread;" and the operation of baking is immediately thereafter alluded to in the instructions to Sarah to "make ready quickly three measures of fine meal, knead it, and make cakes upon the hearth." At the same time, when, in the city of Sodom, Lot entertained two angels, "he made them a feast, and did bake unleavened bread, and they did eat" (Genesis xix. 3). It may be inferred from the mention of unleavened bread that, in those patriarchal times, the two great classes of bread were known and used. At a period little later the art of baking was carried to a high perfection in Egypt, which then took the lead in the arts of civilised life. The Egyptians baked cakes and loaves of many varieties and shapes, in which they employed several kinds of flour, and they flavored their bread with various aromatic ingredients. The chief baker of Pharaoh, who was in prison along with Joseph, doubtless pursued his craft in its essential features in the same way as bakers do at the present day.

From ancient Egypt excellence in the art of baking travelled with the march of civilisation into Greece, and the allusion to bread in the works of classic authors are very numerous. In *The Deipnosophists* of Athenæus mention is made of no less than sixty-two varieties of bread as known among the ancient Greeks, and minute descriptions of many of them are given. We learn from Pliny (*Nat. Hist.*, xviii. 28) that professional bakers were first introduced into Rome at the close of the war with Perseus, king of Macedon. By the practical Romans the baking trade was formed into a kind of incorporation or guild, with special privileges and immunities attached to the calling. Public bakeries were distributed throughout the city, to which slaves were assigned for performing the heavier and more disagreeable tasks connected with the occupation. Grain was delivered into public granaries by enrolled *Saccarii*, and it was distributed to the bakers by a corporation called the *Catabolenses*. No separate mills for grinding corn then existed, the grain being pounded and sifted in the bakeries, and hence the Roman bakers were known as *Pistores*. A special magistrate was appointed to take cognisance of every matter connected with the management of public bakeries.

The calling of the baker during the Middle Ages was considered to be one so closely affecting the interests of the public that it was put under strict regulation and supervision, and these special restrictions continued to affect the trade down to very recent times. In England, an Act of Parliament was passed in 1266 for regulating the price of bread by a public assize, and that system continued in operation till 1822 in the case of the city of London, and till 1836 for the rest of the country. The price of bread was determined by adding a certain sum to the price of every quarter of flour, in the name of the baker's expenses and profit; and for the sum so arrived at tradesmen were required to bake and sell eighty quartern loaves, or a like proportion of other sizes, which it was reckoned each quarter or flour ought to yield.

The art of making bread made its way northwards very slowly; and even at present, in the northern countries of Europe and Asia, loaves of bread are seldom used except by the higher classes of inhabitants. In Sweden, for example, rolls are frequently seen in the towns, but loaves rarely. Towards the end of 1812 the captain of an English packet ordered a Gothenburg baker to bake for him a quantity of bread, to the value of £1 sterling. The baker was confounded at so large an order, and refused to comply till the captain gave him security that he would carry off and pay for the loaves, declaring that he could never dispose of so great a quantity of bread in Gothenburg if it were left upon his hands. In the country part of Sweden no bread is made but rye-cakes, nearly as hard as flint, which are only baked twice a year. About a century ago loaf-bread was almost as rare in the rural districts of Scotland, *barley bannocks* and *oaten cakes* then constituting the universal substitutes among almost all ranks. In many parts of England it is the custom for private families to bake their own bread. This is particularly the case in Kent, and in some parts of Lancashire. In the year 1804 the town of Manchester, with a population of 90,000 persons, did not contain a single public baker.

As compared with wheat-flour all other materials used for making bread are of comparative insignificance. Oatcakes still form a staple article of food in many rural districts of Scotland, and are occasionally used in other countries. They are made by mixing up oatmeal, warm water, and salt, sometimes with the addition of butter or fat, into a very stiff paste, and kneading this out into a thin cake, which is first fired on a hot plate or "girdle," and finished in front of an open fire. Scones of barley-flour, sweet and tough, were formerly largely used in Scotland, but have now given place to a similar preparation of wheaten flour. Rye bread, both fermented and unfermented, is largely consumed by the inhabitants of the northern parts of Europe in the poor and backward districts. Cakes of maize meal, baked like oat cakes, are consumed in many parts of the United States. The meal of various species of millet is used in Southern Europe to form bread; and in India and China, durra (*Sorghum vulgare*) and other cereal grains are baked for food. Of non-cereal flours, the principal used for bread-making is buckwheat, *Fagopyrum esculentum*, extensively employed in Russia and Holland. The flour of pease, beans, and other leguminous seeds, are also baked into cakes; and cavassa cakes are made from the meal of the tapioca plant, *Jatropha Manihot*, in South America. Excepting rye, none of these substances is used for making vesiculated or fermented bread.

The grain of wheat consists of an outer husk or covering, an embryo or germ, and a central mass of farinaceous material. The outer husk is composed of several distinct layers of ligneous tissue, closely adhering to the seed, and very hard in texture. In grinding, this is detached in scales, and constitutes the chief proportion of the bran. The inner portion of the envelope is softer, and contains an active nitrogenous principle, termed cerealin, and is besides rich in fat and salts. This portion goes with the pollard or parings in the dressing of wheat flour. Towards the centre of the grain the substance becomes whiter in color and more friable in texture, so that, in grinding, the finest flour in consistence is always the whitest in appearance. By agriculturists several hundred varieties of wheat and a number of distinct species are recognised; but in commerce the grain is distinguished as white and red, or as hard and soft wheats. There is a considerable range of difference in the proportions of their proximate constituents, hard wheats as a rule being much more nitrogenous than the soft varieties; and similarly, wheats grown in hot climates are also usually richest in nitrogen-

The following analyses of two typical varieties of wheat are taken from Payen's tables, water being neglected:—

	Hard Wheat. Taganrog.	Soft Wheat. Touzelle.
Nitrogenous matter	20.00	12.65
Starch	63.80	74.51
Dextrin	8.00	6.05
Cellulose	3.10	2.80
Fatty matter	2.25	1.87
Mineral matter	2.85	2.12

When wheat is ground it is sifted or dressed into a series of mill products, ranging from fine flour to bran, according to the size of the ground particles.

It is a disputed point whether dextrin or sugar exists in flour of the best quality; but the action of heat and moisture in the baking process quickly transforms a portion of the starch into the soluble condition. In flour of inferior quality a large percentage of dextrin is usually found — a circumstance very detrimental to its bread-making qualities. A table of the percentage of gluten, obtained by Messrs. Lawes and Gilbert from a large number of flours, shows a variation from 8.9 to 14.9 per cent. This gluten itself (the insoluble nitrogenous substance in flour) is a compound body, composed of three or four distinct substances; but its physical conditions of elasticity, tenacity, and color are of much greater importance to the baker than either its chemical constitution or its amount.

The varieties of wheaten bread are divisible into two great classes — *Unvesiculated* and *Vesiculated* Bread. Under the first head are included such products of the art as are fired or baked without first being raised or rendered spongy by the development of carbonic acid gas within the mass, either by fermentation or otherwise. Vesiculated bread is produced when carbonic acid is either developed in or introduced into the dough, so as to permeate the mass with an infinite number of minute cavities, which render the product light and spongiform.

Unvesiculated Bread.— The simplest form of bread, and the rudest baking, are seen in the Australian "Damper," a cake made from dough composed of flour, salt, and water, baked in the dying embers of a wood fire. The dough is laid on a flat stone, covered with a tin plate, and the hot ashes heaped around and over it, care being taken not to expose it to a heat of more than 212° Fahr. Passover cakes, scones and "bannocks" are prepared from a similar dough, and fired on hot plates or in ovens, and form an agreeable and nutritious food. When such dough is exposed to a high heat, so that the resulting cake is hard, dry, and resonant, biscuits (*bis cuit*, twice baked) are formed.

Biscuit Manufacture.— Biscuit making is a branch of trade distinct from ordinary baking, conducted under different conditions, and requiring machinery and processes peculiar to itself. Biscuits are made by a rapid and continuous process; they can be preserved a long time, and in proportion to their price they occupy little space, so that it is practicable to sell them in markets remote from the place of manufacture. The manufacture of biscuits is now conducted on a very large scale, ingenious and complicated machinery is employed in the various processes, and a large export trade in biscuits has grown up.

There is an endless variety in the form and composition of plain and fancy biscuits.

The richest class of biscuits, the dough for which is necessarily soft, are cut out by hand labor, and fired on trays in common ovens. The dough for rout biscuits is placed in a strong metal box or chamber in which a piston is tightly fitted. The piston is moved forward by a screw, and it pushes the dough through a series of holes or dies. The dough is received on a sliding board, and is cut into proper lengths by a knife. Cracknels are made without either milk or water being used to mix the dough, eggs alone being employed for this purpose. Certain proportions of butter, sugar, and sesqui-carbonate of ammonia are added to the mixture of flour and eggs, and the dough is baked in the usual way. The cracknels, when cut out, are thrown into a boiler of boiling water, and in about two minutes they float to the top. They are then fished out and thrown into cold water, and then drained on cloths, panned, and fired in an ordinary oven at a high heat. In the firing, the ammonia carbonate, being very volatile, is driven off, and the cracknell thus assumes its spongy structure. Many other varieties of biscuits are rendered light and spongiform by the use of the sesqui-carbonate of ammonia, or of carbonate of soda, in conjunction with sour milk. In the firing of biscuits, not only the moisture of the dough is driven off, but a certain proportion of the water held by the flour in its apparently dry state, so that from 10 lb of flour only about 9 lb of water biscuits are obtained.

Vesiculated Bread.— Under this head is included such bread as is rendered spongiform in structure by the action of carbonic acid within the dough, and which is not baked hard and dry as in the case of biscuits. It includes ordinary loaf bread, pan loaves, French or Paris loaves, cottage loaves, bricks, rolls, buns, and many varieties of fancy bread distinguished by local names and minor differences of form and composition. Vesiculated bread is made in three different ways:—

1*st*, By the development of carbonic acid within the dough through fermentation of the flour. This is the ordinary and principal method of bread-making.

2*d*, By mixing the dough with water previously aerated with carbonic acid. The aerated bread made under the patent of the late Dr. Dauglish is thus manufactured.

3*d*, By the disengagement of carbonic acid from chemical agents introduced in the dough. Dodson's patent unfermented bread comes under this head, and the "baking powders" and "yeast powders" extensively sold consist generally of carbonate of soda or ammonia and citric or tartaric acid, which evolve carbonic acid in presence of water.

Fermented Bread.— The manufacture of fermented or leavened bread is, as has already been hinted, of very great antiquity, and it is still by the fermentation process that bread is chiefly made. In ancient times leaven was employed to induce fermentation in dough ("a little leaven leaveneth the whole lump,"Gal. v. 9), and to this day Parisian bakers, who excel all others in the quality of the bread they produce, chiefly use the same ferment. Leaven is simply a portion of dough, put aside from a previous baking, in which the fermentative action has reached an advanced stage of activity. Yeast, however, has been used as a ferment from an early period, and it appears that it was first so employed in France. Pliny says (*Nat. Hist.*, xviii. 12), "Galliæ et Hispaniæ frumento in potum resoluto, spuma ita concreta pro fermento utuntur; qua de causa levior illis quam cæteris panis est." The use of yeast appears to have died out in France, but was revived again towards the end of the 17th century, when its reintroduction was violently opposed by the Faculty of medicine of Paris. Yeast is now used by Parisan bakers for fancy bread and pastry only.

The baking of fermented bread involves three distinct operations, which are technically denominated "setting the sponge," making the dough or kneading, and baking or firing. It will be convenient first to describe these processes as they are conducted in a Lon-

don bakehouse. The first duty of the baker is to mix a ferment, which consists of a mixture of potatoes, yeast, and flour. The potatoes, in the proportion of 6 lb to a sack of flour, are boiled and mashed in a tub, and water is stirred in, till the mixture is reduced to a temperature of from 70° to 90° Fahr. About 2½ pints of yeast and 12 lb of flour scalded in boiling water are then added, and the whole forming a thin uniform paste is set aside for several hours, during which it undergoes an active fermentation. Setting the sponge consists in mixing the ferment in a large trough with flour and water sufficient to make the whole into a rather stiff paste. The flour used at this stage, when "full sponge" is made, should be about one-half the entire quantity intended to be used in the "batch," and the ingredients have to be thoroughly incorporated by the workman stirring them laboriously together with his arms. The operation occupies from twenty minutes to half an hour, and when ready the sponge is covered over and allowed to rest for several hours according to the temperature at which it is maintained. Generally in from four to five hours the sponge "rises;" fermentation has been going on, and carbonic acid steadily accumulating within the tenacious mass till it has assumed a puffed out appearance. By degrees the sponge gives off the gas in puffs, and the mass begins to collapse, till what was a swollen convex surface assumes a somewhat concave form, the centre being depressed while the sides adhere to the edges of the trough. The workman judges by the amount of collapse the time the sponge is ready to be taken in hand for kneading or making the dough.

A loaf ready for going into the oven has about half the bulk it attains during the process of firing. Batches of cottage and household loaves are packed close side by side on the sole of the oven, the sides of each loaf being rubbed with butter to prevent them from adhering to each other, and they are consequently crusted on the top and bottom only. Pan loaves are baked each in separate tinned pans of the form of the loaf, and Parisian loaves are baked end to end in long tinned pans. The firing of bread in the oven occupies from 1 to 1½ hours, the temperature at the beginning of the process being 550° to 600° Fahr. The baker can ascertain if the oven is at a proper temperature by throwing a little flour on the sole of the oven, which ought to turn to a light brown color. Ovens in London are usually built of brick, with a sole only 2½ inches thick; in Scotland stone is used, the sole being from 10 to 12 inches thick, and the oven consequently retains heat much more effectually.

Sound flour yields from 90 to 94 4-lb loaves per bag of 280 lb, some "strong" flours giving even a greater quantity of bread.

The bakers' standard of excellence of flour, apart from the question of color, is the weight of bread it will produce of a proper dryness and texture. The "strength" of flour in this respect appears to depend much more on its condition than on the absolute percentage of its constituents.

Panary Fermentation.—It would be altogether out of place in this paper to refer to the conflicting theories as to the cause of fermentation in organic substances. The so-called panary fermentation in bread-making is a true alcoholic fermentation, and whether induced by yeast or leaven the result is precisely the same. The gluten of the flour is the fermenting agent, and it is stirred into activity by contact with a glutinous body already in an active condition, which may be either yeast or leaven. In this condition it exerts a fermentative influence over the sugar which may either have existed previously in flour, or which is at least immediately developed in it by the influence of moisture. The active gluten splits up each molecule of sugar into two of alcohol, two of carbonic acid, and one of water, and consequently an infinite number of minute air bubbles are developed throughout the fermenting mass.

As the evolution of carbonic acid and alcohol proceeds, the sponge gradually swells, the little bubbles coalesce and enlarge, rising through the tenacious mass till the surface is reached, and then the carbonic acid bursts out and the dough begins to fall. This process would go on a considerable time, but the alcoholic fermentation would soon pass into an acetous fermentation, and the sponge would become sour. When acetous fermentation ensues, as not unfrequently happens in baking, it may be remedied to some extent by the addition of bicarbonate of soda to the sponge. The late master of the mint, Dr. Thomas Graham, was the first to demonstrate the presence of alcohol in fermented dough, and he thus describes his experiment. "To avoid the use of yeast, which might introduce alcohol, a small quantity of flour was kneaded and allowed to ferment in the usual way to serve as leaven. By means of the leaven a considerable quantity of flour was fermented, and when the fermentation had arrived at the proper point, formed into a loaf. The loaf was carefully enclosed in a distillatory apparatus, and subjected for a considerable time to the baking temperature. Upon examining the distilled liquid the taste and smell of alcohol were quite perceptible, and by repeatedly rectifying it, a small quantity of alcohol was obtained, of strength sufficient to burn and to ignite gunpowder by its combustion. The experiment was frequently repeated, and in different bakings the amount of the spirit obtained of the above strength was found to vary from 0.3 to 1 per cent. of the flour employed." Although the temperature of the oven drives off that amount of the spirit, fermented bread is yet found to retain a proportion of alcohol, as much as from 0.221 to 0.401 per cent. having been found in different specimens of baked bread. Speaking in 1858, Dr. Odling estimated the amount of alcohol thrown out into the atmosphere from the bread baked in London as equal to 300,000 gallons of spirits annually. Many years ago a patent was secured by a Mr. Hicks for collecting and condensing the alcoholic fumes from bakers' ovens, and a company was formed for working the invention. After an expenditure of £20,000 the attempt had to be abandoned, not from any failure to obtain the spirit, but because the bread baked in the process was dry, unpalatable and unsalable.

When what is termed "whole wheaten flour"—that is, the entire substance of the grain, excepting only the outer bran—is baked, it is known that the resulting loaf is of a dark brown color, sweetish in taste, and liable to be somewhat heavy and sodden. The brown color was at one time supposed to be due to the presence of bran particles in the flour, and in 1846 an American, Mr. Bentz, invented a process for removing the outer cuticle of wheat before grinding, it being supposed that the flour so prepared would yield a loaf of white color, while utilising a larger proportion of the substance of the grain than is commonly used. To the astonishment of experimenters, however, the bread made from such flour was found to have the color and other chacteristics of whole wheaten bread. The subject was investigated by an eminent French chemist, M. Mège Mouriès, who found that the peculiar action of whole wheaten flour was due to the presence in the outer part of the seed of a peculiar nitrogenous body, to which he gave the name cerealin, and which is closely allied in composition and action to the diastase of malt. Cerealin exerts a peculiarly energetic influence on starch, transforming it into a brown adhesive mixture of dextrin and sugar. He showed that when the fermentative

action of gluten preponderates, the result is the formation of the products desired by the baker — carbonic acid and alcohol; but when the influence of cerealin prevails, lactic fermentation ensues, and dextrin, sugar, and acid substances are formed, which it is the object of the baker to avoid. Several methods of avoiding this deteriorating influence of cerealin, and at the same time securing the use of the maximum of flour, have been put in operation by M. Mège Mouriès. The process now in use at the Boulangerie Centrale de l'Assistance Publique (the Scipion) in Paris, for the preparation of the flour and baking white bread with the whole of the mill products excepting the bran, he thus describes: — "The corn is moistened with from 2 to 5 per cent. of water saturated with sea-salt, and at the end of some hours the exterior coverings only become moist and tender. The grain is then thrown between nearly closed millstones, and 70 per cent. of flour is obtained without cerealin, plus 10 to 14 per cent. of meal. This is bruised between light stones, and separated by winnowing from the greater part of the husk remnants. To prepare the bread, all the leaven is made with flour at 70 per cent., and the meal is added to the soft dough last of all; as, in spite of the small amount of cerealin which it still contains, it will not produce brown bread, because at that time the length of incubation is not sufficient to change it into a leaven. Thus white bread is produced containing all the farinaceous part of the wheat."

It not unfrequently happens that flour of good color, and unexceptionable chemical composition, fails to yield a dough which will rise by fermentation, and the loaf from which is sweet, solid, sodden, and adhesive. Wheat that has been badly harvested, or which in any way has been allowed to sprout, has part of the gluten changed into the form of diastase, which, like cerealin, changes starch into dextrin and sugar. The gluten of flour which has been dried at a too high temperature, and of flour which has been kept in a damp situation, is modified and acts in the same manner. If dough is made with an infusion of malt, it yields a result exactly the same as that above described. It is to guard the starch of inferior flour against this deteriorative influence that a proportion of alum is used by many bakers of second-class bread. Alum has the power of preserving starch to a large extent from the metamorphic action of altered gluten, diastase, or cerealin, and of producing from an inferior flour a loaf of good texture and color. The use of alum is regarded as an adulteration, and heavy penalties have been imposed on its detection; but its estimation in bread is a process of the greatest difficulty, and authorities are by no means agreed as to its deleterious influence. Other mineral salts have a similar protective power on the starch of inferior wheat, and lime-water has been successfully employed in place of alum. To this also it is objected by some that the addition of lime renders the valuable phosphatic salts of flour insoluble by transforming them into phosphate of lime.

Aerated Bread.—When carbonic acid, instead of being generated by fermentation within dough, is separately prepared and incorporated with flour and water, aerated bread is produced. The system by which this is effected was invented by the late Dr. Dauglish, and aerated bread has been manufactured under his patent since March 1859. The system is now in operation in all the principal towns in the United Kingdom, and it appears to be steadily gaining in public favor.

Unfermented Bread.—Under this head is included such bread as is vesiculated by means of carbonic acid evolved from chemical substances introduced in the making of the dough. About 1842 Mr. Henry Dodson commenced to manufacture bread on this system, and obtained a patent for his process. He used hydrochloric acid and bicarbonate of soda in such proportions that while, by their re-action, they liberated sufficient carbonic acid to aerate the dough, they formed chloride of sodium or common salt enough for the bread. Liebig, in his *Familiar Letters*, says regarding this system: — "Chemists, generally speaking, should never recommend the use of chemicals for culinary preparations, for chemicals are seldom met with in commerce in a state of purity. Thus, for example, the muriatic [hydrochloric] acid which it has been proposed to mix with carbonate of soda in bread is always very impure, and very often contains arsenic." The sesqui-carbonate of ammonia is also used as a source of carbonic acid in vesiculating bread, and it, on account of its highly volatile nature, is entirely driven off in the process of baking. A great amount of private or domestic baking is conducted on the same principle, butter-milk and bicarbonate of soda being used for mixing the dough in making "scones." In this case the lactic acid of the milk combines with the soda, liberating carbonic acid. The baking powders and yeast powders which are sold, and the so-called self-raising flour, all depend for their action on the mixture of bicarbonate of soda with some organic acid, such as tartaric or citric acid.

The art of baking, although it is the most important of all industries connected with the preparation of human food, is one which is still carried on in the most rude and primitive manner. While modern inventions and the progress of improvement have changed the conditions under which nearly all arts and manufactures are conducted, the baking of bread is still conducted as it was during the palmy days of ancient Greece. The nature of the processes necessary for the preparation of bread, the limited time it will keep, and the consequent impossibility of storing the product or sending it any considerable distance, tend to keep the trade in the position of a limited and local handicraft. It is, therefore, not a pursuit which attracts capitalists, and master bakers are mostly in the position of small tradesmen, without either the inclination or ability to invest money in expensive machinery and fittings. In the case of biscuit-baking the conditions are quite different, and it, as has been seen, has developed into a great manufacture, with elaborate and complex machinery and the most perfect mechanical appliances. Many forms of machine have been proposed as substitutes for the rude and laborious manual labor — always unfavorable to health, and sometimes not very clean — involved in baking. Many of these machines admittedly produce better bread than can be made by handwork, and that at no inconsiderable saving of material and time, but the necessity of either steam or water power for their effective working greatly restricts their use.

The two processes to which machinery has been successfully adapted, are the mixing of the sponge and the kneading of the dough. Attempts have been made to mould loaves by machinery, but these have hitherto failed; nor has the endeavor to fire bread in traveling ovens yet been practically successful. A great variety of kneading machines have been suggested and used, since the first trial of such an implement in Paris upwards of a century ago.

Much thought and skill have been expended in the endeavor to effect improvements in the ordinary form of a baker's oven, but hitherto no plan has been devised which produces bread of a quality superior to that fired in the oven which is commonly used. A baker's oven of the common description is a low, vaulted chamber, about 10 feet long, by 8 feet wide, and 30 inches high. It is built and floored of stone or brick, and has a small door in front by which the moulded dough is put in and the loaves withdrawn. At one side of this door, in the

extreme corner, are placed the furnace and fire-grate, opening into the oven, and at the opposite corner, the smoke flue by which smoke escapes from the interior. The heat is by this arrangement carried throughout the entire oven, and when the temperature is sufficient the fire is withdrawn, the flue shut, and the dough is quickly introduced on a "peel," or long wooden shovel. Various efforts have been made to effect the heating of ovens by fire external to the chamber itself, but they fail to produce that radiation of heat which is found essential to good baking. Perkin's hot-water oven for some time met with favor in Great Britain, and a modification of it was employed in France. On this system the oven is heated by superheated water, conveyed from a stove through closed pipes, which are coiled around the entire interior of the oven. This oven has the recommendation of perfect cleanness, and the temperature in it is easily regulated; but it is costly in construction, and the method has not commended itself in practice. Among ovens heated from the exterior, that of M. Rolland takes a high place for ingenuity and novelty of construction. Its characteristic peculiarity consists in the possession of a revolving sole, which not only allows the easy introduction and withdrawal of the bread, but the bringing of the different parts regularly and uniformly under the influence of the heat applied. The revolution of the sole is accomplished by a handle worked from the front of the oven; and besides this rotatory motion the sole can also be raised or lowered so as to bring either the upper or under side of the bread close to the heat as desired. The heating of M. Rolland's oven is effected by means of flues, which pass radially under and over the revolving sole. The chief objection urged against this form of oven is, that the air within it becomes too dry, which detracts from the flavor of the loaves fired in it. The use of the Vienna oven is general in Germany, and is extending in Paris for the baking of small or Vienna bread. It is egg-shaped in form, with an inclined sole, a very small aperture, and a low roof. Its average internal dimensions are 12 feet in depth, 10 feet wide, and 18 inches high. In the best of these ovens glazed tiles are used for the sole. The inclination of the sole facilitates the filling and emptying of the oven; and the confined space of the interior retains a large proportion of moisture, which gives a fine color to the crust and flavor to the crumb of the bread.

Qualities of Bread.—The process of baking changes the structure of the crust or outer part of a loaf, and, according to Reichenbach, developes in it a substance termed *Assamar*, which he says has an influence in retarding the waste of tissue. It does not alter the starch of the crumb or internal part, but only swells the granules, and by the induced sponginess of the mass renders it readily digestible. Well-baked bread should have a yellowish-brown crust; the crumb should be uniform in texture, permeated with minute cavities, and without "eyes" or large air-cells.

BAKING POWDER is essentially a mixture of tartaric acid and bicarbonate of soda. These are carefully dried and sifted together, some flour being usually mixed with them to dilute the strength. When added to flour in the manufacture of bread or biscuits, carbonic acid gas is liberated by the action of the water which is used, and this blows or puffs up the doughy mass, giving it the requisite lightness.

BAKSHISH. The ordinary meaning of this word, in Persian, is a present; but in the East, in modern times, it has acquired the special signification of gratuity. (Fr. *pourboire*, Ger. *Trinkgeld*, Eng. *tip*.)

BAKU, or BADKU, the chief town of the government of the same name, in the Russian province of Transcaucasia (Daghestan), situated in the peninsula of Apsheron, on the west coast of the Caspian, and possessing one of the most spacious and convenient ports in that sea. It is built in the form of an obtuse triangle, on the slope of an arid hill, and is defended by a double wall and ditch constructed during the reign of Peter the Great. The general appearance of the town is decidedly Oriental, with its flat-roofed houses rising one behind the other, often in so close proximity that the top of the one forms the courtyard of the next. The whole soil around Baku is impregnated with petroleum, which, monopolized till 1872, now forms the staple branch of its industry. Some of the fountains ignite spontaneously, and this natural phenomenon has caused Baku to be esteemed as a holy city by the Parsees or fire-worshipers. There is evidence that petroleum has been flowing from the Apsheron Peninsula for 2,000 years. Of the 500 petroleum wells at Baku, most are situated on the Balakhani Peninsula, eight or nine miles to the north of the town. Lines of pipe carry the oil into the "black town" of Baku, which is full of oil refineries emitting vast volumes of smoke, black and greasy buildings, and pools of oil refuse. One prolific well, tapped in September, 1886, began to spout oil with extraordinary force, deluging the whole district. Nothing could be done to stop the outflow, which on the eighth day had reached a daily rate of 11,000 tuns, or more than the entire produce of the world at the time. Another gigantic naphtha fountain burst out in March, 1887, rising to a height of 350 feet, and after forming an extensive petroleum lake, forced its way into the sea. The production of crude petroleum in 1885 exceeded 420,000,000 gallons, and 120 firms now have oil refineries there. Population about 20,000. Baku is capital of a government of Russian Transcaucasia, with an area of 15,516 square miles, and a population (1883), of 569,992.

BALA, a market-town of Wales, county of Merioneth, and hundred of Penllyn, at the northern extremity of the lake of the same name, 17 miles N.E. of Dolgelly.

BALAAM, or rather BILEAM, the son of Beor, belonging to Pethor, by the River Euphrates in Aram, is represented in Scripture as a seer who possessed the power of blessing and cursing effectually. According to the narrative in Numbers xxii.–xxiv., he was invited by Balak, king of Moab, to come and curse Israel, in order to ensure the latter's defeat. Jehovah, however, forbade him to go as he was requested, and therefore he refused to accompany the deputation of elders, who had been sent to invite him, "with the rewards of divination in their hand." After the arrival of a second embassy more imposing than the first, he received divine permission to go, but only on condition that he should adhere strictly to what Jehovah should tell him. He set out accordingly, and in his journey experienced the anger of the Lord, an angel being sent to stop his progress, who was perceived only by the ass on which the prophet was riding. After Balaam's eyes had been opened he saw the angel, and declared his willingness to go back, but received permission to continue his journey on condition of saying nothing but what was suggested to him by God. His reception by Balak was honorable and imposing, yet he continued faithful to Jehovah, and told the king he would only announce what Jehovah revealed. Standing on the height of Baal-Bamoth, and surveying the tents of Israel, he declared his inability to curse a people so peculiar and righteous. Brought next to the top of Pisgah, and beholding thence a part of the Israelite camp, he announced that Jehovah saw no iniquity or perverseness in Jacob; that He was with them; that they were therefore strong and victorious. Conducted afterwards to the top of Peor, he surveyed

the army of Israel, and predicted their future, their goodly dwellings in Canaan, and their successful wars against the nations down to Saul's time. Though Balak was angry and interrupted him, Balaam continued his prophecy, announcing Israel's valiant deeds, from David down to Hezekiah. Upon this he returned to his home.

Another account of Balaam appears in Numbers xxxi. 8–16, Joshua xiii. 22, where we learn that he advised the Midianite women to seduce the Israelites to the licentious worship of Baal, and that he was slain in a war with the Midianites.

The character given to Balaam in the first account is a favorable one. He is a worshipper of Jehovah the true God, receives divine revelations, and repeatedly declares that he will not go beyond or against them. Faithful to his calling, he steadfastly resists temptations sufficiently powerful, and therefore God communicates His Spirit to him, enabling him to predict the future of Israel.

The second account is unfavorable. In it he appears as a diviner, a heathen seer, who tempted the worshippers of the true God to idolatry. Instead of being a prophet of Jehovah, receiving visions and revelations, a man to whom the Almighty came by night, giving him instructions what to do, he is an immoral soothsayer. Of the two accounts, the latter, brief as it is, seems entitled to greater consideration. The former is elaborate and artificial, the theme being the glorification of the chosen people by the mouth of one of their enemies. An inspired seer from the far distant land of Aram is called in to bless the Israelites. He does so reluctantly, but like a true prophet, announcing nothing but what came to pass. The way in which he is taught the high destiny of the chosen people is instructive. Ignorant at first of Israel's relation to the true God, and thinking they were like others, he was disposed to curse them, but is enlightened, and forcibly impelled to follow the divine revelations. From a heathen *mantis* he is converted into a true prophet by revelations and visions which he cannot resist. The seer is taken to three places in succession, whence he surveys Israel, and utters oracular sayings concerning them. Three times the angel of the Lord stands in the way, and three times the ass is smitten by Balaam. There are four prophetic announcements — xxiii. 7–10, 18–24; xxiv. 3–9, 15–24. The first refers to the separate condition of Israel, their numbers, and their worship of the true God amid the idolatry of the surrounding nations. The second declares that God blesses Israel because there is no iniquity or perverseness in them, that He dwells among them, reveals himself to them, and makes them powerful and victorious. Both these refer to Mosaic times, or at least to times not later than Joshua. But the third announcement has the character of prediction, and refers to future events. Hence Balaam is introduced as a man whose eyes are opened, who hears the words of God, and sees visions of the Almighty. The condition of the people down to the time of Saul is glanced at, their secure settlement in Canaan, and victorious wars with the native races. The fourth prophecy apparently carries down the history to the time of Hezekiah; and a future ruler is distinguished as the star out of Jacob, the sceptre out of Israel, the conqueror of the Moabites and Edomites. The mention of the Kenites and Assyria in ver. 22, the former of whom were allies of Edom, shows, in the opinion of some recent critics, that the writer was acquainted with the Edomite wars under Amaziah and Uzziah, and hoped that the latter power would permanently subjugate the restless Edomites. This would bring the composition down to the first half of the 8th century. Verses 23 and 24 are obscure, but probably refer to no event later than Hezekiah. A fleet from the Phœnician Cyprians seems to have attacked the Canaanitish and Phœnician coasts, threatening the Syrians farther north.

The writer of Num. xxxi. 8, 16, Joshua xiii. 22, is the Elohist, whose account is very brief. Meagre, however, as it is, it is probably historical. A heathen soothsayer, connected with the Midianites, perished in one of their battles with Israel. The writer of Numbers xxii.–xxiv. is, in this view, the Jehovist, who, under the name of Balaam, gives expression to his ideas and hopes in the elevated diction of an inspired prophet. As Jacob and Moses had pronounced blessings on Israel under the immediate inspiration of the Almighty, so Balaam is summoned from a distant land to eulogize the same people.

BÁLÁGHÁT, a British district in the Central Provinces of India, situated between 21° and 23° N. lat. and 80° and 81° E. long.; bounded on the N. by the district of Mandlá; on the E. by the district of Chhattisgarh; on the S. by Chhattisgarh and Bhandárá; and on the W. by the district of Seoní. Bálághát forms the eastern portion of the central plateau which divides the province from east to west. These highlands, formerly known as the Ráigrh Bichhiá tract, remained desolate and neglected until 1866, when the district of Bálághát was formed, and the country opened to the industrious and enterprising peasantry of the Wainangá valley. Geographically the district is divided into three distinct parts:—(1.) The southern lowlands, a slightly undulating plain, comparatively well cultivated, and drained by the Waingangá, Bágh, Deo, Ghisrí, and Son rivers. (2.) The long narrow valley, known as the Mau Táluká, lying between the hills and the Waingangá river, and comprising a long, narrow, irregular-shaped lowland tract, intersected by hill ranges and peaks covered with dense jungle, and running generally from north to south. (3.) The lofty plateau, in which is situated the Ráigárh Bichhiá tract, comprising irregular ranges of hills, broken into numerous valleys, and generally running from east to west.

Since 1867 considerable encouragement has been given to the cultivating tribes of Fonwárs, Kunbis, Marárs, etc., of the low country to immigrate, and take up lands in the upland tracts. By this means a large quantity of jungle land has lately come under cultivation.

BALAKLAVA, a small Greek fishing village with 700 inhabitants, in the Crimea, eight miles southeast of Sebastopol. From September, 1854, to June, 1856, it was the British headquarters during the Crimean war, and the famous charge of the Six Hundred (October 25, 1854), has made the name historic.

BALANCE. For the measurement of the "*mass*" of (*i.e.*, of the quantity of matter contained in) a given body we possess only *one* method, which, being independent of any supposition regarding the nature of the matter to be measured, is of perfectly general adaptability. The method — to give it at once in its customary form — consists in this, that after having fixed upon a *unit mass*, and procured a sufficiently complete set of bodies representing each a known number of mass-units (a "set of weights"), we determine the ratio of the *weight* of the body under examination to the *weight* of the unit piece of the set, and identify this ratio with the ratio of the *masses*. Machines constructed for this particular *modus* of weighing are called *balances*. Evidently the weight of a body as determined by means of a balance — and it is in this sense that the term is always used in everyday life, and also in certain sciences, as, for instance, in chemistry — is independent of the magnitude of the force of gravity; what the merchant (or chemist)

calls, say, a "pound" of gold is the same at the bottom as it is at the top of Mont Blanc, although its real weight, *i.e.*, the force with which it tends to fall, is greater in the former than it is in the latter case.

To any person acquainted with the elements of mechanics, numerous ideal contrivances for ascertaining which of two bodies is the heavier, and for even determining the ratio of their weights, will readily suggest themselves; but there would be no use in our noticing any of these many conceivable balances, except those which have been actually realised and successfully employed.

Spring Balances.—The general principle of this class of balances is that when an elastic body is acted upon by a weight suspended from it, it undergoes a change of form, which is the greater the greater the weight. The simplest form of the spring balance is a straight spiral of hard steel (or other kind of elastic) wire, suspended by its upper end from a fixed point, and having its lower end bent into a hook, from which, by means of another hook crossing the first, the body to be weighed is suspended,—matters being arranged so that even in the empty instrument the axis of the spiral is a plumb-line. Spring balances are very extensively used for the weighing of the cheaper articles of commerce and other purposes, where a high degree of precision is not required. In this class of instruments, to combine compactness with relatively considerable range, the spring is generally made rather strong; and sometimes the exactitude of the reading is increased by inserting, between the index and that point the displacement of which serves to measure the weight, a system of levers or toothed wheels, constructed so as to magnify into convenient visibility the displacement corresponding to the least difference of weight to be determined. Attempts to convert the spring balance into a precision instrument have scarcely ever been made; the only case in point known to the writer is that of an elegant little instrument constructed by Professor Jolly, of Munich, for the determination of the specific gravity of solids by immersion, which consists of a long steel-wire spiral, suspended in front of a vertical strip of silvered glass bearing a millimetre scale. To read off the position of equilibrium of the index on the scale, the observing eye is placed in such a position that the eye, its image in the glass, and the index are in a line, and the point on the scale noted down with which the index apparently coincides.

The *Precision Balance* being quite identical in principle with the ordinary "pair of scales," there is no sharp line of demarcation between it and what is usually called "a common balance," and it is equally impossible to name the inventor of the more perfect form of the instrument. But taking the precision balance in what is now considered its most perfected form, we may safely say that all which distinguishes it from the common balance proper is, in the main, the invention of the late Mr. Robinson of London. In Robinson's, as in most modern precision balances, the beam consists of a perforated flat rhombus or isosceles triangle, made in one piece out of gun-metal or hard-hammered brass. The substitution for either of those materials of *hard steel* would greatly increase the relative inflexibility of the beam, but, unfortunately, steel is given to rusting, and, besides, is apt to become magnetic, and has therefore been almost entirely abandoned. The perforations in the beam are an important feature, as they considerably diminish its weight (as compared with what that would be if the perforations were filled up) without to any great extent reducing its relative solidity. In fact, the loss of carrying power which a solid rhombus suffers in consequence of the middle portions being cut out, is so slight that a very insignificant increase in the size of the minor diagonal is sufficient to compensate for it. *Why* a balance beam should be made as light as possible is easily seen; the object (and it is well here to say at once, the *only* object) is to diminish the influence of the unavoidable imperfections of the central pivot. To reduce these imperfections to a minimum, the beam in all modern balances is supported on a polished horizontal plane of *agate* or *hard steel* fixed to the stand, by means of a perfectly straight "*knife edge*," ground to a prism, of hard steel or agate, which is firmly connected with the beam, so that the edge coincides with the intended axis of rotation. In the best instruments the bearing plane is continuous, and the edge rests on it along its entire length; in less expensive instruments the bearing consists of two separate parts, of which the one supports the front end, the other the hind end of the edge. Every complete balance is provided with an "arrestment," one of the objects of which is, as the name indicates, to enable one to arrest the beam, and, if desired, to bring it back to its normal position; but the most important function of it is to secure to *every point of the central edge* a perfectly fixed position on its bearing. In Robinson's, and in the best modern balances, the beam is provided at its two extremities with two knife-edges similar to the central one (except that they are turned upwards), which, in intention at least, are parallel to, and in the same plane as the central edge; on each knife-edge rests a plane agate or steel bearing with which is firmly connected a bent wire or stirrup, provided at its lower end with a circular hook, the plane of which stands perpendicular to the corresponding knife-edge; and from this hook the pan is suspended by means of a second hook crossing the first, matters being arranged so that, supposing both end-bearings to be in their proper places and to lie horizontally, the working points of the two hook-and-eye arrangements are vertically below the intended point-pivots on the edges. In this construction it is an important function of the arrestment to assign to each of the two terminal bearings a *perfectly constant* position on its knife-edge.

Compound Lever Balances.—Of these numerous inventions—in all of which a high degree of practical convenience is obtained at the expense of precision—we must content ourselves with noticing two which, on account of their extensive use, cannot be passed over. We here allude, in the first place, to that particular kind of equal-armed level balances, in which the pans are situated above the beam, and which are known as "*Roberval's balances;*" and secondly, to those peculiar complex *steel-yards* which are used for the weighing of heavy loads by means of comparatively small weights.

The ordinary *Decimal Balance* is a combination of levers purporting to weigh heavy masses with comparatively light weights.

Torsion Balances.—Of the several instruments bearing this name, the majority are no balances at all, but machines for measuring horizontal forces (electric, magnetic, &c.), by the extent to which they are able to distort an elastic wire vertically suspended and fixed at its upper end. In the torsion *balances* proper the wire is stretched out horizontally, and supports a beam so fixed to it that the wire passes through its centre of gravity. Hence the elasticity of the wire here plays the same part as the weight of the beam does in the common balance. An instrument of this sort was invented by Ritchie for the measurement of very small weights, and for this purpose it may offer certain advantages; but, clearly, if it were ever to be used for measuring larger weights, the beam would have to be supported by knife-edges and bearings, and in regard to such application therefore (*i.e.*, as a means for serious

gravimetric work), it has no *raison d'être*. See ELECTRICITY and MAGNETISM.

For *Hydrostatic weighing machines* see the article HYDROMETER.

BALANCE OF POWER. The theory of the Balance of Power may be said to have exercised a preponderating influence over the policy of European statesmen for more than two hundred years, that is, from the Treaty of Westphalia until the middle of the present century; and to have been the principal element in the political combinations, negotiations, and wars which marked that long and eventful period of modern history. It deserves, therefore, the attentive consideration of the historical student, and, indeed, the motive cause of many of the greatest occurrences would be unintelligible without a due estimate of its effects. Even down to our own times it has not been without an important influence; for the Crimean War of 1854 was undertaken by England and France for no other object than to maintain the balance of power in Eastern Europe, and to prevent the aggrandisement of Russia by the dismemberment of the Ottoman empire and the conquest of Constantinople. Nevertheless there is, perhaps, no principle of political science, long and universally accepted by the wisest statesmen, on which modern opinion has, within the last twenty years, undergone a greater change; and this change of opinion is not merely speculative, it has regulated and controlled the policy of the most powerful states, and of none more than of Great Britain, in her dealings with the continent of Europe.

The theory of the balance of power rested on several assumptions. It was held, more especially from the time of Grotius, in the early part of the 17th century, that the states of Europe formed one grand community or federal league, of which the fundamental principle and condition was the preservation of the balance of power; that by this balance was to be understood such a disposition of things, as that no one potentate or state shall be able absolutely to predominate and prescribe laws to the others; that all were equally interested in maintaining this common settlement, and that it was the interest, the right, and the duty of every power to interfere, even by force of arms, when any of the conditions of this settlement were infringed or assailed by any other member of the community. In this respect all neighboring nations, trading with each other, form one great body and a sort of community. Thus, Christendom is a kind of universal republic, which has its interests, its fears, and its precautions to be taken. All the members of this great body owe it to one another for the common good, and owe it to themselves for the security of their country, to prevent the progress of any other members who should seek to overthrow this balance, which would turn to the certain ruin of all the other members of the same body. Whatever changes or affects this general system of Europe is too dangerous, and draws after it infinite mischief. Whatever may be the value of these philanthropic principles, history reminds us that when they were most loudly professed they were most frequently violated, and that no cause of war seems to have been so frequent or so fatal as the spurious pretext of restoring peace and defending the general tranquillity of the world. Thus, it was to balance the power of the house of Austria that Cardinal Richelieu flung France into the quarrels of Germany in the Thirty Years' War, and even lent her aid to the Protestant cause. It was to balance the encroaching and aggressive power of Louis XIV. that numerous combinations were formed between England, Austria, and Holland, which, after nearly half a century of almost uninterrupted contests and bloodshed, ended in the peace of Utrecht. The pretext of Frederick II., when he was meditating some act of rapine, generally was that he believed some hostile combination had been formed against him, which it was wise to anticipate. In short, no cause of war has been more frequently alleged and acted upon, than that a proper consideration for the balance of power rendered it necessary to take forcible measures to avert some remote or hypothetical danger.

The ablest and most eloquent champion of the system of equipoise in the present century was the Chevalier von Gentz, who published his *Fragments upon the Balance of Power in Europe* in 1806, under the influence of the catastrophe which had subjugated the Continent, and who subsequently took an active part at the Congress of Vienna in the attempts to constitute a a new system of European policy. Gentz defines the balance of power as "a constitution subsisting between neighboring states more or less connected with one another, by virtue of which no one among them can injure the independence or essential rights of another, without meeting with effectual resistance on some side, and consequently exposing itself to danger." And he rests this constitution on four propositions: — (1.) That no state must ever become so powerful as to coerce all the rest; (2.) That every state which infringes the conditions is liable to be coerced by others; (3.) That the fear of coercion should keep all within the bounds of moderation; and (4.) That a state having attained a degree of power to defy the union should be treated as a common enemy. To determine the true character and limits of the balance of power, we must have recourse, not to vague general principles, but to positive law, framed in the shape of international contracts, which are termed treaties, and which have been sanctioned at different epochs of modern history by a congress of states. This historical treatment of the subject leads us to more tangible and solid ground; and it will be seen that on these occasions more especially attempts have been made to establish a balance of power in Europe upon the basis of general treaties; and that these attempts have been rewarded by considerable, though not by permanent, success in the 17th, 18th and 19th centuries.

The first idea of a general congress, to put an end to the horrors of the Thirty Years' War, and to adjust the conflicting claims of rival creeds and hostile princes, appears to have originated with the emperor of Germany in 1640. The attempt to restore peace by the authority of the Germanic Diet had failed. It became necessary to have recourse to mediating powers, and after a protracted preliminary negotiation, the Congress of Münster or Westphalia opened on the 11th July 1643, — the Catholic and Protestant belligerents being represented on the one hand, and the mediating powers, France, Sweden, Venice, and the Pope, on the other. We do not propose in this place to follow the train of these complicated negotiations. It is enough for our present purpose to remark that the great treaty which resulted from them, and was signed on the 24th October 1648, became the basis of the public law of Europe, and the first official recognition of the existence of a European balance of power. The conditions established in Germany left the Catholic, the Lutheran, and the Reformed Churches in possession of their respective independence, whilst they relieved the minor princes from their strict dependence on the empire; but, above all, they conferred on France and Sweden, as mediating powers, the right of intervention for the purpose of upholding the provisions of the treaty. In other words, the balance which had been established between the states of Central Europe was regulated by external weights, which could be brought to bear upon it. The result of this combination, due mainly to Cardinal Mazarian, was certainly

injurious to the unity and independence of Germany, and it tended to aid the aggressive and dictatorial power of Louis XIV. Nevertheless, the fundamental principles of the Treaty of Westphalia were recognized and renewed as the conditions of the general peace of Europe down to the French Revolution; they were not wholly absent from the minds of the negotiators at Vienna in 1815; and they only received their death-blow from the hand of the Prussian Government in 1866 and 1870. Whatever might be the merits of the Treaty of Westphalia, it had not that of securing to Europe an unbroken or durable peace; and even the territorial relations of France and Germany were altered within thirty years of that time by the conquest of Franche Comté and Alsace. But the wars of Louis XIV. were not general wars, until he engaged in the fatal attempt to place his grandson on the throne of Spain, and to unite the two crowns in the house of Bourbon. Efforts had been made, in view of the approaching extinction of the Spanish branch of the house of Austria, to preserve the balance of power by a timely partition of the vast dominions of the Spanish empire — a remarkable example of an attempt to prevent a formidable catastrophe by an equitable arrangement. But it may be doubted whether any arrangement in which so little account was taken of the wishes and traditions of nations could possibly have succeeded; and it unquestionably failed, because Louis XIV. did not hesitate to repudiate the treaties he had signed, and to avail himself of the last will and testament of Charles II., which had been extorted from the Spanish court by his intrigues. That event raised again the whole question of the balance of power in Europe. It was received as a doctrine of political faith that the union of the French and Spanish crowns in one family must be fatal to the independence of all other states; that it would replace the Stuarts upon the throne of England, and establish the ascendency of France and the Catholic party over Europe. It was therefore resisted by a coalition, of which England, Austria, and Holland were the principal members. France was at length reduced to the lowest point of humiliation, and in 1709 peace might have been obtained on every point but one. Louis refused to turn his arms against his own grandson, and the war continued till 1715. Philip V. retained the Spanish crown, and the relations of all the European states were once more adjusted with legal nicety at Utrecht. Great pains were taken to provide, by a system of renunciations, against the possibility of the union of the crowns of France and Spain on the same head, because it was held that such a contingency would be fatal to the balance of power in Europe. But these precautions did not prevent the conclusion, at a later period, of the family compact between the two branches of the house of Bourbon, which was regarded as a lasting danger to other countries, and was opposed by the whole strength of Britain and the genius of Chatham. The peace of Utrecht was denounced by Parliament and detested by the nations as an inglorious termination of a glorious war, and its authors were consigned to obloquy and exile; but it secured the peace of Europe for thirty years; it reduced the power of France; and had it not been for the German dominions of the house of Hanover, it might have been still longer before England was drawn into another war.

Hitherto the political system of Europe had comprised little more than the states of France, Austria, Spain, Sweden, and Holland, with the occasional intervention of Great Britain, more for the defence of the interests of others than of her own. But the 18th century witnessed a total change in the politics of the world. A new empire, Russia, arose in the north, under the genius of Peter and of Catherine; the ambition and military skill of Frederick II. raised Prussia from a secondary member of the German empire to a powerful and independent kingdom; the colonial empires of Spain, France, and Britain had extended their territorial interests to the continents of Asia and America, and to the eastern and the western isles, insomuch that wars, begun in Europe, soon raged on the banks of the Ganges and the St. Lawrence; and the declaration of independence of the United States of America called into being a new and powerful people of the future. The partition of Poland, which was commenced in 1772, marked a new era of aggressive revolutionary policy; it was a gross invasion of the principle of the balance of power, effected by three powers, jealous of their respective strength, but indifferent to the rights of an independent nation and to the opinion of Europe. That lawless act was the prelude to more violent attacks on the sovereignty and nationality of many countries, for before the century closed the French Revolution, and the wars that followed it, crushed to atoms the ancient fabric of Europe. Whilst events of this magnitude were occurring in the world, it is obvious that the theory of the balance of power was entirely displaced and dislocated. New elements were at work over a far wider area, new sources of power and influence were opened of far more importance than those territorial and dynastic questions which occupied the statesmen of Münster and of Utrecht; ancient land-marks were swept away; minor states were annihilated; and the temporary domination of Napoleon over a great portion of the continent of Europe seemed to have overthrown the balance of power for ever. In those dark and evil days public writers like Gentz and Mackintosh still maintained the principle that peace could only be restored by a due recognition of the rights and independence of every nation, and England adhered inflexibly to the policy of combining the scattered elements of Europe against the common enemy. Half a dozen times over these coalitions failed; but they succeeded at last, and England had the glory of playing no inconsiderable part in the restoration of the liberties of all other nations against foreign aggression.

Upon the fall of Napoleon in 1814 it became the common interest, and the universal desire, of all the sovereigns and nations of Europe to restore peace upon a settled basis, to re-establish the authority of public law, to reinstate the rightful owners in the possessions and dominions they had been forcibly deprived of, to reduce the military establishments which weighed so heavily on the finances and on the population of Europe, and to create anew a balance of power between the states of Europe, by which the greatest of them might be restrained and the least of them protected. A secret article had been annexed to the Treaty of Paris, declaring that "the allied powers had agreed among themselves on the bases which were to be given to the future system of equilibrium;" though what the nature of that agreement and of those bases was, has never been made clearly apparent. But the matter was unquestionably referred to the congress then about to open at Vienna, where the most powerful sovereigns and the most distinguished ministers of all the European states met for the first time in council. That congress was certainly the most complete, and in its action the most important, assemblage of independent political powers and their representatives which ever took place in the world. Its decisions were not all of them just, or wise, or disinterested. The broad general principles of pacification which had been laid down were more than once traversed and thwarted by particular interests and ambitions. The theory of the rights of legitimate sovereigns over their subjects was carried to an extravagant point, pregnant with danger for the future. Genoa was transferred to

Sardinia, Venice to Austria, Norway to Sweden, Poland to Russia, part of Saxony to Prussia, and the sacred hopes and pledges of freedom which had animated the nations in the contest were forgotten by the leading courts of Europe in the division of the spoil. But in spite of these shortcomings and abuses, we cannot concur with writers who, like Hardenberg, denounce the Congress of Vienna as an auction of nations and an orgy of kings. It was said that every one withdrew from the Congress of Vienna disappointed, no one having obtained as much as he expected; but if so, that would suggest the inference that the general interest of Europe, prevailed over the pretensions of each particular state. From the point of view we are now considering, which is the restoration of the balance of power, it cannot be denied that the Treaties of Vienna secured forty years of peace to Europe. They stood the brunt of two fresh convulsions in France in 1830 and 1848, and their main provisions, though modified with respect to the Low Countries in 1832, and abrogated in Italy by the campaign of 1859, were not seriously impaired until the dissolution of the Germanic body in 1866, and the Franco-German War of 1870. During the whole of this period the warlike ambition of France, and the disposition of Russia to overawe Central Europe, were successfully held in check. At Vienna itself, and during the congress, the struggle was close and sometimes doubtful. Russia was resolved to retain the whole of Poland, which she occupied with her armies, and Prussia claimed the whole of Saxony as a compensation for her share of the Polish provinces. To counteract this combination of Russia and Prussia, an alliance was signed on the 3d January 1815 between Austria, England, and France, which might have led to hostilities between those powers and their recent allies. Perhaps it was fortunate that the return of Napoleon from Elba broke up the congress, and reminded all the powers that union and mutual concessions were the first duties of those who had devoted themselves to the cause of law, order, and peace. It was a sign of the wisdom of the congress, and of its respect for sound principles, that although France was the vanquished power and the author of the calamities ot Europe, she was treated at Vienna with as much consideration as any other state. Her ambassador, M. de Talleyrand, had his full weight in the congress; and no attempt was made in 1814 to curtail her ancient territorial possessions or to lower her rank in Europe. On the contrary, the just influence of France was recognised as an essential condition of the balance of power.

For the first time, then, by this general act of the Congress of Vienna, the territorial possessions and frontiers of the Continental states were defined in one document, to which all the Governments of Europe were parties; the constitution of the Germanic body was incorporated in the same instrument, and the neutrality and independence of the smallest cities and commonwealths were established and guaranteed. Every state in Europe had therefore an equal right and interest to invoke the authority of the treaty, and to claim the execution of all its conditions. A complete fabric of European policy, such as had never existed before, was thus literally established by mutual contract; and every infraction of it might justly be brought under the consideration of the high contracting parties, or might even have been the ground of a declaration of war. In several instances this controlling power was wisely and beneficially exercised, and more than one burning question was adjusted by the conferences which met from time to time, always on the basis of the treaties of 1815. This certainly was the nearest approach ever made to a practical balance of power; and we owe to it, as we have seen, a long period of mutual confidence, respect for public law, and peace, which contributed enormously to the progress, prosperity, and happiness of the world.

But there are darker shades to the picture. The comprehensive interest which every state was thus held to have acquired in maintaining the general settlement might be held, and was held, to justify a dangerous and mischievous degree of intervention in the internal affairs of every other country, and this right was too often exercised in a manner injurious to liberty and independence. The northern powers, not content with the terms of the general alliance and the Treaties of Vienna, proceeded to connect themselves more closely by the mystic ties of the Holy Alliance, which provided that they were to act together on all subjects, and to regard their interests as one and indivisible. The construction they put upon the system recently established in Europe was that it gave the allied powers a right to interfere, not only for the prevention of quarrels, aggressions, and war, but in the internal government of states, for the purpose of preventing changes which they chose to regard as injurious to their own security and eventually to the balance of power. At the congresses and conferences of Troppau, Carlsbad, Aix-la-Chapelle, and Verona, these doctrines were avowed and acted upon to their furthest extent, and under pretence of maintaining and defending the common interests of Europe, the popular movements and constitutional progress of Italy were crushed, a French army entered Spain in 1823 to restore the authority of Ferdinand VII. against the Cortes, and even the independence of the South American colonies was represented as a blow to the peace and security of Europe. The British Government had early perceived that the interpretation thus given to the theory of the balance of power, and to what was termed the federal system in Europe, was only another name for an intolerable oppression, and that the right of intervention in the internal affairs of other countries was claimed and exercised under false and dangerous pretexts. The duke of Wellington, who represented Great Britain at the Congress of Verona, under instructions framed by Lord Castlereagh, was the first to declare that England could be no party to such an application of the theory of the alliance, and that that country preferred isolation to any such system of combined policy. That was the germ of the modern doctrine of non-intervention. But as long as the Treaties of Vienna lasted, it was her duty and her right to endeavor to support their authority, and to vindicate the rights established by a compact to which that country was a party. She declined in 1852 to join with Prussia in enforcing the declaration made by the allied powers in 1815, which excluded any member of the family of Bonaparte from the throne of France; but she sought, in conjunction with France, to protest against the annihilation of the kingdom of Poland, the incorporation of Cracow, the admission of non-German provinces into the confederation, and the invasion of Schleswig; and she opposed the annexation of Savoy and Nice to France, but alone without effect. The compact of Vienna was gradually set aside and violated in the course of years by those who were most interested in maintaining it; and when the Emperor Napoleon III. proposed, in 1863, a new congress for the purpose of revising and re-establishing the balance of power in Europe, under the name of an International Council, England refused to be a party to the negotiation, and rejected the scheme. Lord Russell replied, "There being no supreme authority in such an assembly to enforce the decision of the majority, the congress would probably separate, leaving many of its

members on worse terms with each other than they had been before." This was the last attempt made to bring the authority of a congress, representing the collective authority of Europe, to bear on questions affecting the general peace. When this point was reached it was apparent that the whole theory of the confederated system in Europe had become, for a time at least, obsolete; that the treaties and mutual guarantees on which that system rested had lost their power; and that there was no controlling force to resist the ambitious or warlike designs of any state capable of giving effect to them. The Italian campaign of 1859 had considerably altered the condition of Southern Europe, and weakened Austria. Possibly, Prussia, in withholding her assistance at that time from her federal ally, foresaw in the defeat of Austria an event favorable to her own future pretensions. At any rate, for the first time, a war seriously affecting the balance of power was begun and ended by the two principal belligerents alone, and even the price paid by the house of Sardinia for the services of France — the cession of Savoy and Nice — was tacitly acquiesced in by Europe. Twenty years before, it would have been thought impossible that the doctrine of non-intervention should have acquired so great an ascendency.

But the consequences of this novel state of affairs soon became manifest in the increasing disintegration of Europe. No state could have a greater claim than Denmark to the protection of the principles of the balance of power, for, as late as 1852, all the great powers had pledged themselves by treaty to maintain the integrity of her dominions, the unity of the monarchy, and the order of succession to the crown which was then established. Yet in 1864 the German powers proceeded to what was termed a Federal Execution against her; Holstein, Lauenberg, and, eventually, Schleswig were torn from her by Prussia, Austria acting a subordinate part. England in vain appealed by her diplomacy to the terms of the agreement of 1852, but France and Russia stood aloof, and the greatest injustice the world had witnessed since the partition of Poland was consummated. As every event in political life is closely connected, Prussia now proceeded to ally herself with the crown of Italy against Austria, and to execute her grand design of the overthrow of the Germanic Confederation and the expulsion of Austria from that body, which had been regarded as the centre of gravity of the European system. As long as that body subsisted, war was impossible between its respective members, and France was incapable of attacking their united forces. The success of Prussia in the campaign of 1866 was rapid and complete, and Austria ceased to form part of the Germanic Confederation. The power of Prussia was further increased by the military conventions, which gave her the absolute command over the armies of the minor German states. This was undoubtedly the severest blow which had yet been inflicted on the balance of power in Europe; and the Emperor Napoleon III., who had recently given vent to his dissatisfaction with the treaties of 1815, now found himself confronted by an enemy infinitely more powerful and dangerous. The results of Sadowa were as fatal to the influence and security of France as if she herself had lost a campaign. The French nation, however, failed to understand the magnitude of the danger, though they were irritated by the approach of it. War was, on more than one occasion, on the point of breaking out; and at length France plunged into it with a recklessness and incapacity only to be equalled by the tremendous calamities that war caused her to endure. Again, no third state was drawn by political considerations into the conflict. The terms of peace were settled between the vanquished and the conquerors without reference to the general interests of other nations; and no attempt has been made to place these arrangements under the sanction of the public law of Europe. Russia took advantage of the agitated condition of Western Europe to abrogate, by her own will and pleasure, an important stipulation of the Treaty of Peace of 1856, and Europe again submitted to this breach of covenant.

The general result is that, at the present time, the military power of the German empire far surpasses that of any other state, and could only be resisted by a general combination of all the rest. Where the reign of law ends, the reign of force begins, and we trace the inevitable consequence of this dissolution of legal international ties in the enormous augmentation of military establishments, which is the curse and the disgrace of the present age. Every state appears to feel that its security depends on arming the whole virile population, and maintaining in what is called a state of peace all the burdens of a complete armament; indeed, in the most barbarous ages and the most sanguinary wars there were, doubtless, fewer men under arms, and less money was spent in arming them, than at the present day.

BALANCE OF TRADE. The theories connected with the balance of trade arose out of the "mercantile system" of political economy. In the mercantile system, which looked upon the possession of gold as the grand aim, it not unnaturally came to be a maxim that a nation becomes richer in proportion as the money-value of its exports exceeds that of its imports; the excess being paid in gold, was thought to be just so much added to the national wealth. Now, the difference between the money-value of the exports and imports of a State is called the "balance of its trade;" and by the adherents of the mercantile system, this balance was said to be "in favor" of the country or "against" it, according as the exports or imports showed the excess. As a practical result of this theory, every sort of device was adopted in order to bring out a favorable balance. Laws were enacted prohibiting importation of foreign manufactures, or imposing high duties upon them, and giving premiums and other protective encouragements to exportation. The aim of commercial legislation, in short, was to promote the flow of the precious metals to one's own country, and to keep them there. The fallacies of the balance of trade were obviously due to a mistaken conception of the nature of wealth, and must, therefore, be traced to the errors of the mercantile system.

BALANOGLOSSUS, a worm-like animal of much zoölogical interest as a connecting link between invertebrates and vertebrates. The genus, which includes at least four species, occupies so unique a position, that it is regarded as representative of a distinct class of Enteropneusta (gut-breathers). The animals live in fine sand, which they appear to saturate with lime.

BALASINOR, a tributary State of India, in the Province of Guzerat, Bombay. Area about 150 square miles; pop., 42,000. The chief town, Balasinor, is fifty-one miles north of Baroda. Pop., 9,000.

BALASOR, a district of British India in the Orissa division, under the Lieutenant-Governor of Bengal, is bounded on the N. by the district of Midnapur; on the S. by Cattack district, from which it is separated by the Baiteraní river; on the W. by the tributary states of Keunjhar, Nígiri, and Morbhanj; and on the E. by the Bay of Bengal. Balasor district forms a strip of alluvial land between the hills and sea, varying from about 9 to 34 miles in breadth; area, 2066 sq. miles. The hill country rises from the western boundary line. The district naturally divides itself into three well-defined tracts — (1.) The Salt Tract, along the coast; (2.)

The Arable Tract, or rice country; and (3.) The Submontane Tract, or jungle lands. The Salt Tract runs the whole way down the coast, and forms a desolate strip of a few miles broad. Towards the beach it rises into sandy ridges, from 50 to 80 feet high, sloping inland, and covered with a vegetation of low scrub jungle. Sluggish brackish streams creep along between banks of fœtid black mud. The sand hills on the verge of the ocean are carpeted with creepers and the wild convolvulas. Inland, it spreads out into prairies of coarse long grass and scrub jungle, which harbor wild animals in plenty; but throughout this vast region there is scarcely a hamlet, and only patches of rice cultivation at long intervals. From any part of the Salt Tract one may see the boundary of the inner arable part of the district, fringed with long lines of trees, from which every morning the villagers drive their cattle out into the saliferous plains to graze. The Salt Tract is purely alluvial, and appears to be of recent date. Towards the coast the soil has a distinctly saline taste.

The Arable Tract lies beyond the salt lands, and embraces the chief part of the district. It is a long dead level of rich fields, with a soil lighter in color than that of Bengal or Behar; much more friable, and apt to split up into small cubes with a rectangular cleavage. A peculiar feature of the Arable Tract is the *Páts*, literally the Cups, or depressed lands near the river banks. They were probably marshes that have partially silted up by the yearly overflow of the streams. These Cup-lands bear the finest crops. As a whole, the Arable Tract is a treeless region, except around the villages, which are encircled by fine mango, *pipal*, banyan, and tamarind trees, and intersected with green shady lanes of bamboo. A few palmyras, date palms, and screw pines (a sort of aloe, whose leaves are armed with formidable triple rows of hook-shaped thorns) dot the expanse, or run in straight lines between the fields. The Submontane Tract is an undulating country with a red soil, much broken up into ravines along the foot of the hills. Masses of laterite, buried in hard ferruginous clay, crop up as rocks or slabs. At Kopári, in Kila Ambohatá, about 2 square miles are almost paved with such slabs, dark red in color, perfectly flat, and polished like plates of iron. A thousand mountain torrents have scooped out for themselves picturesque ravines, clothed with an ever-fresh verdure of prickly thorns, stunted gnarled shrubs, and here and there a noble forest tree.

BALASOR, the principal town and administrative headquarters of the above district, situated on the River Burábalang, about eight miles from the sea-coast as the crow flies, and sixteen by the river. The population of Balasor is estimated at 800,000, nearly all Hindus.

BALBI, ADRIAN, an eminent geographer, was born at Venice in 1782, and died in 1848.

BALBO, CESARE, a noted Italian writer and statesman, was born at Turin, November 21, 1789, and died in 1853.

BALBOA, VASCO NUNEZ DE, one of the bravest and most successful of the Spanish discoverers of America, was born at Xeres de los Caballeros, in Estremadura, about the year 1475. He was by birth a *hidalgo*, or gentleman, but was in poor circumstances. Little is known of his life till the year 1501, when he was one of the company of adventurers who followed Roderigo de Bastidas in his voyage of discovery to the western seas. He appears to have settled in Hispaniola, and took to cultivating land in the neighborhood of Salvatierra, but with no great success, as his debts soon became oppressive. In 1509 the famous Ojeda sailed from San Domingo with an expedition, and founded the settlement of San Sebastian. He had left orders with Enciso, an adventurous lawyer of the town, to fit out two ships and convey provisions to the new settlement. Enciso set sail in 1510, and Balboa, whose debts made the town unpleasant to him, managed to accompany him, by concealing himself in a cask which was conveyed from his farm to the ship as if containing provisions. The expedition, after various adventures, reached San Sebastian to find Ojeda gone and the settlement in ruins. While Enciso was undecided how to act, Vasco Nuñez proposed that they should sail for Darien, on the Gulf of Uraba, where he had touched when with Bastidas. His proposal was at once accepted and carried out. The new town was named Sta. Maria de la Antigua del Darien. Bitter quarrels broke out among the adventurers, caused chiefly by Enciso prohibiting all private interchange for gold with the natives. Enciso was deposed from the office of authority which he had assumed, but it was found no easy matter to elect a successor. Nicuesa, in whose province they were, was proposed by several, and was brought from Nombre de Dios by a ship which had been sent out to bring assistance to him. The inhabitants of Darien, however, would not receive him, and, in their wrath, seized him and placed him, with seventeen companions, in a crazy bark with which to find his way back to Hispaniola. The party of Vasco Nuñez grew strong; Enciso was thrown into prison, and finally sent off to Spain along with Vasco's ally, the alcalde Zamudio. Being thus left in authority, Balboa began to make excursions into the surrounding country, and by his bravery and conciliatory manners gained the friendship of several native chiefs. On one of these excursions he heard for the first time of the great ocean that lay on the other side of the mountains, and of the wondrous land of gold, afterward called Peru. Soon after his return to Darien he received letters from Zamudio, informing him that Enciso had complained to the king, and had obtained a sentence condemning Balboa and summoning him to Spain. In his despair at this message Vasco resolved to attempt some great enterprise, the success of which he trusted would conciliate his sovereign. On the 1st September 1513, he set out with about 190 men, well armed, and sailed to Coyba, where he left half his forces to guard the canoes and ships. With the remainder he started on his perilous journey across the isthmus. On the 26th September they reached the summit of the range of mountains, and the glorious expanse of the Pacific was displayed to them. Three days later they began to descend the mountains on the western side, and Vasco, arriving at the sea-shore, formally took possession of the ocean in the name of the Spanish monarch. He remained on the coast for some time, heard again of Peru, had the Pearl Islands pointed out to him, and set out for Darien. On the 18th January 1514 he reached the town, and was received with the utmost joy. He at once sent messengers to Spain bearing presents, to give an account of his discoveries; but, unfortunately, these did not arrive till an expedition had sailed from Spain, under Don Pedro Arias de Avila (generally called Pedrarias, or Davila), to replace Vasco Nuñez, and to take possession of the colony. For some time after Pedrarias reached Darien Vasco was in great straits, but at length letters came from the king, announcing to him his satisfaction with his exploits, and naming him *Adelantado*, or admiral. Pedrarias was prevailed upon to be reconciled with Vasco, and gave him one of his daughters in marriage. Vasco then resolved to accomplish his grand project of exploring the western sea. With infinite labor materials for building ships were conveyed across the isthmus, and two brigantines were constructed. With these the adventurers took possession of the Pearl Islands, and, had it not been for the weather, would have reached the coast of Peru. This

career of discovery was stopped by the jealousy of Pedrarias, who feared that Balboa would throw off his allegiance, and who enticed him to Acla by a crafty message. As soon as he had him in his power, he threw him into prison, had him tried for treason, and forced the judge to condemn him to death. The sentence, to the grief of all the inhabitants, was carried into execution on the public square of Acla in 1517.

BALBRIGGAN, a seaport of Ireland, in the county of Dublin and parish of Balrotherv 18½ miles N.N.E. of the capital. Population, 2,400.

BALCONY (till about 1825 BALCO'NY; Ital. *balcone*), a projecting gallery in front of a window or of several windows, with a balustrade or parapet at its outer edge, and supported by consoles, or brackets fixed in the wall, or by pillars resting on the ground below. The balcony was unknown in Greek and Roman architecture, the earliest examples of it occurring in Italy, to the climate of which country it is peculiarly adapted.

BALDACHIN (Ital. *baldacchino*), a canopy of the form of a tent or umbrella, made of costly materials and richly adorned, which is either supported on pillars or fastened to the roof over a throne or couch, or over a pulpit, an altar, or other sacred object. One of the most celebrated is the baldachin in the Church of St. Peter's in Rome, cast in bronze by Bernini, which is supported on four large twisted columns.

BALDE, JAKOB, a modern Latin poet of considerable repute, was born at Ensisheim in Alsace in 1603, and died in 1668.

BALDI, BERNARDINO, a distinguished mathematician and miscellaneous writer, was descended of a noble family at Urbino, in which city he was born on the 6th of June, 1533. Baldi died at Urbino on the 12th of October, 1617. He was, perhaps, the most universal genius of his age, and is said to have written upward of a hundred different works, the chief part of which have remained unpublished. His various works give satisfactory evidence of his abilities as a theologian, mathematician, geographer, antiquary, historian and poet.

BALDNESS (Gr. *alopecia*, fox-mange). Congenital baldness (complete absence of hair at birth) is sometimes met with; but in most cases is only temporary, and gives place in a few years to a natural growth of hair. Occasionally, however, it persists through life.

Senile baldness (calvities) is one of the most familiar signs of old age. It is more common in men than women. A precisely similar condition occurs not unfrequently at an earlier age (presenile baldness). Great loss of hair frequently follows severe illness or other causes which produce general debility. As health returns, the hair usually returns with it; its growth may be promoted by the use of lotions containing cantharides, ammonia, or some other stimulating agent. Baths containing common salt, and brisk rubbing, are also useful.

BALDRIC is a belt or sash worn partly as a military and partly as a heraldic symbol.

BALDUNG, HANS, called also Hans Grün, a German painter and engraver, contemporary with Albert Durer, to whom, in expression, coloring, and finish, he was little inferior. He was born at Gmünd, in Swabia, about 1476, and died at Strasburg in 1545.

BALDINGER, ERNEST GOTTFRIED, a German physician of considerable eminence, and the author of a great number of medical publications, was born near Erfurt, 13th of May, 1738. In 1768 he became professor of medicine at Jena, whence he removed, in 1773, to Göttingen, and in 1785 to Marburg, where he died of apoplexy on the 21st of January, 1804.

BALDINUCCI, FILLIPPO, a distinguished Italian writer of the history of the arts, was born at Florence about 1624, and died in 1696.

BALDOVINETTI, ALESSIO, was a distinguished painter of Florence in the 15th century, whose works have now become very scarce. Hogarth takes him as a type of those obscure artists to whom the affected amateurs of his time were wont to ascribe old paintings—"'Tis a fine piece of Alessio Baldovinetti, in his third manner."

BALDUINUS, JACOBUS, a distinguished professor of civil law in the university of Bologna. He died at Bologna in 1225, and has left behind him some treatises on Procedure, which have the merit of being the earliest of their kind.

BALDUR, one of the most interesting figures of the Scandinavian mythology, was the son of Odin and Frigg. His name (from *baldr*, the foremost or pre-eminent one) denoted his supreme excellence and beauty. The wonderful legend of his death is first dimly recorded in the *Voluspa*, the grandest and most ancient of Eddaic poems, and more fully in the younger Edda. Baldur was visited by evil dreams, and felt his life to be in danger. His mother, Frigg, took oath of all things in the world, animal, vegetable, and mineral, that they should not slay her son. The gods being then secure, found pastime in setting the good Baldur in their midst, and in shooting or hurling stones at his invulnerable body. Then Loki, the evil god, took on him the form of a woman and went to Frigg in Fensal. From Frigg he learned that of all things in the earth but one could injure Baldur, and that was a little tree westward from Valhal, that was too young to take the oath. Thither went Loki and found the plant; it was the mistletoe. He plucked it up, fashioned it into an arrow, and went back to the Æsir. They were still in a circle, shooting at Baldur; and outside the ring stood the blind god Höder, of whom Loki asked wherefore he did not shoot. When Höder had excused himself because of his blindness, Loki offered to aim for him, and Höder shooting the arrow of mistletoe, Baldur suddenly fell, pierced and dead. No such misfortune had ever yet befallen gods or men; there was long silence in heaven, and then with one accord there broke out a loud noise of weeping. The Æsir dared not revenge the deed, because the place was holy, but Frigg, rushing into their midst, besought them to send one to Hel to fetch him back. Hel promised to let him go if all things in heaven and earth were unanimous in wishing it to be so; but when inquiry was made, a creature called Thökt was found in the cleft of a rock that said, "Let Hel keep its booty." This was Loki, and so Baldur came not back to Valhal.

BALDUS, an eminent professor of the civil law, and also of the canon law, in the university of Perugia. He came of the noble family of the Ubaldi; and his two brothers, Angelus de Ubaldis and Petrus de Ubaldis, were almost of equal eminence with himself as jurists. He was born in 1327, and studied civil law under Bartolus at Perugia, where he was admitted to the degree of doctor of civil law at the early age of seventeen in 1344.

BALDWIN I., King of Jerusalem, 1100–18, was born in 1058. He was the youngest brother of Godfrey de Bouillon, with whom he took part in the first Crusade. After the death of his brother Godfrey, in 1100, he became Protector of the Holy Sepulchre, and Baron of Jerusalem, and immediately assumed the regal title, which his brother had refused. He died in 1118.—BALDWIN II., cousin and successor of Baldwin I., reigned from 1118-31. During his reign Tyre was taken and the order of the Templars was instituted. He died in 1131.—BALDWIN III., King of Jerusalem, 1143-62, the son and successor of Foulques of Anjou, was born in 1129. He died in 1162, and with his death the Christian power in the East began to decline. He was suc-

ceeded in the government by his brother Amalric, who died in 1173.—BALDWIN IV., the son and successor of Amalric, surnamed the Leper, reigned till 1184, when he caused BALDWIN V., a child six years old, the son of his sister Sybilla, to be crowned. The child died in 1186.

BALDWIN I., the first Latin Emperor of Constantinople, was born in 1171 A.D., and succeeded his father as Count of Hainault and Flanders in 1195. In 1200 he joined the fourth Crusade, and assisted in the recapture of Constantinople for the Emperor Isaac II. Alexis having been murdered by a rising of the citizens, Baldwin was chosen Emperor, and crowned in 1204. But, defeated and taken prisoner by the Bulgarian king, he died (1206) in captivity.

BALDWIN II., Emperor of Constantinople, was born in 1217. He was but eleven years old when, by the death of his brother Robert, he succeeded to the throne. In 1261 his capital was taken by one of the generals of Michael Palæologus, and Baldwin fled to Italy. With him terminated the Latin Empire in the East, after it had lasted fifty-seven years. He died in 1273.

BALDWIN, THOMAS, a celebrated English prelate of the twelfth century.

BALE, JOHN, Bishop of Ossory, in Ireland, was born at Cove, in Suffolk, in November, 1495, and died in 1563.

BALEARIC ISLANDS, a remarkable group in the western part of the Mediterranean Sea, lying to the south and east of Spain. The name, as now employed, includes not only the ancient *Insulæ Baleares* (*Major* and *Minor*), but also the *Pityusæ* or Pine Islands, as the two more western were called. The origin of the name Baleares is a mere matter of conjecture, and the reader may choose any of the derivations usually offered with about an equal chance of not being right.

Majorca is the largest island of the group, having an area of 1,430 square miles. It shape is that of a trapezoid, with the angles directed to the cardinal points; and its diagonal, from Cape Grozer in the west to Cape Pare in the east, is about sixty miles. On the northwest the coast is highly precipitous, but on the other side it is low and sloping. On the northeast there are several considerable bays, of which the chief are those of Alcuda and Pollenza, while on the southwest is the still more important bay of Palma. No fewer than twelve ports or harbors are enumerated round the island, of which may be mentioned Andraix, Soller and Porto Colom. In the northwest Majorca is traversed by a chain of mountains running parallel with the coast, and attaining its highest elevation in Silla de Totillas, 4,600 feet above the sea. Besides the towns already mentioned, Lluchmayor and Campos are places of considerable size; and the castle of Belbez near Palma, which was the former residence of the kings, is worthy of notice. Population of the island, 204,000.

Minorca, the second of the group in size, is situated twenty-seven miles east-northeast of Majorca. It has an area of 260 square miles, and extends about thirty-five miles in length. The coast is deeply indented, especially on the north, with numerous creeks and bays,—that of Port Mahon being one of the finest in the Mediterranean, if not the best o them all. "June, July, August, and Port Mahon are the best harbors of the Mediterranean." The surface of the island is uneven, flat in the south, and rising irregularly toward the centre, where the mountain El Toro has an altitude of 5,250 feet.

Iviça, Ivissza, or in Spanish, Ibiza, the *Ebusus* of the ancients, lies fifty miles southwest of Majorca, and about sixty from Cape San Martin on the coast of Spain, between 38° 50′ and 39° 8′ N. lat., and between 1° 14′ and 1° 38′ E. long. Its greatest length from northeast to southwest is about twenty-five miles, and its greatest breadth about thirteen. The coast is indented by numerous small bays, the principal of which are those of San Antonio on the northwest and of Iviza on the southeast coast. Of all the Balearic group, Iviza is the most varied in its scenery and the most fruitful. The population of the island is about 21,000, of whom 5,500 are resident in the capital.

South of Iviza lies the smaller and more irregular island of Formentera, which is said to derive its name from the production of wheat. With Iviza it agrees both in general appearance and in the character of its productions, but it is altogether destitute of streams.

Of the origin of the early inhabitants of the Balearic Islands nothing is certainly known, though Greek and Roman writers refer to Bœotian and Rhodian settlements. According to general tradition the natives, from whatever quarter derived, were a strange and savage people till they received some tincture of civilization from the Carthaginians, who early took possession of the islands, and built themselves cities on their coasts. Of these cities, Mahon, the most important, still retains the name which it derived from the family of Mago. About twenty-three years after the destruction of Carthage the Romans accused the people of the islands with piracy, and sent against them Q. Cæcilius Metellus, who soon reduced them to obedience, settled amongst them 3,000 Roman and Spanish colonists, founded the cities of Palma and Pollentia, and introduced the cultivation of the olive. Besides valuable contingents of the celebrated Balearic slingers the Romans derived from their new conquests mules (from Minorca), edible snails, *sinope*, and pitch. Of their occupation numerous traces still exist—the most remarkable being the aqueduct at Pollentia.

BALES, PETER, a famous caligraphist, and one of the first inventors of short-hand writing. He was born in 1547, and is described by Anthony Wood as a "most dexterous person in his profession, to the great wonder of scholars and others." He died in 1610.

BALFE, MICHAEL WILLIAM, musician and composer, was born, in 1808, at Limerick, in Ireland. Musical knowledge of a higher kind he never possessed, nor did he supply this want by the natural impulses of a truly refined nature. To speak of Balfe as an artist is either to misuse the word or to permit its meaning to depend on temporary successes, no matter how acquired, indeed less on the intrinsic merits of his works than on their undoubted success; and, most of all, on the fact of his being one of the few composers of British birth whose names are known beyond the island. He died in 1870.

BALFOUR, SIR JAMES, of Pittendreich, at one time lord president of the Supreme Court in Scotland, an active and unscrupulous politician during the stormy period of the reign of Mary. He died in 1583.

BALFOUR, SIR JAMES, Bart., of Denmylne and Kinnaird, an eminent annalist and antiquary, was born about 1600, and died in 1657.

BALFOUR, ROBERT, a learned Scotchman, born about the year 1550, and was for many years principal of the Guienne College at Bordeaux.

BALFROOSH, or BAKFURUSH, a large commercial town of Persia, province of Mazanderan, on the River Bhawal, which is here crossed by a bridge of nine arches, about twelve miles distant from the southern shore of the Caspian Sea, where the small town of Meshed-i-Sir serves as a kind of port.

BALGUY, JOHN, an eminent English theologian and moral philosopher, was born at Sheffield, August 12, 1686. He entered St. John's College, Cambridge, in 1702, graduated Bachelor of Arts in 1706, was ordained to the ministry in 1710, and soon after obtained

the small living of Lamesly and Tanfield in the county Durham. He died at Harrowgate, September 21, 1748.

BALI, or LITTLE JAVA, one of the Sunda Islands, in the Eastern Seas, separated from Java by the straits of the same name, which are a mile and a half wide. It is seventy-five miles in length; its greatest breadth is fifty miles. A chain of mountains crosses the island in a direction east and west, and terminates on the east in the volcanic peak Gunungagung, 12,379 feet above the sea-level. The climate and soil are the same as in Java; it has mountains of proportionate height, several lakes of great depth, and streams well fitted for the purposes of irrigation. Rice is produced in great quantities, and is even exported to Madura, Celebes, Timor, and Java. The other productions are tobacco, maize, pulses, oil, and salt; also cotton of an excellent quality. Coffee is now grown with great success; in the district of Teja Kulo alone, 150,000 trees were planted in the first four months of 1873. The inhabitants (estimated at about 800,000), though originally sprung from the same stock as those of Java, exceed them in stature and muscular power, as well as in activity and enterprising habits.

BALIOL, or BALLIOL, SIR JOHN DE, an English baron, after whom Balliol College in Oxford has been named, was the son of Hugh Baliol, of Bernard's Castle, in the diocese of Durham. His great wealth and power raised him to a prominent position in the kingdom, and he rendered good service to Henry III. in his contest with De Montfort and the revolted barons. In 1263 he endowed several scholarships at Oxford, and formed the intention of founding a college. This he did not accomplish, but after his death in 1269, his widow, Devorgille or Devorguill, carried out his design, and the foundation received the name of Balliol College. Sir John's son was the well-known John Baliol, the competitor with Bruce for the throne of Scotland.

BALISTES, or FILE FISH, a genus of bony fishes of the order of Plectognathi of Cuvier. The type of a large family, Balistidæ, the species of which are almost all inhabitants of tropical and subtropical seas, frequent rocky coasts and coral reefs.

BALKAN (the ancient *Hæmus*), a mountain range that separates the waters of the Lower Danube from those that flow into the Archipelago; or, in the more extended application of the name, the whole mountain system from the Adriatic to the Euxine. The main chain has a mean elevation of 4,000 to 5,000 feet, and rises in various parts to a height of 7,000 or 8,000. Mount Scardus attains a height of 9,700 feet.

BALKAN PENINSULA is the peninsula in south-eastern Europe running southward between the Adriatic and the Ægean. The northern boundary is the Save and the Lower Danube, though historically and politically Roumania, and some parts of the Austrian dominions are closely associated with the regions south of the Danube. Greece is a peninsula upon a peninsula, but is not usually accounted one of the Balkan States. In a general way, the Balkan Peninsula and the Balkan States cover the area of Turkey in Europe and the non-Turkish States either now or lately under Turkish suzerainty, with the exception of Roumania and Greece. The Balkans proper (ancient *Hæmus*) form the boundary between Bulgaria and Eastern Roumelia. They are highest in the west, where the mean height is 6,500 feet. The ridge is crossed by some thirty passes, of which the Skipka, between Kezanlik and Tirnova, and 4,290 feet high, is the most noted in history—especially as the scene of severe fighting in the Russo-Turkish war of 1877-78.

The following table, compiled from official returns, gives the area and population of the different parts of the Balkan Peninsula:

POLITICAL DIVISIONS.	Area in Sq. Miles.	Population.
Immediate Possessions of Turkey in Europe	63,875	4,500,000
Bulgaria (tributary principality)	24,699	2,007,919
Eastern Roumelia (autonomous province)	13,861	976,100
Bosnia, Herzegovina (in the occupation of Austro-Hungary)	23,577	1,336,091
Novi-Bazar (in the occupation of Austro-Hungary)		168,000
Total, Turkey in Europe	126,012	8,988,110
Servia (kingdom)	18,757	1,902,409
Montenegro (principality)	3,486	250,000
Total, Balkan Peninsula	148,225	11,140,529

Greece, with the aid of the Great Powers, obtained her independence in 1836, as also did Servia in 1830-67. Walachia and Moldavia (now united in the kingdom of Roumania) were made tributary principalities by the Peace of Paris, 1856. Roumania and Servia obtained their complete independence by the Berlin treaty of 1878—the former receiving the Dobrudja in exchange for a portion of Bessarabia, which was restored to Russia, the latter having its area enlarged. The same treaty handed over to Austro-Hungary the administration of Bosnia and Herzegovina.

BALKH, the ancient *Bactra* or *Zariaspa*, was formerly a great city, but is now for the most part a mass of ruins, situated on the right bank of the Adirsiah or Balkh river, in a large and fertile plain 1,800 feet above the sea. The modern name is, according to Vámbéry, the Turkish *balik*, or *balikh*, a city. The ruins, which occupy a space of about twenty miles in circuit, consist chiefly of fallen mosques and decayed buildings of sun-burnt brick. No monuments of pre-Mahometan date have been pointed out, if we except the bricks with cuneiform inscriptions which Ferrier asserts he observed; but nothing like a proper investigation of the site has yet been effected. The antiquity and greatness of the place are recognized by the native populations, who speak of it as the *Mother of Cities*. In 1220 Genghis Khan sacked Balkh, butchered its inhabitants, and leveled all the buildings capable of defense,—treatment to which it was again subjected in the fourteenth century by Timur.

BALKHASH (Kirghiz *Tingis;* Chinese *Sihai*) a great inland lake near the eastern borders of Russian Central Asia, between 44° and 47° N. latitude, and 73° and 79° E. longitude. Lying 780 feet above sea-level, it extends 323 miles west-southwest; its breadth at the west is fifty miles, at the east from nine to four miles; the area is 8,400 square miles.

BALL, JOHN, a priest who was one of the leaders in the rebellion of Wat Tyler in England in 1381.

BALL, JOHN, a Puritan divine, of whom Baxter speaks in very high terms, was born, in 1585, at Cassington, or Chessington, near Woodstock, and died in 1640.

BALL, SIR ROBERT STAWELL, LL.D., F. R. S., astronomer, was born in Dublin, July 1, 1840, and studied at Trinity College. He was appointed Lord Rosse's astronomer at Parsonstown in 1865, professor of Applied Mathematics and Mechanics at the Royal Irish College of Science in 1873; and in 1874 professor of Astronomy at Dublin, and Astronomer Royal for Ireland.

BALLADS. The word ballad is derived from the Old French *baller*, to dance, and originally meant a song sung to the rhythmic movement of a dancing chorus. Later, the word became the technical term for a particular form of old-fashioned French poetry, remarkable for its involved and recurring rhymes.

In England the term has usually been applied to any simple tale, told in simple verse, though attempts have been made to confine it to the subject of this paper,

namely, Popular Songs. By popular songs we underderstand what the Germans call *Volks-lieder*, that is, songs composed by the people, for the people, handed down by oral tradition, and in style, taste, and even incident, common to the people in all European countries. The beauty of these purely popular ballads, their directness and freshness, has made them admired even by the artificial critics of the most artificial periods in literature. Addison devoted two articles in the *Spectator* to a critique of the same poem. Montaigne praised the *naïvété* of the village carols; and Malherbe preferred a rustic *chansonette* to all the poems of Ronsard. These, however, are rare instances of the taste for popular poetry, and though the Danish ballads were collected and printed in the middle of the 16th century, and some Scotch collections date from the beginning of the 18th, it was not till the publication of Allan Ramsay's *Evergreen* and *Tea Table Miscellany*, and of Bishop Percy's *Reliques*, that a serious effort was made to recover Scotch and English folk-songs from the recitation of the old people who still knew them by heart. At the time when Percy was editing the *Reliques*, Madame de Chénier, the mother of the celebrated French poet of that name, composed an essay on the ballads of her native land, modern Greece; and later, Herder and Grimm and Goethe, in Germany, did for the songs of their country what Scott did for those of Liddesdale and the Forest. It was fortunate, perhaps, for poetry, though unlucky for the scientific study of the ballads, that they were mainly regarded from the literary point of view. The influence of their artless melody and straightforward diction may be felt in the lyrics of Goethe and of Coleridge, of Wordsworth, of Heine, and of André Chénier. Chénier, in the most affected age even of French poetry, translated some of the Romaic ballads; one, as it chanced, being identical with that which Shakspeare borrowed from some English reciter, and put into the mouth of the mad Ophelia. The beauty of the ballads and the interest they excited led to numerous forgeries. It is probable that Hogg was as great a culprit in Scotland as Prosper Mérimée with his *Guzla*, or collection of Servian imitations, in France. Editors could not resist the temptation to interpolate, to restore, and to improve the fragments that came in their way.

The vexed and dull controversy as to the origin of Scottish folk-songs was due to ignorance of the comparative method, and of the ballad literature of Europe in general. The result of the discussion was to leave a vague impression that the native ballads were perhaps as old as the time of Dunbar, and were the production of a class of professional minstrels. These minstrels are a stumbling-block in the way of the student of the growth of ballads. The domestic annals of Scotland show that her kings used to keep court-bards, and also that strollers, *jongleurs*, as they were called, went about singing at the doors of farm-houses and in the streets of towns. Here were two sets of minstrels who had apparently left no poetry; and, on the other side, there was a number of ballads that claimed no author. It was the easiest and most satisfactory inference that the courtly minstrels made the verses, which the wandering crowders imitated or corrupted. But this theory fails to account, among other things, for the universal sameness of tone, of incident, of legend, of primitive poetical formulæ, which the Scotch ballad possesses, in common with the ballads of Greece, of France, of Provence, of Portugal, of Denmark, and of Italy. The object, therefore, of this article is to prove that what has long been acknowledged of nursery tales, of what the Germans call *Märchen*, namely, that they are the immemorial inheritance at least of all European peoples, is true also of ballads. The main incidents and plots of the fairy tales of Celts, and Germans, and Slavonic and Indian peoples, their unknown antiquity and mysterious origin, are universally recognised. No one any longer attributes them to this or that author, or to this or that date. The attempt to find date or author for a genuine popular song is as futile as a similar search in the case of a *Märchen*.

There can scarcely be a better guide in the examination of the *notes* or marks of popular poetry than the instructions which M. Ampère gave to the committee appointed in 1852–53 to search for the remains of ballads in France. M. Ampère bade the collectors look for the following characteristics:—"The use of assonance in place of rhyme, the brusque character of the recital, the textual repetition, as in Homer, of the speeches of the persons, the constant use of certain numbers,—as three and seven,—and the representation of the commonest objects of every-day life as being made of gold and silver." M. Ampère might have added that French ballads would probably employ a "bird-chorus," the use of talking-birds as messengers; that they would repeat the plots current in other countries, and display the same non-Christian idea of death and of the future world, the same ghostly superstitions and stories of metamorphosis, and the same belief in elves and fairies, as are found in the ballads of Greece, of Provence, of Brittany, Denmark, and Scotland. We shall now examine these supposed common notes of all genuine popular song, supplying a few out of the many instances of curious identity. As to brusqueness of recital, and use of assonance instead of rhyme, as well as the aid to memory given by reproducing speeches verbally, these are almost unavoidable in all simple poetry preserved by oral tradition. Then there is "the league, the league, the league, but barely three," of Scotch ballads; and the τριὰ πουλακιὰ three golden birds, which sing the prelude to Greek folk-songs, and so on. A more curious note of primitive poetry is the lavish and reckless use of gold and silver. M. Tozer, in his account of ballads in the *Highlands of Turkey*, remarks on this fact, and attributes it to Eastern influences. But the horses' shoes of silver, the knives of fine gold, the talking "birds with gold on their wings," as in Aristophanes, are common to all folk-song. Everything almost is gold in the *Kalevala*, an epic formed by putting into juxtaposition all the popular songs of Finland. Gold is used as freely in the ballads, real or spurious, which M. Verkovitch has had collected in the wilds of Mount Rhodope.

Next as to talking-birds. These are not so common as in *Märchen*, but still are very general, and cause no surprise to their human listeners. The omniscient popinjay, who "up and spoke" in the Border minstrelsy, is of the same family of birds as those that, according to Talvj, pervade Servian song; as the τριὰ πουλακιὰ which introduce the story in the Romaic ballads; as the wise birds whose speech is still understood by exceptionally gifted Zulus; as the wicked dove that whispers temptation in the sweet French folk-song; as the "bird that came out of a bush, on water for to dine," in the *Water o' Wearies Well*.

In the matter identity of plot and incident in the ballads of various lands, it is to be regretted that no such comparative tables exist as Von Hahn tried, not very exhaustively, to make of the "story-roots" of *Märchen*. A common plot is the story of the faithful leman, whose lord brings home "a braw new bride," and who recovers his affection at the eleventh hour. In Scotland this is the ballad of Lord Thomas, and Fair Annie; in Danish it is Skiaen Anna. It occurs twice in M. Fauriel's collection of Romaic songs. Again, there is the familiar ballad about a girl who pretends to be dead, that she may be borne on a bier to meet her

lover. This occurs not only in Scotland, but in the popular songs of Provence (collected by Damase Arbaud) and in those of Metz (Puymaigre), and in both countries an incongruous sequel tells how the lover tried to murder his bride, and how she was too cunning, and drowned him. Another example of a very wide-spread theme brings us to the ideas of the state of the dead revealed in folk-songs. *The Night Journey*, in M. Fauriel's Romaic collection, tells how a dead brother, wakened from his sleep of death by the longing of love, bore his living sister on his saddle-bow, in one night, from Baghdad to Constantinople. In Scotland this it the story of Proud Lady Margaret; in Germany it is the song which Burger converted into Lenore; in Denmark it is Aagé und Elsé; in Brittany the dead foster-brother carries his sister to the apple close of the Celtic paradise (*Barzaz Breiz*). Only in Brittany do the sad-hearted people think of the land of death as an island of Avalon, with the eternal sunset lingering behind the flowering apple trees, and gleaming on the fountain of forgetfulness. In Scotland the chankering worm doth chide even the souls that come from where, "beside the gate of Paradise, the birk grows fair enough." The Romaic idea of the place of the dead, the garden of Charon, whence "neither in spring or summer, nor when grapes are gleaned in autumn, can warrior or maiden escape," is likewise pre-Christian.

It would not be difficult to multiply instances of resemblance between the different folk-songs of Europe; but enough has, perhaps, been said to support the position that they are popular and primitive in the same sense as *Märchen*. They date from times, and are composed by peoples who find, in a natural improvisation, a natural utterance of modulated and rythmic speech, the appropriate relief of their emotions, in moments of high-wrought feeling or on solemn occasions. Ballads sprang from the very heart of the people, and flit from age to age, from lip to lip of shepherds, peasants, nurses, of all the class that continues nearest to the state of natural men. They make music with the plash of the fisherman's oars and the hum of the spinning-wheel, and keep time with the step of the ploughman as he drives his team. The country seems to have aided man in their making; the bird's note rings in them, the tree has lent her whispers, the stream its murmur, the village-bell its tinkling tune. The whole soul of the peasant class breathes in their burdens, as the great sea resounds in the shells cast up on the shores. Ballads are a voice from secret places, from silent peoples, and old times long dead; and as such they stir us in a strangely intimate fashion to which artistic verse can never attain.

BALLANCHE, Pierre Simon, a distinguished French philosopher of the theocratic school, was born at Lyons in 1776, and died in 1847.

It is almost impossible to give a connected view of Ballanche's fundamental ideas. He belonged to the theocratic school, who, in opposition to the rationalism of the preceeding age, emphasised the principle of authority, placing revelation above individual reason, order above freedom and progress. But Ballanche made a sincere endeavor to unite in one system what was valuable in the opposed modes of thinking. He held with the theocratists that individualism was an impracticable view; man, according to him, exists only in and through society. He agreed further with them that the origin of society was to be explained, not by human desire and efforts, but by a direct revelation from God. Lastly, with De Bonald, he reduced the problem of the origin of society to that of the origin of language, and held that language was a divine gift. But at this point he parts company with the theocratists, and in this very revelation of language finds a germ of progress. Originally, in the primitive state of man, speech and thought are identical; but gradually the two separate; language is no longer only spoken, it is also written, and finally is printed. Thus the primitive unity is broken up; the original social order which co-existed with, and was dependant on it, breaks up also. New institutions spring up, upon which thought acts, and in and through which it even draws nearer to a final unity, a rehabilitation, a *palingenesis*. The volition of primitive man was one with that of God, but it becomes broken up into separate volitions which oppose themselves to the divine will, and through the oppositions and trials of this world work onward to a second and completer harmony. The history of humanity is therefore comprised in the fall from the perfect state, and in the return, after repeated trials, to a similar condition. In the dim, shadowy records of mythical times may be traced the obscure outlines of primitive society and of its fall; and this is attempted in the *Orphée*. Actual history exhibits the conflict of two great principles, which may be said to be realised in the patricians and plebeians of Rome. Such a distinction of caste is regarded by Ballanche as the original state of historical society; and history, as a whole, he considers to have followed the same course as that taken by the Roman plebs in its gradual and successful attempts to attain equality with the patriciate. On the future events through which the human race shall achieve its destiny Ballanche gives few intelligent hints. The sudden flash which disclosed to the eyes of Hebal the whole epic of humanity cannot be reproduced in language trammelled by time and space. Scattered throughout the works of Ballanche are many valuable ideas on the connection of events which makes possible a philosophy of history; but his own theory, so far as it can be understood and judged, does not seem likely to find more favor than it has already met with.

BALLARAT, or Ballaarat, a thriving Australian town, next in importance to Melbourne, in the province of Victoria. It is situated about 58 miles northwest of Geelong. It owes its rise to the discovery of the gold fields there in June, 1851, being the oldest of the considerable gold fields of Victoria. The "Welcome Nugget," the largest ever found, was discovered in 1858 at Bakery Hill. It weighed 2,217 oz. 16 dwt. The "Lady Hotham," found near Canadian Gully, weighed 1,158 oz. 2 dwt. In 1880 about 7,000 men were employed at the gold fields, 1,000 of whom were Chinese. Population (1881) Ballarat, 22,411; Ballarat East, 14,894, total, 37,260. The combined cities contain 56 churches, 477 hotels, 10,000 dwellings, 11 banks, 8 iron foundries, 13 breweries and distilleries, 3 flour-mills, a free public library, a mechanics' institute, a hospital, a "benevolent institution," a theatre and a public garden, while about sixty miles of water-mains and fifty of gas-mains have been laid down.

BALLĀRĪ [Bellary], a district in the Madras Presidency, is bounded on the N. by the Nizám's territory, from which it is separated by the Tungbhadrá river; on the E. by the districts of Kadapa and Karnul; on the S. by the Mysore country; and on the W. by Mysore, and the Bombay district of Dharwar. Its extreme length from north to south is 170 miles, and its breadth from east to west about 120 miles. The area of the district, including 145 square miles of the Sandúr State, is estimated at about 11,496 square miles; according to other returns the area is 10,857 square miles (excluding Sandúr), of which 1004 consist of barren soil, sites of villages, beds of water-courses, &c., and 9852 of lands either actually cultivated or capable of cultivation. The census of 1885 returned the population at 1,752,069, of whom 94 per cent were Hindus. It is estimated that

941,712, or 71.8 per cent. of the population, live by agriculture. The general aspect of the district is that of an extensive plateau between the Eastern and Western Ghâts, of an average height of from 800 to 1,000 feet above the sea-level. The most elevated tracts are on the west, where the surface rises toward the culminating range of hills, and on the south, where it rises to the elevated table-land of Mysore. Toward the center the surface of the plain presents a mountainous aspect, being almost treeless.

Little is known of the early history of the district. It appears to have been a portion of the ancient kingdom of Vijayanagaram, and on the overthrow of that state in 1564 A.D. by the Mahometans, the tract now forming the district of Ballári was split up into a number of military holdings, held by chiefs called Poligárs. In 1635 the Carnatic was annexed to the Bijápur dominions, from which again it was wrested in 1680 by Sivaji, the founder of the Marhattá power. It was then included in the dominions of Nizám-ul-mulk, the nominal viceroy of the Great Mughul in the Dakhin, from whom again it was subsequently conquered by Haidar Ali of Mysore. At the close of the war with Tipu Sultán, 1792, the territories which now form the Ballári district fell to the share of the Nizám of Haidarábád, by whom it was ceded to the British in 1800, in return for a force of English troops to be stationed at his capital. In 1818 the district of Ballári was constituted as it at present remains.

BALLARI, the principal town of the above district, is the chief seat of the judicial and revenue establishments, and the headquarters of the military force in the ceded districts. Population, 60,000.

BALLAST is a heavy substance employed to give a ship sufficient immersion in the water to insure her safe sailing with spread canvas, when her cargo and equipment are too light. The amount of ballast required by a ship depends not only on her size and cargo, but also on her build; some forms of construction requiring more ballast than others. The substances used as ballast are various—chiefly iron, stone, gravel, sand and water. In ships of any considerable size, or engaged in any service of importance, iron has long superseded stone, gravel, or other variety of dry ballast, but within recent years the adoption of water ballast has become very general in almost all classes of vessels. The practice of fitting vessels with double bottoms, divided into cellular spaces by continuous longitudinal keelsons and transverse bracket floors—of which the *Great Eastern* is an early and notable example—had been instituted by Mr. Scott Russell between 1850-58. The object then in view, however, was that of enhanced structural strength, but about 1874-78 several vessels were built on the north-east coast of England on the cellular-bottom system, the end in view being chiefly the carriage of water-ballast.

BALLATER, a village of Aberdeenshire, Scotland, on the river Dee, forty-two miles west from Aberdeen. In its vicinity are the medicinal wells of Pannanich, Balmoral Castle (a summer residence of Queen Victoria) and Ballatrich Farm, where Byron spent a part of his boyhood. Ballatrich is a short distance from "Lachin-y-Gair" (Lochnagar), one of the loftiest of the Grampian range, and the subject of one of Byron's most beautiful poems.

BALLENSTEDT, a city in the duchy of Anhalt-Bernburg. It is situated on the Getel in the Harz Forest, in a most picturesque district, and consists of an old and a new town. Population, 5,000.

BALLET is a word, the signification of which depends upon the century in which we find it employed. Originally derived from the Greek "to dance," it has passed through the mediæval Latin *ballare* (with *ballator* as synonymous with *saltator*) to the Italian *ballare* and *ballata*, to the French *ballet*, to the old English word *ballette*, and to *ballad*. In old French, according to Rousseau, *ballet* signifies "to dance, to sing, to rejoice;" and thus it incorporates three distinct modern words, "ballet, ball, and ballad." Through the gradual changes in the amusements of different ages, the meaning of the first two words has at length become limited to dancing, and the third is now confined to singing. But, although ballads are no longer the vocal accompaniments to dances round the maypole, our old ballads are still sung to dance tunes. The present acceptation of the word *ballet* is—a theatrical representation in which a story is told only by gesture, accompanied by music which should be characterised by stronger emphasis than would be employed with the voice. The dancing should be connected with the story, but is more commonly incidental. The French word was found to be so comprehensive as to require further definition, and thus the above-described would be distinguished as the *ballet d'action* or pantomime ballet, while a single scene, such as that of a village festival with its dances, would now be termed a *divertissement*.

The *ballet d'action*, to which the changed meaning of the word is to be ascribed, and therewith the introduction of modern ballet, has been generally attributed to the 16th century. Novelty of entertainment was then sought for in the splendid courts of Italy, in order to celebrate events which were thought great in their time, such as the marriages of princes, or the triumphs of their arms. Invention was on the rack for novelty, and the skill of the machinist was taxed to the utmost. It has been supposed that the art of the old Roman *pantomimi* was then revived, to add to the attractions of court-dances. Under the Roman empire the *pantomimi* had represented either a mythological story, or perhaps a scene from a Greek tragedy, by mute gestures, while a chorus, placed in the background, sang *cantica* to narrate the fable, or to describe the action of the scene. The question is whether mute pantomimic action, which is the essence of modern ballet, was carried through those court entertainments, in which kings, queens, princes, and princesses took parts with the courtiers; or whether it is of later growth, and derived from professional dancers upon the stage. The former is the general opinion, but an analysis of the only ballet which is known to have been printed in a complete form during the 16th century, would lead to the inference that the court entertainments of Italy and France were masques, or masks, which included declamation and song, like those of Ben Jonson with Inigo Jones for the court of James I.

The introduction of the Italian style of ballet into France was on the occasion of the marriage of the Duc de Joyeuse with Mdlle. de Vaudemont, sister to the queen. This was in 1581; and the ballet was printed in 1582, in a small folio of eighty-two leaves, with music, dialogue, engravings of the scene and of the fancy dresses, and full details of the plot. One lady of the court sang a song, two others a duet, and, again, others a chorus. Jupiter and Mercury each sang a song, but Circe and the rest spoke poetry. The king's musicians, as tritons, were the mainstays of the music; the ladies and gentlemen of the court appeared in splendid fancy dresses, and danced the entrées. The inventor of the ballet was Baltazarini Belgioioso, who had assumed the name of Baltasar de Beaujoyeux upon his appointment as first musician to Catherine de Medicis, queen dowager of France. The disuse of dialogue and of vocal music in ballet seems to have been arrived at only by degrees. At length the opinion gained ground that, in stage representations, the ac-

tions, feelings, and passions could be more faithfully, gracefully, and intelligibly expressed to the eye by pantomimic action, than it would be possible to do to the ear. The art of dramatic expression then became a greater object of study; and, perhaps, from about the middle of the last century, or in the time of Noverre, the spectators have been prepared only by a short printed summary of the story which was to be represented.

BALLINA, a seaport and market-town of Ireland, county of Mayo, 18 miles N.N.E. of Castlebar, situated on the River Moy, which is here crossed by two bridges. Population in 1871, 5551.

BALLINASLOE, a town of Ireland, province of Connaught, 91 miles W.S.W. of Dublin. The River Suck, an affluent of the Shannon, divides it into two parts; the western being in the county of Galway, the eastern in the county of Roscommon.

BALLOON. See AERONAUTICS.

BALLOT, or secret voting, has been employed in political, legislative, and judicial assemblies, and also in the proceedings of private clubs and corporations. At Athens, the dicasts, in giving their verdict, generally used balls of stone *(psephi)* or of metal *(sponduli)*. Those pierced in the centre, or black in color, signified condemnation; those unpierced, or white, signified acquittal. The boxes were variously arranged; but generally a brass box received both classes of votes, and a wooden box received the unused balls. In the assembly, cases of *privilegia*, such as ostracism, the naturalisation of foreigners, or the release of state-debtors, were decided by secret voting. The petalism, or voting by words on olive-leaves, practiced at Syracuse, may also be mentioned. At Rome the ballot was introduced to the comitia by the *Leges Tabellariae*, of which the *Lex Gabiana* (139 B.C.) relates to the election of magistrates, the *Lex Cassia* (137 B.C.) to *judicia populi*, and the *Lex Papiria* (131 B.C.) to the enactment and repeal of laws. The wooden *tabellae*, placed in the *cista*, or wicker box, were marked U. R. *(uti rogas)* and A. *(antiquo)* in the case of a proposed law; L. *(libero)* and D. *(damno)* in the case of a public trial; in the case of an election, *puncta* were made opposite the names or initials of the candidates. *Tabellae* were also used by the Roman judices, who expressed their verdict or judgment by the letters A. *(absolvo)*, C. *(condemno)*, and N. L. *(non liquet)*.

In Great Britain the ballot was suggested for use in Parliament by a political tract of the time of Charles II. It was actually used by the Scots Parliament of 1662 in proceeding on the "Billeting Act," a measure proposed by Middleton to secure the ostracism of Lauderdale and other political opponents who were by secret vote declared incapable of public office. The plan followed was this: each member of Parliament wrote, in a disguised hand, on a piece of paper, the names of twelve suspected persons; the billets were put in a bag held by the registrar; the bag was then sealed, and was afterwards opened and its contents ascertained in the Exchequer Chamber, where the billets were immediately burned, and the names of the ostracised concealed on oath. The Billeting Act was repudiated by the king, and the ballot was not again heard of till 1705, when Fletcher of Saltoun, in his measure for a provisional government of Scotland by annual Parliaments in the event of Queen Anne's death, proposed secret voting to protect members from court influence. The gradual emancipation of the British Parliament from the power of the Crown, and the adoption of a strictly representative system of election, have not only destroyed whatever reason may once have existed for the ballot in deliberative voting, but have rendered it essential that such voting should be open. It was in the agitations for parliamentary reform at the beginning of the 19th century that the demand for the ballot in parliamentary elections was first seriously made. The Benthamites advocated the system in 1817. At the Peterloo Massacre (1819) several banners were inscribed with the ballot. O'Connell introduced a bill on the subject in 1830; and the original draft of Lord John Russell's Reform Bill, probably on the suggestion of Lords Durham and Duncannon, provided for its introduction. Later on Mr. Grote became its chief supporter in the House of Commons; and from 1833 to 1839, in spite of the ridicule cast by Sydney Smith on the "mouse-trap," and on Mr. Grote's "dagger-box, in which you stab the card of your favorite candidate with a dagger," the minority for the ballot increased from 106 to 217. In 1838 the ballot was the fourth point of the People's Charter. In the same year the abolition of the land qualification introduced rich commercial candidates to the constituencies. Lord Melbourne's cabinet declared the question open. The cause, upheld by Macaulay, Ward, Hume (in his resolutions, 1848), and Berkeley, was strengthened by the Report of Lord Hartington's Select Committee (15th March 1870), to the effect that corruption, treating, and intimidation by priests and landlords took place to a large extent at both parliamentary and municipal elections in England and Ireland; and that the ballot, if adopted, would probably not only promote tranquillity at elections, but protect voters from undue influence, and introduce greater freedom and purity in voting, provided secrecy was made inviolable, except in cases where a voter was found guilty of bribery, or where an invalid vote had been given. At Manchester and Stafford in 1869, test ballots had taken place on the Australian principle as practised in Victoria — the voting cards containing the names of all the candidates, printed in different colors (for the benefit of illiterate voters), and the voter being directed to score out the names of those he did not support, and then to place the card (covered by an official envelope) in the box. It was found at Manchester that the voting was considerably more rapid, and therefore less expensive, than under the old system; that only 80 cards out of 11,475 were rejected as informal; and that, the representatives of candidates being present to check false statements of identity, and the public outside being debarred from receiving information what voters had voted, the ballot rather decreased the risk of personation. At Manchester the cards were not numbered consecutively, as is done in Victoria, so that (assuming the officials to be free from corruption) no scrutiny could have detected by whom particular votes were given. At Stafford the returning officer stamped each card before giving it to the voter, the die of the stamp having been finished only on the morning of the election. By this means the possibility was excluded of what was known in the colonies as "the Tasmanian Dodge," by which a corrupt voter gave to the returning officer, or placed in the box, a blank non-official ticket, and carried out from the booth his official card, which a corrupt agent then marked for his candidate, and gave, so marked, to corrupt voter No. 2 (before he entered the booth), on condition that he also would bring out his official card, and so on *ad libitum;* the agent thus obtaining security for his bribe, unless the corrupt voter chose to disfranchise himself by making further marks on the card.

At the close of 1870 the ballot was employed in the election of members for the London School Board, under the Education Act of that year.

In 1872 Mr. Foster's Ballot Act (35 and 36 Vict. c. 33) introduced the ballot in all parliamentary and municipal elections, except parliamentary elections for uni-

versities; and the code of procedure prescribed by the Act was adopted by the Scotch Education Board in the first School Board election (1873), under "The Education (Scotland) Act, 1872."

The ballot is used very largely in the British Colonies, and on the Continent. In South Australia, under the Constitution Act of 1856 and the Electorial Act of 1858, both the Legislative Council and the House of Assembly are elected by manhood suffrage under the ballot, the returning officer *putting his initials* on the voting card, which the voter is directed, under pain of nullity, to fold so that the officer may not see the vote which is indicated by a cross. The cards are destroyed when the poll is announced; and thus personation, though proved against certain voters for the purpose of punishing them, would not void an election, for there can be no scrutiny before the Court of Disputed Returns. Canvassing has almost disappeared. In Victoria, under the Electoral Act of 1865, both the Legislative Council and the Legislative Assembly are elected practically by manhood suffrage under the ballot, which was introduced in 1856. The officer adds to his initials a number corresponding to the voter's number on the register, and the cards are preserved till after the time for petitioning the Committee of Elections and Qualifications has expired, so that a scrutiny may take place of challenged votes. The important Road Boards under the Local Government Consolidation Act of 1869 are also elected by ballot. In Tasmania the chief peculiarity is that (as in South Australia) the card is not put directly by the voter into the box, but handed to the officer who puts it there (this being thought a security against double voting or voting with a non-official card, and also against the voter carrying away his card); here also the cards are destroyed immediately, while in New South Wales, where, as in Victoria, the voting is by scoring out and not by a cross, the cards are kept for five years. The vigorous municipal boards of these colonies are also elected by ballot, which has diminished expense and undue influence very greatly, but has not produced complete secrecy of voting.

In France, where from 1840 to 1845 the ballot, or *scrutin*, had been used for deliberative voting in the Chamber of Deputies, its use in elections to the Corps Législatif was carefully regulated at the beginning of the Second Empire by the Organic Decree of 2d February 1852. Under this law the voting was superintended by a bureau consisting of the deputy returning officer (called president of the section), four unpaid assessors selected from the constituency, and a secretary. Each voter presents a polling card, with his designation, date of birth, and *signature* (to secure identity), which he has previously got at the *Mairie*. This the president mutilates, and the vote is then recorded by a "bulletin," which is not official, but is generally printed with a candidate's name, and given to the voter by an agent outside, the only conditions being that the bulletin shall be "sur papier blanc, sans signes extérieurs, et préparé en dehors de l'assemblée." The total number of votes given (there being only one member in each electoral district) is checked by reference to "la feuille *d'appel* et inscription des votants," the law still supposing that each voter is publicly called on to vote. If the voter, when challenged, cannot sign his polling card, he may call a witness to sign for him. The following classes of bulletins are rejected: —"illisibles, blancs, ne contenant pas une désignation suffisante; sur lesquels les votants se sont fait connaître; contenant le nom d'une personne n'ayant pas prêté le serment prescrit" (*i.e.*, of a person not nominated). Only the votes pronounced bad by the bureau in presence of representative scrutineers are preserved, in case these should be called for during the "Session pour vérification des Pouvoirs." Practically the French ballot did not afford secrecy, for you might observe what bulletin the voter took from the agent, and follow him up the *queue* into the polling-place; but the determined voter might conceal his vote even from the undue influence of Government by scratching out the printed matter and writing his vote. This was always a good vote, and scrutiny of good votes was impossible. The ballot is still used in the elections to the National Assembly, but in the Assembly itself only in special cases, as, *e.g.*, in the election of a "rapporteur." Under the law of 10th August 1871, the conseils généraux (departmental councils) are elected by ballot. In Piedmont the ballot formed part of the free constitutional government introduced by Charles Albert in March 1848; it was extended to Italy in 1861. Voting for the Italian Chamber of Deputies takes place under the law of 20th November 1859, and in public halls (not booths), to which admission is gained by showing a certificate of inscription, issued by the mayor to each qualified voter. A stamped blue official paper, with a memorandum of the law printed on the back (*bolletino spiegato*), is then issued to the elector; on this he writes the name of a candidate (there being equal electoral colleges), or, in certain exceptional cases, gets a confidential friend to do so, and hands the paper folded up to the president of the bureau, who puts it in the box (*urna*), and who afterwards presides at the public "squittinio dei suffragi." No scrutiny is possible; canvassing and bribery are rare; and Cavour thought the ballot had quite nullified the clerical power, at least in Piedmont. Greece is the only European country in which the ball ballot is used. The voting takes place in the churches, each candidate has a box, on which is his name. Each box has two compartments —"Yes" and "No"—into one of which the voter drops his ball.

In the United States the ballot system has frequently been changed to meet the exigencies of the case. In a country where the ballot *is* the government, where the suffrages of the citizen cannot be dispensed with without dispensing with the organic law, the voter wishes to precisely know, before depositing his ballot, what for and for whom he has voted. To cover this point, and at the same time to absolutely secure an uninfluenced and secret ballot, what is known as the Australian, or, commonly, the "Kangaroo," ballot was invented. The origin of it seems to have been the locality indicated by the name. So great has been the desire to influence voters, to know beforehand that a given scheme would be decided upon, or a certain man elected, that the usual manipulators of elections, not including the average citizen, would have prevented, and would now if possible prevent, the adoption of any plan to frustrate that which in innumerable instances, was a means of livelihood.

But State Legislatures may not so easily withstand a public sentiment never by any means generally controlled by the professional small politician, and the sentiment in favor of the new system grew as it came to be understood until at this writing the States are adopting it one after the other, with modifications in details it is true, but leaving its essential features, which are well understood, unchanged.

To make the features and advantages of a balloting system like the Australian clear, it is necessary to understand something of the evils designed to be prevented. A custom, concealed, but well known and prevalent, was to offer the unscrupulous voter such inducements as would control his ballot. This can still be done. Men can still be induced to cast a vote for certain considerations. But it is necessary for the vote-purchaser to know that the agreement for which

the inducement or reward has been given, generally in advance, should be carried out. To this end often the ballot was prepared, the voter was accompanied to the polling-place, and it was seen that the folded ballot, and no other, was duly deposited. When this essential step in the proceedings is prevented; when it cannot be known whether the voter has actually deposited the ballot agreed upon or not, the manipulation is practically impossible among those who deal in the unreliability of a class, and with whom want of conviction or purpose, mendacity, and poverty are the recognized stock in trade.

To prevent these under-mining influences the Australian Ballot was invented. As stated, its details vary by States, but its general features remain so far as yet adopted, often with safeguards not included in the original, and it may be generally described. The ballot to be used by every voter is in custody of one of the judges of election at the polling place, and is not procurable outside, not to be found in the hands of "peddlers," and each one must be accounted for, used and unused, when the election is over.

There is but one ticket, which is printed under supervision of law, and furnished in form by the State. No other must exist under penalty. This authorized printed ticket contains in distinct order and arrangement, all names or subjects or questions to be voted for, with directions printed upon the ticket, verbally and publicly explained by the proper person when explanations are asked for.

Registration is required as a preliminary step. When the intending voter appears he must give his name and residence verbally, and his registration is then verified before he receives his ticket. Only one is given him, and with it he retires *alone* to a booth to prepare it in accordance with his intentions.

The booth is a small inclosure. The specific details of it are non-essential, so that it be private, inclosed, and contain only one voter at a time. There are in this booth to be found a writing-board or desk, a pen, ink and blotting-pad, and nothing else. The printed slip, or ticket, which the voter carries with him to this booth, is usually printed so that there is a small oval, or circle, blank in the center, at the head of each party-list. If a simple X be made within this little circle, that list of names is counted as having been voted for. If, however, the prescribed sign is not made at the head of the list, any name printed there may be marked as described, in which case that name is voted for. If the sign be made at the head of a list, and then the pen be run through a name, or names, in the list below, the list is voted for *with the exception of the names so marked*. As this, if so left, would deprive the voter of his suffrage in regard to other candidates for the same offices whom he may prefer, he is authorized to mark with the sign of approval the name of any other candidate on the list *corresponding to the ones he has marked out*.

It will be seen that thus any citizen of sufficient intelligence to read, may in a few moments cut or "split" his ticket to suit himself. He must, as he should, exercise care. His rule is that he cannot vote for two candidates for the same place, and must not, unless he desires that his vote shall be thrown out, commit this error in the marking of his ballot.

When, through mistake, the voter has spoiled his ticket, he must not attempt to correct. But he may leave his booth and return with the ballot given him to the person from whom he had it, and exchange it for a new one to be again carried to a booth and correctly made. If, however, he renders his ballot unintelligible or illegal without knowing he has done so, and so places it in the ballot-box, it must necessarily be thrown out at the final count.

These, in general terms, are the essential features of the Australian ballot, and so long as they are adhered to in statutes now in force or yet to be passed, all old and accustomed forms of fraud and pre-manipulation would seem to be almost impossible.

BALLSTON SPA, the capital of Saratoga county, N. Y., is situated six miles southwest of Saratoga Springs and thirty-two miles from Albany. It contains two national banks, two newspaper offices, and manufactures of paper, cotton and woolen goods, sash, doors and blinds, axes and scythes. The town has several mineral springs, much patronized by visitors in the season, when the population increases to over 5,000.

BALLYCASTLE, a seaport town of Ireland, county Antrim, situated on a bay opposite Rathlin island. The town is well built, consisting of two parts, about a quarter of a mile asunder, and connected by a fine avenue. Towards the close of the 18th century, one of the Boyd family devoted himself to the extension and improvement of the town, establishing manufactures, endowing charities, and building churches, and succeeded in producing a temporary vitality. Upwards of £150,000 is said to have been expended upon the pier and harbor; but the violence of the sea overthrew the former, and the latter has been filled with sand.

BALLYSHANNON, a seaport and market-town of Ireland, county of Donegal, situated at the mouth of the Erne. The river is here crossed by a bridge of fourteen arches, which connects the town with the suburb of Purt. Below the bridge the river forms a beautiful cascade, 150 yards wide, with a fall at low water of 16 feet. The harbor is a small creek of Donegal Bay, about 600 yards long and 350 yards broad, and is only accessible to small vessels. Population, 3,000.

BALMEZ, JAIME LUCIEN, a Spanish ecclesiastic, eminent as a political writer and a philosopher, was born at Vich in Catalonia, on the 28th August 1810, and died there on the 9th July 1848.

BALMORAL CASTLE, a residence of her Majesty Queen Victoria, on the right bank of the River Dee, about 9 miles above Ballater and 50 miles from Aberdeen. The property, which now consists of upward of 10,000 acres, besides a large tract of hill ground, belonged in its original extent to the Farquharsons of Inverey, by whom it was sold to the Earl of Fife. In 1848 it was leased by the late Prince Consort, and in 1852 was finally purchased for a sum of £32,000. The castle, which was erected at Prince Albert's private expense, is of the Scotch baronial style of architecture.

BALNAVES, HENRY, a Scottish Protestant, born at Kirkcaldy in Fife, in the reign of James V., and educated at the university of St. Andrews. There is some doubt both as to the exact date of his birth, which has been fixed as 1520, and as to the rank in society to which he belonged. He completed his studies on the Continent, and, returning to Scotland, entered the family of the Earl of Arran, who at that time was regent; but in the year 1542 the earl dismissed him for embracing the Protestant religion. In 1546 he was implicated in the murder of Cardinal Beaton, at least he is known to have taken refuge with the conspirators in the castle of St. Andrews; and when they were at last obliged to surrender to the French, he was sent with the rest of the garrison as a prisoner to France. During his confinement at Rouen he wrote the work entitled *Confession of Faith*, to which Knox added marginal notes and a preface; but it was not published till 1584, five years after his death. He returned to Scotland about the year 1559, where he died (in the city of Edinburgh) in 1579.

BALSAM, an oleo-resin or natural compound of resin and essential oil, in such proportions that the substance is in a viscous or semi-fluid condition. The gradations from a solid resin to a limpid essential oil are insensible, and most resins have a balsamic consistency on their exudation, only hardening by exposure to air. It has been proposed to limit the name balsam to such substances as contain cinnamic or an analogous acid in addition to the volatile oil and resin which turpentines contain alone; but this distinction has not been carried out.

The fragrant balsams which contain cinnamic or benzoic acid may, however, be regarded as a distinct class, allied to each other by their composition, properties, and uses. Those of this class found in commerce are the balsam of Peru, balsam of Tolu, liquid storax, and liquidambar. *Balsam of Peru* is the produce of a lofty leguminous tree, *Myrospermum peruiferum*, growing within a limited area in San Salvador, Central America, but now introduced into Ceylon. It is a thick, viscid oleo-resin of a deep brown or black color and a fragrant balsamic odor. It has been analysed by Kachler, who thus states its percentage composition,—cinnamic acid 46, resin 32, benzylic alcohol 20. It is used in perfumery, and in medicine as a stimulant application to indolent sores, as well as internally for asthma and pectoral complaints. *Balsam of Tolu* is likewise produced from a species of *Myrospermum*, *M. toluiferum*. It is of a brown color, thicker than Peru balsam, and attains a considerable degree of solidity on keeping. It also is a product of equatorial America, but is found over a much wider area than is the balsam of Peru. Tolu balsam consists of a combination of inodorous resin with cinnamic acid, no benzoic acid being present in it. It is used in perfumery and as a constituent in cough syrups and lozenges. *Liquid storax* is a balsam yielded by *Liquidambar orientalis*, a native of Asia Minor. It is a soft resinous substance, with a pleasing balsamic odor, especially after it has been kept for some time. It contains a principle — styrol or cinnamene — to which it owes its peculiar odor, besides cinnamic acid, stryacin, and a resin. Liquid storax is used in medicine as an external application in skin diseases, and internally as an expectorant. An analogous substance is derived from *Liquidambar Altingia* in Java., *Liquidambar balsam* is derived from *Liquidambar styraciflua*, a tree found in the United States and Mexico. It contains cinnamic acid, but is destitute of benzoic acid.

Of balsams entirely destitute of cinnamic and benzoic constituents the following are found in commerce:— *Mecca Balsam* or *Balm of Gilead*, yielded by the *Balsamodendron Berryi* (*B. gileadense* of De Candolle), a tree growing in Arabia and Abyssinia, is supposed to be the balm of Scripture and the *βάλσαμον* of Theophrastus. When fresh it is a viscid fluid, with a penetrating odor, but it solidifies with age. It was regarded with the utmost esteem among the nations of antiquity, and to the present day it is peculiarly prized among the people of the East. *Balsam of Copaiba* or *Capivi* is a fluid oleo-resin of a pale brown or straw color, produced from several trees of the genus *Copaifera*, growing in tropical America. It possesses a peculiar odor and a nauseous persistent tarry taste.

Canada Balsam.—The oleo-resins obtained from coniferous trees are usually termed turpentines, but that yielded by *Abies balsamea* is known in commerce as Balsam of Canada. It is a very transparent substance, somewhat fluid when first run, but thickening considerably with age, possessed of a delicate yellow color, and a mild terebinthous odor. According to Flückiger and Hanbury it contains 24 per cent. of essential oil, 60 per cent. of resin soluble in alcohol, and 16 per cent. of resin soluble only in ether. It has been used for the same purposes as copaiba, but its chief uses are for mounting preparations for the microscope and as a varnish.

BALTA, the chief town of a circle of the same name in the Russian government of Podolia. Population, 25,000.

BALTARD, Louis Pierre, a distinguished French architect and engraver, was born at Paris in 1765, and died in 1846.

BALTIC PROVINCES (in Russia). This term, in a wider sense, comprehends the five Russian governments bordering on the Baltic, viz., Courland, Livonia, Esthonia, Petersburg, and Finland; in a restricted sense it often designates the first three. The Baltic provinces once belonged to Sweden, except Courland, which was a dependency of Poland. They came into the possession of Russia partly in the beginning of the eighteenth century, through the conquests of Peter the Great, partly under Alexander in 1809. The three Baltic governments strictly so called have an area of 36,500 square miles, and (1889) a population estimated at 2,225,000.

BALTIC SEA. The name by which this inland sea is commonly designated is first found in the 11th century, in the work of Adam of Bremen, entitled *Cherographia Scandinaviæ*. The derivation of the word is uncertain. It seems probable that, whatever may be the etymology of the name *Baltic*, that of the Great and Little *Belts* is the same. The Swedes, Danes, and Germans call it the *Ossee* or East Sea.

The Baltic is enclosed by Sweden, Russia, the German empire, and Denmark; and it communicates with the North Sea, by the winding channel which lies between the southern part of the Scandinavian peninsula and the northern peninsula of Schleswig and Jutland. The first part of this channel is in great measure blocked by the islands of Zealand and Fünen, so as to form the three narrow passages which are known as the Sound (between Sweden and Zealand), the Great Belt (between Zealand and Fünen), and the Little Belt (between Fünen and Jutland). Each of these forms a distinct communication between the Baltic and the Cattegat, which is the open portion of the channel lying between the coast of Sweden and the eastern side of Jutland; while the Cattegat opens freely into the Skager Rack, which is the continuation of same open channel, between the southern end of Norway and the north-west coast of Jutland, into the North Sea.

The length of the Baltic Sea, from Swinemünde in the S. to Tornea in the N., is nearly 900 miles; and its greatest width, between Karlscrona and Memel, exceeds 200 miles. Its whole area, including the Gulfs of Bothnia and Finland, is about 160,000 geographical square miles. It runs first in an easterly direction as far as Memel, a distance of 300 miles, and then northwards a distance of 350 miles, at which point it separates into two great gulfs. One of these, the Gulf of Finland, runs nearly due E.; the other, the Gulf of Bothnia, almost N. The Gulf of Bothnia is 400 miles in length, with an extreme breadth of 120 miles, but where narrowest it does not exceed 40 miles. The archipelago of Aland lies at its entrance. The Gulf of Finland is 280 miles in length, with a mean breadth of 60 or 70 miles.

The depth of the Baltic rarely exceeds 100 fathoms — being greatest between the island of Bornholm and the coast of Sweden, where it reaches 115 fathoms, and least in the neighborhood of the mouths of large rivers, which bring down a great quantity of earthy matter, especially in the spring, so that in many parts the bot-

tom is being so rapidly raised by its deposit that the mouths of rivers formerly navigable are now inaccessible. This is especially the case in the northern part of the Gulf of Bothnia, above Quarken, where several tracts are now dry land which were once water; and also in the neighborhood of Tornea, where meadows now take the place of waters which were traversed in boats by the French Academicians, when they were measuring an arc of the meridian. Along the southern coast the shallowness of the harbors is a great obstacle to navigation, especially since they are closed by ice for nearly one-third of the year. On the western side it is not more than 15 fathoms deep; and, in general, it is only from 8 to 10 fathoms. On the S. it nowhere exceeds 50 fathoms. The Gulf of Finland suddenly shallows from 50 or 60 fathoms to 5, or even less. The average depth of the Gulf of Bothnia is not greater than that of the rest of the sea. Numerous rocky islands and reefs, many of them level with the water, render the navigation of this sea extremely dangerous.

The shore of the Baltic is generally low. Along the southern coast it is for the most part sandy,—with sand-banks outside, and sand-hills and plains inland. Where streams come down, there are often fresh-water lakes termed *haffs*, which are separated from the sea by narrow spits called *nehrungs*. Two of these *haffs* are of great extent; one of them, termed the Frische Haff, lies between Danzig and Königsberg, which last town is situated on the part of it most remote from the sea; the other, termed the Kurische Haff, lies between Königsberg and Memel, the latter town being situated on the channel connecting the haff with the sea. Near the entrance to the Gulf of Finland the coast becomes rocky, and continues to be so for the most part around the gulfs both of Finland and Bothnia, except towards the head of each; the rocks, however, are never high. The shores of the southern part of the Swedish peninsula are mostly high, but not rocky; at Stockholm, however, there is an archipelago of rocky islands, on some of which the town is partly built.

Drainage Area.— The Baltic may be considered as the estuary of a great number of rivers, none of them individually of great size, but collectively draining a very large area, which is estimated at about 717,000 square miles, or nearly one-fifth of the entire area of Europe. This great drainage area is remarkable for the small proportion of its boundary that is formed by mountains or high table-lands,—its greater part consisting of land of no considerable elevation, which slopes down very gradually to its coast-line, and of which a large proportion is covered by lakes. This is especially the character of the drainage area of the Neva, whose waters are immediately derived from the large shallow Lake Ladoga, which receives the contributions of numerous other lakes, Onega being the largest, though Lake Saima in Finland, with its irregular prolongations, is scarcely less extensive. The entire surface drained by the Neva is estimated at about 100,000 square miles, or nearly twenty times that of the drainage area of the Thames. Through Lake Onega, the Neva is connected with the Dwina and the Volga by canals, through which small vessels can pass from the Baltic into either the White Sea or the Caspian. The Duna or South Dwina, which discharges itself into the Gulf of Riga, is another important river, draining an area of about 35,000 miles in West Russia, and having a length of 520 miles, of which 405 miles are navigable. The drainage area of the Niemen, which enters the Baltic at Memel, is conterminous with that of the Duna, and is of about the same extent; the river is navigable for more than 400 miles from its outlet, and communicates with the Dnieper by a canal through which vessels can pass from the Baltic to the Black Sea. The Vistula, which receives the waters of the whole area of Russian and Prussian Poland, flowing past Warsaw into the Baltic at Dantzig, is a very large and important river, having a length of 520 miles, of which 430 are navigable, and a drainage area of 72,000 square miles. And the Oder, rising in the hill districts of Silesia, drains the extensive level areas of Brandenberg and Pomerania, and discharges into an estuary, that may be said to begin from Stettin, the water drawn from an area of 45,000 square miles. Numerous rivers discharge themselves into the Gulf of Bothnia, bringing down water from the mountain ranges of Sweden and Norway; but their course is comparatively short and direct, with few tributaries, so that, individually, they do not attain any great size. The drainage of the more level southern portion of Sweden is for the most part collected by the great lakes of Wener, Wetter, and Mälar, of which the first pours its waters into the North Sea, and the others into the Baltic. By means of a canal joining Lakes Wener and Wetter vessels can pass directly from the Cattegat into the Baltic.

Climate.— It is not only, however, the extent of its drainage area, but the large proportion borne by the rain and snow which fall upon that area to the amount dissipated by evaporation from its surface, that goes to swell the aggregate of fresh water poured into the basin of the Baltic; for there is probably no inhabited region of the whole globe over which so large a quantity of snow falls, in proportion to its area, as it does in the countries round this basin. They receive, direct from the Atlantic, a vast amount of moisture brought by its west and south-west winds; and even the winds which have already passed over the low plains of Jutland and Northern Germany will have parted with little of their moisture before reaching the Baltic provinces of Russia. When these vapor-laden west and south-west winds meet the cold dry east and north-east winds of Siberia, their moisture is precipitated, in summer as rain, and in winter as snow; and owing to the prevalence of a low atmospheric temperature through a large part of the year, the proportion lost by evaporation is extremely small as compared with what passes off from other inland seas. The large excess of the amount of fresh water discharged into the basin, over that which passes off by evaporation from its surface, is indicated by its low salinity, which, however, varies considerably in its different parts and at different seasons of the year. The temperature of the Baltic is remarkable for its *range*, which is rather that of a terrestrial than of a marine area — this being doubtless owing in great degree to the fact that its shallowness and the low salinity of its water allow a large part of its surface to be frozen during the winter. Nearly the whole of the Gulf of Bothnia, with the land enclosing it on both sides, lies between the January isotherms of 10° and 20° — the former crossing it near its head, and the latter near its junction with the Baltic proper; and the whole of the Baltic proper, with the land enclosing it on the east, south, and west, lies between the January isotherms of 20° and 30°. On the other hand, the July isotherm of 60°, which crosses England near the parallel of 54° passes across the Gulf of Bothnia near the Walgrund Islands, almost 9° further north; and the whole of the Baltic proper, with the Gulf of Finland and the southern part of the Gulf of Bothnia, lies between the July isotherms of 60° and 65°. Thus the range between the *mean summer* and *mean winter* temperatures, which is only about 20° in the British Islands, is about 40° over the Baltic area. The *mean annual* temperature of the Gulf of Bothnia ranges between 30° at its northern extremity and 40° at its southern, while that of the Baltic

ranges from 40° at its northern boundary to about 46° at its southern.

Formation and Transportation of Ice.— The greater part of the Gulfs of Bothnia and Finland is usually frozen over during the winter, the formation of ice beginning at the head and extending downwards. Masses of ice, conveyed by the currents into the Baltic proper, freeze together as the winter advances, and form vast fields, generally extending on the east side as far south as the islands of Dagö and Oesel, and on the west to the south of Stockholm. It happens sometimes, though rarely, that large portions of the Baltic proper are continuously frozen over; but navigation is usually interrupted by the blocking up of its bays and harbors with ice, from the latter part of December to the beginning of April. The freezing of the Gulfs of Bothnia and Finland begins earlier and ends later.

The curious phenomenon of *the formation of bottom-ice*, and its rise to the surface, is more frequently seen in the Baltic and the Cattegat than in the open ocean,— chiefly, it seems probable, on account of the shallowness of these seas. It has been particularly observed by Prof. Nilsson in the Cattegat, off Kullen Point, near the southern extremity of Sweden; but according to Chydenius it is very common in various parts of the Baltic, having been especially noticed by the fishermen off the Aland Islands. In calm winter weather, water of from 4 to 8 feet deep is often covered in a very short time with small plates of ice, mostly circular in form, varying in diameter from 1 to 5 inches, and having a uniform thickness which never exceeds two lines. These plates can be seen coming up from below, rising edgeways towards the surface, often with such force as to lift themselves three or four inches out of the water. When they come up in great numbers they are often piled one upon another, and are then usually soon broken, by the action either of waves or of currents, into small pieces, which unite again by regulation so as to form irregular cakes of ice; and these, as soon as the water becomes tolerably still, cohere into a continuous rough sheet. But it sometimes happens that if the plates come up more sparsely, and the weather is very still and cold, they remain unbroken, and the diameter of each increases, sometimes to two feet or even more. When fishermen notice these ice-plates coming up from below in large quantities, they at once make for land, as they know they might otherwise be soon completely ice-bound. The same thing appears to happen in polar seas in the shallow water near land.

It does not seem very clear in what way this formation of bottom-ice is to be accounted for. Bottom-ice has often been noticed in fresh-water lakes and streams; and large plates have been seen to rise to the surface, sometimes with force enough to bring up stones of considerable size,— in one instance a heavy iron chain. In these cases it would seem that the motion of the bottom-water over roughened surfaces contributes to its congelation. And in the shallow water near the sea-shore, stones and sea-weeds may be seen covered with ice, like the hoar-frost on trees, before any ice forms on the surface. It is to be remembered that *sea*-water increases in density down to its freezing point, so that the water cooled at the surface will always go down, the deepest stratum being thus the coldest. And thus, although no lower temperature can be carried down by the water than that to which it has been subjected at the surface, the water that does not freeze at (say) — 2° 5 C. when lying upon water, changes into ice when it comes in contact with the irregular solid bottom, perhaps on account of the more ready dissipation, under the latter circumstances, of the heat set free in the act of congelation.

When ice forms over the shallow bottoms which border parts of the Gulfs of Bothnia and Finland, large blocks of stone are frequently frozen into it; and these, being lifted when the water rises in the early summer, are often transported by currents to considerable distances, finally subsiding again to the bottom when the ice melts. In this manner a deposit of rocky fragments, some of them 6 or 8 feet across, is being formed at the bottom of the Baltic outlets; as is known from the fact, that sunken ships which have been visited by divers in the Sound and in Copenhagen roads have been found covered with such blocks within no very long period. It not unfrequently happens, moreover, that sheets of ice with included boulders are driven up on the coast during storms, and are thus carried some way inland, being sometimes packed to a height of even 50 feet. The diminution which has been noticed from time to time in the depth of the channels, and the appearance above water of what were formerly regarded as sunken rocks or reefs, have been regarded as concurring with other evidence to prove that a general rise of land is now going on over this area. But it seems probable, from what has now been stated, that the increase of height and dimensions which has been observed in the reefs and inlets of the skär during the last half century, may be adequately accounted for by the action of ice, which has piled up (generally on a basis of *fixed* rock) accumulations of transported *débris*.

Early in the last century the Swedish physicist Celsius (to whom we owe the invention of the centigrade scale) formed the opinion that the waters both of the Baltic and of the North Sea were gradually subsiding; and this opinion, though controverted by other authorities, was embraced by Linnæus. It is now clear that many of the facts by which it was supported are explicable by the transporting agency of rivers and of ice, as already explained; and it was pointed out by Playfair in 1802, that even admitting the proofs on which Celsius relied, they would rather show that the land is rising, than that the water is receding. During the present century a great deal of attention has been given to this question, on account of its geological interest, by many very able observers; and the results may be briefly summarised as follows: — (1.) An elevation of the whole of Norway, from the North Cape to the Naze, has taken place within a comparatively recent period, — as is evidenced by the numbers of raised beaches containing existing shells, which are found at different points along the western coast, frequently at a height of 200 feet above the present sea-level, and in some spots at a height of more than 600 feet. As these beaches, where one lies above another, are not always parallel, it appears that the elevatory action did not take place equally over the whole area; and the movements were probably intermittent, with long pauses between. (2.) At various points along the coast of the Baltic and the Gulf of Bothnia, alike in Sweden and in Finland, similar collections of shells have been found, belonging to species now inhabiting the basin, and characterised by the peculiar *facies* to be presently noticed as distinguishing its molluscan fauna from that of the ocean. Such deposits have been found very far inland, and at a height of 230 feet above the sea. Hence it appears that before this upheaval took place, the Baltic must have been separated, as now, from the North Sea by the mountain ridge of Norway, although it extended over a considerably larger area of what is at present low-lying land. (3.) Notwithstanding the numerous observations which have been made with a view to ascertain whether any change of level is now going on, the question must be regarded as still undetermined. Little reliance can be placed on occasional comparisons of the height of marks made upon rocks above the sea-level, since,

although there are no tides, the height of the water in the basin is subject to considerable variations, from causes to be presently explained. (4.) There is a good deal of evidence, on the other hand, that, towards the southern extremity of Sweden there has been a *depression* of the land since the historic period. In this portion, known as Scania, no elevated beds of recent marine shells have been met with; in its seaport towns there are streets now at or even below the level of the water, which must have been above it when first built; and a large stone whose distance from the sea was measured by Linnæus, in 1749, was found 100 feet nearer the water's edge when its distance was again measured in 1836. Near Stockholm, again, a fishing-hut, with remains of boats of every antique form and construction, was found, in 1819, at a depth of 60 feet, covered over with gravel and shell-marl; and it was considered by Sir C. Lyell to be impossible to explain the position of this hut without imagining first a subsidence to the depth of more than 60 feet, and then a re-elevation. On the whole, it appears clear that oscillations of level, not uniform either in direction or degree, have taken place in various parts of the Scandinavian peninsula within a recent period, whilst in regard to the continuance of any such changes at the present time we have no certain knowledge, though it is considered probable by many of the most distinguished *savans* both of Sweden and Norway.

The fauna of the Baltic may be regarded as that of a large estuary, having a narrow communication with the sea,—its marine inhabitants being such as can adapt themselves to considerable variations in the salinity of its water. Whales rarely enter the Baltic; but porpoises frequent the neighborhood of the Danish islands. Seals are obtained in considerable numbers at the breaking up of the ice around Gottland and the Aland Isles. The salmon is among the most abundant fishes of the Baltic proper, ascending its rivers from April to June; and salmon-trout are caught in some of its bays.

BALTIMORE, in Maryland, the seventh largest and one of the most flourishing cities in the United States, is situated on the north side of the Patapsco River or Bay, 14 miles above its entrance into the Chesapeake, 37 miles N. E. of Washington, and 100 S. W. of Philadelphia. The natural advantages of this position were long overlooked by the settlers in the vicinity of the Chesapeake; and it was only in 1729 that they directed their attention to the place, and laid out a plan of the town. At that time a part of it was under cultivation as a farm, but all the rest was a wilderness. For some years its growth was by no means rapid, as it had to contend with all the obstacles that could be thrown in its way by the jealousy of older rivals. From an authentic sketch of Baltimore made in the year 1752, it appears that it then contained about twenty-five houses, only four of which were built of brick, the rest being of a more primitive structure. In 1768 it became the county town; and in 1775, according to a census then taken, it contained 564 houses, and 5934 inhabitants. From this time it rose rapidly into importance; and in 1780 became a port of entry, when a custom-house was opened. Previous to this all vessels trading to and from the port had to be entered, cleared and registered at Annapolis. In December 1796 it obtained an act of incorporation. By the census of 1890 Baltimore contained 434,151 inhabitants.

The city is splendidly situated on slightly undulating ground, and extends about 4½ miles from E. to W., and 3½ from N. to S., covering an area of 10,000 acres. It is divided into two nearly equal parts by a small stream called Jones's Falls, crossed by a number of bridges. The division east of the falls is nominally subdivided into two parts—Fell's Point and Old Town. The former, the most easterly part of the town, is the principal resort of seamen, and is the place where the shipbuilding and manufactures are principally carried on. The Old Town lies to the N. and W. of this. The portion west of the Falls is likewise divided into two parts, the city proper and Spring Garden. The former is the centre of trade, and the residence of the more wealthy inhabitants; while the latter, which is the extreme south-western quarter, and the lowest and most unhealthy portion of the city, is inhabited by the poorer classes. Baltimore contains about 200 churches, and has three universities, several colleges, 122 public schools, a state normal school, a manual labor school, besides numerous private schools and academies, an academy of art and science, an infirmary, hospitals, asylums, dispensaries, &c., three theatres, an opera-house, a museum, and many fine public buildings. The most imposing building in the city is the new city hall, one of the finest structures of the kind in the country. It occupies an entire square of ground, an area of about 26,000 square feet, near the centre of the city, and contains the various municipal offices. The style of architecture is the Renaissance, of which it is a fine specimen. The entire outer facing of the walls, the portico, and all the ornamental work, are of white Maryland marble; the inner walls and floors are of brick, and are fire-proof. It is four stories high, surmounted by a Mansard roof of iron and slate, with a dome and tower of iron on a marble base, rising to the height of 240 feet. The interior is very finely finished. It was begun in 1867, and cost about $2,600,000. Another important public building is that of the Peabody Institute, founded by the late George Peabody, Esq. of London, and endowed by him to the amount of $1,400,000. It has provisions for a public library, a gallery of art, and a conservatory of music, also for lectures and musical performances. It was incorporated in 1857. One wing of the building, which is immediately contiguous to the Washington monument, is completed, and the remainder is in progress. The completed wing is faced and ornamented with white marble, in a simple but massive and imposing style, and contains the library of over 56,000 volumes (1875), and a hall for lectures, concerts, &c. The new postoffice is a splendid structure, built of granite, and recently completed. The Johns Hopkins University is another imposing edifice, built by the legacy of the late Johns Hopkins. There are also several grain and coal elevators, and numerous magnificent hotels. Baltimore has several splendid monuments, which have acquired for it the name of "the Monumental City." The largest of these, erected to the memory of Washington, stands on an eminence of 150 feet, and has, with its base, an altitude of 200 feet. It is of white marble; the base is 50 feet square, and 24 feet in height, surmounted by a Doric column 25 feet in diameter at the base, with a spiral staircase in its interior, and on the summit is a statue of Washington, 13 feet high. The "Battle Monument," also of white marble, was erected by public subscription in 1815, to the memory of those who had fallen in defence of the city in the previous year. It is 52 feet high; the base is of Egyptian architecture; the column is in the form of a bundle of Roman faces, upon the bands of which are inscribed the names of those whom it commemorates; and the whole is surmounted by a female figure, the emblematical genius of the city. The city is supplied with water from Lake Roland, an artificial lake about 8 miles north of the city, of a capacity of 500,000,000 gallons, and from three other reservoirs, with an aggregate storage capacity of about 580,000,000 gallons, the common source of supply being Jones's Falls. There are also

numerous public springs and fountains throughout the town. Baltimore has a number of parks and public squares, chief of which is Druid Hill Park, a tract of 700 acres on the extreme north-west of the city, possessing more natural beauties than any other in the United States.

The manufactures and commerce of Baltimore are very extensive and flourishing. There is scarcely a branch of industry that is not prosecuted to some extent in the city or its vicinity. Among these are shipbuilding, iron and copper works, woolen and cotton manufactures, pottery, sugar-refining, petroleum refining, distilling, saddlery, agricultural implement-making, cabinet, tanning, &c. In the vicinity of Baltimore is found the finest brick clay in the world, of which more than 100,000,000 bricks are made annually. The Abbot Iron Works in the eastern part of the city has one of the largest rolling mills in the United States. An industry peculiar to Baltimore is the packing of oysters in air-tight cans for shipment to all parts of the world. The oysters are taken in Chesapeake Bay. Fruits and vegetables are also packed in the same way, the entire trade consuming from twenty to thirty million cans annually. This city is one of the greatest flour markets in the Union, and has a large export trade in tobacco. There are twenty-six banks, and seven savings-banks; seventeen fire and marine and three life insurance companies, besides many agencies for other companies. The harbor, which consists of three parts, is excellent. Its entrance, between Fort M'Henry and the lazaretto, is about 600 yards wide, with 23 feet of water. This depth is continued with an increased width for a mile and a quarter to near Fell's Point. The entrance to the second harbor is opposite Fell's Point, where the width is contracted to one-fourth of a mile, with a depth of 16 feet. Above this entrance it widens to an ellipse of a mile long, half a mile broad, and 15 feet deep. The third, or inner harbor, has a depth of 14 feet, and penetrates to near the centre of the city. Vessels of the largest class can lie at the wharves near Fell's Point, Locust Point, and Canton, and those of 500 tons can come into the inner harbor. The harbor is defended by Fort M'Henry. Opposite Fort M'Henry is Fort Carroll, a solid masonry structure, designed to aid in defense of the harbor, but which was abandoned on account of the sinking of the foundation.

A dozen important lines of railroad center at Baltimore, notable among which is the Baltimore and Ohio railroad, the oldest in the country. The city has also a very extensive coastwise trade. Intramural communication is afforded by numerous lines of street railroads. Baltimore is of considerable historic interest. It was incorporated as a city almost a century ago. In the war of 1814 the British bombarded Fort McHenry, and made an attempt to capture the city, but were defeated, and their commander, General Ross, was killed. It was on this occasion that Key wrote the "Star Spangled Banner."

At the outbreak of the Civil war there was considerable doubt as to which side Maryland would cast her fortunes with. Being a slave State, and having its social and commercial connections chiefly with the South, the presumption was that it would join the Confederacy. Baltimore contained in those days, like most busy seaports, a class of loafers and thugs, known locally as "plug-uglies." Impelled possibly by their Southern proclivities, but more probably by their inborn desire for deviltry, a mob of this class attacked a Massachusetts regiment which, in April, 1861, was passing through Baltimore on its way to Washington. The volunteers replied with volleys of musketry, and some of the rioters were killed. A few days later General Butler occupied the city, and Maryland remained in the Union.

BALUCHISTAN, a maritime country of Asia, whose coast is continuous with that of the northwestern part of the Indian Peninsula. It is bounded on the N. by Afghanistan, on the E. by Sindh, on the S. by the Arabian Sea, and on the W. by Persia. Baluchistan has an area of 106,500 sq. miles, its extreme length from E. to W. being 500 miles, and its breadth 370.

The outline of the sea-coast is in general remarkably regular, running nearly due E. and W., a little N. from Cape Monze, on the border of Sindh, to Cape Jewnee, on the River Dustee. It is for the most part craggy, but not remarkably elevated, and has in some places, for considerable distance, a low sandy shore, though almost everywhere the surface becomes much higher inland. The principal headlands, proceeding from E. to W., are Cape of Monze or Ras Moarree, which is the eastern headland of Sonmeanee Bay; Goorab Sing; Ras Arubah; Ras Noo, forming the western headland of Gwadel Bay, Ras Jewnee, forming the eastern point of Gwadur Bay, and Cape Zegin at its western extremity. There is no good harbor along the coast, though it extends about 600 miles; but there are several roadsteads with good holding-ground, and sheltered on several points. Of these the best are Sonmeanee Bay, Homara, and Gwadur. On the latter are situated a small town and a fort of the same name, and also a telegraph station of the Indo-European line.

Of the early history of this portion of the Asiatic continent little or nothing is known. The poverty and natural strength of the country, combined with the ferocious habits of the natives, seem to have equally repelled the friendly visits of inquisitive strangers and the hostile incursions of invading armies. The first distinct account which we have is from Arrian, who, with his usual brevity and severe veracity, narrates the march of Alexander through this region, which he calls the country of Oritæ and Gadrosii.

The country derives its name from the Baluches, but the Brahoes are considered the dominant race, from which the ruler of the country is always selected. From whatever quarter these may have arrived, they eventually expelled, under their leader Kumbur, the Hindu dynasty, which at that time governed the country, and conquered Baluchistan for themselves. The Baluches are a quite distinct race, and must have arrived in this country at a subsequent period, probably in small bodies, some of which may have come from Syria or from Arabia; in proof of this the Kyheree, for instance, possess a remarkably handsome breed of horses showing unmistakable Arab blood. Anyhow, so marked is the social distinction between Baluch and Brahoe, that when the khan assembles his forces for war the latter tribes demand, as their right, wheaten flour as a portion of their daily rations, while the Baluch tribes are only entitled to receive that made from a coarse grain called jowar. There is also a Persian colony known as the Deliwars; and a considerable number of Hindus, who appear to have been the first settlers in the Brahoe mountains on their expulsion from Sindh, Lus, Mekran by the caliphs of Baghdad.

Taking a general view on the subject of the original inhabitants of Baluchistan, we may conclude that they have, from a very early date, been reinforced by emigration from other countries, and from stragglers dropped from the hosts of the numerous conquerors, from Alexander to Nadir Shah, who have passed and repassed through Baluchistan or its neighborhood on their way to and from India. Thus we find the Saka tribe located on the plains of Gressia, on the borders of Mekran, the ancient Gedrosia, and still further to the west, the Dahoe. These tribes are on the direct line of Alexander's march; and we know that tribes of this name from

the shores of the Caspian accompanied his army. In Sarawan we find the Sirperra, and Pliny tells us that a tribe called Saraparæ resided near the Oxus. Further, on the Dushti-be-doulets, a plain at the northern entrance of the Bolan Pass, we find the Kurds, a name, again, familiar as that of the celebrated and ancient nation. The names of numerous other tribes might be cited to support this view, but it would require too much space to follow up the subject. Both Brahoes and Baluches are Mahometans of the Suni persuasion.

The precise period at which the Brahoes gained the mastery cannot be accurately ascertained; but it was probably about two centuries ago. The last rajah of the Hindu dynasty found himself compelled to call for the assistance of the mountain shepherds, with their leader, Kumbur, in order to check the encroachments of a horde of depredators, headed by an Afghan chief, who infested the country, and even threatened to attack the seat of government. Kumbur successfully performed the service for which he had been engaged; but having in a few years quelled the robbers, against whom he had been called in, and finding himself at the head of the only military tribe in the country, he formally deposed the rajah and assumed the government.

The history of the country after the accession of Kumbur is as obscure as during the Hindu dynasty. It would appear, however, that the sceptre was quietly transmitted to Abdulla Khan, the fourth in descent from Kumbur, who, being an intrepid and ambitious soldier, turned his thoughts toward the conquest of Cutch-Gundava, then held by different petty chiefs, under the authority of the Nawabs of Sindh.

After various success, the Kumburanees at length possessed themselves of the sovereignty of a considerable portion of that fruitful plain, including the chief town, Gundava. It was during this contest that the famous Nadir Shah advanced from Persia to the invasion of Hindustan; and while at Kandahar, he despatched several detachments into Baluchistan, and established his authority in that province. Abdulla Khan, however, was continued in the government of the country by Nadir's orders; but he was soon after killed in a battle with the forces of the Nawabs of Sindh. He was succeeded by his eldest son, Hajee Mohummud Khan, who abandoned himself to the most tyrannical and licentious way of life, and alienated his subjects by oppressive taxation. In these circumstances Nusseer Khan, the second son of Abdulla Khan, who had accompanied the victorious Nadir to Delhi, and acquired the favor and confidence of that monarch, returned to Khelat, and was hailed by the whole population as their deliverer. Finding that expostulation had no effect upon his brother, he one day entered his apartment and stabbed him to the heart. As soon as the tyrant was dead, Nusseer Khan mounted the *musnud*, amid the universal joy of his subjects; and immediately transmitted a report of the events which had taken place to Nadir Shah, who was then encamped near Kandahar. The shah received the intelligence with satisfaction, and despatched a firman, by return of the messenger, appointing Nusseer Khan beglerbey of all Baluchistan. This event took place in the year 1739.

Nusseer Khan proved an active, politic, and warlike prince. He took great pains to re-establish the internal government of all the provinces in his dominions, and improved and fortified the city of Khelat. On the death of Nadir Shah in 1747, he acknowledged the title of the king of Cabul, Ahmed Shah Abdulla. In 1758 he declared himself entirely independent; upon which Ahmed Shah despatched a force against him, under one of his ministers. The khan, however, raised an army and totally routed the Afghan army. On receiving intelligence of this discomfiture, the king himself marched with strong reinforcements, and a pitched battle was fought, in which Nusseer Khan was worsted. He retired in good order to Khelat, whither he was followed by the victor, who invested the place with his whole army. The khan made a vigorous defence; and, after the royal troops had been foiled in their attempts to take the city by storm or surprise, a negotiation was proposed by the king, which terminated in a treaty of peace. By this treaty it was stipulated that the king was to receive the cousin of Nusseer Khan in marriage; and that the khan was to pay tribute, but only, when called upon, to furnish troops to assist the armies, for which he was to receive an allowance in cash equal to half their pay. The khan frequently distinguished himself in the subseqent wars of Cabul; and, as a reward for his services, the king bestowed upon him several districts in perpetual and entire sovereignty. Having succeeded in quelling a dangerous rebellion, headed by his cousin Beheram Kahn, this able prince at length died in extreme old age, in the month of June 1795, leaving three sons and five daughters. He was succeeded by his eldest son Muhmood Khan, then a boy of about fourteen years. During the reign of this prince, who has been described as a very humane and indolent man, the country was distracted by sanguinary broils; the governors of several provinces and districts withdrew their allegiance; and the dominions of the khans of Khelat gradually so diminished, that they now comprehend only a small portion of the provinces formerly subject to Nusseer Khan.

In 1839, when the British army advanced through the Bolan Pass towards Afghanistan, the conduct of Mehrab Khan, the ruler of Baluchistan, was considered so treacherous and dangerous, as to require "the exaction of retribution from that chieftain," and "the execution of such arrangements as would establish future security in that quarter." General Willshire was accordingly detached from the army of the Indus with 1050 men to assault Khelat. A gate was knocked in by the field-pieces, and the town and citadel were stormed in a few minutes. Above 400 Baluches were slain, among them Mehrab Khan himself; and 2000 prisoners were taken. Subsequent inquiries have, however, proved that the treachery towards the British was not on the part of Mehrab Khan, but on that of his vizier, Mahomed Hassein, and certain chiefs with whom he was in league, and at whose instigation the British convoys were plundered in their passage through Cutch-Gundava and in the Bolan Pass. The treacherous vizier, however, made our too credulous political officers believe that Mehrab Khan was to blame,—his object being to bring his master to ruin and to obtain for himself all power in the state, knowing that Mehrab's successor was only a child. How far he succeeded in his object history has shown. In the following year Khelat changed hands, the governor established by the British, together with a feeble garrison, being overpowered. At the close of the same year it was reoccupied by the British under General Nott. In 1841, Nusseer Khan, the youthful son of the slain Mehrab Khan, was recognized by the British, who soon after evacuated the country.

From the conquest of Sindh by the British troops under the command of the late General Sir Charles Napier in 1843 up to 1854, no diplomatic intercourse occurred worthy of note between the British and Baluch states. In the latter year, however, under the governor-generalship of the late marquis of Dalhousie, the late General John Jacob, C.B., at the time political superintendent and commandant on the Sindh frontier, was deputed to arrange and conclude a treaty between the Khelat state, then under the chieftainship of Meer Nusseer Khan, and the British Government. This

treaty was executed on the 14th of May 1854, and was to the following effect:—

"That the former offensive and defensive treaty, concluded in 1841 by Major Outram between the British Government and Meer Nusseer Khan, chief of Khelat, was to be annulled.

"That Meer Nusseer Khan, his heirs and successors, bound themselves to oppose to the utmost all the enemies of the British Government, and in all cases to act in subordinate co operation with that Government, and to enter into no negotiations with other states without its consent.

"That should it be deemed necessary to station British troops in any part of the territory of Khelat, they shall occupy such positions as may be thought advisable by the British authorities.

"That the Baluch chief was to prevent all plundering on the part of his subjects within, or in the neighborhood of, British territory.

"That he was further to protect all merchants passing through his territory, and only to exact from them a transit duty, fixed by schedule attached to the treaty; and that, on condition of a faithful performance of these duties, he was to receive from the British Government an annual subsidy of 50,000 rupees (£5000)."

The provisions of the above treaty were most royally performed by Meer Nusseer Khan up to the time of his death in 1856. He was succeeded by his brother, Meer Khodadad Khan, the present ruler, a youth of twelve years of age, who, however, did not obtain his position before he had put down by force a rebellion on the part of his turbulent chiefs, who had first elected him, but not receiving what they considered an adequate reward from his treasury, sought to depose him in favor of his cousin Shere dil Khan. In the latter part of 1857, the Indian rebellion being at its height, and the city of Delhi still in the hands of the rebels, a British officer (Major Henry Green) was deputed, on the part of the British Government, to reside, as political agent, with the khan at Khelat, and to assist him by his advice in maintaining control over his turbulent tribes. This duty was successfully performed until 1863, when, during the temporary absence of Major Malcomb Green, the then political agent, Khodadad Khan was, at the instigation of some of his principal chiefs, attacked, while out riding, by his cousin, Shere dil Khan, and severely wounded. Khodadad fled in safety to a residence close to the British border, and Shere dil Khan was elected and proclaimed khan. His rule was, however a short one, for, early in 1864, when proceeding to Khelat, he was murdered in the Gundava Pass; and Khodadad was again elected chief by the very men who had only the previous year caused his overthrow, and who had lately been accomplices to the murder of his cousin. Since the above events Khodadad has maintained his precarious position with great difficulty; but owing to his inability to govern his unruly subjects without material assistance from the British Government, which they are not disposed to give, his country has gradually fallen into the greatest anarchy; and, consequently, some of the provisions of the treaty of 1854 having been broken, diplomatic relations having been discontinued with the Khelat state since the end of 1874.

The territories of Baluchistan are now comprised under the following divisions — Jalawan, Sarawan, Khelat, Mekran, Lus, Cutch-Gundava, and Kohistan.

The climate of Baluchistan is extremely various in the different provinces. The soil in general is exceedingly stony. In the province of Cutch-Gundava, however, it is rich and loamy, and so very productive, that, it is said, were it all properly cultivated, the crops would be more than sufficient for the supply of the whole of Baluchistan. Gold, silver, lead, iron, tin, antimony, brimstone, alum, sal-ammoniac, and many kinds of mineral salts, and saltpetre, are found in various parts of the country. The precious metals have only been discovered in working for iron and lead, in mines near the town of Nal, about 150 miles S.S.W. of Khelat. The different other minerals above enumerated are very plentiful. The gardens of Khelat produce many sorts of fruit, which are sold at a very moderate rate, such as apricots, peaches, grapes, almonds, pistachio-nuts, apples, pears, plums, currants, cherries, quinces, figs, pomegranates, mulberries, plantains, melons, guavas, &c. All kinds of grain known in India are cultivated in the different provinces of Baluchistan, and there is abundance of vegetables. Madder, cotton and indigo are also produced; and the latter is considered superior to that of Bengal. Great attention is given to the culture of the date fruit in the province of Mekran. The domestic animals of Baluchistan are horses, mules, asses, camels, buffaloes, black-cattle, sheep, goats, dogs, and cats, besides fowls and pigeons, but there are neither geese, turkeys nor ducks. The wild animals are tigers, leopards, hyenas, wolves, jackals, tiger-cats, wild dogs, foxes, hares, mangooses, mountain goats, antelopes, elks, red and moose deer, wild asses, &c. Of birds they have almost every species to be met with either in Europe or India.

The principal towns in Buluchistan are as follows:— KHELAT is the capital of the whole country; *Mustoong*, of the province of Sarawan; *Kozdar*, of Jalawan; *Beyla*, of Beyla; *Kej*, of Mekran; *Bagh*, of Cutch-Gundava; and Dadur and Gundava are towns in the last-mentioned province.

The capital stands on an elevated site 7000 feet above the sea, on the western side of a well-cultivated plain or valley, about eight miles long and two or three broad, a great part of which is laid out in gardens and other enclosures. The town is built in an oblong form, and on three sides is defended by a mud wall, 18 or 20 feet high, flanked, at intervals of 250 yards, by bastions, which, as well as the wall itself, are pierced with numerous loopholes for matchlock-men. The defence of the fourth side of the city has been formed by cutting away perpendicularly the western face of the hill on which it is partly built. On the summit of this eminence stands the palace, commanding a distinct view of the town and adjacent country.

We have no data from which we can form an accurate computation of the population of Baluchistan, but it may be estimated at about 400,000. The two great races of Baluch and Brahoe, each subdivided into an infinite number of tribes, are clearly distinguished from each other by their language and appearance.

The Baluches are a handsome, active race of men, not possessing great physical strength, but inured to changes of climate and season, and capable of enduring every species of fatigue. In their habits they are pastoral and much addicted to predatory warfare, in the course of which they do not hesitate to commit every kind of outrage and cruelty. Notwithstanding their predatory habits, however, they are considered to be a hospitable people.

The common dress of the Brahoes is a coarse white or blue calico shirt, buttoned round the neck, and reaching below the knee; their trousers are made of the same cloth, or of a kind of striped stuff called soosee, and puckered around the ankles. On their heads they wear a small silk or cotton quilted cap, fitted to the shape of the skull, and a *kummurbund* or sash, of the same color, round their waists. The Baluches wear a similar dress, but a turban on the head and wide trousers unconfined at the ankle. In winter the chiefs and their relatives

appear in a tunic of chintz, lined and stuffed with cotton; and the poorer classes, when out of doors, wrap themselves up in a surtout made of cloth, manufactured from a mixture of goats' hair and sheep's wool. The women's dress is very similar to that of the men; their trousers are preposterously wide, and made of silk, or a mixture of silk and cotton.

BALUE, JEAN, a French cardinal, who raised himself from a very mean station to dignity and honors. He was born of very humble parentage at Angle in Poitou, in 1421, and was first patronised by the bishop of Poitiers. He eventually became almoner to Louis XI., and managed to secure a considerable share in the government; but being detected in treasonable correspondence with the duke of Bourgogne, he was confined by Louis in an iron cage 8 feet square. On his release, however, eleven years afterwards, he was loaded with honors by Sixtus IV., was sent as legate to France, and received the bishopric of Albano. He died at Ancona in 1491.

BALUZE, ETIENNE, a celebrated French scholar, was born at Tulle on the 24th of December 1630, and died in July 1718. His reputation and his mastery of French law and antiquities obtained for him in 1670 the professorship of canon law in the royal college, a chair founded expressly for him. On the fall of the Cardinal de Bouillon in 1710, Baluze, who had attached himself to his party, was removed by a *lettre de cachet* from Paris, and transferred from Rouen to Blois, Tours, and Orleans in succession. He obtained his recall in 1813, though he never recovered his professorship. Of Baluze's numerous works the best known is the *Capitularia Regum Francorum*, which is of considerable historical value.

BALZAC, HONORÉ DE, perhaps the greatest name in the post-Revolutionary literature of France, was born at Tours in 1799, and died in 1858. His date thus corresponds with the whole period of the rise, the acme, and the decline of the Romantic school, to which he can scarcely, however, be said to have belonged. It is true that he was inspired by many of the influences that animated Victor Hugo and his followers. Like them he was much occupied by the study of the fantastic element in mediæval art, so strongly opposed to the calm and limit of classical literature, like them he reproduced the remoter phases of life and passion, and thought that few subjects were so base or obscure as to be unworthy of artistic treatment. But there is something in the powerful personality of Balzac indicated by the colossal body, by the strong and sensual face, somewhat resembling the profile of the Emperor Nero, which preserved him from the mannerism of any school. He was never successful in reproducing the existence of the past, he was essentially the man of his own day, and *La Comédie Humaine* is as much the picture of the 19th, as the *Divina Commedia* is of the 13th century. The passions that move his characters are the intense desire of boundless wealth, of luxury, of social distinction; and though here and there his financiers, his journalists, his political intriguers, his sordid peasantry, are relieved by the introduction of some pure figure like that of Eugénie Grandet, of David, or of Eve, there are only too many elaborate studies of creatures sunk below the surface of humanity, the embodiments of infinite meanness and nameless sin. He was merely "the secretary of society," he said, and "drew up the inventory of vices and virtues." His ambition was "by infinite patience and courage, to compose for the France of the 19th century that history of morals which the old civilisations of Rome, Athens, Memphis, and India have left untold." The consequence of this ambition is, that Balzac's voluminous romances have too often the air of a minute and tedious chronicle, and that the contemporary reader is wearied with a mass of details about domestic architecture, about the stock exchange, and about law, which will prove invaluable to posterity.

Balzac's private history, which may be traced through many passages of his novels, was a strange and not a happy one. He was early sent from his home in Tours to the college of Vendôme, where he neglected the studies and sports of childhood to bury himself in mystic books and mystic reveries. He has told the story of his school life in *Louis Lambert*, how he composed a *théorie de la volonté*, a theory which was to complete the works of Mesmer, Lavater, Gall, and Bichat. This promising treatise was burned by one of the masters of the school; and Balzac, falling into bad health, returned home. The next stage in his education was a course of study at the Sorbonne, and of lectures on law. In the offices of attorneys and notaries he picked up his knowledge of the by ways of chicanery,—knowledge which he uses only too freely in his romances. Nature did not mean Balzac for an advocate; he was constant in the belief in his own genius, a belief which for many years he had all to himself, and his family left him to work and starve, on the scantiest pittance, in a garret of the Rue Lesdiguières. There followed ten years of hard toil, poverty, experiments in this and that way of getting a living. These struggles are described in *Facino Cane*, in the *Peau de Chagrin*, and in a series of letters to the author's sister, Madame de Surville. Balzac found "three sous for bread, two for milk, and three for firing" suffice to keep him alive, while he devoured books in the library of the Arsenal, copied out his notes at night, and then wandered for hours among the scenes of nocturnal Paris. "Your brother," he writes to Madame de Surville, "is already nourished like a great man,—he is dying of hunger." He tried to make money by scribbling many volumes of novels without promise, and borrowed funds to speculate in the business of printing. Ideas which have since made other men's fortunes failed in Balzac's hands, and he laid the foundations of those famous debts which in later life were his torment and his occupation. At length appreciation came, and with appreciation what ought to have been wealth. Balzac was unfortunately as prodigal of money as of labor; he would shut himself up for months, and see no one but his printer; and then for months he would disappear and dissipate his gains in some mysterious hiding-place of his own, or in hurried travelling to Venice, Vienna, or St. Petersburg. As a child he had been a man in thought and learning; as a man he was a child in caprice and extravagance. His imagination, the intense power with which he constructed new combinations of the literal facts which he observed, was like the demon which tormented the magician with incessant demands for more tasks to do. When he was not working at *La Comédie Humaine*, his fancy was still busy with its characters; he existed in an ideal world, where some accident was always to put him in possession of riches beyond the dreams of avarice. Meantime he squandered all the money that could be rescued from his creditors on sumptuous apparel, jewels, porcelain, pictures. His excesses of labor, his sleepless nights, his abuse of coffee undermined his seemingly indestructible health. At length a mysterious passion for a Russian lady was crowned by marriage; the famous debts were paid, the visionary house was built and furnished, and then, "when the house was ready, death entered." Balzac died at the culmination of his fame, and at the beginning, as it seemed, of the period of rest to which he had always looked forward.

BALZAC, JEAN LOUIS GUEZ DE, a celebrated French writer, was born at Angoulême in 1594, and died at

Paris in 1654. His fame rests entirely upon the *Letters*, which, though empty, bombastic, and affected in matter, are written with great skill, and show a real mastery over the language. They introduced a new style; and Balzac has thus the credit of being the first reformer of French prose, as his contemporary Malherbe was the first reformer of French poetry.

BAMBA, a province of Congo, on the western coast of Africa, lying to the S. of the River Ambriz. This district is fertile, abounds in gold, silver, copper, salt, &c., and is said to be thickly populated. Its chief town, which bears the same name, was formerly of considerable importance, the climate being remarkably healthy for that region of Africa.

BAMBARRA, a country of inner Africa, on the Joliba or Upper Niger. The principal towns are Segor, Sansading, Jamima, Mursha, Jabbi, Sai, Kullikoro, Maraca-Duba, and Damba, in many of which the Mahometans have mosques. For further particulars see AFRICA.

BAMBARRA, a town of western Africa on a backwater of the Niger, of considerable commercial importance, and situated in a fertile plain, 115 miles S.S.W. of Timbuctoo.

BAMBERG, a town of Bavaria, in the circle of Upper Franconia, on the River Regnitz, 3 miles above its junction with the Maine, and 33 miles N. of Nuremberg, with which it is connected by railway. It was founded in 1004 by the Emperor Henry II., and finished in 1012, but was afterwards partially burnt, and rebuilt in 1110. It contains the tombs of the founder and his empress Cunigunde, Conrad III., Pope Clement II., &c., and numerous monuments and paintings by eminent masters. Bamberg was formerly the capital of an independent bishopric, which was secularised in 1801, and assigned to Bavaria in 1803. Population 25,738.

BAMBOCCIO. See LAER, PETER VAN.

BAMBOO, a genus (*Bambusa*) of arborescent grasses very generally distributed throughout the tropical lands of the globe, but found and cultivated especially in India, China, and the East Indian Archipelago. There is a large number of species enumerated; but, as is the case with most plants under cultivation, much difficulty is found in distinguishing species from varieties produced by artificial selection. *Bambusa arundinacea* is the species most commonly referred to. It is a tree-like plant, rising to a height of 40, 60, or even 80 feet, with a hollow stem, shining as if varnished. The stem is extremely slender, not exceeding the thickness of 5 inches in some which are 50 feet high, and in others reaching 15 or 18 inches in diameter. The whole is divided into joints or septa called knots or internodes, the intervals between which in the case of some of the larger stems is several feet. These joints or divisions are formed by the crossing of the vascular bundles of fibres. They produce alternate lateral buds, which form small alternate branchlets springing from the base to the top, and, together with the narrow-pointed leaves issuing from them, give the plant an elegant feathered appearance as it waves in the wind. The rapidity of its growth is surprising. It attains its full height in a few months, and Mr. Fortune records the observation of a growth of from 2 to 2½ feet in a single day. In Malabar it is said to bear fruit when fifteen years old, and then to die.

The bamboo is cultivated with great care in regular plantations by the Chinese. The plant is propagated by shoots or suckers deposited in pits 18 inches or 2 feet deep at the close of autumn or the beginning of winter. Various expedients are followed to obtain good bamboos; one of the most usual being to take a vigorous root and transplant it, leaving only four or five inches above the joint next the ground. The cavity is then filled with a mixture of horse-litter and sulphur. According to the vigor of the root, the shoots will be more or less numerous; they are destroyed at an early stage during three successive years; and those springing in the fourth resemble the parent tree. The uses to which all the parts and products of the bamboo are applied in Oriental countries are almost endless. The soft and succulent shoots, when just beginning to spring, are cut over and served up at table like asparagus. Like that vegetable, also, they are earthed over to keep them longer fit for consumption; and they afford a continuous supply during the whole year, though it is more abundant in autumn. They are also salted and eaten with rice, prepared in the form of pickles, or candied and preserved in sugar. As the plant grows older, a species of fluid is secreted in the hollow joints, in which a concrete substance, highly valued in the East for its medicinal qualities, called *tabaxir* or *tabascheer*, is gradually developed. This substance, which has been found to be a purely siliceous concretion, is possessed of peculiar optical properties. The grains of the bamboo are available for food, and the Chinese have a proverb that it produces seed more abundantly in years when the rice crop fails, which means, probably, that in times of dearth the natives look more after such a source of food. The Hindus eat it mixed with honey as a delicacy, equal quantities being put into a hollow joint, coated externally with clay, and thus roasted over a fire. It is, however, the stem of the bamboo which is applied to the greatest variety of uses. Joints of sufficient size form water buckets; smaller ones are used as bottles, and among the Dyaks of Borneo they are employed as cooking vessels. Bamboo is extensively used as a timber wood, and houses are frequently made entirely out of the product of the plant; complete sections of the stem form posts or columns; split up, it serves for floors or rafters; and, interwoven in lattice-work, it is employed for the sides of rooms, admitting light and air. The roof is sometimes of bamboo solely, and when split, which is accomplished with the greatest ease, it can be formed into laths or planks. It is employed in shipping of all kinds; some of the strongest plants are selected for masts of boats of moderate size, and the masts of larger vessels are sometimes formed by the union of several bamboos built up and joined together.

The bamboo is employed in the construction of all kinds of agricultural and domestic implements, and in the materials and implements required in fishery. Bows are made of it by the union of two pieces with many bands; and, the septa being bored out and the lengths joined together, it is employed, as we use leaden pipes, in transmitting water to reservoirs or gardens. From the light and slender stalks shafts for arrows are obtained; and in the south-west of Asia there is a certain species of equally slender growth, from which writing-pens or reeds are made. A joint forms a holder for paper or pens, and it was in a joint of bamboo that silk-worm eggs were carried from China to Constantinople during the reign of Justinian. The outer cuticle of Oriental species is so hard that it forms a sharp and durable cutting edge, and it is so siliceous that it can be used as a whetstone. This outer cuticle, cut into thin strips, is one of the most durable and beautiful materials for basket-making, and both in China and Japan it is largely so employed. Strips are also woven into cages, chairs, beds, and other articles of furniture, Oriental wicker-work in bamboo being unequalled for beauty and neatness of workmanship. In China the interior portions of the stem are beaten into a pulp, and used for the manufacture of the finer varieties of paper. Bamboos are imported to a considerable extent into Europe for the use of basket-makers, and for umbrella and walk-

ing-sticks. In short, the purposes to which the bamboo is applicable are almost endless, and well justify the opinion that "it is one of the most wonderful and most beautiful productions of the tropics, and one of Nature's most valuable gifts to uncivilized man."

BAMBOROUGH, a village in Northumberland, on the sea-coast, 14 miles N. of Alnwick.

BAMBOUK, a country in the interior of Western Africa, situated between the Senegal and its tributary the Faleme. It is traversed from N.W. to S.E. by the steep and wall-like range of the Tamba-Ura Mountains. The soil in a large part of the country is of remarkable fertility; rice, maize, millet, melons, manioc, grapes, bananas, and other fruits, grow almost without cultivation; the forests are rich in a variety of valuable trees; and extensive stretches are covered with abundant pasturage of the long guinea grass. As a natural consequence there is great profusion of animal life. The inhabitants, a branch of the Mandingo race, have made but little progress in civilisation. The one product of their country which really excites them to labor is gold; and even it is so common and accessible that the rudest methods of collection are deemed sufficient. The most remarkable deposit is at Natakoo, where a considerable hill seems to be wholly composed of auriferous strata. There is also a good mine at Kenieba. In exchange for the gold, cloth, ornaments, and salt—the last a most valuable article—are imported. The usual beast of burden is the ass, the horse being only possessed by the very wealthiest in the country. Sheep and cattle are both pretty numerous. Unfortunately, the climate is very unhealthy, especially in the rainy season, which lasts for about four months, from July or August. The chief towns are Bambouk, Salaba, and Konkuba. The Portuguese early penetrated into Bambouk, and were even for some time masters of the country; but the inhabitants made a general rising and completely drove them out. Remains of their buildings, however, are still to be seen. The French, soon after they had formed their settlement on the Senegal, turned their attention to this land of gold. It was not till 1716, however, that Compagon, under the auspices of De la Brue, the governor of Senegal, succeeded, by great address, and not without risk, in visiting various parts of the auriferous region; and his explorations were followed up by David, Levens, and others. Raffenel visited the country in 1844, and Pascal, a naval lieutenant, was there in 1859. A few commercial stations or *comptoirs* have recently been established.

BÁMIÁN, a once renowned city in the territory now subject to the Afghans. Its remains lie in a valley of the Hazara country, on the chief road from Kábul towards Turkestán, and immediately at the northern foot of that prolongation of the Indian Caucasus now called Koh-i-Baba.

That the idols of Bámián, about which so many conjectures have been uttered, were Buddhist figures, is ascertained from the narrative of the Chinese pilgrim, Hwen Thsang, who saw them in their splendor in 630 A.D. His description of the position of the city and images corresponds accurately with modern reports. He assigns to the greater image, which was gilt (the object, probably, of the plaster coating), a height of 140 or 150 feet, and to the second 100. The latter would seem from his account to have been sheathed with copper. Still vaster than these was a recumbent figure, 2 miles east of Bámián, representing Sakya Buddha entering *Nirvána*, *i.e.*, in act of death. This was "about 1000 feet in length." No traces of this are alluded to by modern travellers, but in all likelihood it was only formed of rubble plastered (as is the case still with such *Nirvána* figures in Indo-China), and of no durability. For a city so notable Bámián has a very obscure history. It does not seem possible to identify it with any city in classical geography: *Alexandria ad Caucasum* it certainly was not.

BAMPTON, Rev. John, founder of the series of divinity lectures at Oxford known as the *Bampton Lectures*, appears to have been born in 1689 and to have died in 1751. He was a member of Trinity College, Oxford, and for some time canon of Salisbury.

BANANA (*Musa sapientum*), a gigantic herbaceous plant belonging to the natural order *Musaceæ*, originally a native of the tropical parts of the East, but now cultivated in all tropical and sub-tropical climates. It forms a spurious kind of stem, rising 15 or 20 feet by the sheathing basis of the leaves, the blades of which sometimes measure as much as 10 feet in length by 2 feet across. The stem bears several clusters of fruit, which somewhat resemble cucumbers in size and form; it dies down after maturing the fruit. The weight of the produce of a single cluster is sometimes as much as 80 lb, and it was calculated by Humboldt that the productiveness of the banana as compared with wheat is as 133 to 1, and as against potatoes 44 to 1. The varieties of banana cultivated in the tropics are as numerous as the varieties of apples in temperate regions, and the best authorities now agree that no specific difference exists between it and the plantain. The fruit is extensively used as food; and in many of the Pacific islands it is the staple on which the natives depend. In its immature condition it contains much starch, which on ripening changes into sugar; and as a ripe fruit it has a sweet but somewhat flavorless taste. From the unripe fruit, dried in the sun, a useful and nutritious flour is prepared. The following represents the percentage composition of the pulp of the ripe fruit:—Nitrogenous matter, 4.820; sugar, pectin, &c., 19.657; fatty matter, 0.632; cellulose, 0.200; saline matter, 0.791; water, 73.900. An analysis of the flour by Dr. Murray Thompson yielded the following results:—Water, 12.33; starch, 71.60; gum and sugar, 6.82; nitrogenous matter, 2.01; cellulose, 5.99; oil, 0.50; salts, 0.64.

BANAT, a district in the south-east of Hungary, consisting of the three counties of Thorontal, Temeswar, and Krasso, which has strangely acquired this title, though it was never governed by a "ban." It is bounded by the Theiss, the Maros, and the Danube, forming almost a regular parallelogram. The soil is in many parts a remarkably rich alluvial deposit. Under the Turkish yoke it was allowed to lie almost desolate in marsh and heath and forest; but Joseph II. determined to render it, if possible, a populous and prosperous district. He accordingly offered land, at a very low rate, to all who were willing to settle within its borders. Germans, Greeks, Turks, Servians, Italians, and Frenchmen responded to his call, and soon developed the agricultural resources of the region. Canals were formed at great expense of labor; marshes and forests were cleared; and now the Banat is one of the most highly cultivated parts of the Austrian empire.

BANBRIDGE, a town of Ireland, county of Down, on the Bann, 23 miles S. W. of Belfast, standing on the summit of an eminence. To facilitate access, a central carriage-way, 200 yards long, has been cut through the main street to a depth of 15 feet, the opposite terraces being connected by a bridge.

BANBURY, a market-town, municipal and parliamentary borough, and railway junction, in the county of Oxford, 71 miles from London, and a little to the west of the River Cherwell and the Oxford and Birmingham canal.

BANCA, Banka, or Bangka, an island off the east

coast of Sumatra, and separated from it by the Strait of Banca. It varies from 8 to 20 miles in breadth, and has an area of 5000 English square miles. Its mines of tin, which were discovered in 1710, are remarkably productive, and in 1872 yielded no less than 68,148 piculs, the average yield during the previous ten years being 73,961 piculs. The washing is almost wholly carried on by Chinese, and a large part of the metal finds its way to their country. Iron, copper, lead, silver, and arsenic are also found in the island. The soil is generally dry and stony, and the greater part of the surface is covered with forests, in which the logwood tree especially abounds.

BANCROFT, RICHARD, Archbishop of Canterbury in the reign of James I., distinguished as an inflexible opponent of Puritanism, was born at Farnworth in Lancashire in 1544. He was educated at Cambridge University, studying first at Christ's College, and afterwards at Jesus College. He took his degree of B.A. in 1567, and that of M.A. in 1570. Ordained about that time, he was named chaplain to Dr. Cox, then bishop of Ely, and in 1575 was presented to the rectory of Teversham in Cambridgeshire. The next year he was one of the preachers to the university, and in 1584 was presented to the rectory of St. Andrew's, Holborn. His unquestionable abilities, and his zeal as a champion of the church in those unsettled times, secured him rapid promotion, and at length the highest ecclesiastical position in the land. He graduated B.D. in 1580, and D.D. five years later. In 1585 he was appointed treasurer of St. Paul's Cathedral, London. On February 9, 1589, he preached at Paul's Cross a sermon on 1 John iv. 1, the substance of which was a passionate attack on the Puritans. He described their speeches and proceedings, caricatured their motives, denounced the exercise of the right of private judgment, and set forth the divine right of bishops in such strong language that one of the queen's councillors held it to amount to a threat against the supremacy of the Crown. Sixteen days after the publication of this ecclesiastical manifesto, Bancroft was made a prebendary of St. Paul's. Within a few years he was advanced to the same dignity in the collegiate church of Westminster, and in the cathedral church of Canterbury. He was chaplain successively to Lord Chancellor Hatton and Archbishop Whitgift. In May 1597 he was consecrated bishop of London; and from this time, in consequence of the age and incapacity for business of Archbishop Whitgift, he was virtually invested with the power of primate, and had the sole management of ecclesiastical affairs. Among the more noteworthy cases which fell under his direction were the proceedings against Martin Mar-Prelate, Cartwright and his friends, and the pious Henry, whose "seditious writings" he caused to be intercepted and given up to the Lord Keeper. In 1600 he was sent on an embassy, with others, to Embden, for the purpose of settling certain matters in dispute between the English and the Danes. This mission, however, failed. Bishop Bancroft was present at the death of Queen Elizabeth. He took a prominent part in the famous conference of the prelates and the Presbyterian divines held at Hampton Court in 1604. By the king's desire he undertook the vindication of the practices of confirmation, absolution, private baptism, and lay excommunication; he urged, but in vain, the reinforcement of an ancient canon, "that schismatics are not to be heard against bishops;" and in opposition to the Puritans' demand of certain alterations in doctrine and discipline, he besought the king that care might be taken for a *praying clergy*; and that, till men of learning and sufficiency could be found godly homilies might be read and their numbers increased. In the capacity of a commissioner for ecclesiastical causes (1603), he advocated severe measures for the suppression of "heresy and schism" treating books against Episcopacy as acts of sedition, and persecuting their authors as enemies of the state. In March 1604, Bancroft, in consequence of the death of the primate, was appointed by royal writ president of Convocation then assembled; and he there presented for adoption a book of canons collected by himself. In the following November he was elected successor to Whitgift in the see of Canterbury. In 1608 he was chosen chancellor of the University of Oxford. He died at Lambeth Palace, November 2d, 1610.

BANDA, a district of British India, in the Alláhábád division, under the Lieutenant-Governor of the North-Western Provinces. It is bounded on the N. by the district of Fathipur, from which it is separated by the River Jamná; on the N.E. by the districts of Fathipur and Alláhábád; on the S.E, by the native state of Riwá; on the S. and S.W. by some of the petty states Bundelkhand; and on the W. and N.W. by the district of Hamírpur. Area, 3030 square miles, of which 1390 are under cultivation, 846 cultivable, but not cultivated, 108 revenue free, and 688 uncultivable waste. The census of 1872 took the area at 2908.68 square miles, and returned the district population at 697,610 souls,—viz., Hindus, 657,107; Mahometans, 40,497; Christains, 6. Average density, 230 persons to the square mile. Of the population in 1872, 2897 were landed proprietors, 42,230 agriculturists, and 63,644 non-agriculturists. In some parts the district rises into irregular uplands and elevated plains, interspersed with detached rocks of granite; in others it sinks into marshy lowlands, which frequently remain under water during the rainy season. The sloping country on the bank of the Jamná is full of ravines. To the S.E. the Vindhya chain of hills takes its origin in a low range not exceeding 500 feet in height, and forming a natural boundary of the district in that direction. The principal river of the district is the Jamná, which flows from north-west to south-east, along the N.E. boundary of the district for 125 miles. Its most important tributaries within the district are the Ken, Bágain, Paisuní, and Ohán, all of which take their rise in the Vindhya hills. The principal towns and market villages in the district are Mau, Májhgáon or Rájápur, Markâ, Samgará, Augásí, Chillá, and Barágáon, all situated on the bank of the Jamná.

BANDA ISLANDS, a group in the East Indian Archipelago, lying to the S. of Ceram. They are ten or twelve in number, and have an area of about 7150 square miles. Their volcanic origin is distinctly marked. Banda Lantoir, which derives its name from the *lontar* or Palmyra palm, is the largest of the group. The principal articles of commerce in the Banda group are nutmegs and mace. The native population having been cleared off by the Dutch, the plantations were worked by slaves and convicts till the emancipation of 1860. The introduction of Malay and Chinese laborers has since taken place. The plantations or *perken* can neither be sold nor divided. About 700,000 lb or upwards of nutmegs are obtained in a year, with a proportionate quantity of mace. The imports are provisions, cloth, and iron-ware from Batavia, and various native productions from the Aru Islands, Ceram, &c.

The Banda Islands were discovered and annexed by the Portuguese Abreus about 1511; but in the beginning of the 17th century his countrymen were expelled by the Dutch. In 1608 the English built a factory on Pulo Way, which was demolished by the Dutch as soon as the English vessel left. Shortly after, however, Banda Neira and Lantoir were resigned by the natives to the English, and in 1620 Pulo Roon and Pulo Way were

added to their dominions; but, in spite of treaties into which they had entered, the Dutch attacked and expelled their British rivals. In 1654 they were compelled by Cromwell to restore Pulo Roon, and to make satisfaction for the massacre of Amboyna; but the English settlers not being adequately supported from home, the island was retaken by the Dutch in 1664. They retained undisturbed possession of their conquests in this quarter of the globe until the year 1796, when the Banda Islands, along with all the other Dutch colonies, were conquered by the British. They were restored by the treaty of Amiens in the year 1800, again captured, and finally restored by the treaty of Paris concluded in 1814. In the Presidency of Banda there are 111,194 inhabitants, of whom 6000 belong to Neira.

BANDANA, a kind of printed handkerchief of Indian origin, usually of cotton. The cloth is first dyed Turkey red, and the pattern is made by discharging the color with bleaching liquor in a powerful Bramah press.

BANDELLO, MATTEO, an Italian novelist, was born at Castelnuovo, near Tortona, about the year 1480. Bandello wrote a number of poems, but his fame rests entirely upon his extensive collection of *Novelle*, or tales, which have been extremely popular. They belong to that species of literature of which Boccaccio's *Decameron* and the queen of Navarre's *Heptameron* are, perhaps, the best. He died in 1562.

BAND-FISH *(Cepola)*, a genus in the family Cepolidæ in the blenny-form division of Acanthopterygious Fishes. The body is much elongated and laterally compressed and is covered by very small scales. The dorsal fin is very long, and consists like the anal of soft rays. The tail vertebræ are very numerous, and the whole structure of the body exhibits unusual delicacy.

BANDICOOT *(Perameles)*, a genus of small marsupials, occupying in the fauna of Australia a place somewhat analogous to that of the much higher shrews in Europe. The fur is short and rough. The long head forms a pointed snout, the tail is rather short, the marsupial pouch is complete and opens backward. They keep to the ground, making nests in the hollows. Their movements and habits are like those of hares or rabbits. Numerous species occur in Australia and New Guinea.

BANDICOOT RAT, MALABAR RAT, or PIG-RAT *(Mus giganteus)*, the largest known species of rat. The name is a corruption of the Telinga *pandikoku*, literally meaning pig-rat. The animal inhabits many parts of India, and is plentiful in Ceylon. It attains the weight of two or three pounds, and is twenty-four to thirty inches long, including the tail, which at the base is two and one-half inches in circumference.

BANDINELLI, BARTOLOMMEO or BACCIO, a Florentine sculptor, was born in 1487, and died in 1559. His best works are the marble colossal group of Hercules and Cacus in the Piazza del Gran Duco; his group of Adam and Eve; his exquisite *bassi-rilievi* in the choir of the cathedral of Florence; his copy of the Laocoon; and the figures of Christ and Nicodemus on his own tomb.

BANDINI, ANGELO MARIA, an Italian author, was born at Florence in 1726, and died in 1800.

BANDOLINE is a mucilaginous substance used for stiffening hair, and keeping it in shape or form.

BANDON, or BANDONBRIDGE, an inland town and parliamentary borough of Ireland, in the county of Cork, and twenty miles by rail from the county town, is situated on both sides of the River Bandon, which is here crossed by a bridge of six arches. Population, 6,500.

BANFF, the county town of Banffshire, is a place of great antiquity; according to tradition it was at times the residence of Malcolm Canmore. It was visited by David I. and his son Henry; and there is a charter of Malcolm IV., signed at Banff the eleventh year of his reign, which corresponds with 1163. Population, 4,000.

BANFFSHIRE, a maritime county in the northeast of Scotland, bounded on the north by the Moray Firth, east and south by Aberdeenshire, and west by Morayshire and part of Inverness-shire. It has an area of 686 square miles, or 439,219 statute acres, its extent from north to south being fifty miles, and from east to west thirty-two miles,—its average breadth not exceeding fourteen miles. Population, 63,000.

Some interesting minerals have been found in Banffshire. Among them may be mentioned magnetite, chromite, and asbestos at Portsoy; fluorite near Boharm, at Keith, and on the Avon; also cyanite and chiastolite in clayslate at Boharm. Attempts were made many years ago to work a vein of sulphuret of antimony near Keith; and more recently mines of hæmatite were opened near Arndilly on the Spey.

The manufactures of Banffshire are very unimportant, the inhabitants being principally engaged in agriculture and the rearing of cattle. The salmon-fishery is actively prosecuted on the rivers, and herring and other fisheries on the coast. Distilling is largely carried on in Glenlivet and other places; and there is a woollen factory at Keith.

Banffshire was the scene of many bloody conflicts between the Scots and their Danish invaders. From 1624 to 1645 it was the theatre of almost incessant struggles, and the Covenanting troubles of that period, combined with the frequent conflicts of the clans, were productive of serious evils. Several remains of antiquity are pointed out in different parts of the country, such as the sculptured stone at Mortlach, and the churches of Cullen and Fordyce. Ruins of castles and traces of encampments are often to be met with, and a great number of cairns and tumuli are also found. Among the distinguished men whom Banffshire has produced, the following may be mentioned:—Archbishop Sharp of St. Andrews; George Baird, distinguished for his services as sheriff of the county during the time of the Covenanters; Thomas Ruddiman, the grammarian; Walter Goodall, the defender of Mary Queen of Scots; Dr. Alexander Geddes; and James Ferguson, the astronomer.

BANGALORE, the administrative capital and most important town of the chief commissionership of Mysore, also a large military cantonment, is now one of the handsomest English stations in India, with noble public buildings, spacious and artistically laid out gardens, broad smooth roads, well-supervised bazaars, and a good water supply. The markets display almost every sort of English and Indian fruit or vegetable. Bangalore forms the residence of the chief commissioner of Mysore and the principal officers of his administration, and is well worthy of its place as the political and military capital of the province. Population (1890), 200,000.

BANGKOK, a city of Siam, which was raised to the rank of capital in 1769. It is situated on both sides of the River Menam, about 20 miles from the sea. The river is navigable to the city for vessels of 350 tons, but there is a bar at its mouth, which at the lowest ebbs has only six feet of water, and at no time has more than fourteen. The general appearance of Bangkok is very striking, alike from its extent, the strange architecture of its more important buildings, and the luxuriant greenness of the trees with which it is profusely interspersed. The streets are in many cases traversed by canals, and the houses raised on piles, while a large part of the population dwell in floating houses moored along the river sides in tiers three or four deep. The nucleus of the city on the eastern bank is surrounded by a wall 30

feet high, and 10 or 12 feet thick, relieved by numerous towers and bastions ; but the rest of the city stretches irregularly for full seven miles along each side of the river, and in some places attains nearly as great a breadth,— the Menam itself being about a quarter of a mile across. In all there are upwards of a hundred temples in the city and suburbs. The palace of the "First King" is inclosed in high white walls, which are about a mile in circumference. It consists of a large number of different buildings for various purposes — temples, public offices, seraglios, the stalls for the sacred elephant, and accommodation for thousands of soldiers, cavalry, artillery, and war elephants, an arsenal, a theatre, &c. The hall of audience, in which the throne of the king stands, is situated in the middle of the principal court. The temples are of great richness, floored with mats of silver, and stored with monuments and relics. In one of them is a famous jasper statue of Buddha. The population of the city is of various nationalities,— Burmese, Peguans, Cambodians, Cochin-Chinese, Malays, Indo-Portuguese, and others, besides the two predominant classes, the Chinese and Siamese. There is great commercial activity, the principal articles of trade being sugar, pepper, and rice. The population is said to amount to 400,000.

BANGOR, a parliamentary borough and market-town of Carnarvonshire, North Wales, nine miles N.E. of Carnarvon, to which it is a contributory borough. Population of burgh in 1889, 11,000.

BANGOR, a seaport and market-town of Ireland, county Down, on the south side of Belfast Lough, twelve miles east-northeast of Belfast. Population, 2,560.

BANGOR, a seaport-town in the State of Maine, and the county seat of the county of Penobscot, on the river of that name, at its junction with the Kenduskeag, 60 miles from the sea. It was incorporated as a town in 1791, and raised to the rank of a city in 1834. The harbor is spacious, and affords anchorage for the largest vessels at high tide. The chief article of trade is timber, which employs about 2000 ships annually; and there are saw-mills, planing-mills, ship-yards, foundries, and manufactories of furniture. There are numerous good schools arranged on a graduated scale, and churches of about ten different denominations. A theological seminary belonging to the Congregationalists was founded in 1816. A library, instituted in 1843, has upward of 11,000 volumes. Population in 1890, 19,090.

BANGWEOLO (also called Bemba), a great Central African lake, discovered by Livingstone in 1868, which is 150 miles long by 75 in width, and 3,700 feet above the sea.

BANIALUKA, a town and fortress of Turkey, in the eyalet of Bosnia, situated on the Verbas or Verbitza, a navigable tributary of the Save. Its warm baths, for which it is still known, would seem, from the antiquities discovered on the spot, to have been frequented by the Romans. There are upwards of forty mosques in th town, and one of them is regarded as the finest in Turkey. In 1688 it was captured for the Austrians by Louis of Baden. Population, 15,000.

BANIM, JOHN, an Irish novelist of great power and ability, was born at Kilkenny in 1798. He received a good education, and at a very early age gave evidence of remarkable genius. In his thirteenth year he entered Kilkenny College. He published a poem, *The Celt's Paradise*, and had some success as a writer for the stage. During a short visit to Kilkenny he married, and at the same time planned, in conjunction with his brother Michael (born 1796), a series of tales illustrative of Irish life. He then set out for London, the great centre of literary activity, and supported himself by writing for magazines and for the stage. A volume of miscellaneous essays was published anonymously in 1824, called *Revelations of the Dead Alive*. In April, 1825, appeared the first series of *Tales of the O'Hara Family*, which achieved immediate and decided success. One of the most powerful of them, *Crohoore of the Bill Hook*, was by Michael Banim. In 1826 a second series was published, containing what is decidedly one of the best Irish novels, *The Nowlans*. His last piece of literary work was the novel entitled *Father Connell*. He died in July, 1842, aged 44. Banim's true place in literature is to be estimated from the merits of the *O'Hara Tales;* his later works, though of considerable ability, are not unfrequently prolix, and are marked by too evident an imitation of the *Waverly Novels*. The *Tales*, however, show him at his best; they are masterpieces of faithful delineation. The strong passions, the lights and shadows of Irish peasant character, have rarely been so ably and truly depicted. The prevailing quality is a wonderful vehemence, combined with gloominess.

BANJARMASSIN, a district in the south-east of Borneo, which was incorporated by the Dutch in consequence of the war of 1860, in regard to the succession in the sultanate, which had been under their protection since 1787. It is watered by the river system of the Banjar, and traversed by a chain of mountains that in some places reaches the height of 3000 feet. The district has been divided by the Dutch into the residency of Kween and the sub-residencies of Amuntal and Martapura. The town of Martapura was the seat of the sultan from 1771. The principal productions of the district are gold, diamonds, coal, pepper and other spices, drugs, edible birds' nests, gum, wax, rattans, &c. The inland portion is covered with forest, while the flat and swampy seaboard is largely occupied by rice-fields. The inhabitants, who are for the most part Dayaks, are roughly estimated from 300,000 to 600,000.

BENJARMASSIN, the chief town of the above district, also known as Fort Tatas, is situated about 15 miles from the mouth of the Banjar. Population, 30,000.

BANJO (originally a mere negro mispronunciation of *bandore*, derived through the medium of Spanish or Portuguese, from Lat. *pandura*, Gr. *pandoura*, a three-stringed musical instrument), an instrument of the guitar kind, played with the fingers, but without frets to guide the stopping.

BANKING. A bank, in its simplest form, is an institution where money may be deposited for safe keeping; but banks are usually established to lend as well as to receive money; and the profits of a banker are commonly derived from the excess of the interest he receives from those indebted to him over the interest he allows, so far as he allows any to those who have deposited money with him. Early denunciations of usury (Exod. xxii. 25) show the antiquity of the practice of lending money at interest; but this must have long preceded the origin of the business of both borrowing and lending money. When this first appeared it was not, at least in modern Europe, a distinct profession, but was undertaken by goldsmiths and dealers in precious metals. In the progress of the separation of employments, which is a characteristic of an advancing society, banking became a business of its own, which has again been subdivided into many branches independently pursued. It was, for example, formerly generally allowed to be part of the business of a banker to borrow money by issuing promissory notes payable to bearer, which passed from hand to hand as money, within the sphere of the operations of the banks, and banks thus borrowing money were called *Banks of Issue;* but it has been contended of late years that the function of issuing notes passing by delivery as money

should be reserved for the state, or for some institution controlled and directed by the state; and we shall have hereafter to notice the controversy that has arisen on this point, and the steps that have been taken in consequence of it. An explanation of the different species of banks will also properly be deferred till a later stage, but it will be convenient here to give a general sketch of the nature of the business of an ordinary banker. We have said he receives and lends money; he may receive money either on a deposit or on a current or drawing account. When money is received on deposit it is commonly repayable to the depositor alone, to whom a deposit note or receipt is given; but it may also be paid to any one to whom the depositor gives an order on the bank either endorsed on the deposit note or receipt or accompanying it. If the banker undertakes to pay interest on deposits, the rate varies according to the length of the notice the depositor agrees to give before withdrawing the money, the ability of the banker to deal with it being, of course, dependent upon the time he may rely upon keeping it. When money is received on a current or drawing account, the customer of the banker draws it out, as he requires, by means of orders, to which the specific name cheques is given; and partly for convenience and partly by way of security against fraud, bankers are in the habit of giving their customers books of forms of cheques consecutively numbered. Cheques are generally payable to the person in whose favor they are drawn (the payee) or bearer, though they are sometimes payable to the payee or order, in which case endorsement by the payee is necessary before the money can be received.

Bankers lend money by opening credits in their books, against which their favored customers may draw to the extent of the credits opened; by discounting bills; by the purchase of securities; or by advancing money on securities, &c., &c. It will have been gathered that they also undertake the business of collecting the money for cheques, for bills, and for other securities as they mature, which they may have received from their customers. The labor of collection is much facilitated in England by the fact that bills of exchange are almost invariably made payable in London, and that every country banker has a correspondent among the London bankers who collects for him and pays for him; and the London bankers again maintain an establishment called the Clearing-house, where their clerks meet to effect their interchanges.

Banking appears to have reached a high state of development among the ancients. The bankers of Greece and Rome exercised nearly the same functions as those of the present day, except that they do not appear to have issued notes. They received money on deposit, to be repaid on demands made by cheques or orders, or at some stipulated period, sometimes paying interest for it, and sometimes not. Their profits arose from their lending the balance at their disposal at higher rates of interest than they allowed the depositors. They were also extensively employed in valuing and exchanging foreign moneys for those of Athens, Corinth, Rome, &c., and in negotiating bills of exchange. In general they were highly esteemed, and great confidence was placed in their integrity. The rate of interest charged by the bankers was sometimes very high, but that was not a consequence, as has been alleged, of their rapacity, but of the defective state of the law, which, as it gave every facility to debtors disposed to evade payment of their debts, obliged the bankers to guarantee themselves by charging a proportionately high rate of interest. Banking reappeared in Italy upon the revival of civilisation. The bank of Venice is reputed the first in date in the history of modern Europe; but it did not become a bank, as we understand the term, till long after its foundation. Historians inform us that the republic being hard pressed for money, was obliged, upon three different occasions, in 1156, 1480, and 1510, to levy forced contributions upon the citizens, giving them in return perpetual annuities at certain rates per cent. The annuities due under the forced loan of 1156 were, however, finally extinguished in the 16th century; and the offices for the payment of the annuities due under the other two loans having been consolidated, eventually became the bank of Venice. This might be effected as follows:—The interest on the loan to Government being paid punctually, every claim registered in the books of the office would be considered as a productive capital; and these claims, the right of receiving the annuity accruing thereon, must soon have been transferred, by demise or cession, from one person to another. This practice would naturally suggest to holders of stock the simple and easy method of discharging their mutual debts by transfers on the office books, and as soon as they became sensible of the advantages to be derived from this method of accounting, bank-money was invented. It will, however, be seen that the establishment thus described was at first no more than the transfer office of a National Debt, transfers of which were accepted at par in discharge of private debts, and it is indeed said that the funded debt transferred sometimes commanded an agio or premium above the current money of the republic. This establishment was ruined, after passing through many changes, by the invasion of the French in 1797.

The origin of modern banking may be traced to the money-dealers of Florence, who were in high repute as receivers on deposit and lenders of money in the 14th century; and banking was indeed practised at Florence in the 13th if not in the 12th century.

The business of banking was not introduced into England till the 17th century, when it began to be undertaken by goldsmiths in London, who appear to have borrowed it from Holland. It was attacked, as innovations commonly are.

The Bank of England, which has long been the principal bank of deposit and circulation in Great Britain, and indeed in Europe, was founded in 1694. Its principal projector, Mr. William Paterson, an intelligent Scotch gentleman, was afterwards engaged in the ill-fated Darien enterprise. Government being at the time much distressed for want of money, partly from the defects and abuses in the system of taxation, and partly from the difficulty of borrowing because of the supposed instability of the Revolutionary establishment, the bank grew out of a loan of £1,200,000 for the public service. The subscribers, besides receiving 8 per cent. on the sum advanced as interest, and £4000 a year as the expense of management, in all £100,000 a year, were incorporated into a society denominated the Governor and Company of the Bank of England. The charter is dated the 27th of July 1694. It declares, amongst other things, that they shall "be capable, in law, to purchase, enjoy, and retain to them and their successors, any moneys, lands, rents, tenements, and possessions whatsoever; and to purchase and acquire all sorts of goods and chattels whatsoever, wherein they are not restrained by Act of Parliment; and also to grant, demise, and dispose of the same.

"That the management and government of the corporation be committed to the governor and twenty-four directors, who shall be elected between the 25th of March and the 25th day of April each year, from among the members of the company duly qualified.

"That no dividend shall at any time be made by the said governor and company, save only out of the interest,

profit, or produce arising by or out of the said capital, stock, or fund, or by such dealing as is allowed by Act of Parliament.

"They must be natural-born subjects of England, or naturalised subjects; they shall have in their own name, and for their own use, severally, viz., the governor at least £4000, the deputy governor £3000, and each director £2000, of the capital stock of the said corporation.

"That thirteen or more of the said governors and directors (of which the governor or deputy-governor must be always one) shall constitute a court of directors, for the management of the affairs of the company, and for the appointment of all agents and servants which may be necessary, paying them such salaries as they may consider reasonable.

"Every elector must have, in his own name and for his own use, £500 or more capital stock, and can only give one vote. He must, if required by any member present, take the oath of stock, or the declaration of stock in case he may be one of the people called Quakers.

"Four general courts shall be held in every year, in the months of September, December, April, and July. A general court may be summoned at any time, upon the requisition of nine proprietors duly qualified as electors. The majority of electors in general courts have the power to make and constitute bye-laws and ordinances for the government of the corporation, provided that such bye-laws and ordinances be not repugnant to the laws of the kingdom, and be confirmed and approved according to the statutes in such case made and provided."

The corporation is prohibited from engaging in any sort of commercial undertaking other than dealing in bills of exchange, and in gold and silver. It is authorised to advance money upon the security of goods or merchandise pledged to it, and to sell by public auction such goods as are not redeemed within a specified time.

It was also enacted, in the same year in which the bank was established, by statute 6 William and Mary, c. 20, that the bank "shall not deal in any goods, wares, or merchandise (except bullion), or purchase any lands or revenues belonging to the Crown, or advance or lend to their majesties, their heirs or successors, any sum or sums of money, by way of loan or anticipation on any part or parts, branch or branches, fund or funds of the revenue, now granted or belonging, or hereafter to be granted, to their majesties, their heirs and successors, other than such fund or funds, part or parts, branch or branches of the said revenue only on which a credit of loan is or shall be granted by Parliament." And in 1697 it was enacted, that the "common capital or principal stock, and also the real fund, of the governor and company, or any profit or produce to be made thereof, or arising thereby, shall be exempted from any rates, taxes, assessments, or impositions whatsoever during the continuance of the bank; that all the profit, benefit, and advantage from time to time arising out of the management of the said corporation, shall be applied to the uses of all the members of the said association of the governor and company of the Bank of England, rateably and in proportion to each member's part, share, and interest in the common capital and principal stock of the said governor and company hereby established."

In 1696, during the great recoinage, the bank was involved in great difficulties and was even compelled to suspend payment of its notes, which were at a heavy discount. Owing, however, to the judicious conduct of the directors, and the assistance of the Government, the bank got over the crisis. But it was at the same time judged expedient, in order to place it in a situation the better to withstand any adverse circumstances that might afterwards occur, to increase the capital from £1,200,000 to £2,201,171. In 1708 the directors undertook to pay off and cancel one million and a half of exchequer bills they had circulating two years before, at 4½ per cent., with the interest upon them, amounting in all to £1,775,028, which increased the permanent debt due by the public to the bank, including £400,000 then advanced in consideration of the renewal of the charter, to £3,375,028, for which they were allowed 6 per cent. The bank capital was then also doubled or increased to £4,402,342. But the year 1708, is chiefly memorable in the history of the bank, for the Act previously alluded to, which declared, that during the continuance of the corporation of the Bank of England, "it should not be lawful for any body politic, erected or to be erected, other than the said governor and company of the Bank of England, or of any other persons whatsoever, united or to be united in covenants or partnership, exceeding the number of six persons, in that part of Great Britain called England, to borrow, owe, or take up any sum or sums of money on their bills or notes payable on demand, or in any less time than six months from the borrowing thereof." This proviso is said to have been elicited by the Mine Adventurers Company having commenced banking business and begun to issue notes. It will be seen on examination that the proviso did not prohibit the formation of associations for general banking business; it simple forbade the issue of notes by associations of more than six partners; but the issue of notes was regarded as so essential to the business of banking, that it came to be believed that joint-stock banking associations were absolutely prohibited in England, and no such association was founded until after the legislation of 1826 which expressly permitted them to be established. The charter of the Bank of England, when first granted, was to continue for eleven years certain, or till a year's notice after the 1st of August 1705. The charter was further prolonged in 1697. In 1708, the bank, having advanced £400,000 for the public service, without interest, the exclusive privileges of the corporation were prolonged till 1733. And in consequence of various advances made at different times, the exclusive privileges of the bank were continued by successive renewals till the 1st August, 1855, with the proviso that they might be cancelled on a year's notice to that effect being given after the said 1st of August 1855.

The capital of the bank on which dividends are paid has never exactly coincided with, though it has seldom differed very materially from, the permanent advance by the bank to the public. We have already seen that it amounted in 1708 to £4,402,342. Between that year and 1727 it had increased to near £9,000,000. In 1746 it amounted to £10,780,000. From this period it underwent no change till 1782, when it was increased 8 per cent., amounting to £11,642,400. It continued stationary at this sum down to 1816, when it was raised to £14,553,000, by an addition of 25 per cent. from the profits of the bank, under the provisions of the Act 56 Geo. III. c. 96. The act for the renewal of the charter 3 and 4 Will. IV. c. 98, directed that the sum of £3,671,700, being the fourth part of the debt due by the public to the bank, should be paid to the latter, giving the bank the option of deducting it from its capital. But that has not been done; and after sundry changes, the capital of the bank amounts, as formerly, to £14,553,000.

The Bank of England has been frequently affected by panics amongst the holders of her notes. In 1745 the alarm occasioned by the advance of the Highlanders, under the Pretender, as far as Derby, led to a run upon

the bank; and in order to gain time to effect measures for averting the run, the directors adopted the device of paying in shillings and sixpences! But they derived a more effectual relief from the retreat of the Highlanders, and from a resolution agreed to at a meeting of the principal merchants and traders of the city, and very numerously signed, declaring the willingness of the subscribers to receive bank-notes in payment of any sum that might be due to them, and pledging themselves to use their utmost endeavors to make all their payments in the same medium.

During the tremendous riots in June 1780, the bank incurred considerable danger. Had the mob attacked the establishment at the commencement of the riots, the consequences might have proved fatal. But they delayed their attack till time had been afforded for providing a force sufficient to insure its safety. Since that period a considerable military force occupies the bank every night as a protection in any emergency that may occur.

Different Species of Banks — The Clearing-house — Authorisation of Banks with Limited Liabilities.

We have elsewhere hinted at the subdivision of the business of banking which has accompanied the development of commerce. A banker borrows and lends money, but the conditions under which money is borrowed or lent may be extremely various, and the different classes of bankers are distinguished from one another by differences in the rules which they observe in borrowing or lending. Bankers may borrow money on call, at deposit, on debentures, at interest, or without interest, and they may lend on open credits, by discounting bills, by advances on mortgage repayable in instalments or otherwise, &c., &c.

Banks of Deposit.—These banks receive money on deposit, that is to say, on conditions that a certain prescribed notice shall be given of the time of withdrawal. They allow interest, and they usually lend a large proportion of their money on securities which are not at any moment immediately capable of being realised.

Land Mortgage Banks may be classed with banks of deposit, but they are also accustomed to borrow on debentures repayable at the end of one, two, three, or a larger number of years, at rates of interest varying with the period of the debenture. These institutions were first started for the purpose of granting facilities to the mortgagers of land. The money received on debentures was lent out again to proprietors and purchasers of land, who repaid their debts by annual instalments. It was in this way that the legislation of Stein was facilitated in Germany; the peasant being able to obtain at once from the Land Mortgage Bank the capital necessary to redeem the feudal rights of his lord, a debt which he repaid by a series of annual payments often corresponding to what he had previously paid as rent, until he became an absolute unincumbered owner of the fields he cultivated.

Credit Companies, such as the *Crédit Foncier*, the *Crédit Mobilier*, &c., &c., are strictly analogous to land mortgage banks, except that they invest their funds in loans on the security of general industrial undertakings, to which business they have added the function of negotiators of direct loans between companies formed for the conduct of such undertakings and the capitalist public.

Discount Banks and *Discount Agencies* borrow money on call or deposit, and lend it exclusively in the discount of bills and negotiable securities, which they often rediscount with capitalists desirous of investing their money in forms capable of being speedily realised.

Trust Associations borrow money on debentures and invest it in the loans of foreign states or similar securities,—the principle of such an association being that the original investor can be secured against the default of any one borrower by the receipt of a high average rate of interest and the general solvency of the rest.

Savings-Banks are institutions established for the receipt of the smaller savings of the poor. As at present existing they are divided into two classes, the Trustees' Savings-banks and the Post Office Savings-banks; but it seems probable that some rearrangement of their machinery will be made in the next session of Parliament. For further particulars see SAVINGS-BANKS.

Allusion has already been made to the Clearing-house. This institution was established, just a century ago, as a place where the clerks of the bankers in the City of London could assemble daily to exchange with one another the cheques drawn upon and bills payable at their respective houses. Before the Clearing-house existed, each banker had to send a clerk to to the places of business of all the other bankers in London to collect the sums payable by them in respect of cheques and bills; and it is obvious that much time was consumed by this process, which involved also the use of an unnecessary quantity of money and corresponding risks of safe carriage. In 1775 the common centre of exchange was agreed upon. Its use was confined to the bankers,—at that time and long afterward exclusively private bankers,—doing business within the city, and the bankers in the west end of the metropolis used some one or other of the city banks as their agent in clearing, a practice which still continues. When the joint-stock banks were first established the jealousy of the existing banks was powerful enough to exclude them altogether from the use of the Clearing-house; and some years elapsed before this feeling was removed so as to allow them to be admitted.

At first the Clearing-house was simply a place of meeting, but it came to be perceived that the sorting and distribution of cheques and bills could be more expeditiously conducted by the appointment of two or three common clerks, to whom each banker's clerk could give all the instruments of exchange he wished to collect, and from whom he could receive all those payable at his own house. The payment of the balance settled the transaction, and the analysis of the statistics of the Clearing-house by the late Mr. Babbage (*Journ. Statist. Soc.*, March, 1856), shows that the amount of cash that passed was often less than 4 per cent. of the total sums cleared. Latterly, however, the arrangements of the Clearing-house have been further perfected, so that neither notes nor coin are now required. The Clearing-house, as well as each banker using it, has an account at the Bank of England; and the balances due at the close of each day's transactions are settled by transfers from one account to another at the bank.

The use of the Clearing-house was still further extended in 1858, so as to include the settlement of exchanges between the country bankers of England. Before that time each country banker receiving cheques on other country bankers sent them to those other bankers by post (supposing they were not carrying on business in the same place), and requested that the amount should be paid by the London agent of the banker on whom the cheques were drawn to the London agent of the banker remitting them. Cheques were thus collected by correspondence, and each remittance involved a separate payment in London. In 1858 it was proposed to set up a country clearing-house in London; but it was suggested by Sir John Lubbock that the existing establishment could accomplish what was desired, and this was eventually done. A country banker now sends cheques on other country banks to his London correspondent, who exchanges them at the Clearing-house

with the correspondents of the bankers on whom they are drawn. (Sir John Lubbock, *Jour. Statist. Soc.*, Sept. 1865.) It will be easily understood that an extraordinary economy in the use of coin has resulted from these arrangements; and in the paper by Sir John Lubbock to which we have referred, he gives statistics showing that out of the sum of a million paid into the bank in which he is a partner, only £21,500 consists of bank notes and £6,210 of coin. An ordinary weekly clearing varies from 100 to 130 millions; in 1868 the weekly average was, however, no more than £65,397,075, from which it rose continuously to an average of £116,254,717 in 1873. There was a little falling off in 1874, which is now being recovered.

Up to the year 1858 banking companies could not be constituted with limited liability of partners except by way of privilege under special Acts of Parliament, Royal Charters, or Letters Patent; and although the Bank of England, and the three oldest established banks in Scotland, were thus favored without any consequent deterioration in the character of their management, abundant arguments were adduced in depreciation of a general law in the subject. In 1858, however, an Act was passed authorising the formation and registration of banking companies with limited liability, and also enabling existing unlimited companies to register as associations with a limited liability of partners, subject to a proviso that, if the bank was a bank of issues, the liability of its partners should remain unlimited in respect of such issue. Several banks have been established and registered under this law, and no evil results have been observed to follow.

Present Management of the Bank of England.

When the charter was renewed in 1833, the notes of the Bank of England were made legal tender everywhere in England except at the bank. Of the wisdom of this regulation no doubt can be entertained. Bank-notes are necessarily always equivalent to bullion; and by making them substitutes for coin at country banks, the demand for the latter during periods of alarm or runs is materially diminished, and the stability of the bank and of the pecuniary system of the country proportionally increased.

Since 1826 the bank has established branches in some of the great commercial towns.

The Bank of England transacts the whole business of Government. "She acts not only," says Adam Smith, "as an ordinary bank, but as a great engine of state. She receives and pays the greater part of the annuities which are due to the creditors of the public; she circulates Exchequer bills; and she advances to the Government the annual amount of the land and malt taxes, which are frequently not paid till some years thereafter."

The Bank of England rarely discounts bills that have more than two, or at most three months to run, and it were well were this rule generally observed by other establishments. The discounting of bills at long dates is a powerful stimulus to unsafe speculation. When individuals obtain loans which they are not to be called upon to pay for six, twelve, or perhaps, eighteen months, they are tempted to adventure in speculations which are not expected to be wound up till some proportionally distant period; and as these not unfrequently fail, the consequence is that, when the bills become due, there is commonly little or no provision made for their payment. In such case the discounters to avoid an imminent loss, sometimes consent to renew the bills. But, while a proceeding of this sort is rarely productive of ultimate advantage to either party, the fact of its having taken place makes other adventurers reckon that, in the event of their speculation proving less successful than they anticipated, their bills will be treated in the same manner, and thus agravates and extends the evil.

In other respects, too, the discount of bills at long dates, or their renewal, or the making of permanent loans, is altogether inconsistent with sound banking principles, for it prevents the bankers from having that command over their resources which is advantageous at all times, and indispensable in periods of difficulty or distress.

In the discounting of bills, a great deal of stress is usually laid, or pretended to be laid, on the distinction between those that arise out of real transactions and those that are fictitious or that are intended for accommodation purposes. The former are said to be legitimate, while the latter are stigmatised as illegitimate. But Mr. Thornton has shown that the difference is neither so well marked nor so wide as many suppose. A notion seems to be generally entertained that all real bills are drawn against produce of one sort or other, which (or its value) is supposed to form a fund for their payment. Such, however, is not always, nor even most commonly, the case. A, for example, sells to B certain produce, for which he draws a bill at sixty days' date. But prices are rising, trade is brisk, or a spirit of speculation is afloat, and, in a week or two (sometimes much less), B sells the produce at an advance to C, who thereafter sells it to D, and so on. Hence it may, and, in fact, frequently does happen, that bills amounting to four, five, or even ten times the value of a quantity of merchandise, have grown out of its successive sales, before the first bill of the series has become due. And not only this, but bills are themselves very frequently rediscounted; and in this case the credit of the last indorser is generally the only thing looked to; and there is not, perhaps, one case in ten in which any inquiries are made in regard to the origin and history of the bills, though they are often of the most questionable description.

On the whole, therefore, it would seem that the real or presumed solvency of the parties signing a bill, and responsible for its payment, is the only safe criterion by which to judge whether it should or should not be discounted. But the fact of a merchant or other trader offering accommodation bills for discount ought unquestionably to excite a suspicion that he is trading beyond his capital. Inquiries of the most searching description should forthwith be instituted; and unless satisfactory explanations are given, his paper should be rejected. On the same principle, the offering of bills for rediscount ought to awaken suspicions of the bankers and others who resort to so questionable a mode of carrying on business. But, except in so far as a feeling of distrust may be thus very properly excited, there does not appear to be anything in an accommodation bill *per se* to hinder it from coming within the pale of negotiability. It is a mode of obtaining a loan from a bank; and when the character of the bill is known to the banker, or is openly declared, it does not appear to be an objectionable mode.

Besides bills avowedly intended for accommodation purposes, another and a different variety of such bills is drawn by parties at a distance from each other, often men of straw, and made to appear as if they were bottomed on real transactions. Bills of this sort are, it is greatly to be regretted, always current, and often to a large extent. Of course no person of respectability can be knowingly connected with such bills, which are almost always put in motion either to bolster up some bankrupt concern, or to cheat and defraud the public. But despite the mischief of which they are productive, it appears to be pretty generally supposed that the currency of these bills is an evil which cannot be prevented. There can, however, be no real doubt that it may, at all

events, be very greatly diminished; and this desirable result would be effected were it enacted that all bills shall henceforth bear upon their face what they really are; that those that are intended for accommodation purposes shall have at their head the words "*Accommodation bill;*" and that those only shall bear to be for "value received" that has grown out of *bona fide* transfers of property. An enactment of this sort could not be felt as a grievance by any one unless he had a fraudulent purpose in view. And were the impressing of a false character on a bill made a criminal offence, punishable by several years' imprisonment, there is every probability that a formidable check would be given to the issue of spurious bills, and to the manifold abuses to which the practice gives rise.

Bill-discounters who have got fictitious paper on their hands and attempt to get rid of it by concealing its character or representing it in a favorable light make themselves parties to the fraud. Such conduct is so very flagitious, that when it can be fairly brought home to the parties it should subject them to the severest penalties.

The Bank of England does not allow, either at the head office in London, or at its branches, any interest on deposits, and many plausible reasons have been advanced in defence of this rule.

Previously to 1786 the bank received an allowance for paying the dividends, superintending the transfer of the stock, &c., of the national debt, at the rate of £562, 10s. a million on its amount. In 1786 this allowance was reduced to £450 a million, the bank being, at the same time, entitled to a considerable allowance for its trouble in receiving contributions on loans, lotteries, &c. This, though long regarded as a very improvident arrangement on the part of the public, was acquiesced in till 1808, when the allowance on account of management was reduced to £300 per million on £600,000,000 of the public debt, and to £300 per million on all that it exceeded that sum, exclusive of some separate allowances for annuities, &c. The impression, however, was still entertained that the allowances for management should be further reduced, and this has been effected in the interim.

Exclusive of its functions as public banker and manager of the public debt, the Bank of England is connected with Government through the circulation. It is entitled to issue the sum of £15,000,000 upon securities, that is, on the credit of the funds lent to Government. But for these the bank receives about 3 per cent. interest, and such being the case, the public is clearly entitled to a portion, if not to the whole amount of the profits realised by the bank on the issue of these £15,000,000. It is difficult to say how much this ought to be. The issue department of the bank seldom re-issues notes, but for the most part destroys them as soon as they are returned to it. This practice is said to be necessary to enable the bank to obviate fraud, by keeping a proper account of the numbers of the notes afloat. An opinion is, however, pretty generally entertained that this might be effected by a less expensive process than that which is now resorted to. And certainly, it seems to be a very wasteful proceeding, that a quantity of newly manufactured notes issued by the bank in the forenoon, and returned to her in the afternoon, should not be re-issued, but consigned to the flames. The Scotch banks are justly censurable for keeping their notes too long afloat, but this is running with a vengeance into the opposite extreme.

In 1861 a fresh arrangement was made between the Government and the bank, to endure for 25 years. Under this agreement the bank receives £300 per million on £600,000,000, and £150 per million on the amount of debt above that sum; but from these allowances are deducted £60,000 for exemption from stamp duties and the whole allowance out of profit of issue, making together nearly £200,000.

It should be observed that the responsibility and expense incurred by the bank, in managing the public debt, are very great. The temptation to the commission of fraud, in transferring stock from one individual to another, and in the payment of the dividends, is well known; and notwithstanding the skilfully devised system of checks adopted by the bank for preventing this, it has frequently sustained very great losses by forgery and otherwise. In 1803 the bank lost, through a fraud committed by one of the principal cashiers, Mr. Astlett, no less than £340,000; and the forgeries of Fauntleroy, the banker, cost it a still larger sum. At an average of the ten years ending with 1831, the bank lost, through forgeries on the public funds, £40,204 a year.—*Report on Bank Charter, Appen.* p. 165.

Besides the transactions alluded to, the bank entered, on the 20th of March 1823, into an engagement with Government with respect to the public pensions and annuities, or, as they have been more commonly termed, the *dead weight.* At the end of the war, the naval and military pensions, superannuated allowances, &c., amounted to above £5,000,000 a year. They would, of course, have been gradually lessened, and ultimately extinguished, by the death of the parties; but it was resolved in 1822 to attempt to spread the burden equally over the whole period of *forty-five* years, during which it was calculated the annuities would continue to decrease. To effect this purpose, it was supposed that, upon Government offering to pay £2,800,000 a year for forty-five years, capitalists would be found who would undertake to pay the entire annuities, according to a graduated scale previously determined upon, making the first year a payment of £4,900,000, and gradually decreasing the payments until the forty-fifth and last year, when they were to amount to only £300,000. This supposition was not, however, realised. No capitalists were found willing to enter into such distant engagements. But in 1823, the bank agreed, on condition of receiving an annuity of £585,740 for *forty-four* years, commencing on the 5th of April 1823, to pay, on account of the pensions, &c., at different specified periods, between the years 1823 and 1828, both inclusive, the sum of £13,089,419.—(4 Geo. IV. c. 22.) This annuity has, in due course of time, expired.

Formerly the business transacted at the bank was so much encumbered with forms and conditions, that the generality of merchants and ordinary people rarely thought of employing it to keep their money or make their payments. But in this respect an entire change has been effected. Cheques, the minimum amount of which was formerly £10, may now be drawn of any amount, great or small; and all sorts of banking business is conducted with facility and despatch, and, it may be added, with perfect security.

The bank opens banking accounts, or, as they are called, "drawing accounts," for the safe custody, and the receipt and payment of cash, not only with merchants and traders, but with all persons who choose to keep their money at a banker's and to draw cheques against it. The bank also takes charge of its customers' bills of exchange, Exchequer bills, and other securities, and does all that is needful either in the collection of bills of exchange, the exchange of Exchequer bills, the receipt of dividends, and so forth, free of any charge. Plate chests, and deed and security boxes, may be deposited free of expense, by customers, for safe custody. The bank looks to the average balance of cash on each account to compensate for the trouble and expense of

keeping it, and in this respect the requirements of the bank are certainly not greater than those of ordinary bankers. No particular sum is required to be lodged on opening an account; it is only necessary that the party should be known as respectable, and in a condition to require a banking account. But the bank receives and holds sums of money for safe custody for parties who have no current accounts.

Scotch Banks.

The Act of 1708, preventing more than six individuals from entering into a partnership for carrying on the business of banking, did not extend to Scotland. In consequence of this exemption, several banking companies, with numerous bodies of partners, have existed, for a lengthened period, in that part of the empire.

The Bank of Scotland was projected by Mr. John Holland, merchant, of London, and was established by Act of the Scotch Parliament in 1695, by the name of the Governor and Company of the Bank of Scotland. Its original capital was £1,200,000 Scotch, or £100,000 sterling, distributed in shares of £1000 Scotch, or £83, 6s. 8d. sterling, each. The Act exempted the capital of the bank from all public burdens, and gave it the exclusive privilege of banking in Scotland for twenty-one years. The objects for which the bank was instituted, and its mode of management, were intended to be, and have been, in most respects, similar to those of the Bank of England. The responsibility of the shareholders is limited to the amount of their shares. The capital of the bank was increased to £200,000 in 1774, and was enlarged by subsequent Acts of Parliament, the last of which (44 Geo. III. c. 23) was passed in 1804, to £1,500,000, its present amount. Of this sum £1,000,000 has been paid up. The last-mentioned Act directed that all sums relating to the affairs of the bank should henceforth be rated in sterling money; that the former mode of dividing bank stock by shares should be discontinued; and that, for the future, it should be transferable in sums or parcels of any amount. On the union of the two kingdoms in 1707, the Bank of Scotland undertook the recoinage, and effected the exchange of the currency in Scotland. It was also the organ of Government in the issue of the new silver coinage in 1817.

The Bank of Scotland is the only Scotch bank constituted by Act of Parliament. It began to establish branches in 1696, and issued notes for one pound as early as 1704. The bank also began, at a very early period, to receive deposits on interest, and to grant credit on cash accounts, a minute of the directors with respect to the mode of keeping the latter being dated as far back as 1729. It is, therefore, entitled to the credit of having introduced and set on foot the distinctive principles of the Scotch banking system, which, whatever may be its defects, is perhaps superior to most other systems hitherto established. Generally speaking, the Bank of Scotland has been cautiously and skillfully conducted; and there can be no doubt that it has been productive, both directly and as an example to other banking establishments, of much public utility and advantage.

It may be worth mentioning, that the Act of Will. III. establishing the Bank of Scotland, declared that all foreigners who became partners in the bank should by doing so become, to all intents and purposes, naturalised Scotchmen. After being for a long time forgotten, this clause was taken advantage of in 1818, when several aliens acquired property in the bank in order to secure the benefit of naturalisation. But after being suspended, the privilege was finally cancelled in 1822.

The *Royal Bank of Scotland* was established in 1727. Its original capital of £151,000 has been increased to £2,000,000.

The *British Linen Company* was incorporated in 1746, for the purpose, as its name implies, of undertaking the manufacture of linen. But the views in which it originated were speedily abandoned, and it became a banking company only. Its capital amounts to £1,000,000.

None of the other banking companies established in Scotland are chartered associations with limited responsibility, the partners being liable, to the whole extent of their fortunes, for the debts of the firms. The number of partners is in every case considerable. The affairs of the banks are uniformly conducted by a board of directors, annually chosen by the shareholders.

The Bank of Scotland began, as already stated, to issue £1 notes so early as 1704, and their issue has since been continued without interruption. "In Scotland," to use the statement given in the Report of the Committee of the House of Commons of 1826 on the Promissory Notes of Scotland and Ireland, "the issue of promissory notes payable to the bearer on demand, for a sum not less than 20s., has been at all times permitted by law; nor has any Act been passed limiting the period for which such issue shall continue legal in that country."

All the Scotch banks receive deposits of as low a value as £10, and often lower, and allow interest upon them.

The interest allowed by the banks upon deposits varies, from time to time, according to the variations in the current rate of interest. The aggregate amount of the sums deposited with the Scotch banks in 1874–5 is stated to be £78,401,070.

A witness, connected for many years with different banks in Scotland, and who had experience of their concerns at Stirling, Edinburgh, Perth, Aberdeen and Glasgow, being examined by the Commons' Committee of 1826, stated that more than half the deposits in the banks with which he had been connected were in sums from £10 to £200. Being asked what class of the community it is that makes the small deposits, he gave the following answer,— from which it appears that the mode of conducting this branch of the bank business in Scotland has long given to that country most part of the benefits derivable from the establishment of savings-banks:—

Answer.— They are generally the laboring classes in towns like Glasgow; in country places like Perth and Aberdeen, it is from servants and fishermen, and that class of the community who save small sums from their earnings, till they come to be a bank deposit. There is now a facility for their placing money in the Provident Banks, which receive money till the deposit amounts to £10. When it comes to £10 it is equal to the minimum of a bank deposit. The system of banking in Scotland is an extension of the Provident Bank system.

The loans or advances made by the Scotch banks are either in the shape of discounts, or upon cash-credits, or, as they are more commonly termed, *cash accounts.*

A cash-credit is a credit given to an individual by a banking company for a limited sum, seldom under £100 or £200, upon his own security, and that of two or three individuals approved by the bank, who become sureties for its payment. The individual who has obtained such a credit is enabled to draw the whole sum, or any part of it, when he pleases, replacing it, or portions of it, according as he finds it convenient, interest being charged upon such part only as he draws out. "If a man borrows £5000 from a private hand, besides that it is not always to be found when required, he pays interest for

it whether he be using it or not. His bank credit costs him nothing, except during the moment it is of service to him, and this circumstance is of equal advantage as if he had borrowed money at a much lower rate of interest" (Hume's *Essay on Balance of Trade*). This, then, is plainly one of the most commodious forms in which advances can be made. Cash-credits are not, however, intended to be *dead loans;* and they are not granted except to persons in business, or to those who are frequently drawing out and paying in money.

The system of cash-credits has been very well described in the Report of the Lords' Committee of 1826 on Scotch and Irish Banking.

The expense of a bond for a cash-credit of £500 is 12s. 6d. stamp duty, and a charge of from 5s. to 10s. 6d. per cent. for preparing it.

There have been, on the whole, comparatively few failures among the Scotch banks. In 1793 and 1825, when so many of the English banks were swept off, there was not a single establishment in Scotland that gave way. This superior solidity appears to have been owing to various causes,—partly to the banks having, for the most part, large bodies of partners, who, being conjointly and individually bound for the debts of the companies to which they belong, go far to render their ultimate security all but unquestionable, and partly to the facility afforded by the law of Scotland of attaching a debtor's property, whether it consists of land or movables, and making it available for the payment of his debts.

But, on the whole, we are inclined to think that the long familiarity of the inhabitants with banks and paper money, and the less risk that has attended the business of banking in Scotland, have been the principal causes of the greater stability of the Scotch banks. This stability was not, however, everywhere exhibited in the crisis of 1857, when two of the principal Scotch banks, the headquarters of which were in Glasgow, were compelled to stop payments.

A complaint has been often raised that the Act of 1845 gave the existing Scotch banks a practical monopoly of the business of banking in North Britain, and it must be admitted to be the fact, that only one new bank has been established in Scotland since the passing of the Act, and that bank carried on business for a short time only. It is, however, true that legislation precisely the same has not prevented the establishment of new banks in Ireland, and it is doubtful whether the observed fact is rightly attributed to the cause assigned to it. With the exception of London, and some of the larger provincial towns, there have been very few banks established in England since 1836, eight years before the Bank Charter Act; and of the banks established in 1835 and 1836, very many were formed by the conversion of pre-existing private banks into joint-stock associations. The truth appears to be that the natural obstacles to the establishment of a new bank in a district already occupied by banks and bankers are almost insuperable. A bank cannot be successful unless it commands credit; and those who want a place of safe keeping for their money select establishments that have been tried and tested through long years. Hence it appears that, though private banks of long standing continue in esteem, the attempts to set up new private banks are most rare; and, unless the wealth and prosperity of a neighborhood have rapidly developed, so that capitalists have risen to prominence in it who are not connected as shareholders or directors with existing banks, it is not easy to form joint stock associations of weight enough to compete with the institutions in possession of the field. It is not necessary to refer the absence of new banking companies in Scotland or elsewhere to the legislation of Sir Robert Peel. Though he allowed the Scotch banks to increase indefinitely the issue of their notes, it was upon condition of keeping in hand cash to represent every note above fixed limits; so that the amount of profit derivable from their issues is not capable of increase, and the value of their privileges will have been strictly included in the selling price of shares in these banks since 1845. As far as the privilege of issue goes capitalists preparing to start a new banking association in Scotland would be in the same position as in buying shares in an established company; and if they do not start an association of their own, it is from the difficulty of attracting confidence, rather than because they would not enjoy the profits of a privileged circulation for which they would have to pay a full value. It must also be observed that the competition among the existing banks is sufficiently active to have caused them to increase the number of their branches 40 per cent. since 1845.

Another question has been raised in relation to Scotch banks, which was the subject of a keen parliamentary discussion during the past session (1875). It has been mentioned that English joint-stock banks of issue are debarred from setting up branches in London, or within sixty-five miles of it, a prohibition originally imposed on them in the interest of the Bank of England as a bank of issue. There is no such prohibition affecting Scotch and Irish banks, which can set up offices in London, or elsewhere in England subject to the single condition affecting all banking establishments set up in England since 1844, that notes other than Bank of England notes are not issued at such offices; and it is obvious that a Scotch or Irish banking company establishing a head office in London would be able to give it at once a large agency business, and would be able to feed it continuously with new connections owing to the flow of immigration from Scotland and Ireland to London. Accordingly, the Directors of the National Bank of Ireland began to conduct the general business of banking at their head office in London in 1854, and they have subsequently set up seven or eight branches in the metropolis, each of which is understood to be the centre of much business. This example was so far followed, that the National Bank of Scotland started an office in London in 1864; the Bank of Scotland did the same in 1867; and the Royal Bank in 1874, having attained a private act for the purpose. The Clydesdale Bank also opened three branches in Cumberland in 1874. In consequence of this action Mr. Goschen brought into Parliament a bill, the object of which was to disable Scotch banks from coming into England, as English joint-stock banks of issue are disabled from coming to London. The bill did not extend to Irish banks, as they were held too firmly settled in the metropolis to be expelled from it. Two arguments were advanced in favor of this measure: the first, that it was hard that Scotch banks should be permitted to do that which is denied to English joint-stock banks; but it is an easy, and, it would seem, a conclusive answer to this argument, that English joint-stock banks of issue should be freed from the disability now imposed upon them. Now that an increase in its issue is not a measure of profit to the Bank of England, there is no reason why these country banks of England should not be allowed to set up head offices in London, subject to the law forbidding the issue of their notes in London. The second argument in favor of Mr. Goschen's measure was, that something ought to be done to hasten that unification of issues which Sir Robert Peel contemplated; and if the Scotch banks had come to Parliament asking for a liberty they did not possess, there would have been some plausibility in this argument. It

is to be feared that the whole strength of the support to Mr. Goschen's bill sprang from the jealousy of the existing bankers of London of any intrusion into their domain. Unworthy as this source of opposition was, it prevailed so far as to cause the appointment of a Select Committee of the House of Commons to consider the law and practice of banking, and this Committee's report appeared in August, 1875, and has formed the basis of subsequent legislation.

Banking in Ireland.

"In no country, perhaps," says Sir Henry Parnell, "has the issuing of paper money been carried to such an injurious excess as in Ireland. A national bank was established in 1783, with similar privileges to those of the Bank of England in respect to the restriction of more than six partners in a bank, and the injury that Ireland has sustained from the repeated failure of banks may be mainly attributed to this defective regulation. Had the trade of banking been left as free in Ireland as in Scotland, the want of paper money that would have arisen with the progress of trade would in all probability have been supplied by joint-stock companies, supported with large capitals and governed by wise and effectual rules.

"In 1797, when the Bank of England suspended its payments, the same privilege was extended to Ireland; and after this period the issues of the Bank of Ireland were rapidly increased. In 1797 the amount of the notes of the Bank of Ireland in circulation was £621,917; in 1810, £2,266,471; and in 1814, £2,986,999.

"These increased issues led to corresponding increased issues by the private banks, of which the number was fifty in 1804. The consequence of this increase of paper was its great depreciation; the price of bullion and guineas arose to 10 per cent. above the mint price; and the exchange with London became as high as 18 per cent., the par being 8⅓. This unfavorable exchange was afterwards corrected, not by any reduction in the issues of the Bank of Ireland, but by the depreciation of the British currency in the year 1810, when the exchange between London and Dublin settled again at about par.

"The loss that Ireland has sustained by the failure of banks may be described in a few words. It appears, by the Report of the Committee on Irish Exchanges in 1804, that there were, at that time, in Ireland fifty registered banks. Since that year a great many more have been established, but the whole have failed, one after the other, involving the country from time to time in immense distress, with the following exceptions—First, a few that withdrew from business; secondly, four banks in Dublin; thirdly, three at Belfast; and, lastly, one at Mallow. These eight banks, with the new Provincial Bank and the Bank of Ireland, are the only banks now (1827) existing in Ireland."

Since Sir Henry Parnell published the pamphlet from which we have taken the foregoing extract, several joint-stock banking companies have been founded in Ireland. The Provincial Bank, to which Sir Henry alludes, has a paid up capital of £540,000, and has been well and profitably managed. But others have been less fortunate. The Agricultural and Commercial Bank of Ireland, established in 1834, with 2170 partners, a paid up capital of £352,790, and many branches, stopped payment during the pressure in November 1836, and by doing so involved many persons in great distress. It appears to have been extremely ill-managed. The auditors appointed to examine into its affairs reported—"Its book-keeping has been found to be so faulty, that we are convinced no accurate balance-sheet could at any time have been constructed." And they significantly added—"the personal accounts at the head office require a diligent and searching revision."

The Tipperary Joint-Stock Bank, which was established in 1839, and stopped payments in 1855, appears to have been little, if at all, better than a mere swindling engine. Luckily it did not issue notes; and the sphere of its operations was not very extensive. But, so far as influence went, nothing could be worse, being ruinous alike to the majority of its partners and to the public.

We have in the previous section on Scotch banks mentioned the fact of the establishment by the National Bank of Ireland of a head office and of several branches in London. This example has been so far followed by the Provincial Bank that it has also set up a head office in London, without, however, competing for general business in the metropolis. An addition was made to the number of Irish banks in 1864 by the establishment of the Munster Bank (Limited), having its head office in Cork. It has established upwards of 40 branches, and pays a dividend of 12 per cent. to its shareholders.

Bank of Amsterdam.

The Bank of Amsterdám was founded in 1609, on strictly commercial principles and views, and not to afford any assistance, or to intermeddle with the finances of the state. Amsterdam was then the great entrepôt of the commerce of the world, and of course the coins of all Europe passed current in it. Many of them, however, were so worn and defaced as to reduce their general average value to about 9 per cent. less than their mint value; and, in consequence, the new coins were immediately melted down and exported. The currency of the city was thus exposed to great fluctuations; and it was chiefly to remedy this inconvience and to fix the value or par of the current money of the country, that the merchants of Amsterdam established a "bank," on the model of that of Venice. Its first capital was formed of Spanish ducats or ducatoons, a silver coin which Spain had struck in the war with Holland, and with which the tide of commerce had enriched the country it was formed to overthrow. The bank afterwards accepted the coins of all countries, worn or new, at their intrinsic value, and made its own bank-money payable in standard coin of the country, of full weight, deducting a "brassage" for the expense of coinage, and giving a credit on its books, or "bank-money," for the deposits.

The Bank of Amsterdam professed not to lend out any part of the specie entrusted to its keeping, but to retain in its coffers all that was inscribed on its books. In 1672, when Louis XIV. penetrated to Utrecht, almost every one who had an account with the bank demanded his deposit, and these were paid off so readily that no suspicion could exist as to the fidelity of the administration. Many of the coins then brought forth bore marks of the conflagration which happened at the Hôtel de Ville, soon after the establishment of the bank. This good faith was maintained till about the middle of last century, when the managers secretly lent part of their bullion to the East India Company and Government. The usual "oaths of office" were taken by a religious magistracy, or rather by the magistracy of a religious community, that all was safe, and the good people of Holland believed, as an article of their creed, that every florin which circulated as bank-money had its metallic constituent in the treasury of the bank, sealed up, and secured by oaths, honesty, and good policy. This blind confidence was dissipated in December 1790, by a declaration that the bank would retain 10 per cent. of all deposits, and would return none of a less amount than 2500 florins.

Even this was submitted to and forgiven. But, four

years afterwards, on the invasion of the French, the bank was obliged to declare that it had advanced to the States of Holland and West Friesland, and the East India Company, more than 10,500,000 florins, which sum it was, of course, unable to make up to the depositors, to whom, however, it assigned its claims on the states and the company. Bank-money, which previously bore an agio of 5 per cent. immediately fell to 16 per cent. below current money.

This epoch marked the fall of an institution which had long enjoyed an unlimited credit and had rendered the greatest services. The amount of treasure in the vaults of the bank, in 1775, was estimated by Mr. Hope at 33,000,000 florins.

The Bank of France.

This bank, second in magnitude and importance to the Bank of England only, was originally founded in 1800, but was not placed on a solid and well-defined basis till 1806. Its capital, which was originally fixed at 45,000,000 fr., was raised in the last-mentioned year to 90,000,000 fr., divided into 90,000 shares or *actions*, of 1000 fr. each. Of these shares, 67,900 have passed into the hands of the public; the remaining 22,100, having been purchased up by the bank out of its surplus profits, were subsequently cancelled. Hence its capital amounted, down to 1848, to 67,900,000 fr. (£2,716,000), with a reserve fund, first of 10,000,000 fr., and more recently of 12,980,750 fr. Since 1806 the bank has enjoyed the privilege of being the only institution in Paris entitled to issue notes payable on demand; and, as will be afterwards seen, it is now the only authorized issuer of such paper in France. Its charter and exclusive privileges have been prolonged and varied by laws passed at different periods.

The bank has established, at different periods since 1817, offices or branches (*succursales*) in different parts of the country. They are managed nearly in the same way as the parent establishment; but their operations were long on a comparatively small scale. These are exclusive of the departmental banks united, as will be immediately seen, to the bank in 1848.

Notwithstanding the skill and caution with which its affairs have generally been conducted, the revolution of 1848 brought the bank into a situation of extreme danger. It had to make large advances to the Provisional Government and the city of Paris. And these circumstances, combined with the distrust that was universally prevalent, occasioned so severe a drain upon the bank for gold, that to prevent the total exhaustion of its coffers, it was authorized, by a decree of the 16th March 1848, to suspend cash payments, its notes being at the same time made legal tender. But to prevent the abuse that might otherwise have taken place under the suspension, the maximum amount of its issues was fixed at 350 millions. The bank was then also authorized to reduce the value of its notes from 500 fr. to 200 and 100 fr.

Previously to 1848, joint-stock banks, on the model of that of Paris, and issuing notes, had been established in Lyons, Marseilles, Bordeaux, Rouen, and other large cities. And it was then determined that these banks should be incorporated with the Bank of France, and made branches of the latter. This was effected by decrees issued on the 27th April and 2d May 1848, by which the shareholders of the banks referred to (nine in number) were allowed, for every 1000 fr. nominal value of their shares, a share of 1000 fr. nominal value of the stock of the Bank of France. And, in consequence of this measure, 23,351 new shares, representing a capital of 23,351,000 fr., were added to the stock of the Bank of France, making the latter consist of 91,250 fr divided into 91,250 shares. In 1851 the bank resumed specie payments.

The suppression of the local issues of the departmental banks was, no doubt, a judicious measure, and was indispensable, indeed, to secure the equal value of the paper circulating in different parts of the country. This, however, might have been effected by the mere stoppage of the issues of the departmental banks, without consolidating them with the Bank of France. The latter measure is one of which the policy is very questionable; and there are, as already seen, good grounds for thinking that the banking business of the departments would have been more likely to be well conducted by local associations, than by branches of the Bank of France. Constant additions have been made to the number of branches, which now exceeds seventy.

Owing to the war with Russia, and still more to the rage for speculation, and the drain for silver to the East that followed it, the Bank of France became exposed to considerable difficulties. And in the view of strengthening its position, and also, it may be presumed, of providing a loan for Government, a law was passed (9th June 1857), by which the capital of the bank was increased from 91,250 shares of 1000 fr. each to 182,500 shares of 1000 fr. each. The new shares were assigned to the existing proprietors at the rate of 1100 fr. per share, producing a total sum of 100,375,000 fr., of which 100 millions were lent to Government at 3 per cent. Hence the measure, though it added to the credit and security of the bank, made no addition to the means directly at its disposal.

Down to the passing of this law, the bank could not raise the rate of interest on loans and discounts above 6 per cent. But this impolitic restriction was removed, and the bank authorized to charge any rate of interest which she reckoned expedient, except upon advances to Government, the maximum interest on which was limited to 3 per cent. The bank was further authorized to issue notes of the value of 50 fr., to make advances on railway shares, &c., and the charter was extended to 1897.

The management of the Bank of France was severely tried in the latter part of 1864 by the occurrence of a financial crisis at Paris; and in January 1865 a commission of inquiry was appointed to examine into the principles and practice of banking. There was, however, nothing mysterious or exceptional in the experience of 1864. Speculation had been much stimulated in France by the establishment of companies (Crédit Foncier, Crédit Mobilier, &c.,|&c.) for the undertaking of public works, and much capital was locked up and more pledged towards the completion of enterprises supposed at first to be highly profitable, but in reality offering a distant and doubtful promise of remuneration. The crisis of 1864 was the dissipation of these delusions, and the voluminous publication of evidence and opinion by the commission of inquiry produced no practical consequences.

The war of 1870-71 could not but have an important influence on the operations of the bank. Successive Governments resorted to it for assistance, which was obtained by increasing the issue of its notes and by giving them a forced currency. The rate of interest, which had been 2½ per cent. from May 1867, rapidly rose to 6 and 6½, at which it remained with scarcely any variation from 9th August 1870 till late in the year 1872. The rate would probably have risen much higher, but on the 13th August a law was approved suspending the liability of the acceptors of bills current to meet them at maturity, and this suspension was renewed until it was finally withdrawn in July 1871. The amount of unpaid bills held by the bank reached a maximum of 368 millions of francs, but the ultimate loss was extremely

small. On the 23d June 1870 the metallic reserve at the bank was 1318½ millions of francs, which was reduced to a minimum of 505 millions on the 24th December of the same year. The notes in circulation before the war had been about 1400 millions of francs; but before the end of the year 1870 their volume had increased to 1700 millions; and this again rose to 2000 millions before July 1871, and to 2400 millions before the end of 1871. A law of the 29th December 1871 fixed the maximum at 2800 millions, which was finally raised on 15th July 1872 to a maximum of 3200 millions. The debt of the state to the bank increased concurrently with this increase of issues, which was, indeed, authorized for the purpose of enabling the bank to assist the treasury. On the 26th December 1870 the bank held treasury "bons" to the extent of 174,800,000 francs only, but on the 30th November 1871 it held 1,193,600,000 of these "bons," and in August 1872 the amount reached 1,363,100,000 francs. A law of the 21st June 1871, followed by an agreement between the bank and the Government, provided for the repayment of this debt in annual payments of 200 millions, but up to this time (August 1875) the income of the state has never been large enough to provide the whole of this sinking fund. The bank has, however, been able to increase its metallic reserve through the liquidation of securities and the accumulation of deposits; so that, after having been reduced, as we have said, to 505 millions in December 1870, and not attaining to more than 634 millions in December 1871, it rose in the same month of 1872 to 793 millions, in 1873 to 820 millions, and in 1874 to 1331, or just the amount at which it stood before the declaration of war. Its volume has, however, continued to increase, and on the 25th March of this year (1875) it stood at 1528 millions; and the forced currency of the notes of the bank might be at any time withdrawn. It must be admitted that the management of the bank throughout these years of difficulty has been eminently prudent and successful.

The bank is obliged to open a *compte courant* for any one who requires it, and performs services, for those who have such accounts, similar to those performed for their customers by the banks in London. The bank does not charge any commission on current accounts, so that its only remuneration arises from the use of the money placed in its hands by the individuals whose payments it makes. It is probable, therefore, as has been alleged, that this part of the business is but little profitable. The bank also discounts bills with three signatures at variable dates, but not having more than three months or ninety days to run. Besides discounting bills, the bank makes advances on stocks and pledges of various kinds, and undertakes the care of valuable articles, such as plate, jewels, title-deeds, &c., at a charge of ⅛ per cent. on the value of the deposit for every period of six months and under.

The administration of the bank is vested in a council of twenty-one members, viz., a governor and two sub-governors, nominated by the chief of the state, and fifteen directors and three censors, nominated by the shareholders. The bank has a large surplus capital or rest. In 1848 the dividends only amounted to 75 fr. per share. In 1855 and 1856 they were 200 and 272 fr. on each share. In 1870 they fell to 114 fr., but rose again to 300 fr. in 1871, and to 320 fr. in 1872. In July 1856 the 1000 fr. share of bank-stock was worth 4075 fr.; in July 1857 it had sunk to 2880 fr.

Banking in the United States.

Before the late Civil War it had been the uniform practice of the different States of the Union to allow banks to be established for the issue of notes, payable in specie on demand. In cases where the liability of shareholders in banks was to be limited to the amount of their shares, they had, previously to 1838, to be established by Acts of the local legislatures; but, in general, these were easily obtained, and it may be said that banking was quite free, and that, practically, all individuals or associations might issue notes, provided they abided by the rules laid down for their guidance, and engaged to pay them when presented.

Under this system the changes in the amount and value of the paper currency of the United States were greater than in any other country, and it produced an unprecedented amount of bankruptcy and ruin.

Between 1811 and 1820, about 195 banks, in different parts of the Union, became bankrupt; and it is said, in a report by the Secretary of the Treasury of the United States, dated 12th May 1820, that these failures, which mostly happened in 1814 and 1819, produced a state of distress so general and severe that few examples of the like had then occurred.

But bad as this instance was, it was nothing to that which took place subsequently to 1834. The accounts of the aggregate issues of the banks differ a little, but the following statement is believed to be very nearly accurate, viz:—

Years.	Notes.
1830	$ 66,628,898
1834	94,839,570
1835	103,692,495
1836	140,310,638
1837	149,185,890

Now observe, that this sudden and enormous increase took place under the obligation which we are told is quite enough to prevent all abuse of paying notes on demand. The result was what most men of sense must have anticipated, viz., that a revulsion took place, and that every bank within the Union, without, it is believed, a single exception, stopped payment in 1837.

In 1838 such of the banks as had been best managed and had the largest capitals resumed payment in specie. But in 1839 and 1840 a farther crash took place; and the bank-notes afloat, which, as has been seen, amounted to $149,185,890 in 1837, sunk to $83,734,000 in 1842, and to $58,563,000 in 1843. It is supposed that in this latter crash nearly 180 banks, including the Bank of the United States, were totally destroyed. And the loss occasioned, by the depreciation which it caused in the value of stock of all kinds and of all sorts of property, was quite enormous. And yet, vast as the loss was, it was really trifling, as a writer in the *American Almanack* has stated, compared with "the injury resulting to society from the upheaving it occasioned of the elements of social order, and the utter demoralization of men by the irresistible temptation to speculation which it afforded, ending in swindling to retain ill-gotten riches."

The evils of the American system were aggravated by the lowness of the notes which most banks issued. This brought them into the hands of retail traders, laborers, and others in the humbler walks of life, who always suffer severely by the failure of a bank.

After 1838 and 1842 various measures were taken in nearly all the States, but principally in New York, to restrain the free action of the banks, and to prevent a repetition of the calamities referred to.

In New York, for example, banks were divided into two great classes—the incorporated and the free banks. The former, incorporated by the State law, had to conform to certain regulations, and to contribute a half per cent. annually upon their capital to a security fund, which was devoted to the payment of the notes of de-

faulting banks. But this was a most objectionable plan; for, in the first place, it did not prevent bankruptcies, and in the second place, it compelled the well-managed banks to contribute to a fund which went to pay the debts of those that were mismanaged. It consequently declined in favor, and soon became rarely acted upon.

In the other or free banking system, all individuals or associations who chose to deposit securities (minimum amount, $100,000) for their payment were allowed to issue an equal amount of notes. And this was certainly by far the more efficient as well as the more popular of the two plans. It was, however, not free from objection; because, 1*st*, A longer or shorter, but always a considerable, period necessarily elapses after a bank stops before its notes can be retired; and, 2*d*, The securities lodged for the notes were necessarily at all times of uncertain and fluctuating value, while, in periods of panic or general distrust, they became all but inconvertible. The Sub-Secretary of the Treasury of the United States animadverted as follows on this plan, in a letter dated 27th Nov. 1854:—

"The policy of many of the State Governments has of late years consisted in encouraging the issue of small notes, by sanctioning the establishment of what are popularly called 'free banks,' with deposits of stocks and mortgages for the 'ultimate' security of their issues. This 'ultimate' security is, it may be admitted, better than no security at all. The mischief is, that it is least available when most wanted. The very causes which prevent the banks from redeeming their issues promptly, cause a fall in the value of the stocks and mortgages on 'the ultimate security' of which their notes have been issued. The 'ultimate' security may avail something to the broker who buys them at a discount, and can hold them for months or years; but the laboring man who has notes of these 'State security banks' in his possession, finds, when they stop payment, that 'the ultimate security' for their redemption does not prevent his losing twenty-five cents, fifty cents, or even seventy-five cents in the dollar.

"In a circulating medium we want something more than 'ultimate security.' We want also 'immediate' security; we want security that is good to-day, and will be good to-morrow, and the next day, and for ever thereafter. This security is found in gold and silver, and in these only."

The Report of the Superintendent of Banking for the State of New York for 1856 showed that the securities he then held in trust amounted to $39,359,071, which were almost wholly lodged by banking associations and individual bankers.

During the year the securities held in trust for the undermentioned banks that had become insolvent in 1855 were disposed of. But the sums realized by their sale did not in any case suffice to pay the notes at par; while a period, varying from two to four years, would have to elapse before the affairs of the insolvent banks were finally settled.

This statement set the defective nature of the security system, as administered in New York, in the clearest point of view. It might, no doubt, have been improved by increasing the proportion of securities to notes. But, owing to the variety of securities that were taken (viz., all manner of bonds and mortgages, state, canal, and railway stocks, &c., &c.), and the uncertainty of their value, a great deal of risk was always incurred in accepting them, and they could never form a proper foundation on which to issue notes.

In 1857 another crash took place, and *all* the banks in the Union, from the Gulf of Mexico to the frontiers of Canada, again stopped payments.

There had been a rapid increase of discounts since 1851, and that increase was especially great in 1856, and went on augmenting down to August 1857. On the 8th of that month the discounts and advances by the New York banks amounted to $122,077,252, the deposits in their possession being, at the same time, $94,436,417. This was the maximum of both. On the 24th of August the Ohio Life and Trust Company, which carried on an extensive banking business in New York, stopped payments, and by so doing gave a severe shock to credit and confidence, which the suspension of two or three more banks turned into a panic. Notes being in a certain degree secured, the run upon the banks was principally for deposits. And to meet it they so reduced their discounts and advances, that, on the 17th October, they amounted to only $97,245,826. This sudden and violent contraction necessarily occasioned the suspension of many of those mercantile houses that had depended on the banks for discounts. And it did this without stopping the drain for deposits, which had sunk, on the 17th October, to $52,894,623, being a decrease of $41,546,784 in about two months. The universal stoppage of the banks was a consequence of these proceedings.

The Civil War had as one of its consequences the introduction of a general banking law in the United States, conformable in many respects to the principles of what we have described as the free banking law of New York. At the beginning of the war in 1861, the amount of paper money in circulation was about $200,000,000, of which $150,000,000 had been issued in the loyal States; and the coin in circulation was estimated at $275,000,000. The necessities of the Treasury very soon compelled the Government to borrow from the associated banks of New York, Philadelphia, and Boston, and to issue demand notes to the extent of $50,000,000,—which, however, were not at first made legal tender. In February 1862 an Act was passed by Congress authorizing the issue of $150,000,000, in Treasury notes of not less than $5 each, out of which, however, $50,000,000 were in lieu of the notes already issued; and this issue was declared to be legal tender except in the discharge of customs, duties, and of the payment of interest by the United States on the national debt. It will be easily understood that coin went out of circulation, and a premium on gold was established, which increased as the amount of the Treasury notes was increased by successive legislation and as national bank-notes came to be issued in pursuance of the law we must proceed to describe. This is the Banking Law of the 25th February 1863, which, as amended by the Act of the 3d June 1864, now continues in force. By this law a Currency Bureau and Comptroller of Currency were appointed in the Treasury Department, with the power to authorize banking associations of not less than five persons subscribing, except in very small towns, a minimum capital of $100,000, 50 per cent. to be paid up at once, and the remainder within six months. It was enacted that any such association, before commencing business, must transfer to the Treasurer of the United States any United States interest-bearing bonds not less than one-third of the capital stock, and should thereupon receive from the Comptroller of the Currency circulating notes of different denominations in blank, registered and countersigned, equal in amount to 90 per cent. of the current market value of the bonds so transferred, but not exceeding their par value. The whole amount of notes thus issued was not to exceed $300,000,000, one-half to be apportioned among the States according to their representative population, and the other half to be apportioned with regard to the existing banking capital, resources, and business of the States

The banks already existing in the several States were rapidly transformed into national banks under the operation of this law, and their previous notes withdrawn in exchange for the new national bank issue. The currency of the Union thus came to consist of the demand-notes of the Treasury, which rose in 1865 to about $450,000,000, and of the notes of the national banks, which rapidly approached the limit of $300,000,000,—the latter notes passing throughout the Union, whatever the bank through which they were issued, as freely as the former, since the ultimate payment of them was secured by the deposit under the law we have stated, of an adequate amount in United States' bonds at the Treasury. It is not our purpose to trace the subsequent financial history of the States, but the experience of 1873 must be referred to for the instruction it affords. As no sufficient steps were taken after the termination of the war to reduce the swollen value of the currency, gold remained out of circulation, though with the growth of business the premium on it declined to an average rate of 12 per cent.; but no inconvenience was felt from the existence of a pure paper circulation, and the opinion, in fact, arose that the currency thus established was a sure preventive of recurring panics and exaggerated rates of discount. But in September 1873 the financial house of Jay, Cooke, & Co., having locked up a large amount of capital in railway enterprises not immediately if ever likely to be productive, suspended payments; other financial houses were forced to take the same step, several banks closed their doors, and a severe panic set in. The holders of the notes in circulation of the banks that failed were protected by the deposit of bonds at the Treasury, and the notes were never discredited ; but the financial distress throughout the Union was excessive, and continued for many months. It was practically demonstrated that the national bank law protected the holders of national bank-notes from loss, but afforded no immunity against the occurrence of financial crises. See article on UNITED STATES.

BANKRUPTCY. When a person is unable to pay his debts in full, the law of civilized countries adopts some means of satisfying the creditors, as far as they can be satisfied, out of the debtor's estate, and relieving the debtor himself from pressure which, by his own efforts, he would not be likely to overcome. The debtor having been declared a bankrupt, his property vests in his creditors for the purpose of being ratably divided among them, and he thereupon starts a new man, entirely relieved from the obligations thus partially satisfied. Such, in general terms, is the process of bankruptcy as observed in modern societies, slowly evolved out of the criminal code in answer to the necessities of a widely-spread industrial life. The slow development of the law, and the practical difficulties with which each new adjustment was met, are copiously illustrated by the history of bankruptcy legislation in England. The first English statute on bankruptcy was directed against *fraudulent debtors*, and gave power to the lord chancellor and other high officers to seize their estates and divide them among the creditors.

Since that time there have been a great many revisions of the bankruptcy laws. The most important changes made were the abolition of the distinction between bankruptcy and insolvency and of imprisonment for debt.

In the United States, Congress alone has power to pass a bankruptcy law which shall have authority throughout the country. The several states may enact such statutes when there is no law of Congress in operation, but these statutes will fully bind only the citizens of the state which enacts them. There is no power to obtain effectual control of property without its limits so as to prevent local preferences; nor can the state laws discharge contracts due to non-residents. The general government has made so little use of the power confided to it, that many of the states were obliged to pass bankruptcy laws, notwithstanding the imperfection of their operation in some cases, and those, often, the most important of the interests involved. Massachusetts had an excellent system, established in 1838, which is especially mentioned because the act of Congress was largely drawn from this source. All state laws on the subject were suspended while a general law of bankruptcy was in force.

The first general Bankrupt Act was passed in 1800, and repealed in 1803. In 1841 another law was put in operation, with a special view of meeting the urgent needs of debtors who had been ruined by the commercial revulsion of 1837-38, and who could receive no effectual relief from the local laws. The act was repealed in thirteen months; but in the meantime a very large number of cases had been disposed of, amounting, for example, to 3,250 in Massachusetts alone. The law last in operation took effect June 1, 1867. It was hoped by its authors that it would form a permanent addition to the commercial jurisprudence of the country, but in 1878 it was repealed. We append a synopsis of the insolvency and assignment laws of all the states and territories.

Alabama.—Every general assignment made by a debtor, by which a preference or priority of payment is given to one or more creditors over the remaining creditors of the grantor, shall be and inure to the benefit of all the creditors of the grantor equally. All assignments by a debtor made with intent to hinder, delay, or defraud creditors, is void.

Arizona.—A general assignment by insolvent debtor must be recorded, have annexed an inventory, under oath, of all creditors, their residence, sum and consideration due each, how evidenced, with statement of debtors' entire estate, giving values. Insolvent may make assignments for benefit of such creditors only as will accept their *pro rata* in discharge of all liability.

Arkansas.—Assignments for the benefit of creditors may be made with or without preference. Assignee must give bond in double the amount of property assigned, and must sell within 120 days, at auction, all the property assigned to him for the payment of debts. Proof of fraud on the part of assignor is sufficient to invalidate the assignment, whether the assignee knew of it or not.

California.—No assignment of an insolvent debtor is valid except in conformity with the Civil Code sections 3,449-73, as amended in 1889.

Colorado.—A general assignment may be made for benefit of creditors. Deed of assignment to be recorded where assignor resides. Deed of non-resident to be recorded where principal business is carried on. Assignor to attach inventory under oath, giving name of creditors and the amount of their respective demands. Deed for benefit of all creditors, whose consent will be presumed.

Connecticut.—Voluntary assignments in insolvency can be made by any debtor to a trustee of his own selection, subject to the substitution of another by the probate court, if deemed proper. Assigning debtor must lodge with court of probate, within five days after assignment, a list verified under oath of his creditors and schedule of his property. A creditor for over $100, having brought suit and finding no property to attach, may apply to the probate court for the appointment of a trustee in insolvency of the debtor's estate. A hearing is had, and, if the petition is granted, trustee takes all debtor's estate not exempt; and all incomplete levies or

attachments on mesne process commenced within sixty days previous are dissolved.

Delaware.—There is a domestic insolvent law, providing for full surrender and equal distribution of all property, but it is very seldom used, and there is no provision in the act for the discharge of the debtor upon his making an assignment. The assignee must file a schedule of property assigned within thirty days, and two appraisers are then appointed by the chancellor. Assignments must be for the benefit of all creditors alike.

District of Columbia.—There is no insolvent law in force. Debtors may assign their property for the benefit of creditors, with or without preferences. No bond is required of the assignee, and no provision is made for the discharge of an insolvent debtor unless the debt are paid in full. No exception is made in favor of employes or servant for salaries or wages due them.

Florida.—Assignments by insolvents are provided for by law. Preferences are not allowed. All property, except that which is exempt, must be surrendered to the assignee. Assignee gives bond and winds up estate. The assignment releases debtor from all debts made prior to the assignment.

Georgia.—A debtor may prefer one creditor to another, and may create a *bona fide* lien, by mortgage or other legal means, may sell in payment of the debt, or transfer papers as collateral security. But every assignment made by a debtor insolvent at the time, either in trust or in behalf of creditors, is fraudulent and null and void, when any trust or benefit is reserved to the assignor, or any person for him. There is no imprisonment for debt.

Idaho.—An insolvent debtor may be discharged of his debts by executing an assignment of all his property, real and personal, which, with a sworn inventory of property, and schedule of creditors, must be filed in court. At a creditors' meeting, held after thirty days' notice given, one or more assignees, not exceeding three, are appointed, and claims proved. Court will set aside property exempt, and issue order for direct payment of money, where no mortgage or pledge had been given, or where such security, if given, has been rendered nugatory by act of defendant.

Illinois.—The county court has jurisdiction in cases of voluntary assignment for the benefit of creditors, which assignment must be duly acknowledged and recorded in the county where the assignor resides, or where the business has been carried on, and in the county or counties where land embraced in the assignment is situate. Assignee must file bond, inventory and valuation, and send notice by mail to creditors of whom he shall be informed, to present claims under oath, within three months from publication of notice. Claims not so presented do not participate in dividends until after the payment in full of all claims properly presented and allowed. Assignee is required to make equal dividends among creditors at the first term of court after the three months allowed, and to render a final account within one year.

Indiana.—Any debtor in embarrassed or failing circumstances, may make a general assignment of all property in trust for benefit of all *bona fide* creditors. To be valid this must be by indenture duly signed and acknowledged, and filed with the recorder of the county in which assignor resides, for record within ten days after the execution thereof. Indenture to contain full description of real estate and be accompanied by schedule of personal property, and assignor to make oath that the indenture and schedule contains a full statement of all his property, etc. Trustee makes oath and files bond in circuit court, and must file copy of assignment, etc., in office of clerk of that court within fifteen days after execution of indenture. Trustee named failing to act, court may appoint a substitute upon petition.

Indian Territory.—There is no provision.

Iowa.—No insolvent law. Assignments not valid unless for benefit of all creditors, when assent of creditors is presumed. Debtor must furnish sworn inventory and list of creditors; and the assignment, which vests in the assignee title to all property of the debtor, must be recorded. Assignee must give bonds, prepare an inventory and valuation, and notify creditors by mail to file claims within three months. All claims not filed within three months after notice published can not be paid until all claims filed within said three months are paid.

Kansas.—Assignments must be for benefit of all creditors, and do not discharge the debtor. Must be executed and recorded like conveyances of real property. Creditors (above ten dollars) are notified by clerk of district court, and at the meeting held for choice of assignee a majority of such creditors must be present, otherwise appointment rests with the court. Creditors who fail to appear are precluded.

Kentucky.—There are two statutory provisions on the subject of insolvency. First. Any assignment, mortgage sale, judgment, or other device resorted to by a debtor in contemplation of insolvency and with a design to prefer one or more creditors, if assailed by petition, filed within six months after the transfer is recorded, shall inure as a general assignment of all the debtor's effects for the equal benefit of all creditors. Second. Assignees must give bond with surety, make an inventory within sixty days, and a report of sales within two years.

Louisiana.—Under the state laws insolvent debtor may make surrender of property to creditors, or an involuntary surrender may be forced by any creditor who shall have issued an execution which is returned unsatisfied. Surrender vests all property of debtor in creditors, and stops all legal proceedings against him. Debtor must file sworn schedules of assets and liabilities. Creditors elect a syndic, who gives bond and manages the estate.

Maine.—Insolvent law applies to residents where debts not less than $300; is voluntary, and where one or more creditors holding one-fourth of provable claims, involuntary; applies also to absconding debtors within six months; assignees elected subject to approval of court, who dispose of property, pay expenses and divide assets, and may be authorized to carry on business. No assignment law; assignment for creditor valid, as at common law, unless avoided by proceedings in insolvency.

Maryland.—A debtor may be declared insolvent upon his own application or upon a petition filed by one or more creditors, the aggregate of whose debts amount to the sum of $250—alleging some of the causes specified in the statute. No preferences are allowed except to employes for wages contracted not more than three months anterior to deed or application in insolvency.

Massachusetts.—The insolvent law is in many respects similar to the United States bankruptcy law repealed in 1878, and has no jurisdiction over debts contracted outside the state, unless the same are proved in the insolvency proceedings. But an assignment to trustee to divide property among creditors can not be avoided by attaching creditor, and only by assignee in insolvency. Any person owing $100 or more may obtain relief; and any creditor may apply within ninety days after commission of act of insolvency for seizure and distribution of estate. Assignee is chosen by majority in value, and may be required to give bond.

Michigan.—Assignments for the benefit of creditors

may be made by any debtor, without preference, and must be of all property of assignor not exempt from execution. Assignee must give approved bond in double the amount of property assigned. The bond, the instrument of assignment, or a duplicate thereof, inventory of the assigned property, and a list of the creditors of the assignor, must be filed with the clerk of the circuit court in the county where the assignor resides, or, if he is not a resident of this state, then in the county where the assignee resides, and if neither are residents of this state, then in the county where the assigned property is principally located. No assignment shall be effectual until such bond shall be executed and filed as above stated and approved by said clerk. No attachment or execution levied upon assigned property after the assignment and before the expiration of the time for filing bond shall be valid.

Minnesota.—Assignments must be in writing, subscribed by debtor or debtors and acknowledged and filed with the Clerk of the District Court in the proper county, within ten days of the levy of an attachment, garnishment, etc. Debtor must file inventory of all property within ten days after filing assignment. Assignee must give bond with two or more sureties to be approved by Judge of District Court in double the amount of property inventoried. Claim must be verified by oath of the party, except claims of the United States or State of Minnesota. Conveyances and payments made by an insolvent debtor within ninety days of insolvency, in contemplation of insolvency, to parties having reasonable cause to believe the debtor to be insolvent, are void, and may be rescinded by the assignee or receiver.

Mississippi.—No insolvent law. Debtor may make assignments to secure creditors and may prefer one creditor over the remainder, but this must be *bona fide.* There is no provision for the discharge of a debtor or his making an assignment.

Missouri.—An insolvent may make a voluntary assignment for the benefit of all creditors, which must contain a statement of the value of his property and his liabilities. Circuit court has supervision of all assignment proceedings, and may appoint an assignee in case of a vacancy in the trust. Debtor is not discharged from his liabilities except by consent of creditors.

Montana.—There is no law relating to assignment or insolvency, except that the wages of miners, mechanics, salesmen, servants, clerks, or laborers, for services rendered within sixty days immediately previous to such assignment, not to exceed $200 for each person, are preferred claims.

Nebraska.—There is no insolvent law. Assignments for benefit of creditors are regulated by act of Feb. 26, 1833. Full authority and jurisdiction is conferred on County Courts to execute and carry out the provisions of the Act. Sheriff of county where assignor resides to be first assignee. Assignment to be filed with County Clerk for record within twenty-four hours after its execution. Within ten days after such assignment, assignor shall file with County Judge a sworn inventory. County Judge to fix a day, not more than fifteen days after receiving such inventory, for meeting of creditors, at his office, to choose assignee to succeed Sheriff.

Nevada.—Insolvent debtors may be discharged from their debts by complying with provisions of insolvent laws. An assignment of insolvent debtor, not in compliance with insolvent laws, is void as to creditors.

New Hampshire.—Assignments for benefit of creditors to be filed in the Probate Court of the county in which debtor resides. Debtor, within ten days thereafter, shall file list of creditors, verified by oath, and within fifteen days a schedule of his property. Wages of clerks, domestics, and other laborers to be paid in full. Debtor given a full discharge from all his debts upon the written approval of three-quarters of his creditors in number and amount, and without such approval upon paying seventy per cent. of his debts.

New Jersey.—The insolvent laws provide for the discharge of a person under arrest for debt or damages on his delivering up all his real and personal property to his creditors. Assignments by debtors for the benefit of creditors must be without preference, and all others are void. Debtor must annex sworn inventory. Wages of clerks, servants and laborers up to $300 each are preferred claims. Assignee must file list of creditors at the end of three months, and make dividends at the next term of court. Creditor not presenting claim does not share in the dividend, but retains his right of action against the debtor.

New Mexico.—Voluntary general assignments may be made for the benefit of creditors. Deed of assignment and inventory must be promptly recorded in the county or counties where the assignor or assignors reside.

New York.—Statutory provisions exist regulating the making of general assignments in trust for the benefit of creditors. Preferences are allowed for the wages or salaries of employés, and to the amount of one-third in value of the assigned estate after deducting such wages or salaries and the cost and expenses of executing the trust. Also, regulating and filing of inventory, the giving of bonds and accounting by the assignee.

North Carolina.—An insolvent debtor may be discharged by filing petition and making assignment of property to a trustee for benefit of all creditors. But his subsequently acquired property (not exempt) is liable for the satisfaction of his debts. No creditor not having received notice is bound by the discharge. Any creditor may suggest fraud, and on fraud or concealment being found by jury, judgment will be that debtor be imprisoned until a full and fair disclosure of all his money, property or effects be made. Voluntary assignments are only good against creditors from registration. A debtor may in an assignment prefer one creditor to another.

North Dakota.—Same as SOUTH DAKOTA. (*q.v.*)

Ohio.—An insolvent debtor may make an assignment in trust for the benefit of creditors. Assignee must, within ten days after delivery of assignment to him, produce the original assignment, or copy thereof, in the Probate Court, file same and enter into a bond in such sum and with such sureties as court shall approve. Assignment made in contemplation of insolvency, with intent to prefer one or more creditors, inures to the benefit of all creditors. Assignment made with intent to hinder, delay or defraud creditors, shall be declared void at the suit of any creditor, and such assignment, after having been declared void, or a preferred assignment, is cause for the appointment of trustee. No assignment shall be construed to include property exempt, unless the exemption is expressly waived.

Oregon.—There is no insolvent law. There is an act governing assignments. No general assignment by an insolvent, or in contemplation of insolvency, for the benefit of all creditors, is valid unless made for the benefit of all creditors in proportion to the amount of their respective claims. The assent of creditors is presumed. The debtor selects his assignee.

Pennsylvania.—A debtor may make a voluntary assignment in trust for the benefit of all creditors, which must be recorded in thirty days. The assignment does not relieve the debtor from the debt. The insolvent laws in cases where imprisonment is still permitted allow a person to be discharged from prison, but do not relieve him from debt.

Rhode Island.—There is no general insolvent law. Assignments for equal benefit of all creditors are allowed; all preferences are void. Any resident debtor whose property, real or personal, is attached may dissolve the attachment by a general assignment for the equal benefit of his creditors.

South Carolina.—An embarrassed debtor may assign his property for the benefit of creditors, who have the right to appoint an agent or agents equal to the number of assignees. The assignment of all his property by a debtor under arrest effects his discharge from such arrest. Only the claims of creditors participating in dividends are affected by these assignments. The debtor, however, can make no preferences or priorities other than as to debts due the public and to such creditors as shall release under the assignment, and all transactions within ninety days before assignment, with a view to give fraudulent preferences, are null and void.

South Dakota.—Insolvent debtor may in good faith make assignment in trust for benefit of creditors which may provide for any subsisting liability of the assignor, whether absolute or contingent. Such assignment is subject to provisions of the code relative to trusts and fraudulent transfers. Any debtor may make assignment without preference of creditors, but is not relieved from liability for any unpaid balance to his creditors.

Tennessee.—No insolvent law. No preferences allowed. Insertion of such clause does not render a general assignment invalid, but *that* clause is nugatory, and all the creditors shall share ratably. General assignment must be accompanied by sworn schedule of assets and liabilities; if not, it is fraudulent and void. A general assignment nullifies all mortgages, etc., of a portion of debtor's property made within three months.

Texas.—A general assignment, by insolvent debtor, must be recorded; have annexed an inventory, under oath, of all creditors; their residence; sum and consideration due each; how evidenced; place created; collateral securities held by creditors; with statement of debtor's entire estate, giving value.

Utah.—Has no statutes on the subject of insolvency or assignments and is governed by the common law.

Vermont.—There is an insolvent law (passed in 1876), but its provisions are of no effect as regards nonresident creditors. The Probate Courts have jurisdiction in insolvency. All assignments must be for the benefit of all creditors.

Virginia.—Has no insolvent laws and no statutory provisions concerning assignments. An insolvent debtor may make a voluntary assignment to a trustee for the benefit of creditors, and may prefer certain creditors to others. Such assignments do not operate as a release.

Washington.—Insolvent debtor may be discharged from debts upon executing an assignment of all his property for benefit of his creditors, if done in good faith and without fraud.

West Virginia.—No insolvent law and no statute regulating assignments in trust for benefit of creditors. Such assignments are sometimes made, but do not operate as a discharge.

Wisconsin.—Assignments for benefit of creditors may be made by an insolvent debtor to such person as the elects, who must give bond in double the nominal value of assets.

Wyoming.—An insolvent debtor may make an assignment in good faith to one or more assignees for satisfaction of creditors. No preference of creditors or payment of false or fraudulent claims is allowed.

BANKS, Sir Joseph, for upward of forty years president of the Royal Society of London, was born in Argyle street, London, February 13, 1743. After taking an honorary degree he left Oxford, and at the age of twenty-one he found himself possessed of ample means, his father having died in 1761. Three years later he made his first scientific expedition to Newfoundland and Labrador, and brought back a rich collection of plants and insects. Shortly after his return, Government resolved to send out Captain Cook to observe the transit of Venus in the Pacific Ocean, and Banks, through the influence of his friend, Lord Sandwich, obtained leave to join the expedition. The voyage occupied three years and many hardships had to be undergone; but the rich harvest of discovery—many natural phenomena being for the first time brought to light—was more than adequate compensation. Banks was equally anxious to join Cook's second expedition, and expended large sums in engaging assistants and furnishing the necessary equipment; but, owing to ill-feeling on the part of some government officials, he was compelled to relinquish his purpose. He, however, employed the assistants and materials he had collected in a voyage to Iceland, returning to the Hebrides and Staffa, the geological formation of which he was the first to describe. In 1778 Banks was elected president of the Royal Society, of which he had been a fellow from 1766. He died March 19, 1820.

BANKURA, a district of British India, within the Bardwan division, under the Lieutenant-Governor of Bengal, bounded on the north and east by Bardwán district; on the south by Midnapur district, and on the west by Mánbhum district. Population, 600,000.

Bankura, the principal town of the district of the same name, stands on the left bank of the river Dhalkisor. It has a bázár, a spacious building for the accommodation of travelers, and the district courts, schools, jail, postoffice, etc. In 1889 the population amounted to 20,000.

BANN, a considerable river of Ireland, which rises in the Mourne Mountains, County Down, and falls into Lough Neagh. The salmon and eel fisheries are of considerable value. Measured in a direct line, the Upper Bann is about thirty-five miles long, and the Lower thirty miles.

BANNERETS. In the early days of chivalry there were two kinds of knights, called respectively *Bachelors* and *Bannerets*. The former carried pennons terminating in a point or points; the latter, banners—that is to say, pennons rendered square by having the points cut off. This process of converting the pennon into the banner was done by the sovereign himself on the field of battle, standing beneath his own royal standard displayed.

BANNOCKBURN, a village of Scotland, on the Bannock, where Bruce defeated the English June 24, 1314.

BANQUETTE, in Fortification, is a raised ledge or step inside the parapet of a rampart, of such a height that musketeers, when standing on it, may be able to fire over the crest of the parapet without too much exposure to the enemy.

BANSHEE, in the folklore of the Irish and Western Highlanders of Scotland, a female fairy who makes herself known by wailings and shrieks, before a death in a family over which she exercises a kind of guardianship. This notion is woven into many folk-tales of rare pathos and beauty. A guardian spirit of the same kind occurs frequently in the folklore of Brittany. The name is supposed to be a phonetic spelling of the Irish *bean sidhe*, old Irish *ben side*, "woman of the fairies."

BANSWARA (literally the forest country), a Rájput feudatory state under the Mewár agency in Rájputáná, borders on Gujarát and is bounded on the north by the native states of Nungarpur and Udaipur or Mewár; on the northeast and east by Pratábgarh; on the south by

the dominions of Holkár and the state of Jubuá, and on the west by the state of Riwákánta. Bánswárá State is about forty-five miles in length from north to south, and 33 miles in breadth from east to west, and has an area of 1,440 square miles, with an estimated population of 144,000 souls. The Mahi is the only river in the state, and great scarcity of water occurs in the dry seasons.

BANTAM, a decayed town of Java, formerly capital of a district of the same name, at the northwestern extremity of the island, situated on the Bay of Bantam, near the mouth of a river which falls into the bay.

BANTRY, a small seaport situated on Bantry Bay, on the southwest coast of Ireland, in the county of Cork.

BANTRY BAY, a deep inlet in the southwestern extremity of Ireland, in County Cork. It is twenty-five miles long, with a breadth of four to six miles. It is one of the finest harbors in Europe, affording safe and commodious anchorage for ships of all sizes. Here a French force attempted to land in 1796.

BANTU (people), a native word applied by Friedrich Müller as an ethnographical name to a large group of African languages and to the people speaking the same. The Bantu races occupy most of Africa from 20° S. latitude to 6° N. latitude northward, and are broadly distinguished from the Negritos and Hottentots to the south and the Soudanese negroes to the north.

BANU, a district of British India, under the Lieutenant-Governor of the Panjáb. Population, 287,547.

BANVILLE, THEODORE DE, a French poet and prose-writer, was born in 1820. His first volume, *Les Caryatides*, issued in 1841, gave him a standing as a poet among the younger members of the Romantic school. He is one of the most musical and sparkling of lyrists; one of the gayest and wittiest of parodists.

BANYAN TREE (*Ficus indica*, Linn., *Urostigma benghalense*, Gaspar.) is a native of several parts of the East Indies and Ceylon. It has a woody stem, branching to a great height and vast extent, with heart-shaped entire leaves terminating in acute points. Every branch from the main body throws out its own roots, at first in small tender fibres, several yards from the ground; but these continually grow thicker until they reach the surface, when they strike in, increase to large trunks, and become parent trees, shooting out new branches from the top, which again in time suspend their roots, and these, swelling into trunks, produce other branches, the growth continuing so long as the earth contributes her sustenance.

BAOBAB (*Adansoniæ digitata*), a magnificent tree belonging to the natural order Sterculiaceæ, also called the Monkey-bread Tree, is a native of tropical Western Africa, but now introduced into the East and West Indies. It is one of the very largest trees—not rising to a great height, but exceeding almost all other trees in the thickness of its trunk (20-30 feet). Even its branches (60-70 feet long) are often as thick as the stems of large trees, and they form a hemispherical head of 120-150 feet in diameter; their outermost boughs drooping to the ground, with large horse-chestnut-like leaves, and huge, white, solitary drooping flowers. The fruit (Monkey-bread) is of the size of a citron.

BAPHOMET, the imaginary symbol or idol which the Knights Templars were accused of worshipping in their secret rites. The term is supposed to be a corruption of *Mahomet*, who in several mediæval Latin poems seems to be called by this name.

BAPTISM. Christian baptism is the sacrament by which a person is initiated into the Christian Church. The word is derived from the Greek, to dip or wash, which is the term used in the New Testament when the sacrament is described. In discussing what is meant by baptism, three things have to be inquired into—(1) the origin of the rite, (2) its meaning, or the doctrine of baptism, and (3) the form of the rite itself.

1. *The Origin of Baptism.*—Christian theologians do not require to go further back than to the New Testament, for there, in the record of our Lord's life, and in the writings of His apostles, they find all that is required to form a basis for their doctrines. But while theologians do not require to go beyond the New Testament for the origin and meaning of baptism, historical investigation cannot help trying to trace analogies to the rite in the Old Testament and even in Pagan history. In the New Testament itself there are two distinct kinds of baptism spoken of—the baptism of John and Christian baptism. Treatises on Jewish antiquities speak of the baptism of proselytes; and St. Paul applies the term baptism to describe certain Old Testament events, and we find in use among Pagan tribes rites resembling Christian baptism. The question arises, what is the relation of Christian baptism to these?

Writers on the antiquities of the Christian church were accustomed to find the source of Christian baptism in the baptism of John, and to assert that John's baptism was simply a universal and symbolical use of the well known ceremony of the baptism of proselytes, and they connected this Jewish rite with Old Testament and even with Pagan lustrations. But this mode of explanation must now be abandoned. It is very difficult to show any real connection between the baptism of John and Christian baptism further than the general relation which all the actions of the forerunner must have had to the Messiah.

The connection between the baptism of John and the Jewish baptism of proselytes, of which a great deal has been made, is also founded on assumptions which cannot be proved. This very plausible theory first assumes that proselytes were baptized from an early time in the Jewish Church, although the Old Testament tells us nothing about it, and then supposes that John simply made use of this ordinary Jewish rite for the purpose of declaring symbolically that the whole Jewish nation were disfranchised, and had to be re-admitted into the spiritual Israel by means of the same ceremony which gave entrance to members of heathen nations. But the subject of the baptism of proselytes is one of the most hopelessly obscure in the whole round of Jewish antiquities, and can never be safely assumed in any argument; and the general results of investigation seem to prove that the baptism of proselytes was not one of the Jewish ceremonies until long after the coming of Christ, while there is much to suggest that this Jewish rite owes its origin to Christian baptism. Others again, find the historical basis of baptism in the lustrations or sprinklings with water so often mentioned in the Old Testament, in such symbolical acts as Naaman's bathing in the Jordan, and in various prophecies where purification from sin is denoted by sprinkling, *e.g.*, Ezek. xxxvi. 25–30, Zech. xiii. 1, &c.; but such anticipations can scarcely be called the historical origin of the rite. Many modern writers connect baptism with certain Pagan rites, and point to the lustrations in use in religious initiation among the Egyptians, Persians, and especially the Hindus, but very little can be made of such far-fetched analogies. Perhaps the most curious instance of this kind is to be found in the double baptism,—the one Pagan and civil, and the other religious and Christian,—which existed side by side with each other in Norway and Iceland. The Pagan rite was called "ansa vatri," while the name for Christian baptism was "skéro." The Pagan rite was much older than the introduction of Christianity, and was connected with the savage custom of exposing infants who

were not to be brought up. The newly-born infant was presented to the father, who was to decide whether the child was to be reared or not; if he decided to rear it, then water was poured over the child and the father gave it a name; if it was to be exposed, then the ceremony was not gone through. The point to be observed is that, if the child was exposed by any one after the ceremony had been gone through, it was a case of murder, whereas it was not thought a crime if the child was made away with before water had been poured over it and it had been named. The analogy lies in the use of water, the bestowal of the name, and the entrance into civil life through the rite.

II. *The Doctrine of Baptism.*—Among the Greek Fathers, for it is there we must look for the beginning of the doctrine, baptism was called by various names, all of which referred to the spiritual effects which were supposed to accompany the rite. For example, a common term for baptism was *regeneration* — for every Christian was supposed to be born again by the waters of baptism. The *great circumcision*, because it was held to succeed in the room of circumcision, the *gift of the Lord*, because it had Christ for its author, and not man; sometimes by way of eminence simply the gift, the *consecration* and *consummation*, because it gave men the perfection of Christians, and a right to partake of the Lord's Supper. In studying the statements made by the early Fathers upon baptism, we find not so much a distinct and definite doctrine as gropings toward a doctrine, and it is not until we come to St. Augustine that we can find any strict and scientific theory of the nature and effects of the sacrament. The earlier theologians sometimes make statements which imply the most extreme view of the magical effects of the sacrament, and at other times explain its results in a purely ethical way. It should never be forgotten that the abundant use of metaphorical language by the Greek Fathers, and the want of anything like a strictly theological terminology, prevent our finding anything like the precise doctrinal statements which became familiar in the Western Church; while the prevalence of curious Greek physical speculations, which taught the creative power of water, mingled with and distorted the ideas about the effects of the water in baptism. It was St. Augustine, the great theologian of the Western Church, who first gave expression to exact dogmatic statements about the nature and meaning of baptism. The real difficulty to be explained was the connection between the outward rite and the inward spiritual change; or to put it more precisely, the relation between the water used and the Holy Spirit who can alone regenerate. The Greek theologians had shirked rather than faced the difficulty, and used terms at one time exaggerating the magical value of the element, at another insisting on the purely ethical and spiritual nature of the rite; but they never attempted to show in what precise relation the external rite stood to the inward change of heart. It is true that one or two theologians had almost anticipated Augustine's view, but the anticipation was more apparent than real, for the theology of the Greek Church in this, as in most other doctrines, is greatly hampered by the mystical tendency to represent regeneration and kindred doctrines much more as a species of chemical change of nature than as a change in the relations of the will. Augustine insisted strongly on the distinction between the sacrament itself and what he called the "res sacramenti," between the inward and spiritual and the outward and material, and by doing so Augustine became the founder of both the modern Roman Catholic and the modern orthodox Protestant views. Apart from certain modifying influences, it would not be difficult for the orthodox Protestant to subscribe to most of Augustine's views upon baptism, for he insists strongly on the uselessness of the external sign without the inward blessing of the Spirit. But in this doctrine, as in most others, Augustine's doctrine of the Church so interfered as to make practically inoperative his more spiritual views of baptism. The Church, Augustine thought, was the body of Christ, and that in a peculiarly external and physical way, and just as the soul of man cannot, so far as we know, exert any influence save upon and through the body, so the Spirit of Christ dispenses His gracious and regenerating influences only through the body of Christ, *i. e.*, the Church. But the Church, Augustine thought, was no invisible spiritual communion. It was the visible kingdom of God, the visible "civitas Dei in peregrinatione per terras," and so entrance into the Church, and the right and possibility of participating in the spiritual benefits which members of the Church can alone enjoy was only possible by means of a visible entrance into this visible kingdom. Thus while Augustine in theory always laid great stress upon the work of the Holy Spirit and upon the spiritual side of baptism, he practically gave the impulse to that view of the sacrament which made the external rite of primary importance. It was the Holy Spirit who alone imparted spiritual gifts to the children of God. But the one way by which the benefits of this Spirit could be shared was in the first place through baptism. Baptism was thought to be necessary to salvation, and all who were unbaptized were unsaved. In this way Augustine, while recognizing the spiritual nature of the sacrament, held views about the importance of the rite which were as strong as those of any Greek theologian who had mingled confusedly in his mind Christian doctrines and the maxims of Pagan philosophy about the creative power of the element of water. Of course such a doctrine of the importance of the baptism with water had to be modified to some extent. There were cases of Christian martyrs who had never been baptized, and yet had confessed Christ and died to confess Him: for their sakes the idea of a baptism of blood was brought forward; they were baptized not with water, but in their own blood. And the same desire to widen the circle of the baptized led the way to the recognition of the baptism of heretics, laymen, and nurses. It was the Augustinian doctrine of baptism which was developed by the Schoolmen, and which now is the substance of modern Roman Catholic teaching. The Schoolmen, whose whole theology was dominated by the Augustinian conception of the Church, simply took over and made somewhat more mechanical and less spiritual Augustine's doctrine. They were enabled to give the doctrine a more precise and definite shape by accommodating it to the terms of the Aristotelian philosophy. They began by distinguishing between the matter and the form of baptism. Had Augustine had this distinction before him he would probably have called the water the matter, and the action of the Holy Spirit the form which verified and gave shape to the matter; but the whole idea of the Schoolmen was much more mechanical, the magical idea of the sacrament came much more into prominence, and the spiritual and ethical fell much more into the background, and with them, while water was the *materia sacramenti*, the *forma sacramenti* was the words of the rite,—"I baptize thee," &c., &c. Thus insensibly the distinction between the external rite and the work of the Holy Spirit, which Augustine had clearly before him in theory at least, was driven back into its original obscurity, and while it was always held theoretically that the grace conferred in baptism was conferred by the Holy Spirit, still the action of the Spirit was so in-

separably connected with the mechanical performance of the rite, that the external ceremony was held to be full warrant for the inward spiritual presence and power, and it was held that in baptism grace was conferred "by the action performed." The actual benefits which were supposed to come in this way were, freedom from original sin and forgiveness of it and all actual sins committed up to the time of baptism, and the implanting of the new spiritual life — a life which could only be slain by a deadly sin. The Scholastic doctrine of baptism is the doctrine of the Roman Catholic Church, and the restatements made by Möhler on the one hand, and Jesuit theologians on the other, do not do more than give a poetical coloring to the doctrine, or bring out more thoroughly the magical and mechanical nature of the rite.

The Protestant doctrine of baptism, like the Scholastic or Roman Catholic, is to be traced back to Augustine and his distinction between the sign and the thing signified, and may be looked at as a legitimate development of the Augustinian doctrine, just as that must be considered to be an advance on the doctrine of the early Church Fathers. The early Fathers had confused the sign with the thing signified, — the water with the action of the Holy Spirit, — and could only mark their half-conscious recognition of the distinction by an alternating series of strong statements made now on the one side and now on the other. Augustine distinguished the two with great clearness, but connected them in an *external* way by means of his conception of the visible Church and of baptism as the door leading into it, and this led his followers to pay exclusive attention to the external side, until the thing signified became lost in the sign. The Protestant theologians connected the two in an *internal* way by means of the spiritual conception of faith, and so were able always to keep the sign in due subordination to the thing signified. It is faith — not faith in the sense of imperfect knowledge, or assent to intellectual propositions, but faith in the sense of personal trust in a personal Savior, or "fiducia," as the 17th century theologians called it — which so connects the water with the presence and power of the Spirit that the one is the means which the other uses to impart His spiritual grace. In this way baptism is looked upon as one of the means of grace, and grace is imparted through it as through the other means — the Lord's Supper, the Word of God, prayer, &c. Just as the dead letters and sounds of the Word of God are but the signs of the presence and power of His Spirit, and become at His touch the living revelation of the Lord, so in baptism, the outward rite, worthless in itself, becomes the sign and pledge of the presence and power of the Spirit of God; and as, in the case of the Word of God, it is faith or "fiducia" that on the human side connects the external signs with the inward power of the Spirit, so, in baptism, it is the same faith which unites the water and the Spirit. So far all orthodox Protestants are agreed, but in order to show the historical evolution of the doctrine, it is necessary to notice in a sentence the difference between the Lutheran and Calvinist doctrines. Luther's own doctrine of baptism changed very much; in the second stage — the stage represented by the tract, *De Babyl. Capt. Eccl.* — it is not different, in germ at least, from the Calvinist view; but he afterwards drew back and adopted views much nearer to the Scholastic theory. He was evidently afraid that, if he went too far from the Scholastic doctrine, and insisted too strongly on the importance of faith, he might be led on to reject the baptism of infants; and his later theories are a recoil from that. The question which Luther had to face and answer here was, What is meant by faith, the faith which connects the symbol with the reality, and so appropriates the gifts of God's grace in the sacrament? Is it a faith which begins and ends in the individual act of faith at work in the person that is baptized? or is it a much wider thing with a more universal significance? Luther did not face this question thoroughly, but his recoil from the Reformed theory of baptism seems to show that he would have taken the former answer. Nor did Calvin face the question; but his doctrine of baptism implies that he would have taken the latter answer. The faith which a man has in Christ, the faith which appropriates, is not the individual's only, but extends far beyond him and his small circle. It is awakened by the Holy Spirit, it comes into being within the sphere of God's saving purpose. Its very existence indicates a *solidarité* between the individual believer and the whole Church of God. Hence on the Reformed doctrine, while faith is essential to the right appropriation of the blessing in the rite, there is no need for thoroughly developed faith in those who are baptized. If they are infants, then they are baptized because of the faith of their parents or near relations, or of the congregation before whom the baptism is performed; only those who are the sponsors for the child bind themselves before God to train up the child to know that it has been baptized, and to appropriate in conscious individual faith the benefits of the ordinance. Such is the Reformed theory of baptism; and it rests upon the ideas of the *solidarité* of believers, of the prior existence of the Church to the individual believer's, and of the ethical unity of the Church. On the other hand, those who hold that the Church is simply the sum of individual men and women, and that it is increased not by the silent widening of the influence of God's saving purpose within mankind, but by individual conversions and by individuals joining the Church, cannot help regarding infant baptism as a mere mockery. Hence the doctrines of the Anabaptists, Baptists, Mennonites, &c. (see BAPTISTS), who reject infant baptism altogether, and maintain that there can be no valid baptism without the conscious appropriation by an act of faith of the benefits symbolized by the rite. It is to be noticed that the tendency of those who reject infant baptism is to regard the sacrament not so much as a means of grace, but simply as an act symbolical of entrance into the Church, and to approach in this way the views of the Socinians and Remonstrants. Quakers reject baptism altogether along with the sacrament of the Supper.

III. *Baptismal Rites.*— In the Apostolic and immediately post-Apostolic Church, there was no stated time or place for baptism. Philip baptized the Ethiopian eunuch by the roadside, as soon as he had declared his faith. The early Church, like most of the Reformation Churches, condemned private baptism.

In the Apostolic Church the baptismal rite seems to have been a very simple one. "Repent and be baptised, every one of you," was all that Peter thought it necessary to say to those whom he invited to join the Christian Church; but soon after the Apostolic times baptism became a very elaborate ceremonial. No one could be baptized unless he had submitted to a long and elaborate course of instruction as a catechumen; and in order to be made a catechumen a ceremony of some length had to be gone through. In the baptismal ceremony the minister first consecrated the water by prayer, and the catechumen was then baptized in the name of the Father, the Son, and the Holy Ghost. The usual mode of performing the ceremony was by immersion. In the case of sick persons the minister was allowed to baptize by pouring water upon the head or by sprinkling. In the early church "clinical" baptism, as it was called, was only permitted in cases of necessity, but the practice

of baptism by sprinkling gradually came in in spite of the opposition of councils and hostile decrees. The Council of Ravenna, in 1311, was the first council of the Church which legalized baptism by sprinkling, by leaving it to the choice of the officiating minister. The custom was to immerse three times, once at the name of each of the persons in the Trinity, but latterly the threefold immersion was abolished, because it was thought to go against the unity of the Trinity. The words used in baptising always embodied the formula in the last chapter of St. Matthew. But the mode of uttering them varied.

The present form of administering baptism in the Church of Rome is as follows: — When a child is to be baptized, the persons who bring it wait at the door of the church for the priest, who comes thither in his surplice and his purple stole, surrounded by his clerks. He begins by questioning the godfathers, whether they promise in the child's name to live and die in the true Catholic and Apostolic faith; and what name they would give to the child. Then follows an exhortation to the sponsors, after which the priest, calling the child by its name, asks, "What dost thou demand of the Church?" The godfather answers, "Eternal life." The priest proceeds, "If thou art desirous of obtaining eternal life, keep God's commandments, — Thou shalt love the Lord thy God," &c.; after which he breathes three times in the child's face, saying, "Come out of this child, thou evil spirit, and make room for the Holy Ghost." Then he makes the sign of the cross on the child's forehead and breast, saying, "Receive the sign of the cross on thy forehead and in thy heart;" upon which, taking off his cap, he repeats a short prayer, and, laying his hand gently on the child's head, repeats a second prayer; then he blesses some salt, and putting a little of it into the child's mouth, he says, "Receive the salt of wisdom." All this is performed at the church door. Afterwards, the priest, with the godfathers and godmothers, come into the church, and advancing towards the font, repeat the Apostles' Creed and the Lord's Prayer. Arrived at the font, the priest again exorcises the evil spirit, and taking a little of his own spittle, with the thumb of his right hand rubs it on the child's ears and nostrils, repeating as he touches the right ear, the same word *Ephphatha*, "be thou opened," which our Saviour made use of to the man born deaf and dumb. Lastly, they pull off its swaddling-clothes, or strip it below the shoulders, during which the priest prepares the oil. The sponsors then hold the child directly over the font, observing to turn it due east and west; whereupon the priest asks the child whether he renounces the devil and all his works, and the godfather having answered in the affirmative, the priest anoints the child between the shoulders in the form of a cross; then taking some of the consecrated water, he pours part of it thrice on the child's head, at each perfusion calling on one of the persons of the Holy Trinity. The priest concludes the ceremony of baptism with an exhortation. It may be added that the Roman Church allows midwives, in cases of danger, to baptize a child before the birth is completed. A still-born child thus baptized may be buried in consecrated ground.

Baptism of the dead seems to have been founded on the opinion that when men had neglected to receive baptism in their life time, some compensation might be made for this default by their receiving it after death, or by another being baptised for them. This practice was chiefly in use among various heretical sects.

Hypothetical Baptism was that administered in certain doubtful cases, with the formula, "If thou art baptized, I do not rebaptize; if thou art not, I baptize thee in the name of the Father," &c.

Solemn Baptism was that conferred at stated seasons. Such in the ancient Church were the Paschal baptism and that at Whitsuntide. This is sometimes also called general baptism.

Lay Baptism we find to have been permitted both by the Common Prayer Book of King Edward, and by that of Queen Elizabeth, when an infant is in immediate danger of death, and a lawful minister cannot be had; but afterwards, in a convocation held in the year 1575, it was unanimously resolved, that even private baptism, in a case of necessity, was only to be administered by a lawful minister. The Scotch Reformed Church also prohibited private baptism by lay persons, but ordained that when any had been thus baptized, the rite was not to be repeated.

The name *baptism* has been applied to certain ceremonies used in giving names to things inanimate. The ancients knew nothing of the custom of giving baptism to inanimate things, such as bells, ships, and the like. The first notice we have of this is in the capitulars of Charles the Great, where it is mentioned with censure; but afterwards it crept by degrees into the Roman offices. Baronius carries its antiquity no higher than the year 968, when the great bell of the church of Lateran was christened by Pope John III. At last it grew to such a height as to form a ground of complaint in the *Centum Gravamina* of the German nation, drawn up at the diet of Nuremberg in 1581, where the ceremony of baptizing a bell, with godfathers, &c., to make it capable of driving away tempests and devils, was declared to be a superstitious practice, contrary to the Christian religion, and a mere seduction of the simple people.

BAPTISTERY (*Baptisterium*) was a hall or chapel in which the catechumens were instructed and the sacrament of baptism administered. It was commonly a circular building, although sometimes it had eight and sometimes twelve sides, and consisted of an ante-room where the catechumens were instructed, and where before baptism they made their confession of faith, and an inner apartment where the sacrament was administered.

BAPTISTS, a denomination of Christians, distinguished, as their name imports, from other denominations by the views they hold respecting the ordinance of baptism.

The early history of the Baptists, both in England and on the Continent, is very obscure. In the great awakening of religious thought and feeling which characterized the beginning of the 16th century, it was inevitable that amongst those who burst the fetters which bound them to the see of Rome some should be willing to retain as much of the ancient doctrine and practice as they could with a safe conscience, whilst others, rejoicing in their new-found liberty, would desire to cast aside every remnant of what they regarded as superstition, and to advance as far as possible in the path of what they deemed Christian liberty; nor is it at all to be wondered at that strange and wild theories on matters even remotely connected with religion should spring into life. But amidst all the diversities of opinion that existed, it was constantly held by Protestants that "holy Scripture containeth all things necessary to salvation, so that whatsoever is neither read therein nor may be proved thereby, although it be sometime received of the faithful as godly and profitable for an order and comeliness, yet no man ought to be constrained to believe it as an article of faith or repute it requisite to the necessity of salvation." We must not be surprised that the right of private judgment, which is involved in the principle thus broadly laid down, was nevertheless far from being conceded to the extent that was desired by those who departed farthest from

the Church of Rome. In fact, each separate section of Protestants claimed for itself to stand on the ground of holy Scripture, and was prepared to resist alike the tyranny of Rome and what is considered the licence of other bodies of Protestants. Thus it happened that the Baptists, or as their opponents called them, the Anabaptists (or, as Zwingli names them, Catabaptists), were strenuously opposed by all other sections of the Christian Church, and it was regarded by almost all the early reformers to be the duty of the civil magistrate to punish them with fine and imprisonment, and even with death. There was, no doubt, some justification for this severity in the fact that the fanaticism which burst forth in the early times of the Reformation frequently led to insurrection and revolt, and in particular that the leader of the "peasant war" in Saxony, Thomas Münzer, and probably many of his followers, were "Anabaptists." One result of this severity is, that the records of the early history of the Anabaptists both on the Continent and in England are very few and meagre. Almost all that is currently known of them comes to us from their opponents. There is, however, much valuable information, together with detailed accounts of their sufferings, in the Dutch Martyrology of Van Braght, himself a Baptist, which bears the title *Martelaers Spiegel der Doops-gesinde* an English translation of the latter half of which was published by Dr. Underhill, now secretary of the Baptist Missionary Society. Probably the earliest confession of faith of any Baptist community is that given by Zwingli in the second part of his *Elenchus contra Catabaptistas*, published in 1527. Zwingli professes to give it entire, translating it, as he says, *ad verbum* into Latin. He upbraids his opponents with not having published these articles, but declares that there is scarcely any one of them that has not a written (*descriptum*) copy of these laws which have been so well concealed. These articles are in all seven. The first, which we give in full, relates to baptism:—

"Baptism ought to be given to all who have been taught repentance and change of life, and who in truth believe that through Christ their sins are blotted out (*abolita*), and the sins of all who are willing to walk in the resurrection of Jesus Christ, and who are willing to be buried with him into death, that they may rise again with him. To all, therefore, who in this manner seek baptism, and of themselves ask us, we will give it. By this rule are excluded all baptisms of infants, the great abomination of the Roman pontiff. For this article we have the testimony and strength of Scripture, we have also the practice of the apostles; which things we simply and also steadfastly will observe, for we are assured of them."

The second article relates to withdrawment or excommunication, and declares that all who have given themselves to the Lord and have been baptized into the one body of Christ should, if they lapse or fall into sin, be excommunicated. The third article relates to the breaking of bread; in this it is declared that they who break the one bread in commemoration of the broken body of Christ, and drink of the one cup in commemoration of his blood poured out, must first be united together into the one body of Christ, that is, into the church of God. The fourth article asserts the duty of separation from the world and its abominations, amongst which are included all papistical and semi-papistical works. The fifth relates to pastors of the church. They assert that the pastor should be some one of the flock who has a good report from those who are without. "His office is to read, admonish, teach, learn, exhort, correct, or excommunicate in the church, and to preside well over all the brethren and sisters both in prayer and in the breaking of bread; and in all things that relate to the body of Christ, to watch that it may be established and increased so that the name of God may by us be glorified and praised, and that the mouth of blasphemers may be stopped." The sixth article relates to the power of the sword. "The sword," they say, "is the ordinance of God outside the perfection of Christ, by which the bad is punished and slain and the good is defended." They further declare that a Christian ought not to decide or give sentence in secular matters, and that he ought not to exercise the office of magistrate. The seventh article relates to oaths, which they declare are forbidden by Christ.

However much we may differ from the points maintained in these articles, we cannot but be astonished at the vehemence with which they were opposed, and the epithets of abuse which were heaped upon the unfortunate sect that maintained them. Zwingli, through whom they come down to us, and who gives them, as he says, that the world may see that they are "fanatical, stolid, audacious, impious," can scarcely be acquitted of unfairness in joining together two of them,—the fourth and fifth,—thus making the article treat "of the avoiding of abominable pastors in the church" though there is nothing about pastors in the fourth article, and nothing about abominations in the fifth, and though in a marginal note he himself explains that the first two copies that were sent him read as he does, but the other copies make two articles, as in fact they evidently are. To us at the present day it appears not merely strange but shocking, that the Protestant Council of Zürich, which had scarcely won its own liberty, and was still in dread of the persecution of the Romanists, should pass a decree ordering, as Zwingli himself reports, that any person who administered anabaptism should be drowned; and still more shocking that, at the time when Zwingli wrote, this cruel decree should have been carried into effect against one of the leaders of the Anabaptists, Felix Mantz, who had himself been associated with Zwingli, not only as a student, but also at the commencement of the work of Reformation. No doubt the wild fanaticism of some of the opponents of infant baptism seemed to the Reformers to justify their severity. In 1537 Menno Simonis joined himself to the Anabaptists and became their leader. His moderation and piety, according to Mosheim, held in check the turbulence of the more fanatical amongst them. He died in 1561, after a life passed amidst continual dangers and conflicts. His name remains as the designation of the Mennonites, who eventually settled in the Netherlands under the protection of William the Silent, Prince of Orange.

About the beginning of the 17th century the severe laws against the Puritans led many dissenters to emigrate to Holland. Some of these were Baptists, and an English Baptist Church was formed in Amsterdam about the year 1609. In 1611 this church published "a declaration of faith of English people remaining at Amsterdam in Holland." The article relating to baptism is as follows:—"That every church is to receive in all their members by baptism upon the confession of their faith and sins, wrought by the preaching of the gospel according to the primitive institution and practice. And therefore churches constituted after any other manner, or of any other persons, are not according to Christ's testament. That baptism or washing with water is the outward manifestation of dying unto sin and walking in newness of life; and therefore in no wise appertaineth to infants." They hold "that no church ought to challenge any prerogative over any other; "that magistracy is a holy ordinance of God;"

"that it is lawful in a just cause for the deciding of strife to take an oath by the name of the Lord."

The last execution for heresy in England by burning alive took place at Lichfield, April 11, 1612. The condemned person, Edward Wightman, was a Baptist.

With the Revolution of 1688, and the passing of the Act of Toleration in 1689, the history of the persecution of Baptists, as well as of other Protestant dissenters, ends. The removal of the remaining disabilities, such as those imposed by the Test and Corporation Acts repealed in 1828, has no special bearing on Baptists more than any other nonconformists. The ministers of the "three denominations of dissenters,"— Presbyterians, Independents, and Baptists,—resident in London and the neighborhood, had the privilege accorded to them of presenting on proper occasions an address to the sovereign in state, a privilege which they still enjoy.

The Baptists were early divided into two sections,—those who in accordance with Arminian views held the doctrine of "General Redemption," and those who, agreeing with the Calvinistic theory, held the doctrine of "Particular Redemption;" and hence they assumed respectively the names of General Baptists and Particular Baptists. In the last century many of the General Baptists had gradually adopted the Arian, or, perhaps the Socinian theory; whilst, on the other hand, the Calvanism of the Particular Baptists had in many of the churches become more rigid, and approached or actually became Antinomianism. In 1770 the orthodox portion of the General Baptists formed themselves into a separate association under the name of the General Baptist New Connection, since which time the "Old Connection" has gradually merged into the Unitarian denomination. Somewhat later many of the Particular Baptist churches became more moderate in their Calvinism, a result largely attributable to the writings of Andrew Fuller. Up to this time the great majority of the Baptists admitted none either to membership or communion who were not baptized, the principal exception being the churches in Bedfordshire and Hertfordshire, founded or influenced by Bunyan, who maintained that difference of opinion in respect to water baptism was no bar to communion. At the beginning of the present century this question was the occasion of great and long-continued discussion, in which the celebrated Robert Hall took a principal part. The practice of mixed communion gradually spread in the denomination. Still more recently many Baptist churches have considered it right to admit to full membership persons professing faith in Christ, who do not agree with them respecting the ordinance of baptism. Such churches justify their practice on the ground that they ought to grant to all their fellow Christians the same right of private judgment as they claim for themselves. It may not be out of place here to correct the mistake, which is by no means uncommon, that the terms Particular and General as applied to Baptist congregations are intended to express this difference in their practice, whereas these terms relate, as has been already said, to the difference in their doctrinal views. The difference now under consideration is expressed by the terms "strict" and "open," according as communion (or membership) is or is not confined to persons who, according to their view, are baptized.

The Baptists early felt the necessity of providing an educated ministry for their congregations. Some of their leading pastors had been educated in one or other of the English universities. Others had by their own efforts obtained a large amount of learning, amongst whom Dr. John Gill was eminent for his knowledge of Hebrew. He is said to have assisted Bishop Walton in the preparation of his Polyglot. Mr. Edward Terrill, from whose *Records* we have already quoted, and who died in 1685, left a considerable part of his estate for the instruction of young men for the ministry, under the superintendence of the pastor of the church now meeting in Broadmead, Bristol, of which he was a member. Other bequests for the same purpose were made, and from the year 1720 the Baptist Academy, as it was then called, received young men as students for the ministry amongst the Baptists. Fifty years later, in 1770, a society, called the Bristol Education Society, was formed to enlarge this academy; and it was still further enlarged by the erection of the present Bristol Baptist College about the year 1811. In the North of England a similar Education Society was formed in 1804 at Bradford, Yorkshire, which has since been removed to Rawdon near Leeds. In the metropolis a college was formed in 1810 at Stepney, and was removed to Regent's Park in 1856. The Pastors' College, in connection with the Metropolitan Tabernacle was instituted in 1856. Besides these, the General Baptists have maintained a college since 1797 which at present is carried on at Chilwell, near Nottingham. A theological institution, intended to promote the views of the "Strict" Baptists, has lately been established at Manchester. There is also a Baptist theological institution in Scotland, and there are three colleges in Wales. The total number of students in these institutions may be reckoned to be about 200.

The Baptists were the first denomination of British Christians that undertook the work of missions to the heathen, which has become so prominent a feature in the religious activity of the present century. As early as the year 1784, the Northamptonshire Association of Baptist churches resolved to recommend that the first Monday of every month should be set apart for prayer for the spread of the gospel, a practice which has since, as a German writer remarks, extended over all Protestant Christendom, and we may add over all Protestant Missions. Six years later, in 1792, the Baptist Missionary Society was formed at Kettering in Northamptonshire, after a sermon on Isaiah lii. 2, 3, preached by the afterwards celebrated William Carey, the prime mover in the work, in which he urged two points: "Expect great things from God; attempt great things for God." In the course of the following year Carey sailed for India, where he was joined a few years later by Marshman and Ward, and the mission was established at Serampore. The great work of Dr. Carey's life was the translation of the Bible into the various languages and dialects of India. The society's operations are now carried on, not only in the East, but in the West Indies, Africa and Europe.

In regard to church government, the Baptists agree with the Independents that each separate church is complete in itself, and has, therefore, power to choose its own ministers, and to make such regulations as it deems to be most in accordance with the purpose of its existence, that is, the advancement of the religion of Christ. A comparatively small section of the denomination maintain that a "plurality of elders" or pastors is required for the complete organization of every separate church.

Some of the English settlers in all parts of the world have carried with them the principles and practice of the Baptists. The introduction of Baptist views in America was due to Roger Williams, who emigrated to Boston, Massachusetts, in 1630. Driven from Massachusetts on account of his denying the power of the civil magistrate in matters of religion, he formed a settlement and founded a state in Rhode Island, and having become a Baptist he formed, in 1639, the first Baptist church in America, of which he was also for a short time the pastor. It is impossible here to trace the his-

tory of the Baptists in the United States. In 1889 there are reported, churches, 46,624; ministers, 32,017; members, 4,078,589. The great majority of the churches practice "strict" communion.

BAR, in Hydrography, is a bank of sand, silt, etc., opposite the mouth of a river, which obstructs or bars the entrance of vessels. The bar is formed where the rush of the stream is arrested by the water of the sea, as the mud and sand suspended in the river-water are thus allowed to be deposited.

BAR, in Law. This word has several legal meanings; thus, it is the term used to signify an inclosure or fixed place in a court of justice where lawyers may plead. The dock, or inclosed space where persons accused of felonies and other offenses stand or sit during their trial, is also called the bar.

BAR, in Music, is a line drawn across the stave to divide the music into small portions of equal duration; and to indicate the accent, each of these small portions, called *measures*, are also commonly termed bars.

BAR, a town of Russian Poland, in the government of Podolia, fifty miles from Kaminetz. Pop., 8,077.

BARABOO, the capital of Sauk county, Wis., is situated on the Baraboo river, thirty-seven miles northwest of Madison. It is a banking and railroad town, and has considerable manufactures of carriages and woolen goods, a foundry, grist-mills, saw-mills, planing-mills and other diversified industries. There is a graded school system and seven churches. Population, 4,602.

BAR-HEBRÆUS. See ABULFARAGIUS, vol. i. p. 19.

BAR-LE-DUC, or BAR-SUR-ORNAIN, the chief town of the department of Meuse in France. It occupies the declivity and base of a hill, on the river Ornain, a tributary of the Marne, 125 miles E. of Paris, and consists of an upper and lower town, the latter being the more modern and respectable of the two. It is a railway station on the Paris and Strasburg line, and has a population of 16,000.

BAR-SUR-AUBE, the chief town of an arrondissement in the department of Aube, in France. It is a station on the Paris-and-Mulhouse line, and is situated on the right bank of the River Aube, at the foot of Sainte Germaine, in a picturesque district, the wine of which is much esteemed. It is a pretty little town, with a few remains of its ancient fortifications. Pop. 4500.

BAR-SUR-SEINE, the chief town of an arrondissement in the department of the Aube, in France. In the Middle Ages Bar-sur-Seine was a place of considerable importance, and, according to Froissart, contained no fewer than 900 "hôtels" or mansions. Pop. 3000.

BÁRA BÁNKÍ, a district of British India under the jurisdiction of the Chief Commissioner of Oudh. It is bounded on the N.W. by the district of Sítápur; on the N. by Bharáich; on the N.E. by Gondá; on the E. by Faizábád; on the S. by Sultánpur and Rai Barelí; and on the W. by Lucknow. The district stretches out in a level plain interspersed with numerous *jhils* or marshes. In the upper part of the district the soil is sandy, while in the lower part it is clayey, and produces finer crops. The principal rivers are the Ghagrà (*Gogra*), forming the northern boundary, and the Gúmtí. Area, 1735 square miles; pop. 1,110,000.

BARAGUAY D'HILLIERS, LOUIS, general, was born at Paris in 1764, and, receiving an appointment in the army of Italy, from Napoleon, shared all the successes of the campaigns of 1796–97. Made a general of division and commandant of Venice, in 1798, he accompanied the expedition to Egypt; and afterward successively held appointments on the Rhine, in the Tyrol; and at Catalonia. He died in 1813.—ACHILLE, his son, was born in Paris in 1795, and entering the army in 1812, next year lost his left hand at the battle of Leipzic. He held a number of appointments up to 1854, when he received the command of the Baltic expedition; and on the capture of Bomarsund, he was made a marshal. In the Italian campaign of 1859 he distinguished himself at Solferino, and during 1870 he was for a brief time commander of Paris. He died at Amélie-les-Bains, June 6, 1878.

BARAHAT, a town of northern Hindustán, situated in the Himálayas, and within the native state of Garhwál. The town was almost destroyed in 1803 by an earthquake — a calamity greatly aggravated by the houses having been built of large stones, with slated roofs.

BARANTE, AMABLE GUILLAUME PROSPER, Baron de Brugière, an eminent French statesman, and the learned historian of the dukes of Burgundy, was the son of an advocate, and was born at Riom, June 10, 1782. At the age of sixteen he entered the Ecole Polytechnique at Paris, and at twenty obtained his first appointment in the civil service. His abilities secured him rapid promotion, and in 1806 the post of auditor to the council of state was given to him. After being employed in several political missions in Germany, Poland, and Spain, during the next two years, he became prefect of Vienne. At the time of the return of Napoleon I. he held the prefecture of Nantes, and this post he immediately resigned. About this period he married. On the second restoration of the Bourbons he was named councillor of state and Secretary-general of the Ministry of the Interior. About the same time he was elected to the Chamber of Deputies for the two departments of Puy-de-Dôme and Loire Inférieure; but in the following year, in consequence of being under the legal age of a deputy, as required by a new law, he lost his seat. After filling for several years the post of Director-general of Indirect Taxes, he was created, in 1819, a peer of France, and took an active and prominent part as a member of the opposition in the debates of the Upper Chamber. As a scholar his *opus magnum* is the *Histoire des Ducs de Bourgogne de la Maison de Valois*, which appeared in a series of volumes between 1824 and 1828. It procured him immediate admission among the Forty of the French Academy; and its great qualities of scholarship, impartiality, accuracy, and purity of style, have given him a place among the greatest French historians. He died in 1866.

BARANYA, a province in the kingdom of Hungary, extending over 1960 square miles. It lies in the angle formed at the junction of the Danube and the Drave, is traversed by offshoots of the Styrian Alps, and contains one city, 13 market-towns, and 341 villages. The inhabitants number about 283,500, and consist of Magyars, Germans, Croatians, and Servians, a large proportion being Roman Catholics.

BARANZANO, JEAN ANTOINE, surnamed *Redemptus*, an eminent natural philosopher and mathematician, was born in Piedmont in 1590, and died at Montargis in 1622.

BÁRÁSAT, a subdivisional town in the district of the 24 Parganás, under the jurisdiction of the Lieutenant-Governor of Bengal. Population, 12,000.

BARATIERE, or BARETTIER, JOHN PHILIP, a very remarkable instance of precocious genius, was born at Schwabach near Nuremberg on the 10th January 1721. His early education was most carefully conducted by his father, Francis Baratière, pastor of the French church at Schwabach, and so rapid was his progress that by the time he was five years of age he could speak French, Latin, and Dutch with ease, and read Greek fluently. He then engaged in the study of Hebrew, and in three years was able to translate the Hebrew Bible into Latin or French, or to retranslate these versions into the orig-

inal Hebrew. From his reading he collected materials for a dictionary of rare and difficult Hebrew words, with critical and philological observations; and when he was about eleven years old translated from the Hebrew Tudela's *Itinerarium*. In his fourteenth year he was admitted Master of Arts at Halle, and received into the Royal Academy at Berlin. The last years of his short life he devoted to the study of history and antiquities, and had collected materials for histories of the Thirty Years' War and of Antitrinitarianism, and for an *Inquiry Concerning Egyptian Antiquities*. His health, which had always been weak, gave way completely under these labors, and he died on the 5th October 1740, aged 19 years and 8 months. He had published eleven separate works, and left a great quantity of manuscript materials.

BARATYNSKI, JEWGENIJ ABRAMOVITCH, a distinguished Russian poet, was born in 1792. He was educated at the royal school at St. Petersburg, and then entered the army. He served for eight years in Finland, and appears to have got into disgrace on account of some foolish pranks which he had played. During these years he composed his first poem, *Eva*, which bears very manifest traces of his residence in Finland. Through the interest of friends he obtained leave from the Czar to retire from the army, and settled near Moscow. There, so far as his broken health would allow him, he devoted his time to poetry, and completed his chief work, *The Gipsy*, which has been spoken of by critics as the best poem of its kind in the Russian language, and as fully equal, if not superior, to the finest productions of Pouschkin. This was his only work of any extent; his health gave way completely, and he died in 1844 at Naples, whither he had gone for the sake of the milder climate.

BARBACENA, a town of Brazil, in the province of Minas-Geraes, situated at the height of about 3500 feet above the sea, in the Sierra Mantiqueira, 150 miles N. W. of Rio de Janeiro. It has low houses and broad streets, and contains a town-hall, a prison, a hospital, founded in 1852 by Antonio Ferreira Armond, and a "school of intermediate instruction," in which French history and geometry are taught. The trade is principally in gold-dust, cotton, and coffee. Population of town and district, 14,000.

BARBADOS, or BARBADOES, the most windward of the Caribbean Islands, 78 miles E. of St. Vincent, the island nearest to it in the Caribbean chain. It lies in the track of vessels, and is well adapted to be an *entrepôt* of commerce. It has nearly the size and proportions of the Isle of Wight, being 21 miles in length, and about 14½ miles in its broadest part. It has a superficial area of 106,470 acres, or about 166 square miles,—70,000 acres (besides grass land) are under cultivation, and nearly 30,000 acres of sugar cane are annually cut. The island is almost encircled by coral reefs, which in some parts extend seaward nearly three miles. There are two lighthouses, one on the south point and another on the south-east coast. A harbor light has also been placed on Needham's Point. The harbor Carlisle Bay, is a large open roadstead. The inner harbor, or careenage, for small vessels, is protected by a breakwater called the Molehead. Barbados presents every variety of scenery,—hill and valley, smooth table-land and rugged rocks. From one point of view the land rises in a succession of limestone and coral terraces, which indicate different periods of upheaval from the sea. From another there is nothing to be seen but a mass of abruptly rising rocks. The rainfall is caused, apart from elevation, by the exposure of the land to those winds laden with moisture which strike the island at different periods of the year.

The N.E. trade-wind blows for three-fourths of the year, and most of the rain comes from the same quarter. March is the driest of the months, and October the wettest; the average rainfall for the former being 1½ inch, and for the latter 9 inches. Leprosy is not uncommon among the negroes, and elephantiasis is so frequent as to be known by the name of "Barbados leg."

Bridgetown is the capital and port of the island, and the centre of business activity. It contains about 23,000 inhabitants. Over the creek which received the waters from the heights around the Indians had built a rude bridge. This was known for a long time after the British settlement as the Indian Bridge, but as the settlement grew, and after the old bridge had been replaced by a more solid structure, the place received the name of Bridgetown. The town was destroyed by fire in 1666, and rebuilt, principally of stone, upon a larger scale. It suffered again from fire in 1766 and 1845.

The first settlers cultivated maize, sweet potatoes, plantains, and yams for their own consumption, and indigo, cotton wool, tobacco, ginger, and aloes for export. Quantities of logwood, fustic, and lignum vitæ were also shipped. But the adaptability of the soil for cane becoming known, and the necessary knowledge for the manufacture of sugar being obtained, this article at once became the great staple of the colony. The value of property very largely increased. The half of an estate of 500 acres, 200 under cane, with buildings and appurtenances, was sold for £7000 about the year 1650, the laborers being slaves from Africa.

It was while the rapid progress of the colony was attracting especial attention, and many persons of family and means, adherents of the royal cause, were finding it a refuge from the troubles at home, that Francis Lord Willoughby of Parham went out as governor, with the consent of King Charles II., who had been proclaimed in Barbados as soon as the news of the execution of Charles I. had arrived. Lord Carlisle had died, and his heir had been entrusted with the duty of paying his debts out of the revenue from the island. Lord Willoughby agreed to take a lease from the new earl of the profits of the colony for twenty-one years, to pay Lord Carlisle one-half, and to accept the governorship, including that of the other islands in the Carlisle grant. Upon his arrival in 1650, notwithstanding the active opposition of a party headed by Colonel Walrond, he procured the passing of an Act acknowledging the king's sovereignty, the proprietary rights of the earl of Carlisle, and his own interest derived from the latter. But the Parliament despatched Sir George Ayscue with a squadron and considerable land forces, to reduce the island to submission to its authority. About the same time the famous Navigation Law was enacted, by which foreign ships were probibited from trading with British colonies, and imports into England and the dependencies were not allowed in foreign bottoms. This restriction had a great effect upon Barbados, which depended upon foreign importation for a great deal of its provisions. Sir G. Ayscue's expedition appeared off Barbados in October 1651. After one unsuccessful attempt, a landing was effected, and Lord Willoughby's force was routed. The counsels of a moderate party in the island, however, prevailed, and a compromise was effected. A treaty was made declaring the authority of the Parliament, but containing provisions not at all unfavorable to the inhabitants, and reserving even to Lord Willoughby his rights in the island. During the Commonwealth prisoners of war were sometimes sent to Barbados. The expedition of 1655 against St. Domingo and Jamaica under Penn and Venables was reinforced by a troop of horse and 3500 vol-

unteers from Barbados. At the Restoration Lord Willoughby went out once more to Barbados and resumed his office. Several of the faithful adherents of the royal cause in the island were made baronets and knights, but the restrictions upon commercial intercourse which had been imposed by the Parliament were made more stringent. Then doubts began to arise in the minds of the planters as to the title by which they held their estates. They had created by their exertions a very valuable property, and the bare possibility of the earl of Carlisle stepping in and dispossessing them caused much discontent. The death of Lord Carlisle brought matters to a crisis. An arrangement was made in 1663 by which the different claimants were satisfied, the proprietary or patent interest was dissolved, and the Crown exercised directly its rights, and undertook the government, although it was not till 1672 that the nomination of the council was taken into the hands of the king. A duty of 4½ per cent. upon the produce of the island was levied in 1663 to satisfy the claims and defray the government expenses. Lord Willoughby received a new commission, and the only practical change effected in the constitution was that all laws were thenceforward made subject to a confirmation by the king. In 1665 the colony successfully resisted an attack by the Dutch; but in conducting an expedition against the French in Guadaloupe in 1666, Lord Wilioughby was lost in a hurricane, and an eventful and occasionally brilliant career was thus prematurely ended. He was succeeded in the government by his brother, Lord William Willoughby, during whose governorship the division of the Caribbean Islands into Windward and Leeward was made. The hurricane of 1675 gave a serious check to the prosperity of the colony. An unsuccessful application was made to the home Government, to remit, on account of the distress that prevailed, the 4½ per cent. duty, which pressed very heavily upon the planters. The island had scarcely recovered from the effects of the hurricane when the supply of labor was restricted and its expense increased by the Royal African Company, at the head of which was the duke of York, receiving a charter for the exclusive supply of slaves of the West India Islands. This company had great influence in the appointment of governors; and in consequence of oppressive proceedings and depreciation of the value of property, many families left the island. A number of persons implicated in the duke of Monmouth's rebellion were sent to Barbados and treated harshly. Duties upon sugar were imposed by the mother country, which were increased at the accession of James the II., to 2s. 4d. per cwt. on Muscovado, and to 7s. upon all sugars for common use. From the survey made by governor Sir Richard Dutton in 1683–4, it appears that the population consisted of 17,187 free, 2381 unfree and servants (prisoners of war and persons brought from England under engagements for terms of years), and 46,602 slaves. The number of acres in useful possession was 90,517, and of sugar works 358. These figures show how rapidly, in spite of all difficulties, the colony had grown in sixty years.

The wars in Europe were reproduced upon a smaller scale, though with equal if not greater intensity, among the different nationalities in the West Indies. In such times the seas swarmed with privateers; and freights were so high as to induce the island Legislature to make a vain attempt to regulate them by law. The news of the peace of Ryswick was received with great joy, and matters remained quiet until the declaration of war against France and Spain in 1702 revived privateering in West Indian waters. Events in the first half of the 18th century do not call for detailed description. It was the custom of the assembly to supplement the salary of the governor (which was paid by the Crown out of the 4½ per cent. duty) by special grants, sometimes of large amount. But this did not prevent many constitutional conflicts between the assembly and the executive. During the war which commenced between England and France in 1756, the West Indies witnessed much fighting, with its attendant suffering. In 1761 a determined attempt was made to break the power of France in the archipelago. Barbados entered with enthusiasm into the project. Guadaloupe had been taken in 1759, and the principal effort now, under Admiral Rodney and General Monck ton, was directed against Martinique. In 1762 that island surrendered. Barbados spent £24,000 in raising and equipping her proportion of men in the attacking forces; and in 1765 the House of Commons voted £10,000 as compensation for the expense incurred. By the Treaty of 1763, however, both these islands were restored to France. The constant wars had naturally an injurious effect upon Barbados. During the governorship of the Hon. Edward Hay, who was appointed in 1773, differences of opinion arose as to the state of the island. When the war between England and the American colonies began, the supply of provisions, upon which Barbados depended, necessarily stopped. The assembly addressed a petition to the king, praying for relief; through the interposition of the governor the relief was not immediately granted; but in 1778, when the island was in a very depressed state, the British ministry sent a quantity of provisions for sale at prime cost. With the advent of General Cunninghame as governor another series of contentious years began. In the midst of disputes as to the right of the governor to exact certain fees without the consent of the assembly, a hurricane visited the island and caused much destruction of property. Parliament in 1782 granted £80,000 for relief, but an attempt to obtain the repeal of the 4½ per cent. duty was again unsuccessful. The French were regaining their ascendency in the archipelago, and had it not been for the great naval victory won by Sir George Rodney, Barbados and the remaining British colonies might have fallen to the enemy. As the 18th century closed, the prospect of the great final struggle with France overshadowed the colonies. The Barbadians energetically put themselves in a state of defence, and at the same time voted and privately subscribed money to assist his Majesty to carry on the war. The peace of Amiens, in 1802, relieved anxiety for a brief interval, but hostilities were soon renewed. When in 1805 Napoleon sent a squadron to the archipelago, with 4000 soldiers, the crisis put Barbados on her mettle. The French fleet was successful in exacting large sums of money from adjacent colonies. Admiral Villeneuve, too, was on his way with a still larger fleet and stronger force. But when Admiral Cochrane arrived off Barbados the safety of the island was secured. Even amid the intense excitement of these events constitutional questions were not forgotten. The governor could only establish martial law when the enemy's fleet was in sight. A premature declaration drew forth a protest from the assembly, and the controversy was only ended when the Home Government asserted the full prerogative of the Crown to impose martial law when necessary for the safety of the island. The most memorable event in 1805 was a flying visit from Lord Nelson in search of a French fleet. In October of the same year the battle of Trafalgar was won, and Bridgetown soon after had its Trafalgar Square and its Nelson statue. In 1809 an expedition sailed from Barbados, under Governor Beckwith, against the French in Martinique. After a bombardment of five days that place was taken. Twelve months later Beckwith similarly attacked Guadaloupe;

and when that island was conquered, after some hard fighting, the power of the French in the archipelago was again reduced to its lowest ebb. When the war ended in 1810 in the West Indies, the British were supreme in that region. But danger was threatened from another source. The rupture between Great Britain and the United States in 1812 caused privateering to be resumed to an extent that almost destroyed the commerce of the island, until the abdication of Napoleon and the peace with America in 1814 again brought relief to the colonies. The military history of Barbados ceased at the close of the Peninsular War.

In the meantime Barbadian affairs had attracted notice in Parliament. In 1812 a motion was made in the House of Commons that the 4½ per cent. duty should be applied exclusively to local purposes. A considerable amount of this revenue had been devoted to pensions to persons entirely unconnected with the colony, and it was stated in the House of Commons that part of the money had been appropriated to the king's household in the reign of William III. Nor were the Barbadians themselves backward in stating their grievances. In 1813 they protested against the importation of East Indian sugars into Great Britain, and also against the system of patent offices, by which non-resident officials were able to draw large sums from the island for services which they never performed. By Act of the Parliament 6 Geo. IV. c. 114, 1825, foreign commodities were admitted into the British possessions at moderate rates of duty if the countries sending those articles would give similar privileges to British ships. As the United States refused reciprocity, the West Indian ports were closed against their vessels, and the United States retaliated by prohibiting all intercourse with British colonies. From the operation of the above-mentioned Act an important constitutional question arose. These duties, levied in the name of the king, were to be paid into the local treasury for the uses of the colony, but the customs officers, of course appointed from home, received instructions to retain their own salaries from the revenue. This was denounced by the assembly as illegal, and after a long controversy it was agreed, in 1832, that 10 per cent. should be deducted to defray the expense of collecting the tax. Another question arose which illustrates the relations between England and the colony. By an island Act of 1773, a 2s. 6d. tonnage duty was imposed, but small vessels belonging to residents were only to pay on three voyages a year. By an Act of Parliament in 1832 this exemption was abolished. The assembly protested and denied the right of Parliament to tax colonies which had no representative institutions; but Lord Stanley, in 1833, declared that this right existed, although its exercise was a matter of expediency. After the hurricane of 1831, which was perhaps the severest the island had ever experienced, causing 1591 deaths and a destruction of property estimated at more than a million and a half sterling, another urgent appeal was made for the remission of the 4½ per cent. duty, but without effect, although £100,000 was granted by Parliament in 1832 for the relief of the islands which had suffered from the visitation; of this sum Barbados took half. By an Act of Parliament passed in 1838, the 4½ per cent. duty was at length removed, after having been in existence for 175 years.

But a social revolution had begun which was destined to change not so much the prosperity of the colony, as the conditions under which that prosperity arose. From the first settlement, of course, the one great want was labor. As the labor supply increased and became more certain the cultivation expanded, wealth was created, and the importance of the colony grew. In the early days white labor was employed, assisted by Indians obtained from other islands and the mainland of South America, but when the sugar-cane began to be cultivated, negro slaves were imported from Africa. This slave trade, mostly conducted by companies or persons in England, continued until the year 1806, when it was stopped by Act of Parliament. In that year there were 60,000 negroes in the island. This measure was, of course, the first step to the abolition of slavery itself. On the 1st of August 1834, the great Act of Emancipation came into force, and four years of apprenticeship began. Out of the 20 millions granted for compensation, Barbados received £1,720,345, being an average payment of £20, 14s. on 83,176 slaves. In consequence of the large population and small extent of uncultivated land, emancipation had not in Barbados such a relaxing effect upon the industry of the negroes as it had in the more thinly-populated colonies. An efficient system of town and rural police was, however, essential. From the time of emancipation the negroes multiplied rapidly. In 1844, out of a total population of 122,198, at least 90,000 were negroes, among whom females were largely in excess. The density of the population in 1871 was therefore 966 to the square mile.

BARBAROSSA, meaning *red-beard*, the name of two celebrated Turkish corsairs of the 16th century. They were the sons of a Roumelian sipahi who had settled in Mitylene after the capture of that island by Mahomet II., and who appears to have embraced Islamism. The elder of the two is generally called Aruch, Horuk, or Ouradjh; the name of the younger was Khizr, but he was afterwards called by the Sultan *Khair-ed-deen*, meaning "one good in the faith," which was corrupted by the Christians into Hayraddin. The brothers early betook themselves to piracy; and after various successes and reverses, they acquired sufficient wealth and renown to enable them to fit out a small fleet with which they ravaged the shores of the Mediterranean, and became the pests of that sea. A richly laden vessel which they presented to the sultan at Constantinople procured for them honorary caftans and recognition of their services. About the year 1516, after having been for some time in the service of the bey of Tunis, they began to acquire considerable possessions on the coast of Africa. Hayraddin seized the island of Shershel, and Aruch gained a footing in Algiers. The latter began to extend his conquests into the district of Telmessan or Tlemcen, and was resisted by the Arabs, who summoned the Spaniards of Oran to their assistance. Aruch fell in battle in 1518, and was succeeded at Algiers by Hayraddin, who, after the reigning prince, Selim, was removed (in what way is somewhat doubtful), consolidated his power by placing himself under the Sublime Porte. Solyman, who was delighted at obtaining so much territory at such a small cost, conferred upon Hayraddin the title of *Begler-beg* of Algiers. The power of the pirates rapidly increased; Algeciras, a small island opposite Algiers, was taken from the Spaniards after an obstinate resistance, and was united to the mainland by a mole. The coasts of the Mediterranean were completely at the mercy of Barbarossa, who carried off immense numbers of slaves. In 1533, when Solyman was about to make war upon his grea rival, Charles V., Hayraddin joined him with a number of ships. He was received with great honor, and made admiral (*capitan-pasha*) of the fleet. His greatest exploit was the capture of Tunis, in which he obtained a footing by adopting the cause of a rival prince. As soon as he had deposed Muley Hassan, the reigning sovereign, he seized the town for himself and held it despite the resistance of the people. Charles V., however, sent out a great fleet, under Andrea Doria, who retook the town after a protracted siege. Barbarossa escaped to Algiers, collected his fleet, and

again swept the seas. He plundered the coasts of Italy, captured Castelnuova, and inflicted a severe defeat on Doria. He died at Constantinople 4th July 1546. (See Von Hammer, *Geschichte des Osmanischen Reiches*, iii. 164, *seq.*; also *Blackwood's Magazine*, vol. lii.) The Emperor Frederick I. is very frequently designated by surname Barbarossa.

BARBARY, the general designation of that part of Northern Africa which is bounded on the E. by Egypt, W. by the Atlantic, S. by the Sahara, and N. by the Mediterranean, and comprises the states of Marocco, Algeria, Tunis, and Tripoli. The name is derived from the *Berbers*, one of the most remarkable races in the region. (See AFRICA, ALGERIA, MAROCCO, TRIPOLI, TUNIS.)

BARBASTRO, a fortified city of Spain, in the province of Huesca, on the River Vero, near its junction with the Cinca.

BARBAULD, MRS. ANNA LETITIA, distinguished pedagogue and author, was born at Kibworth-Harcourt, in Leicestershire, on the 20th June 1743, and died on the 9th March 1825. A collected edition of her works, with Memoir, was published by her neice, Miss Lucy Aikin.

BARBER, one whose occupation is to shave or trim beards. In former times the barber's craft was dignified with the title of a profession, being conjoined with the art of surgery. In France the barber-surgeons were separated from the perruquiers, and incorporated as a distinct body in the reign of Louis XIV. In England barbers first received incorporation from Edward IV. in 1461. By 32 Henry VIII. c. 42, they were united with the company of surgeons, it being enacted that the barbers should confine themselves to the minor operations of blood-letting and drawing teeth, while the surgeons were prohibited from "barbery or shaving." In 1745 barbers and surgeons were separated into distinct corporations by 18 George II. c. 15. The barber's shop was a favorite resort of idle persons; and in addition to its attraction as a focus of news, a lute, viol, or some such musical instrument, was always kept for the entertainment of waiting customers. The barber's sign consisted of a striped pole, from which was suspended a basin, symbols the use of which is still preserved. The fillet round the pole indicated the ribbon for bandaging the arm in bleeding, and the basin the vessel to receive the blood.

BARBERINI, the title of a powerful family, originally of Tuscan extraction, who settled in Florence during the early part of the 11th century. They acquired great wealth and influence, and in 1623 Maffeo Barberini was raised to the papal throne as Urban VIII. He made his brother, Antonio, and two nephews, cardinals, and gave to a third nephew, Taddeo, the principality of Palestrina.

BARBEYRAC, JEAN, an able writer on the principles of natural law, was the nephew of Charles Barbeyrac, a distinguished physician of Montpellier, and was born at Béziers in Lower Languedoc, in 1674.

BARBIERI, GIOVANNI FRANCESCO (otherwise called GUERCINO, from his squinting), an eminent historical painter, was born at Cento, a village not far from Bologna, in 1590. His most famous piece is thought to be the Sta. Petronilla, which was painted at Rome for Gregory XV. and is now in the Capitol. Guercino continued to paint and teach up to the time of his death in 1666. He had amassed a handsome fortune by his labors.

BARBIERI, PAOLO ANTONIO, a celebrated painter of still life and animals, the brother of Guercino, was born at Cento in 1596. He chose for his subjects fruits, flowers, insects, and animals, which he painted after nature with a lively tint of color, great tenderness of pencil, and a strong character of truth and life. He died in 1640.

BARBOUR, JOHN, the author of the great Scottish national poem *The Bruce*, was born, probably in Aberdeenshire, about the beginning of the 14th century. He was a contemporary of Chaucer and Gower; but so little is known of his life, that the very date of his birth can be only approximately given as about 1316. In 1357, as we learn from a safe-conduct permitting him to visit Oxford for the purpose of study, he held the position of archdeacon of Aberdeen. In 1364 he was again permitted to enter England for a similar purpose, and in 1368 he received letters of safe-conduct authorizing him to pass through England on his way to France, whither, it may be conjectured, he was proceeding in order to visit the famous university of Paris. From this date to his death, which took place probably in March 1395, notices of him are slightly more numerous. In 1373 he is described as holding the office of clerk of audit of the king's household. About the same time he must have been busily engaged in the composition of his great work, for, as he himself tells us, his poem was more than half finished in 1375.

A sum of ten pounds, which was paid to the poet by the king's orders in 1377, was in all probability a royal gift on the completion of the work. Barbour seems indeed to have been well treated by his sovereign; he received a perpetual annuity of twenty shillings, which he bequeathed to the dean and chapter of Aberdeen as payment of a yearly mass to be said for his soul), tithes of the parish of Rayne in the Garioch, and a crown wardship, always a lucrative office in these times. A further bounty of ten pounds a year during life, granted in 1388, was probably a reward on the completion of the poet's second large work, *The Bruce*. The cessation of payment of this annuity enables us to fix with some accuracy the date of Barbour's death.

The Bruce, which is Barbour's principal poem, although it is almost the sole authority for the events of the period, is not to be considered as merely a rhyming chronicle. His theme was freedom and the liberation of his country from the dominion of a foreign people. The age of Bruce was the age of Scottish chivalry, and the king himself presented the most perfect model of a valiant knight. With such a crisis and such a hero, therefore, it is not surprising that Barbour should have achieved a work of lasting fame.

The poem begins with an account of the succession to the Scottish crown after the death of Alexander III. In this part of his poem Barbour has made a slight anachronism. He makes his hero compete with John Baliol for the crown of Scotland, while it was his grandfather, the Lord of Annandale, who unsuccessfully contested the right. Then follows a lamentable account of the desolation of the country and the oppression of the people by the English. Bruce's energetic actions to free his country, and his romantic adventures, which form so interesting an episode in Scottish history, are narrated with great minuteness, down to the battle of Bannockburn, which is described with all its interesting details. At this point the national epic properly ends; but Barbour further relates the expedition of Bruce to Ireland, and the exploits of Douglas and Randolph on the borders, and concludes with an account of the deaths of King Robert and his gallant knights.

BARBUDA, one of the lesser Antilles or Caribbean islands, is 10 miles in length by about 8 in breadth, presenting a very flat surface, covered to a great extent with woods, in which deer abound. Many varieties of shell-fish and other fish are found on the coast, which is also frequented by large flocks of water-fowl. The part

of the island under cultivation is fertile; corn, cotton, sugar, tobacco, and indigo are grown; and the rearing of cattle is one of the principal occupations. So salubrious is the climate that Barbuda serves as a kind of *sanitarium* for the adjacent islands. The inhabitants, who number less than 2000, are mainly negroes. The island was annexed to Britain in 1628, and was bestowed in 1680 on the Codrington family, in whose possession it still remains. The north point is in lat. 17° 33′ N. and long. 61° 43′ W.

BARCA, a maritime district of Northern Africa, which formerly belonged to Tripoli, but was raised in 1869 to be a separate province immediately dependent on Constantinople. It extends from the Gulf of Sert (the ancient Syrtes) to the Egyptian frontier, and has an area of about 60,700 square miles. This territory is traversed from east to west by a mountain chain varying in height from 400 or 500 to upward of 1800 feet. A great part of Barca, particularly toward the coast, is very fertile, abounding with excellent pasturage, and producing large supplies of corn. The chief town is Bengazi.

BARCA, an ancient city in Cyrenaica, and within the above district, to which it gave name. Its ruins are now known as *El-Medinah*. It was situated between Cyrene (now *Grennah*) and Hesperides (now *Bengazi*), about 11 miles distant from the sea, on the top of the rising ground that overlooks the Syrtes. It was founded about 554 B.C. by a colony from Cyrene, who fled from the ill-treatment of Arcesilaus II., and obtained the co-operation of a number of Libyans.

BARCELONA, formerly the capital of the kingdom of Catalonia, and now the chief town of the Spanish province to which it gives its name, is a flourishing city and seaport on the shore of the Mediterranean, between the rivers Bésos (*Bætulo*) on the north and the Llobregat (*Rubricatus*) on the south. It stands on the sloping edge of a small but fertile plain now covered with villas and gardens.

The educational institutions of Barcelona have from an early period been numerous and important. The university (*Universidad Literaria*) was originally founded in 1430 by the magistracy of the city, and received a bull of confirmation from Pope Nicholas V. in 1450, possessing at that time four faculties and thirty-one chairs, all endowed by the corporation. It was suppressed in 1714, but restored in 1841, and now occupies an extensive building in the new town. There are, besides, an academy of natural sciences, a college of medicine and surgery,—confirmed by a bull of Benedict XIII. in 1400,—an academy of fine arts, a normal school, a theological seminary, an upper industrial school, an institution for the education of deaf-mutes, a school of navigation, and many minor establishments. Gratuitous instruction of a very high order is afforded by the Board of Trade to upwards of two thousand pupils.

The inhabitants of Barcelona are not only an intelligent and industrious, but a gay and pleasure-loving people. Means of public recreation are abundantly supplied. There are no fewer than fourteen theatres of more or less pretension, the two most important being the Teatro Principal and the Teatro del Liceo.

Barcelona has long been the industrial and commercial centre of Eastern Spain—a pre-eminence which dates from the 12th and 13th centuries. It was the rival of Genoa and Venice, and in renown its hardy mariners were second to none. The origin of the famous code of maritime laws known as the *Consolado del mar* is usually, though not with absolute certainty, ascribed to its merchants; and it is pretty well established that they were the first to employ the method of marine insurance. We find them at an early period trading, not only with the ports of the Mediterranean, but with the Low Countries and England, on the one hand, and with Constantinople and Damascus, Egypt and Armenia, on the other,—entering into treaties with kings and magistracies, and establishing in all important places consuls to look after their interests. The prosperity so deeply rooted continued through numerous vicissitudes till the emancipation of the Spanish American colonies, when a comparative decline set in. This, however, proved only temporary, and, in spite of the disastrous consequences of the French invasion, and the various revolutions of the country since then, Barcelona has no need to look back with regret to the past. A great variety of industries are now carried on—the most important being the spinning and weaving of wool, cotton, and silk. Of the numerous guilds that were anciently formed in the city an interesting list is to be found in Capmany. It carries on a large shipping trade.

According to traditions preserved by the Roman writers, Barcelona owed its origin, or at least its first importance, to the Carthaginians under Hamilcar Barca, after whom it was called *Barcino*. It received a Roman colony, and was known by the name of *Faventia*. After having shared in the various vicissitudes of the barbaric invasions, it became the capital of a dukedom under Louis the Pious, and not long after began to give the title of count to a family that soon made itself independent. In 985 the city was captured by the Moors, but not long after it was recovered by Count Borell. In 1151 Raymund Berenguer married the daughter of Ramiro II. of Aragon, and thus the countship of Barcelona, was united to that kingdom by his son. From the successive princes of the line the city received many privileges. In 1640 Barcelona was the centre of the Catalonian rebellion against Philip IV., and threw itself under French protection. In 1652 it returned to its allegiance, but was captured by the duke of Vendôme in 1697. At the peace of Ryswick, in the same year, it was restored to the Spanish monarchy. During the War of the Sucession Barcelona adhered to the house of Austria. The seizure of Montjuich in 1705 and the subsequent capture of the city by the earl of Peterborough formed one of his most brilliant achievements. In 1714 it was taken after an obstinate resistance by the duke of Berwick in the interests of Louis XIV., and at the close of the war was reluctantly reconciled to the Bourbon dynasty. At the commencement of Bonaparte's attempt on the liberty of Spain, the French troops obtained possession of the fortress, and kept the city in subjection. Since then it has shared in most of the revolutionary movements that have swept over Spain, and has frequently been distinguished by the violence of its civic commotions.

BARCLAY, ALEXANDER, an English poet, was born probably about 1476. His nationality has been matter of much literary dispute, but the evidence on the whole seems to point to the conclusion that, though he spent the greater part of his life in England, he was a native of Scotland. The place of his education is equally doubtful; he studied at one of the great English universities, but at which has not yet been settled by his biographers. He received a benefice from the provost of Oriel College, Oxford, and it might therefore be inferred that he had been a student at that place. But Oxford is nowhere referred to in his writings, whereas Cambridge is mentioned once. He appears to have travelled on the Continent after completing his university course, and on his return received an appointment as chaplain in the collegiate church at Ottery St. Mary in Devonshire. He afterwards became a Benedictine

monk of the monastery of Ely, and at length assumed the habit of St. Francis at Canterbury. Having survived the dissolution of the monasteries, he became successively vicar of Much-Badew in Essex, and, in 1546, of Wokey in Somersetshire; and a few months before his death he was presented by the dean and chapter of Canterbury to the rectory of All-Saints in Lombard Street. As he retained some of his preferments in the reign of Edward VI., it is presumed that he must have complied with the changes of the times. He died at an advanced age in the year 1552, and was interred at Croydon. Barclay wrote at a period when the standard of English poetry was extremely low; and, as excellence is always comparative, this circumstance may partly enable us to account for the high reputation which he enjoyed among his contemporaries. At the same time his best work, being a comprehensive and easily understood satire on the manners of the times, naturally acquired a wide popularity, and was extensively read. The title given to it was the *Ship of Fooles*, and it was first printed by Pinson in 1509.

BARCLAY, JOHN, a distinguished scholar and writer, was born, January 28, 1582, at Pont-à-Mousson, where his father William Barclay (see below) was professor of civil law. Educated at the Jesuits' college, he gave evidence of remarkable ability at an early age, and was only nineteen when he published a commentary upon the *Thebais* of Statius. The Jesuits were naturally desirous that he should enter their order, but to this both himself and his father were averse. The jealous enmity of the order was roused against them in consequence of this refusal, and in 1603 both left France and crossed over to England. In 1610 he edited an important treatise left by his father, *De Potestate Papæ*, which involved him in controversy with the famous Cardinal Bellarmin. In 1614 appeared the wittiest and most interesting part of the *Satyricon*, entitled *Icon Animorum*, which gives a critical survey of the varied manners and characteristics of the several European nations. It has been frequently reprinted. In 1616, after a short stay in Paris, he proceeded to Rome, where he continued to reside till his death on 12th August 1621. The *Argenis*, his last work, a long Latin romance, sometimes looked on as a political allegory, was very popular. It is said to have been warmly admired by Richelieu and Leibnitz, while Cowper, Disraeli, and Coleridge speak of it in terms of high admiration.

BARCLAY, JOHN, M.D., an eminent anatomist, was born in Perthshire in 1760, and died at Edinburgh in 1826.

BARCLAY, JOHN, founder of a small sect in the Scotch Church called Bereans or Barclayites, was born in Perthshire in 1734, and died at Edinburgh in 1798. Neither his writings, which were collected in three volumes, nor the sect formed by him, are of much importance. His adherents were called Bereans, because they regulated their conduct as the inhabitants of Berea are said to have done, by diligently searching the Scriptures.

BARCLAY, ROBERT, one of the most eminent writers belonging to the Society of Friends, or Quakers, was born in 1648 at Gordonstown in Morayshire. He was sent to finish his education in Paris, and it appears he was at one time inclined to accept the Roman Catholic faith. In 1667, however, he followed the example of his father, Colonel Barclay of Urie, and joined the recently formed Society of Friends. He was an ardent theological student, a man of warm feelings and considerable mental power, and he soon came prominently forward as a leading apologist of the new doctrine. He died in 1690 at the early age of forty-two. His *Apology* is still the most important manifesto of the Quaker society. Translations of it into foreign language have also appeared.

BARCLAY, WILLIAM, LL.D., a writer on civil law, was born in Aberdeenshire in the year 1541. He was a man of considerable ability, and his legal writings are still valued. In his political opinions he was directly opposed to his illustrious countryman Buchanan, and was a strenuous defender of the rights of kings; his own speculations on the principles of government are best known to some from an incidental confutation by Locke, in his *Treatises on Government*.

BARCLAY DE TOLLY, MICHAEL, a Russian prince and general, highly distinguished in the wars with Napoleon, was born in Livonia in 1759. He was a descendant of the old Scotch family of Barclay, a branch of whom had settled in Russia in the 17th century. He was adopted by General Vermoulen, and entered a Russian cuirassier regiment when very young. In 1788 and 1789 he served against the Turks, and in the following years against the Swedes and Poles. In 1806, when Russia took up arms against Napoleon, he commanded the advanced guard at the battle of Pultusk. At Eylau he lost an arm, and was promoted to the rank of lieutenant-general. In 1808 he commanded against the Swedes, and in 1809 by a rapid and daring march for two days over the ice he surprised and seized Umeo. In 1810 he was made minister of war, and retained the post till 1813. There was keen opposition to the appointment of a foreigner as commander-in-chief, and after the defeat of Smolensk, the outcry was so great that he resigned his office and took a subordinate place under the veteran Kutusoff. On the death of the latter he was reappointed to the supreme command, and fought at the battles of Bautzen, Dresden, and Leipsic. He was unable to bring up his forces in time for the battle of Waterloo, but marched into France and took part in the occupation of Paris. He was rewarded for his services by being made prince and field-marshal. He died in 1818 at Insterburg, in Prussia, while on his way to the Bohemian baths.

BAR-COCHEBAS, or BAR-COCHAB (*Son of a Star*), a celebrated Jewish leader in the insurrection against Hadrian, 131–135 A.D., whose real name was Simeon. The events of his life belong to the history of the Jews.

BARD, from the Welsh *bardd*, is the name applied to the ancient Celtic poets, though the word is sometimes loosely used as synonymous with poet in general. So far as can be ascertained, the title *bards*, and some of the privileges peculiar to that class of poets, are to be found only among Celtic peoples. The name itself is not used by Cæsar in his account of the manners and customs of Gaul and Britain, but he appears to ascribe the functions of the bards to a section of the Druids, with which class they seem to have been closely connected. Later Latin authors used the term *Bardi* as the recognized title of the national poets or singers among the peoples of Gaul and Britain. In Gaul, however, the institution soon disappeared; the purely Celtic peoples were swept back by the waves of Latin and Teutonic conquest, and finally settled in Wales, Ireland, Brittany, and the north of Scotland. There is clear evidence of the existence of bards in all these places, though the known relics belong almost entirely to Wales and Ireland, where the institution was more distinctively national. In Wales they formed an organized society, with hereditary rights and privileges. They were treated with the utmost respect, and were exempt from taxes or military service. Their special duties were to celebrate the victories of their people, and to sing hymns of praise

to God. In Ireland also the bards were a distinct class with peculiar and hereditary privileges. They appear to have been divided into three great sections: the first celebrated victories and sang hymns of praise; the second chanted the laws of the nation; the third gave poetic genealogies and family histories. The Irish bards were held in high repute, and frequently were brought over to Wales to give instruction to the singers of that country.

BARDESANES, or BAR DEISAN, a celebrated Gnostic, was a native of Edessa in Mesopotamia, and appears to have flourished during the reign of Marcus Aurelius. Very little is known of his life. He is said to have held a disputation with Apollonius, a philosopher in the train of Lucius Verus, and he is known to have written against the Marcionite and other heresies. There is considerable doubt whether he was ever a disciple of Valentinus, but it is acknowledged that he never ceased to belong to the Christian church. However seriously his principles, if rigidly interpreted, might conflict with the doctrines of Christianity, he did not regard himself as opposed to that faith, and he was generally considered one of its best defenders. He was especially famed for his hymns, fragments of which are still extant. Of his other works there seems to remain only a treatise *On Fate*, a portion of which was preserved by Eusebius, while the whole has been printed from a Syriac MS. with English translation by Cureton (*Spicilegium Syriacum*, Lond. 1855).

BARDILI, CHRISTOPH GOTTFRIED, a German metaphysician, distinguished by his opposition to the system of Kant, was born at Blaubeuren in Würtemburg, in 1761, and died at Stuttgart in 1808.

BARDSEY (*i.e.*, Bard's Island), or in Welsh YNYS ENLLI, the Island of the Current. is situated at the northern extremity of Cardigan Bay.

BARDWAN (sometimes spelled Burdwan), a division or commissionership in India under the Lieutenant-Governor of Bengal, comprising the districts of Bardwán, Húglí, with Howrah, Midnapur, Bánkurá or West Bardwán, and Bírbhúm. It is bounded on the N. by the district of the Santál Parganás in the Bhágalpur division, and Murshidábád in the Rájsháhī division; on the E. by the Presidency districts of Nadiyá, and the 24 Parganás; on the S. by the Bay of Bengal, and on the W. by the native tributary state of Morbhanj, and the district of Mánbhúm in the Chhotá Nágpur division.

BARDWÁN, an important district in the division of the same name, under the Lieutenant-Governor of Bengal. It is bounded on the N. by the districts of Bírbhúm and Murshidábád, from which it is separated by the River Ajai; on the E. by the districts of Nadiyá and Húglí, the River Bhágirathí separating it from the former; on the S. by the districts of Húglí and Midnapur; and on the W. by the districts of Bánkurá and Mánbhúm.

BARDWÁN, the principal town of the district of the same name, situated on the route from Calcutta to Benares, and a station on the East Indian Railway. Jacquemont formerly described Bardwán town "as consisting of an assemblage of crowded suburbs, of wretched huts, with walls of mud, and covered with thatch, having no temples of striking aspect, and few handsome houses." At the present time Bardwán is a well-built, busy town, with commodious streets, dotted with large tanks, and surrounded by luxuriant gardens. The Mahárájá's palaces are handsome buildings, furnished in the English style, with elegant mirrors and nick-nacks from Paris, and some tolerable oil paintings. Bardwán forms the headquarters of the civil authorities of the division and district, consisting of the commissioner, the judge, magistrate, and collector, and their European and native assistants.

BARÈGES, a small town situated between two mountain chains in the department of Hautes Pyrénées in France, about 25 miles from Bagnères de Bigorre. It is celebrated for its warm sulphurous springs, first brought into notice by the visit of Madame du Maintenon in 1676, the temperature of which varies from 88° to 111° Fahr. The benefit of the waters is granted to the army at the expense of the Government, which erected a bath-house in 1864. During the winter the town is so exposed to avalanches that only a few of the residents remain. The town gives its name to a silk-fabric (barège) which is principally manufactured in Bagnères de Bigorre.

BARELÍ, or BAREILLY, a district of British India in the Rohilkhand division, under the jurisdiction of the Lt.-Governor of the North-Western Provinces. It is bounded on the N. by Kumáon district and the independent state of Nepál; on the E. by a portion of the district of Sháhjahánpur, and the district of Lakhimpur in Oudh; on the S. by the districts of Budáon and Sháhjahánpur; and on the W. by the native state of Rámpur and Budáon. Barelí is a level country, watered by many streams, the general slope being towards the south. The soil is fertile and highly cultivated, groves of noble trees abound, and the villages have a neat, prosperous look. A tract of forest jungle, called the *Tarái*, stretches along the extreme north of the district, and teems with large game, such as tigers, bears, deer, wild pigs, &c.

BARELÍ [*bareilly*], the principal place in the district of the same name, situated on the left bank of the Juá, a tributary of the Western Rámgangá, in N. lat. 28° 23′, E. long. 79° 28′. It is a large town, with a brisk and lucrative commerce, and manufactures consisting principally of house furnitures, such as chairs, tables, &c.

BARÈRE DE VIEUZAC, BERTRAND, one of the most notorious members of the French National Convention, was born at Tarbes in Gascony, September 10, 1755. He was brought up to the profession of the law, and was admitted advocate to the parliament of Toulouse. He wrote several trivial pieces, panegyrics of Louis XVI., Montesquieu, J. J. Rousseau, and others which obtained prizes from provincial academies, and a dissertation on a Latin inscription which procured him membership of the Academy of Floral Games of Toulouse. Such was the smooth beginning of a career which ultimately became unparalleled for meanness, cowardice, lying, and atrocious cruelty. At the age of thirty he married. Four years later, in 1789, he was elected deputy by his own province to the States-general, which met in May. He had made his first visit to Paris in the preceding year. His personal appearance, his manners, social qualities, and liberal opinions, gave him a good standing among the multitude of provincial wise-heads then thronging into Paris, eager to be the saviors of France, or at least of themselves. He took his place at first with the monarchical party; and his glib pen found occupation in the preparation of various reports, and in editing a journal, the *Point du Jour*, containing reports of the debates of the National Assembly. For a time he formed a connection with the House of Orleans, passing over soon to the republican party. Barère appears to have been wholly free from the restraints of conscience or any guiding principle; his conduct was regulated only by the determination to be on the side of the strongest. After the close of the National Assembly he was nominated one of the judges of the newly-instituted Court of Cassation. In 1792 he

was elected deputy to the National Convention for the department of the Hautes Pyrénées. At first he took part with the Girondists; but on the trial of the king he voted, with the Mountain, for the king's death "*sans appel et sans sursis.*" He closed his speech with a sentence which became memorable, "*L'arbre de la liberté ne saurait croître s'il n'était arrosé du sang des rois.*" As the Mountain became the strongest party Barère advanced with it, unscrupulously carrying out its extremest projects, and playing a prominent part in the Reign of Terror. The light-heartedness with which he acted in these awful scenes, the fluency and flippancy of his speeches and reports, procured him the title of the "Anacreon of the Guillotine." He supported Robespierre in his atrocious measure against the Girondists, crawled like a slave at the feet of the "incorruptible" Maximilian till the day of his fall, and then advocated his execution without a hearing. It was Barère who had proposed the decree that no quarter should be given to any English or Hanoverian soldier, which was unanimously adopted. This procured him admission by acclamation to the Jacobin Club, from which he had been previously excluded. The decree, however, remained a dead letter. A few months after the fall of the Convention, proceedings were taken against Barère and his colleagues of the Terror, Collot d'Herbois and Billaud-Varennes, and he was sent to the Isle of Oléron. He was removed to Saintes, and thence escaped to Bordeaux, where he lay in concealment for several years. In 1795 he was elected member of the Council of Five Hundred, but was not allowed to take his seat. When Napoleon Bonaparte was First Consul he was anxious to employ Barère, but Barère refused to overture. It was only for a while. The witling of the Terror became the hireling and the spy of the new Tyranny. On the fall of Napoleon, Barère played the part of royalist, but on the final restoration of the Bourbons in 1815 he was banished for life from France, and then withdrew into Belgium and temporary oblivion. After the Revolution of July 1830 he reappeared in France, was reduced by a series of lawsuits to extreme indigence, accepted a small pension assigned him by Louis Philippe (on whom he had heaped abuse and railing), and died, the last survivor of the Committee of Public Safety, January 15, 1841.

BARETTI, GIUSEPPE, an Italian critic of some distinction, was born at Turin in 1716, and died in May 1789.

BARFLEUR, called formerly Barbeflot, and in the Latin chroniclers *Barbatus Fluctus*, an ancient town of Normandy, in France, now in the department of Manche, 15 miles E. of Cherbourg. It was at one time the seat of an active trade across the Channel, but was ruined and had its harbor filled up by the English in 1346. Cape Barfleur has a lighthouse 271 feet above the sea, in long. 1° 16′ W., lat. 49° 40′ N.

BARHAM, RICHARD HARRIS, a celebrated humorist, better known by his *nom de plume* of THOMAS INGOLDSBY, was born at Canterbury, December 6, 1768. At seven years of age he lost his father, who left him a small estate, part of which was the manor of Tappington, so frequently mentioned in the *Legends*. At nine he was sent to St. Paul's school, but his studies were interrupted by an accident which shattered his arm and partially crippled it for life. Thus deprived of the power of bodily activity, he became a great reader and diligent student. In 1807 he entered Brasenose College, Oxford, intending at first to study for the profession of the law. Circumstances, however, induced him to change his mind and to enter the church. The choice seems surprising, for he had from childhood displayed that propensity to fun in the form of parody and punning which afterwards made him a reputation. In 1813 he was ordained and took a country curacy; he married in the following year, and in 1821 removed to London on obtaining the appointment of minor canon of St. Paul's Cathedral. Three years later he became one of the priests in ordinary of his Majesty's chapel royal. In 1826 he first contributed to *Blackwood's Magazine;* and on the establishment of *Bentley's Miscellany* in 1837 he began to furnish the series of grotesque metrical tales known as *The Ingoldsby Legends*. These became very popular, were published in a collected form, and have since passed through numerous editions. In variety and whimsicality of rhymes these verses have hardly a rival since the days of *Hudibras*. But beneath this obvious popular quality there lies a store of solid antiquarian learning, the fruit of patient enthusiastic research by the light of the midnight lamp, in out-of-the-way old books, which few readers who laugh over his pages detect. If it were of any avail we might regret that a more active faculty of veneration did not keep him from writing some objectional passages of the *Legends*. His life was grave, dignified, and highly honored. His sound judgment and his kind heart made him the trusted counsellor, the valued friend, and the frequent peacemaker; and he was intolerant of all that was mean, and base, and false. In politics he was a Tory of the old school; yet he was the life-long friend of the liberal Sydney Smith, whom in many respects he singularly resembled. Theodore Hook was one of his most intimate friends. Mr. Barham was a contributor to the *Edinburgh Review* and the *Literary Gazette;* published a novel in 3 vols., entitled *My Cousin Nicholas;* and, strange to tell, wrote nearly a third of the articles in Gorton's *Biographical Dictionary*. His life was not without such changes and sorrows as make men grave. He had nine children, and six of them died in his lifetime. But he retained vigor and freshness of heart and mind to the last, and his latest verses show no signs of decay. He died in London after a long, painful illness, June 17, 1845, leaving his beloved wife, two daughters, and a son, surviving him.

BARI, TERRA DI, a province of Italy, in the district of Apulia, bounded on the N. by the Adriatic, E. and S.E. by the province of Otranto, S.W. by Basilicata, and W. by Capitanata. It has an area of 1782 geographical square miles, and is divided into the three districts of Bari, Barletta, and Altamura. Except in the S. and S.W., where branches of the Apennines occur, the surface is generally level. The soil is for the most part calcareous, with a rich covering of loam. The climate is oppressively hot in summer, but very pleasant during the rest of the year. The only considerable river is the Ofanto, or *Aufidus*; but, in spite of the lack of irrigation, the province is among the best cultivated in the kingdom, producing abundance of grain, flax, tobacco, cotton, wine, oil, almonds, liquorice, &c. Swine, asses, goats, and sheep with a very fine wool, are numerous; and the salt and nitre works form important branches of industry. Among the more important towns beside the capital are Barletta, Trani, Bisceglie, Molfetta, Monopoli, and Fasano on the coast, and Andria Ruvo, Nola, Bitonto, and Conversano somewhat inland. The population, which is densest along the coast, was 604,540 in 1871.

BARI, the ancient *Barium*, capital of the above province and seat of an archbishop, is situated on a tongue of land projecting into the Adriatic. It is defended by various fortifications, among which the most important is the citadel, which is about a mile in circumference, and dates from the Norman possession. The general character of the older part of the town is gloomy and

irregular, but the newer portion has spacious streets, with handsome buildings. *Barium*, according to the evidence of its coins, was a place of importance in the third century, B.C., and had a decided Greek element in its culture; but it never acquired any great influence in the old Roman world, and all allusions to it in the classical authors are of an incidental description.

BARILLA, an impure carbonate of soda, produced from plants which grow in salt-marshes or other places near the sea; it forms a considerable article of commerce, being used in the manufacture of soap and of glass, and for other purposes in the arts. The greatest quantities of barilla are produced in Spain and the Balearic Islands; but the Canary Islands, Italy, and France also contribute a part. It is produced by burning the plants, much in the same way that seaweeds once were largely burned on the coasts of Scotland for kelp.

BARING. The firm of Baring Brothers & Co. was for many years one of the greatest financial and commercial houses in the world.

In November, 1890, the financial world was startled to learn that the great house of Barings, second only to the Rothschilds, was in distress, and in a few days it was announced that a syndicate representing the Bank of England, the Rothschilds, and other great English banks and bankers had assumed the liabilities of the firm and guaranteed to carry out its contracts. The cause of the entanglement was the attempt of Baring Brothers to carry an enormous loan for the Argentine Republic, this alone representing ten millions sterling, while the total liabilities were reported to be over £16,000,000. As the failure of such an important factor in the commercial world would have caused widespread disaster prompt measures were taken by leading financiers, the trouble was tided over and the firm continues in business for the time necessary in which to realize on securities and straighten out affairs.

BARING-GOULD, SABINE, an active littérateur in widely different fields, was born at Exeter in 1834. In early life he lived much in Germany and France. Educated at the Clare College, Cambridge, he was appointed incumbent of Dalton, Thirsk, in 1869; rector of East Mersea, Colchester, in 1871; and in 1881 rector of Lew Trenchard, Devonshire. He attained some notoriety by the production of various novels, which, though powerfully written, have not become popular.

BARITONE, that species of the human voice which lies between the bass and the tenor, but whose tone-character is more allied to the bass.

BARIUM (sym. Ba, eq. 137) is the metal present in heavy spar (sulphate of baryta) and baryta. It was regarded as a white metal, until the researches of Dr. Matthiessen demonstrated that it possesses a yellow color. As yet, the metal barium has not been obtained in mass, but only as a powder.

BARK. The hard outer covering of any stem is often popularly called bark, or by botanical writers, cortex. Botanists are accustomed to restrict the term bark to the outer portion of the dicotyledonous stem, and especially to that of woody and perennial stems.

The bark of many trees is capable of being used for tanning, but those kinds are usually preferred which are rich in tannin, although other properties besides the percentage of tannin determine the value of a bark for preparing leather. Oak bark from *Quercus robur* and *pedunculata* are used more than all other kinds in Europe, and contain from 7 to 11 per cent. of tannin; but the barks of willow, larch, Scotch fir, birch, and alder are likewise employed to a considerable extent. That of the chestnut (*Castanea vesca*) is much esteemed. From both bark and wood of this tree an extract is made in France which is largely used both in tanning and dyeing. In Spain tanners employ the inner layer of the bark of the cork oak. Three species of oak are used for tanning in the United States—namely, *Quercus tinctoria*, *prinus*, and *falcata*; the former two contain about 6 per cent., and the last 8.6 per cent. of tannin.

BARKING, a town of England, county of Essex, seven miles east-northeast of London, on the River Roding, not far from the Thames. It was celebrated for its nunnery, one of the oldest and richest in England.

BARLAAM AND JOSAPHAT, Saints. These two saints appear in both the Greek and the Roman Martyrology, in the former under August 26, in the latter under November 27. Their story is in the highest degree worthy of note, because it is, in fact, a Christianized version of the Indian legendary history of the Buddha Sakya Muni.

The outline of the Greek story is as follows: — St. Thomas had converted the people of India, and after the eremitic life originated in Egypt, many Indians adopted it. But a powerful pagan king arose who hated and persecuted the Christians, especially the ascetics. After this king, Abenner by name, had long been childless, a boy greatly desired, and matchless in beauty, was born to him, and received the name of Josaphat. The king, in his joy, summons astrologers to predict the child's destiny. They foretell glory and prosperity beyond those of all his predecessors. One sage, most learned of all, assents, but intimates that the scene of this glory will be, not the paternal kingdom, but another infinitely more exalted, and that the child will adopt the faith which his father persecutes.

The boy shows a thoughtful and devout turn. King Abenner, troubled by this and by the remembrance of the prediction, selects a secluded city, in which he causes a splendid palace to be built, where his son should abide, attended only by tutors and servants in the flower of youth and health. No stranger was to have access, and the boy was to be cognizant of none of the sorrows of humanity, such as poverty, disease, old age, or death, but only of what was pleasant, so that he should have no inducement to think of the future life; nor was he ever to hear a word of Christ and his religion.

Prince Josaphat grows up in this seclusion, acquires all kinds of knowledge, and exhibits singular endowments. At length, on his urgent prayer, the king reluctantly permits him to pass the limits of the palace, after having taken all precautions to keep painful objects out of sight. But through some neglect of orders, the prince one day encounters a leper and a blind man, and asks of his attendants with pain and astonishment what such a spectacle should mean. These, they tell him, are ills to which a man is liable. Shall all men have such ills? he asks. And in the end he returns home in deep depression. Another day he falls in with a decrepit old man, and, stricken with dismay at the sight, renews his questions, and hears for the first time of death.

At this time Barlaam, an eremite of great sanctity and knowledge, dwelling in the wilderness of Sennaritis, divinely warned, travels to India in the disguise of a merchant, and gains access to Prince Josaphat, to whom he imparts the Christian doctrine and commends the monastic life. Suspicion arises and Barlaam departs. But all attempts to shake the prince's convictions fail. As a last resource the king sends for Theudas, a magician, who removes the prince's attendants and substitutes seductive girls; but all their blandishments are resisted through prayer. The king abandons these efforts and associates his son in the government. The prince uses his power to promote religion, and everything prospers in his hands. At last Abenner himself yields to the faith, and after some years of penitence dies. Josaphat

surrenders the kingdom to a friend called Barachias, and departs for the wilderness. After two years of painful search, and much buffeting by demons, he finds Barlaam. The latter dies, and Josaphat survives as a hermit many years. King Barachias afterwards arrives, and transfers the bodies of the two saints to India, where they are the source of many miracles.

BARLETTA, the ancient *Bardulum*, called in the Middle Ages, *Barolum*, a fortified seaport town of Italy, the seat of an archbishop, in the province of Terri di Bari. Population, 30,000.

BARLEY (*Hordeum*), a most important genus of the cereal plants which belongs peculiarly to temperate regions. Four distinct species of barley, cultivated for the production of grain, are commonly enumerated,—1st, common or two-rowed barley, *Hordeum distichum;* 2d, Bere or Bigg, *H. vulgare;* 3d, six-rowed barley, *H. hextastichum;* and 4th, fan, spratt, or battledore barley, *H. zeocriton*. Of these species, but chiefly of the first two, very many varieties are recognized by cultivators, and new kinds are constantly being introduced. Barley is the most hardy of all cereal grains, its limit of cultivation extending further north than any other; and, at the same time, it can be profitably cultivated in sub-tropical countries. The opinion of Pliny, that it is the most ancient aliment of mankind, appears to be well founded, for no less than three varieties have been found in the lake dwellings of Switzerland, in deposits belonging to the Stone Period. According to Professor Heer these varieties are the common two-rowed (*H. distichum*), the large six-rowed (*H. hextastichum densum*), and the small six-rowed (*H. hextastichum sanctum*). The last variety is both the most ancient and the most commonly found, and is the sacred barley of antiquity, ears of which are frequently represented plaited in the hair of the goddess Ceres, besides being figured on ancient coins. The cultivation of barley in ancient Egypt is indicated in Exod. ix. 31. Till within recent times barley formed an important source of food in northern countries, and barley cakes are still to some extent eaten. Owing, however, to its poverty in that form of nitrogenous compound called gluten, so abundant in wheat, barley-flour cannot be baked into vesiculated bread.

BARLOW, JOEL, an American poet and politician, born in 1755 at Reading in Connecticut. In 1774, some years after his father's death, he was entered at Yale College, New Haven, where he soon began to manifest considerable taste for poetry and power of composition. A few small pieces published by him were received with some degree of public favor. During his vacations he had taken part with the colonists in several engagements against the British, and immediately after completing his course, he qualified himself for the church, and was appointed chaplain to a regiment. This post he held till the conclusion of peace between Britain and America, when he settled in the village of Hartford, and began to practise as a lawyer. He also conducted a newspaper, and about the same time published his best poem, the *Vision of Columbus*, a vigorous and spirited piece of writing. About the year 1788 he gave up his newspaper and his legal practice, and went to Europe as the agent for a land company. Having discovered that this company was merely a swindling concern, he severed his connection with it, but did not return to America. In London he became acquainted with some of the most advanced liberal thinkers, and published several political tracts of a decidedly revolutionary character. In 1793, after having been some time in France, he accompanied the Commission of the National Convention, which was sent to organize the newly-acquired territory in Savoy. During his residence in Paris he engaged in commercial transactions, by which he acquired considerable fortune and importance. In 1795 he was appointed American consul at Algiers, and efficiently discharged the duties of that office. In 1805 he returned to America and began to interest himself in the politics of his own country. A pamphlet of his, sketching a plan of national education, was received with great favor. In 1808 he published an enlarged edition of his great poem, under the title *Columbiad*. It was magnificently illustrated, but did not achieve the popularity of its predecessor. In 1811 he was appointed minister plenipotentiary to France, with the object mainly of negotiating a commercial treaty and of obtaining compensation for some American property that had been unjustly confiscated. To accomplish this he required a personal interview with Napoleon, and set out to meet the emperor, who was at Wilna. On his way he was attacked with inflammation of the lungs, and died at a Polish village near Cracow, on the 22d December 1812.

BARLOW, PETER, an able writer on pure and applied mathematics, was born in Norwich, England, in 1776, and died in 1862.

BARMECIDES, or descendants of Barmak, were a noble Persian family, who attained great power under the Abbaside caliphs. Barmak, the first of them, was a Ghebre, or Persian fire-worshipper, and is supposed to have been a native of the district of Khorassan. He was introduced to the caliph Abd-ul-Malik, and acquired great power under him. His family prospered, and his grandson, Yahya, was vizier to the caliph El Mahdy, and tutor of the famous prince Haroun-al-Raschid, celebrated in the *Thousand and One Nights*. Yahya's sons occupied high offices, one of them, Ja'afar (the Giafar of the *Arabian Nights*), being vizier and constant companion of Haroun. The caliph, however, conceived suspicions against the Barmecides, and in 802 beheaded Ja'afar with great cruelty, condemned the whole family to prison, and confiscated their property. The use of the expression *Barmecides' Feast*, to denote an imaginary banquet, is drawn from one of the tales in the *Arabian Nights*, where an entertainment of merely imaginary viands is served up to a hungry man by one of the Barmecides.

BARMEN, a town is Rhenish Prussia, in the government of Dusseldorf and circle of Elberfeld, on the Bergisch-Märkisch railway. It is formed by the combination of a large number of separate villages, which stretch along the northern valley of the Wupper for a distance of six miles in almost perfect continuity with Elberfeld. It is the chief seat of ribbon-weaving in braids, cotton, cloth, silk stuffs, steel wares, and plated goods. There are also numerous bleachfields, printfields, dyeworks,—famous for their Turkey-red,—soapworks, chemical-works, and potteries. Population, 75,000.

BARNABAS was the surname given by the apostles to Joses, "a Levite, of the country of Cyprus," who, though like Paul not of the twelve, was with him recognized among the number of the apostles.

BARNABAS, EPISTLE OF, and GOSPEL OF. See APOSTOLIC FATHERS and GOSPELS.

BARNACLE, a common crustacean, techinically known as Lepas, and belonging to the group of stalked Cirripedia. Like the closely-allied sessile acorn-shell, a barnacle may be said to be a crustacean fixed by its head, and kicking the food into its mouth by its legs. So much are they disguised, however, in their fixed state, that they were formerly referred to the class of molluscs.

BARNARD CASTLE, a market and manufacturing town and parish in the county of Durham, on the banks of the Tees, 246 miles from London.

BARNAUL, a town of Asiatic Russia, in the government of Tomsk, and capital of a circle to which it gives its name. It is situated in a wide plain which is bounded by offshoots of the Altai Mountains, and is built on both sides of the Barnaulka River at its confluence with the Ob. Population, 12,927.

BARNAVE, ANTOINE PIERRE JOSEPH MARIE, one of the greatest orators and noblest actors and victims of the first French Revolution, was born at Grenoble in Dauphiny, October 22, 1761. He was of a Protestant family. His father was an advocate to the parliament of Grenoble, and his mother was a woman of high birth, superior ability, and noble character. He was at once thoughtful and passionate, studious and social, handsome in person and graceful in manners. He was brought up to the law, and at the age of twenty-two made himself favorably known by a discourse pronounced before the local parliament on the division of political powers. Dauphiny was one of the first of the provinces to feel the excitement of the coming revolution; and Barnave was the foremost to give voice to the general feeling, in a pamphlet entitled *Esprit des édits enregistrés militairement le* 20 *Mai* 1788. He was immediately elected deputy, with his father, to the States of Dauphiny, and took a prominent part in their debates. A few months later he was transferred to a grander field of action. The States-general were convoked at Versailles for May 5, 1789, and Barnave was chosen deputy of the *Tiers État* for his native province. He soon made an impression on the Assembly, and became the friend of most of the leaders of the popular party. He took part in the conferences on the claims of the three orders, drew up the first address to the king, and supported the proposal of Sieyès that the Assembly should declare itself National. Though a passionate lover of liberty, he knew that excess is the ruin of liberty, and maintained the necessity for the individual and for the community of both freedom and restraint. He hoped to secure the freedom of France and her monarchy at the same time. But he was almost unawares borne away by the mighty currents of the time, and he took part in the attacks on the monarchy, on the clergy, on church property, and on the provincial parliaments. With the one exception of the mighty Mirabeau, Barnave was the most powerful orator of the Assembly. On several occasions he stood in opposition to Mirabeau. After the fall of the Bastile he wished to save the throne. He advocated the suspensive veto, the system of two chambers, and the establishment of trial by jury in civil causes. His conflict with Mirabeau on the question of assigning to the king the right to make peace or war was one of the most striking scenes in the Assembly. About this time, after a vehement debate, he fought a duel with Cazalès, in which the latter was slightly wounded. About the close of October 1790 Barnave was called to the presidency of the Assembly. On the death of Mirabeau a few months later, Barnave paid a high tribute to his worth and public services, designating him the Shakespeare of oratory. On the arrest of the king and the royal family at Varennes, while attempting to escape from France, Barnave was one of the three appointed to conduct them back to Paris. On the journey he was deeply affected by the mournful fate of these royal persons, and resolved to do what he could to alleviate their sufferings. In one of his most powerful speeches he maintained the inviolability of the king's person. His public career came to an end with the close of the Constituent Assembly, and he returned to Grenoble at the beginning of 1792. His sympathy and relations with the royal family, and his desire to check the downward progress of the Revolution, brought on him the suspicion and persecution of the more violent party. At the end of August 1792 he was arrested and imprisoned, and in November 1793 was transferred to Paris. The nobility of his character was proof against the assaults of suffering. "Better to suffer and to die," he said, "than lose one shade of my moral and political character." On November 28 he appeared before the Revolutionary Tribunal, in company with Duport-Dutertre, and two days later they both perished by the guillotine.

BARNES, ALBERT, a theologian of America, specially distinguished as a Biblical expositor, was born at Rome in the state of New York, 1st December 1798, and died at Philadelphia 24th December 1870. In 1820 he graduated at Hamilton College, and in the same year commenced his studies for the ministry at Princeton Theological Seminary. Soon after taking licence he was called to the Presbyterian church in Morristown, New Jersey, from which he was transferred to the pastoral charge of the first Presbyterian church of Philadelphia in 1830. In 1867 he was compelled to resign owing to failing health. Barnes held a prominent place in the New School branch of the Presbyterians, to which he had adhered on the division of the denomination. He was an eloquent preacher, but his widespread reputation rests chiefly on his expository works, which have probably had a larger circulation both in Europe and America than any others of their class. Of the well-known *Notes on the New Testament* it is said that more than a million volumes had been issued at the time of their author's death.

BARNES, JOSHUA, an English scholar, born in 1654. In 1695 he was chosen queen's professor in Greek, a language which he wrote and spoke with the utmost facility. He died in 1712.

BARNET, or CHIPPING BARNET, a market-town in the county of Hertford, 11 miles from London, on the great northern road. Near it, in 1471, was fought the decisive battle between the houses of York and Lancaster, in which the great earl of Warwick fell.

BARNEVELDT, JAN VAN OLDEN, Grand Pensionary of Holland, who played a great part and rendered the most signal services to his country in the long conflict with Philip II. of Spain, was born in 1547. He was a native of Amersfoot in the province of Utrecht, and could boast of a long line of noble ancestors. Endowed with superior abilities, he was educated for the profession of the law, and commenced practice as an advocate at the Hague in 1569. He sympathized deeply with his countrymen in their resolution to throw off the hated yoke of Spain, and served as a volunteer at the sieges of Haarlem and Leyden. In 1575 he married; and in the following year he was appointed to the honorable post of counsellor and chief-pensionary of Rotterdam. In 1585, when, in consequence of the assassination of the sagacious and resolute leader of the Dutch, and the general success of the Spaniards under the Prince of Parma, the cause of the patriots seemed almost hopeless, Barneveldt was chosen head of an embassy to Queen Elizabeth, to ask for her assistance and to offer her the sovereignty of the United Provinces. The queen agreed to give aid both in money and men, but refused to accept the sovereignty. An expedition was sent under the command of Dudley, earl of Leicester, on whom the Dutch conferred supreme and absolute authority. Barneveldt was then raised to the high office of advocate-general of Holland and West Friesland. Dissatisfied and indignant at Leicester's incompetence, arrogance, and mismanagement, he endeavored to limit his powers. For this purpose he succeeded in persuading the States to appoint Maurice of Nassau, the young son of the late Prince of Orange, stadtholder and captain-general of Holland

and Zealand, thus contributing to place in the highest position the man who was afterwards to become his great antagonist. Leicester was recalled at the close of 1586. In the course of a few years Barneveldt, by his prudence and energy in administration, succeeded in restoring order and materially improving the financial affairs of the States. He proposed to resign in 1592, but at the urgent entreaty of the States he retained his post. In 1598 he was sent on an embassy to Henry IV. of France, the object of which was to strengthen and maintain the friendship of France and the United Provinces. In 1603, on the accession of James I. to the throne, Barneveldt was again sent to England as head of an embassy, and in conjunction with the French ambassador, M. de Rosny, afterwards duke of Sully, negotiated an arrangement for further assistance against the Spaniards. In 1607, having first insisted on and obtained a recognition of the independence of the Provinces, he began negotiations with Spain with a view to establish a truce. He had to contend against the opposition of the stadtholder and the army, and to suffer from unmerited popular suspicions of taking bribes from the Spanish court. But he triumphed over all difficulties, and on April 9, 1609, the famous twelve years' truce was concluded. From this time Maurice was his sworn foe. The two men were leaders of two great political parties, and the struggle between them was embittered by the admixture of theological and ecclesiastical controversy. In the strife then going on between the Gomarites (the Calvanistic party) and the Arminians, Maurice sided with the former, while Barneveldt supported the latter. Maurice was aiming at the sovereign power; Barneveldt resolutely maintained the freedom of the republic. The clerical party, who looked up to Prince Maurice as their chief, were bent on getting the Calvinistic system established as the state religion, and on refusing to tolerate any other system; Barneveldt and the Arminians contended that each province should be free to adopt the form which it preferred. Barneveldt was the consistent champion of the supremacy of the civil authority, and "the prime minister of Protestantism" (Motley). The convocation of a National Synod was proposed by the party of the stadtholder and resisted by Barneveldt. When disturbances broke out against the Arminians, Maurice refused to suppress them, and disarmed the militia organized for the purpose by Barneveldt. The former now assumed the chief power. An interview took place on August 17, 1618, between the advocate and the stadtholder; each adhered resolutely to his own views, and the meeting remained fruitless. Barneveldt, with his friends Grotius and Hoogerbeets, was arrested and imprisoned on the 29th. In November following, in pursuance of the command of Prince Maurice, the famous Synod of Dort assembled. A few days later the trial of the prisoners began before a special commission. The proceedings were illegal; the accusations against Barneveldt were fully disproved, but he was unjustly found guilty and sentenced to death. This sentence was unscrupulously confirmed by the clerical synod. It was a foregone conclusion, and Barneveldt had seen clearly that there was no hope for him. On the 14th of May 1619, just five days after the closing of the synod, the venerable statesman and patriot, then in his seventy-first year, was beheaded at the Hague. He met his fate without a word of regret, without a sign of fear. His calm courage and his tenderness of heart are attested by a letter, still extant, written to his wife a few hours before his execution. Besides his wife, Maria van Utrecht, Barneveldt left two sons and two daughters. Four years after their father's death the sons took part in a plot against Prince Maurice; one of them made his escape and entered the service of Spain, the other was arrested and beheaded.

BARNSLEY, or BLACK BARNSLEY, mentioned in *Doomesday Book* as Bernesleye, a town and municipal borough in the West Riding of Yorkshire, 171 miles from London and about 11 north of Sheffield. It is situated on rising ground to the west of the River Dearne, in a district of considerable natural beauty. The manufacture of iron and steel, and the weaving of linen and other cloth, are the two principal industries; but there are also bleachfields, printfields, dyeworks, sawmills, cornmills, and malt-houses; and the manufacture of glass, needles, and wire is still carried on. Population in 1889, 32,000.

BARNSTABLE, a seaport town, and capital of the county of the same name, in the state of Massachusetts, North America. It is situated on the south side of a bay of the same name, which opens into Cape Cod Bay, and is 65 miles S.E. of Boston. The population, which is largely sea-faring, amounted in 1890 to 4,022.

BARNSTAPLE, a market and borough town of England, county of Devon, 40 miles N.W. of Exeter. It is situated on the River Taw, 6 miles from its mouth, but has always been considered a seaport. The stream, which is only navigable for small craft, is here crossed by an ancient stone bridge of 16 arches, and by a railway bridge on the Ilfracombe line. Pop., 12,282.

BAROCCHIO, or BAROZZI, GIACOMO DA VIGNOLA, architect, born at Vignola in the Modenese territory, in 1507, and died in 1573.

BAROCCI, or BAROCCIO, FEDERIGO, painter, was born in 1528 at Urbino, where the genius of Raphael inspired him. In his early youth he travelled to Rome, where he painted in fresco, and was warmly commended by Michael Angelo. He then returned to Urbino, where, with the exception of some short visits to Rome, he continued to reside till his death in 1612.

BARODÁ, a city of British India, the capital of the native state known as the Gaikwár's dominions, is situated near the River Biswamintri. The Government of Bombay exercises a political superintendence over the Gaikwár and a British political agent resides at Barodá. The town is fortified. Population, 105,000.

BAROMETER, the instrument by which the weight or pressure of the atmosphere is estimated. The barometer was invented by Torricelli, a pupil of Galileo, in 1643. It had shortly before been found, in attempting to raise water from a very deep well near Florence, that, in spite of all the pains taken in fitting the piston and valves, the water could by no effort be made to rise higher in the pump than about 32 feet. This remarkable phenomenon Torricelli accounted for by attributing pressure to the air. He reasoned that water will rise in a vacuum only to a certain height, so that the downward pressure or weight of the column of water will just balance the pressure of the atmosphere; and he further argued that if a fluid heavier than water be used it will not rise so high in the tube as the water. To prove this, he selected a glass tube about a quarter of an inch in diameter and 4 feet long, and hermetically sealed one of its ends; he then filled it with mercury and, applying his finger to the open end, inverted it in a basin containing mercury. The mercury instantly sank to nearly 30 inches above the surface of the mercury in the basin, leaving in the top of the tube an apparent vacuum, which is, indeed, one of the most perfect that can yet be produced, and is called after this great experimenter, the *Torricellian vacuum*. He next converted the mercurial column into a form suited for observation by bending the lower end of the tube, thus constructing what has since been called the siphon barometer. The fundamental principle of the barometer cannot be better illus-

trated than by his experiment. In truth, a scale is all that is required to render this simple apparatus a perfect barometer.

The heights of the columns of two fluids in equilibrium are inversely as their specific gravities; and as mercury is 10,784 times heavier than air, the height of the atmosphere would be 10,784 times 30 inches, or nearly five miles, if it were composed of layers equally dense throughout. But since air becomes less dense as we ascend, owing to its great elasticity and the diminished pressure, the real height of the atmosphere is very much greater. From observations of luminous meteors, it has been inferred that the height is at least 120 miles, and that, in an extremely attenuated form, it may even considerably exceed 200 miles.

Various fluids might be used in constructing barometers. If water were used, the barometric column would be about 35 feet long. The advantages, however, which *water barometers* might be supposed to possess in showing changes of atmospheric pressure on a large scale, are more than counter-balanced by a serious objection. The space in the tube above the column of water is far from being a vacuum, being filled with aqueous vapor, which presses on the column with a force varying with the temperature. At a temperature of 32° Fahr. the column would be depressed half an inch, and at 75° a foot. Since in mercurial barometers the space at the top of the column is one of the most perfect vacuums that can be produced, the best fluid for the construction of barometers is mercury. It is therefore the only fluid used where scientific accuracy is aimed at. Pure mercury must be used in filling the tubes of barometers; because if it be impure, the density will not be that of mercury, and, consequently, the length of the columns will not be the same as that of a column composed of pure mercury alone.

The best barometers are usually fitted with an *air-trap*, originally proposed by Gay-Lussac for the purpose of arresting the ascent to the Torricellian vacuum of any air that may have found its way into the column by the cistern. The air-trap is fitted into the tube somewhere between the scale and the cistern. Barometers furnished with an air-trap can be conveyed from place to place with more safety, and they remain longer in good working order.

There are two classes of barometers — *Siphon Barometers* and *Cistern Barometers*. The *Siphon Barometer* consists of a tube bent in the form of a siphon, and is of the same diameter throughout. A graduated scale passes along the whole length of the tube, and the height of the barometer is ascertained by taking the difference of the readings of the upper and lower limbs respectively. This instrument may also be read by bringing the zero-point of the graduated scale to the level of the surface of the lower limb by means of a screw, and reading off the height at once from the surface of the upper limb. This barometer requires no correction for errors of capillarity or capacity. Since, however, impurities are contracted by the mercury in the lower limb, which is usually in open contact with the air, the satisfactory working of the instrument comes soon to be seriously interfered with.

The *Cistern Barometer* is subject to two kinds of error, the one arising from capillarity, and the other from changes in the level of the surface of the cistern as the mercury rises and falls in the tube, the latter being technically called the *error of capacity*. If a glass tube of small bore be plunged into a vessel containing mercury, it will be observed that the level of the mercury in the tube is not in the line of that of the mercury in the vessel, but somewhat below it, and that the surface is convex. The capillary depression is inversely proportional to the diameter of the tube. If the diameter of the tube be 0.1 inch, the capillary depression of mercury in boiled tubes, or *error of capillarity*, is 0.070 inch; if 0.2 inch, the error is 0.029 inch; if 0.3 inch, it is 0.014 inch; and if 0.5 inch, it is only 0.003 inch. Since capillarity depresses the height of the column, cistern barometers require an addition to be made to the observed height, in order to give the true pressure, the amount depending, of course, on the diameter of the tube.

The error of capacity arises in this way. The height of the barometer is the perpendicular distance between the surface of the mercury in the cistern and the upper surface of the mercurial column. Now, when the barometer falls from 30 to 29 inches, an inch of mercury must flow out of the tube and pass into the cistern, thus raising the cistern level; and, on the other hand, when the barometer rises, mercury must flow out of the cistern into the tube, thus lowering the level of the mercury in the cistern. Since the scales of barometers are usually engraved on their brass cases, which are fixed (and, consequently, the zero-point from which the scale is graduated is also fixed), it follows that, from the incessant changes in the level of the cistern, the readings would be sometimes too high and sometimes too low, if no provision were made against this source of error.

A simple way of correcting the error of capacity is — to ascertain (1) the neutral point of the instrument, or that height at which the zero of the scale is exactly at the height of the surface of the cistern, and (2) the rate of error as the barometer rises or falls above this point, and then apply a correction proportional to this rate. In many of the barometers used on the Continent the surface area of the cistern is 100 times greater than that of the tube, in which case the error is small, and can, besides, be easily calculated. This is a good barometer for ordinary observers, inasmuch as no error arises in bringing the surface of the mercury of the cistern to the zero-point of the scale, which one requires to have some skill as a manipulator and good light to do correctly. Another way of getting rid of this error is effected by the *Board of Trade Barometer*, constructed originally by Adie of London. In this barometer the error of capillarity is allowed for in fixing the zero-point of the scale, and the error of capacity is obviated by making the scale-inches not true inches, but just so much less as exactly to counterbalance the error of capacity.

But the instrument in which the error of capacity is satisfactorily (indeed, entirely) got rid of is *Fortin's Barometer*. The cistern is formed of a glass cylinder, through which the level of the mercury may be seen. The bottom is made like a bag, of flexible leather, against which a screw works. At the top of the interior of the cistern is a small piece of ivory, the point of which coincides with the zero of the scale. By means of the screw, which acts on the flexible cistern bottom, the level of the mercury can be raised or depressed so as to bring the ivory point exactly to the surface of the mercury in the cistern. In some barometers the cistern is fixed, and the ivory point is brought to the level of the mercury in the cistern by raising or depressing the scale.

What is called the *Fitzroy Barometer* is only a modified form of the siphon barometer, with the lower limb blown into a moderately-sized bulb, resembling a cistern in some respects, and thus giving a larger range to the readings of the upper limb. It is only suited for popular, not for scientific purposes. The common *Wheel Barometer*, the common form of the *weather glass*, is also a modification of the siphon barometer. A small weight, glass or iron, floats on the mercury in the lower limb; to this weight a thread is attached, which is led

round a horizontal axis, a small weight being suspended at its free extremity to keep it tight. The float rises and falls with the fluctuations of the barometer, and a pointer fixed to a horizontal axis being turned by this means indicates the height of the barometer by figures on a dial. Since the mercury only rises or falls in the open end of the siphon to the extent of half the oscillation, a cistern is added to the top of the upper limb to increase the amount of the oscillation in the lower limb. This form of the barometer is only suited for very rough purposes, since large and uncertain errors arise from the shortening and lengthening of the thread with the varying dampness or dryness of the air, and from the friction of the different parts of the mechanism of the instrument.

Since in working out the great atmospheric problem of the force of the wind in its relation to the barometric gradient (*i.e.*, the differences of the pressures at different places, reduced to the same level) readings from about the hundredth of an inch (0.010), or even less, required to be observed and stated with great accuracy, the extreme importance of accurate sensitive barometers will be apparent,—instruments not only possessing a great range of scale, but a scale which will truly indicate the real atmospheric pressure at all times. The two barometers which best satisfy this requirement are *King's Barometer*, which has been in use for many years at the Liverpool Observatory, and *Howson's Barometer*.

The liability of the barometer to be broken in carriage is great. This risk is considerably lessened in the *Board of Trade Barometer*, which has the tube very much reduced in diameter for a part of its length, breakage from "pumping" being so much lessened thereby that the instrument may be sent as a parcel by rail, if only very ordinary care be taken in the carriage. This is essentially the principle of the *Marine Barometer*, which, however, has the tube still more contracted. For rougher modes of transit an ingeniously constructed iron barometer has been invented by Mr. T. Stevenson, C. E.

The *Aneroid Barometer* was invented by Vidi, and patented in England in 1844. Its action depends on the effect produced by the pressure of the atmosphere on a circular metallic chamber partially exhausted of air and hermetically sealed.

The instrument requires, however, to be repeatedly compared with a mercurial barometer, being liable to changes from the elasticity of the brass chamber changing, or from changes in the system of levers which work the pointer. Though aneroids are constructed showing great accuracy in their indications, yet none can lay any claim to the exactness of mercurial barometers. The mechanism is liable to get fouled and otherwise go out of order, so that they may change 0.300 inch in a few weeks, or even indicate pressure so inaccurately and so irregularly that no confidence can be placed in them for even a few days, if the means of comparing them with a mercurial barometer be not at hand.

Of the *self-registering barometers*, the best are those which accomplish this object by photography. This is done by concentrating the rays of a gas flame by means of a lens, so that they strike the top of the mercurial column. A sheet of prepared paper is attached to a frame placed behind a screen, with a narrow vertical slit in the line of the rays. The mercury being opaque throws a part of the paper in shade, while above the mercury the rays from the flame pass unobstructed to the paper. The paper being carried steadily round on a drum at a given rate per hour, the height of the column of mercury is photographed continuously on the paper. From the photograph the height of the barometer at any instance may be taken. *King's*, *Hardy's*, *Hough's*, *Hipp's* and *Thorell's self-registering barometers* may also be referred to as giving continuous records of the presure.

The height of the barometer is expressed in English inches in England and America. In France and most European countries, the height is given in millimètres, a millimètre being the thousandth part of a mètre, which equals 39.37079 English inches. Up to 1869 the barometer was given in half-lines in Russia, which, equalling the twentieth of an English inch, were readily reduced to English inches by dividing by 20. The metric barometric scale is now used in Russia. In a few countries on the Continent the French or Paris line, equalling 0.088814 inch, still continues to be used. Probably millimètre and English inch scales will soon be exclusively in use. The English measure of length being a standard at 62° Fahr., the old French measure at 61°.2, and the metric scale at 32°, it is necessary, before comparing observations made with the three barometers, to reduce them to the same temperature, so as to neutralize the inequalities arising from the expansion of the scales by heat.

The barometer is a valuable instrument as an indicator of coming weather, provided its readings be interpreted with intelligence. High pressures generally attend fine weather, but they not unfrequently accompany wet stormy weather; on the other hand, low pressures, which usually occur with wet and stormy weather, not unfrequently accompany fine mild weather, particularly in winter and in the northern parts of Great Britain. The truth is, the barometer merely indicates atmospheric pressure directly, whilst it indicates weather only inferentially. The chief points to be attended to are its fluctuations taken in connection with the wind and the state of the sky, but above all, the readings of the barometer as compared with those at neighboring places, since it is *difference* of pressure, or the amount of the barometric gradient, which determines the strength of the wind and the weather generally.

Barometrical Measurement of Heights.

The decisive experiment by which Pascal established the reality of atmospheric pressure suggested to him the method of measuring heights by means of the barometer. The first attempts to effect this were necessarily rude and inaccurate, since they went on the assumption that the lower mass of air is of uniform density. The discovery, however, of the actual relation subsisting between the density of air and its elasticity by Boyle in England, and about the same time by Mariotte in France, laid a sure foundation for this branch of atmospheric physics—the relation being that, at the same temperature, the pressure of a gas is exactly proportional to its density.

This law, however, only holds provided the temperature is the same. The familiar illustration of a bladder, partially filled with air, expanding on being placed near a fire, shows that if the pressure remains the same,—the pressure in this case being that of the atmosphere,—the gas will occupy a larger space if its temperature be raised. If the temperature be increased and the air be confined so as to occupy the same space, the pressure will be increased.

The relation between the temperature and pressure of gases was first discovered by Gay-Lussac; and more recently our knowledge of this branch of the subject has been greatly enlarged by the beautiful and accurate experiments of Regnault. From these experiments it has been concluded that the co-efficient which denotes increase of elasticity for 1° Fahr. of air whose volume is constant equals .002036; and that the co-efficient which denotes increase of volume for 1° Fahr. of air

whose elasticity is constant equals .002039. It may further be added that the co-efficient of expansion for carbonic acid gas, hydrogen, and all other gases, is as nearly as possible the same.

When a fluid is allowed to evaporate in the exhausted receiver of an air-pump, vapor arises from it until its pressure reaches a certain point, after which all further evaporation is arrested. This point depends on the nature of the fluid itself and on the temperature, and it indicates the greatest vapor pressure possible for the fluid at the particular temperature.

If gases of different densities be put into the same vessel it is found that they do not arrange themselves according to their densities, but are ultimately diffused through each other in the most intimate manner. Each gas tends to diffuse itself as in a vacuum, the effect of the presence of other gas being merely to retard the process of their mutual diffusion. As regards the atmosphere, evaporation goes on until the maximum vapor pressure for the temperature has been attained, at which point the air is said to be saturated, and whilst the temperature remains the same further evaporation is arrested. Thus, at a temperature of 50° evaporation goes on until the vapor pressure reaches 0.361 inch, but if the temperature were raised to 60° the process of evaporation would be renewed, and go on till the vapor pressure rose to 0.518 inch. If at a vapor pressure of 0.518 inch the temperature were to fall from 60° to 50°, the air would no longer be capable of retaining the whole of the aqueous vapor in suspension, but the surplus part would be condensed and fall as rain. In the change from the aeriform to the liquid state a quantity of latent heat is given out. The yet uncertain effect of these changes, particularly the change of form from the aeriform to the liquid state, on the pressure, temperature, and movements of the air, renders it peculiarly desirable that barometeric observations for the determination of heights should not be made when clouds are forming or rain is falling.

Dalton has shown that air charged with vapor is specifically lighter than when it wants the vapor; in other words, the more vapor any given quantity of air has in it the less is its specific gravity; and Sir William Thompson has shown that the condensation of vapor in ascending currents of air is the chief cause of the cooling effect being so much less than that which would be experienced by dry air. From these ascertained effects of aqueous vapor in modifying the pressure and temperature of the atmosphere, the importance in the barometric measurement of heights of full and accurate observations of the hygrometry of the atmosphere and of the weather will be apparent.

Since the equilibrium of the vapor atmosphere is being constantly disturbed by every instance of condensation, by the ceaseless process of evaporation, and by every change of temperature, and since the presence of oxygen and nitrogen greatly obstructs the free diffusion of the aqueous vapors, it follows that Dalton's law of the independent pressure of the vapor and the dry air does not absolutely hold good. From the constant effort of the vapor to attain to a state of equilibrium there is, however, a continual tendency to approach this state. Since the equal diffusion of the dry air and the vapor is never reached, observations can only indicate local humidity, and therefore as regards any considerable stratum of air can only be regarded as approximate. Though particular observations may often indicate a humidity wide of the mark, yet in long averages a close approximation is reached, except confined localities which are exceptionally damp or dry. Hence in observations for the determination of heights, the results of a long-continued series of observations should be employed, and those hours should be chosen whose mean is near the daily mean.

The most recent results arrived at by Regnault are the best, but it is to be regretted that the whole subject of hygrometry, both as regards the methods of observation and the methods of discussing the observations, is still in an unsatisfactory state. This consideration, taken in connection with our defective knowledge of the relation of aqueous vapor to radiant heat, of the mode of its diffusion both vertically and horizontally, and of the influence exerted by its condensation into cloud and rain, and with our ignorance of the merely mechanical effects of ascending, descending, and horizontal currents of air in increasing or diminishing barometric pressure, renders it evident that heights deduced from barometric observations can only be regarded as approximate. It is much to be desired, in stating results, that the limit of error were taken into account, and the nearest round number in accordance therewith should alone be given as the calculated result. Thus, it is a mistake to give as the height of a place 1999 feet when the calculation is based wholly on barometric observations, and the limit of error amounts to 30 feet or more. The height 2000 should be given as the result.

The correction for decrease of gravity at the higher station, as compared with the force of gravity at the lower station or at sea-level, must also be taken into account. Its amount is small, being, roughly speaking, only about 0.001 inch per 400 feet. Since the force of gravity is diminished in proportion to the square of the distance from the centre of gravity, the rate of its decrease with the height varies in different latitudes. Places at the equator being farther from the earth's centre than places at the poles, it follows that the force of gravity diminishes at a less rapid rate as we ascend at the equator than it does at the poles. Now, since at the equator gravity diminishes less rapidly with the height, the air at any given height will exert a higher pressure there than anywhere else on the globe at the same height as compared with what it does at the sea-level of the latitude. Hence a subtraction requires to be made at the equator, and the amount to be subtracted diminishes as we proceed into higher latitudes, till it falls to zero at latitude 45°, where the force of gravity is assumed to be the mean. For higher latitudes an addition is required which constantly increases till it reaches the maximum at the poles. This correction is also small, being for 1000 feet less than 0.001 inch in Great Britain, and less than 0.003 at the equator and the poles.

From their portability and handiness the aneroid barometer, and the thermometer for ascertaining the point at which water boils, are of great use in determining heights,—the thermometer, if properly managed, being the more accurate of the two. Since, owing to the sluggishness with which the aneroid often follows the changes of pressure, especially low pressures, its readings should not be recorded till it has hung for some hours at the place of observation, and if this be not possible, the time which elapsed from arriving at the place and making the observations should be stated. It may not be unnecessary to add that every opportunity which presents itself should be taken of comparing it with a standard mercurial barometer, owing to the variations, irregular or permanent, to which aneroids are subject, and that the instrument should always be read in one position, since the difference between the reading in a horizontal position and the reading in a vertical position is often considerable.

BARON. The origin and primary import of this term have been much contested. Menage derives it from the Latin *baro*, a word which we find used in classical Latin to signify "a simple" or "foolish man."

Another form of the same word appears to be *varo*, to which Lucilius gives the meaning "a stupid man," "a blockhead," Forcellini observing that its primary sense is "a block of tough, hard wood." But with greater probability Graff derives the word baron from the old German *Bar=Mann, freier Mann.* The word seems related to the Spanish *varon*, which means "a male," "a noble person," and its root may be found in the Sanskrit *vîra.* Like the Greek *aner* and the Latin *vir*, the word *baron* signifies man in general and also a *husband* — the old legal expression *baron* and *feme* being equivalent to our ordinary phrase "man and wife."

In modern English usage the term is particularly applied to a member of the lowest order of the peerage, but in ancient records the barony included all the (titular) nobility of England, because all noblemen were barons though they might possess a higher dignity also; and the great council of peers, in which were included dukes, marquesses, and earls, as well as barons, was styled simply the "Council de Baronage." In like manner we speak of the "barons' wars," and "the barons" who signed Magna Charta, although nobles of higher rank joined in both, and it is usual in summoning to the Upper House a peer's son in the lifetime of the father to give, for the occasion, a separate existence to the latter's barony. Thus Earl Fortescue sat in the House of Lords during his father's lifetime as baron of Castle Hill, county Devon — the barony held with his father's earldom. The fiction is still maintained when a commoner is raised directly to one of the higher grades of the peerage, as in the case of Admiral Jervis, who was created at the same time Baron Jervis and Earl St. Vincent.

Barons of the Exchequer, six judges (a chief baron and five puisne barons) to whom the administration of justice is committed in causes betwixt the king and his subjects relative to matters of revenue. Selden, in his *Titles of Honor*, conjectures that they were originally chosen from among the barons of the kingdom, and hence their name.

Barons of the Cinque Ports (originally Hastings, Dover, Hythe, Romney, and Sandwich) were (prior to 1831) members of the House of Commons, elected by the Cinque Ports, two for each port. Their right to the title is recognized in many old statutes, but in 1606 the use of the term in a message from the Lower House drew forth a protest from the peers, that "they would never acknowledge any man that sitteth in the Lower House to the right or title of a baron of parliament" (*Lords' Journals*). These ports are now under the jurisdiction of a *warden.*

Baron and Feme, in the *English Law*, a term used for husband and wife, in relation to each other, who are accounted as one person. Hence, by the old law of evidence the one party was excluded from being evidence for or against the other in civil questions, and a relic of it is still preserved in the criminal law.

Baron and Feme, in *Heraldry*, is when the coats-of-arms of a man and his wife are borne per pale in the same escutcheon,— the man's being always on the dexter side, and the woman's on the sinister. But in this case the woman is supposed not to be an heiress, for then her coat must be borne by the husband on an escutcheon of pretence.

See HERALDRY.

BARONET, a name originally given to the *lesser barons* mentioned in the preceding article, but now confined to the lowest grade of our hereditary nobility. The order was instituted by King James I. in 1611, at the suggestion of Sir Robert Cotton, to whom the plan had been submitted by Sir Thomas Sherley of Wiston, its actual inventor.

Baronets take precedence according to the dates of their patents, conformably to the terms of which no intermediate honor between baron and baronets can be established, and they rank above all knights except those of the Garter. The title or prefix of *Sir* is granted them by a peculiar clause in their patents, and until 1827 they could claim for themselves and the heirs male of their bodies the honor of knighthood. All baronets are entitled to bear in their coat-of-arms, either in a canton or an escutcheon at their choice, the arms of Ulster, viz., a bloody hand.

Baronets of Scotland, called also *Baronets of Nova Scotia.*—This order of knights-baronets was instituted by Charles I. in the year 1625, when the first person dignified with the title was Sir Robert Gordon of Gordonstone, a younger son of the earl of Sutherland.

After the Union with England in 1707 the baronets of Scotland charged their arms with the Ulster badge, being created as baronets of the United Kingdom.

Baronets of Ireland.—This order was likewise instituted by King James I. in the 18th year of his reign, for the same purpose and with the same privileges within the kingdom of Ireland as had been conferred on the analogous order in England; for which also the Irish baronets paid the same fees into the treasury of Ireland.

BARONIUS, CÆSAR, the great church historian, was born on the 31st October 1538 in the district of Naples. His parents, Camillo de Barono or Baronio and Porcia Trebonia, were of noble birth. He was educated at Veroli and Naples, where his favorite studies were theology and jurisprudence. In 1557 he accompanied his father to Rome, and found himself in the midst of the reactionary enthusiasm which did much to restore Italy, in spite of the efforts of her reformers, to the papal authority. There he was brought in contact with Philip Neri, a man who then and since has done much to reconcile the speculative student with the Church of Rome, and to provide for him work in her service to which he can give his whole heart. Neri had just founded the Italian Oratory, the model of many another, and he and his monks had vowed to devote themselves to student lives, and to dedicate their whole power of study to the Roman Catholic Church. Among the theological studies pursued in the oratory, church history and ecclesiastical biography held a prominent place, the greater part of every forenoon being set apart for these subjects. In this small congregation Baronius found a congenial home, and his superior, Philip Neri, soon saw that he had secured a coadjutor who would make his oratory all he had hoped it would become. The alarm caused by the first Protestant church history, the *Magdeburg Centuries*, gave his studies a special direction, and, as he told Pope Sixtus V., he was urged by his own desires, and the encouragement of Neri, to attempt to answer the Magdeburg divines. This was the origin of the *Annales Ecclesiastici*, his great work, which occupied thirty laborious years. These *Annales*, the first and in many respects the most important historical work which the Roman Catholic Church has produced, begin with the birth of Christ and end with the year 1198. The book is not properly history; it is annals rather, as everything is subordinated to chronology.

BARQUISMETO, a city of Venezuela, and since 1830 the capital of the province of Nueva Segovia, is situated on a confluent of the Portuguesa, which belongs to the northern part of the Orinoco system. The surrounding district is fertile, and produces excellent coffee, cocoa, and sugar; and the climate is healthy and pleasant. Barquisimeto was founded in 1522 by Juan de Villegas, principally for the exploration and working of gold-mines supposed to exist in the neigh-

borhood; and at first it received the name of Nueva Sagovia in honor of his native city. The commercial advantages of its situation soon raised it to considerable prosperity. In 1807 it had about 15,000 inhabitants; but on the 26th of March 1812, it was totally destroyed by an earthquake. It has since been regularly rebuilt, and, in spite of disastrous effects of the revolutionary wars, has recovered its position. Among its public buildings may be mentioned a college and several schools. The inhabitants are partly engaged in the rearing of horses and mules.

BARR, a town in Alsace, 18 miles S. W. of Strasburg, situated on the eastern slope of the Vosges, at the mouth of the Ulrichthal. Population 5651.

BARRA, or BAERAY (from the Scandinavian *Baraey*, isle of the ocean), one of the Hebrides or Western Isles of Scotland, forming part of Inverness-shire. It lies about five miles S.W. of South Uist, and is 8 miles in length by from 2 to 4 miles in breadth.

BARRACKPUR, a magisterial subdivision and town of British India, in the district of 24 Parganás, under the Lieutenant-Governor of Bengal.

BARRACKPUR TOWN and CANTONMENT, situated on the Húglí, 15 miles above Calcutta.

Barrackpur played an important part in the two Sepoy mutinies of 1824 and 1857, but the details of these belong to the general history of British rule in India.

BARRACKS are groups of buildings constructed for the accommodation of soldiers. The word, which was formerly spelt "baracks" or "baraques," is derived from the Spanish "barracas," meaning the little huts or cabins used by the fishermen on the sea-shore, or for soldiers in the field. The French call them "casernes," meaning lodgings for soldiers. Barracks of a temporary character, commonly called "huts," have ordinarily been constructed by troops on a campaign as winter quarters, or when for any length of time in "standing camp,"—they being accommodated when in the field under other circumstances in tents, or else, if not provided with tents, bivouacing without cover.

In time of peace barracks were formerly only provided for troops in fortified places termed "garrisons," soldiers elsewhere being provided with quarters by being billeted on public-houses. The apprehension of disturbances, and risk of the troops being too much mixed up with the populations of the localities in which they might be stationed, mainly led to the construction of barracks in or near towns in England about the year 1792. In the first instance the Deputy-adjutant-general was charged with the building and fitting up of barracks. In 1793 the same officer was appointed "Superintendent-general of barracks," and subsequently "Barrack-master-general." In 1806 the barrack establishment was placed under the direction of a board of four commissioners, of whom one was generally a military man. About the year 1825 the duke of Wellington arranged for the construction and maintenance of barracks to be given over to the corps of Royal Engineers. The custody and equipment of barracks, with the supply of fuel and light to the troops quartered in them, were then made and remained, until recently, the duty of the "barrack department," which consisted of barrack-masters and barrack-sergeants.

The arrangement and composition of barracks vary according to the arm of the service to be accommodated in them; thus for the cavalry, horse and field artillery, Royal Engineer train, and transport branch of the army service corps, stables are required; and it is usual to provide for the unmarried non-commissioned officers and men quarters over their horses, a troop of cavalry or a division of field artillery being placed in a separate block of two stories in height. Horse and field artillery also require gunsheds and workshops for artificers, such as collarmakers, wheelers, &c. All mounted troops require forage and shoeing accommodation as well as saddlers' shops. Garrison artillery and companies of Royal Engineers can be accommodated in similar barracks to those for infantry, but the latter require an ample provision of workshops for artificers, with store accommodation for materials, &c.

Not fifty years since, in the West Indies, men slept in barracks, in hammocks touching each other, only 23 inches of lateral space being allowed for each man. At the same time in England the men slept in wooden beds, with two tiers, like the berths of a ship, and not unfrequently each bed held four men. Now, each soldier has an iron bedstead which turns up in the middle, forming a seat for the day-time, and only two rows of beds are allowed in barrack-rooms, and the principle of providing one window for every two beds is carried out in all new barracks.

The best size of a barrack-room is now considered to be 60 or 62 feet long, by 20 feet wide, and about 12 feet high. The number of men each room is to contain is painted on the door; and in barracks of modern construction each barrack-room has attached to it:—

(1.) A small (single) sergeant's room, with fire-place, cupboard, and small window looking into the men's room.

(2.) An ablution room, with basins, water-taps, and a fixed pan in which the feet can be washed.

(3.) A night urinal, with water for flushing laid on.

Barracks are washed once a week, and on intermediate days the rooms are dry-scrubbed. The walls and ceilings are limewashed by the troops twice a year. The general periodical painting of all barrack buildings is performed twice externally and once interally in every eight years. Formerly, barrack buildings were placed on very limited areas, and even a whole regiment was lodged in one house built in the form of a square, with the quarters of the officers on one side for the better supervision of the men; but the Barrack and Hospital Improvement Commission recommended that the men should be divided in numerous detached buildings, so placed as to impede as little as possible the movement of air and the action of the sun's rays.

For barracks, as a general rule, buildings of two stories in height are preferred to those of three stories, but three-story buildings may be adopted where space is limited and land very costly. Buildings of two stories are less expensive than those of only one story in height, and the general arrangement, when the former mode of construction is adopted, is more compact. The selection of a site for a barrack requires great care and circumspection. This duty is performed in the first instance by the Commanding Royal Engineer of the district, or an officer appointed by him; but the ground proposed is also reported on by an Army medical officer as well as subsequently by the General Officer commanding the district, the final approval resting with the Secretary of State for War.

BARRAS, PAUL FRANÇOIS JEAN NICOLAS, COMTE DE, a distinguished actor in the great French Revolution, was born in June 1755. He was a descendant of a noble family in Provence, and at an early age entered the army. He was twice in India with his regiment, but retired from the service after attaining the rank of captain. Like many others, he saw in the Revolution a good opportunity for retrieving his fortunes, which had been ruined by his extravagance and dissipation; and his penetration enabled him to foresee the certain fall of the royalist party. He threw in his lot with the revolutionists, and speedily distinguished himself by his vigor and hardihood. When elected a member of the

National Convention, he gave an uncompromising vote for the king's death; and at the siege of Toulon, where for the first time he met Napoleon, his energetic measures contributed much to the success of the French arms. Robespierre, who hated Barras for his dissolute habits, and feared him for his boldness, endeavored to have his name included in one of his prescription lists, but, on the 9th Thermidor 1794 Barras completely overthrew his power. His success from this period was secured; after the 13th Vindémiaire 1795, he was nominated general-in-chief; and after the affair of the 18th Fructidor, 1797, in which Augereau played a prominent part, he was practically dictator. Bonaparte's *coup d'état* of the 18th Brumaire 1799 changed the whole aspect of affairs. Barras, seeing that resistance to his powerful protégé was useless, gave in his resignation, and retired to his country seat. His latter years were spent in various intrigues, in which he showed a strong leaning towards the royalist party. He died in 1829. The character of Barras has little in it that is worthy of admiration. He was dissolute in private life, and can scarcely be said to have had any definite public policy. At the same time he was courageous, prudent, and on occasions, an able speaker.

BARRHEAD, a town of Scotland, county of Renfrew, three miles S. of Paisley, and 8 miles S. W. of Glasgow on the Caledonian Railway line between that city and Kilmarnock. Population, 7,000.

BARRI, Girald de, commonly called *Giraldus Cambrensis*, an historian and ecclesiastic of the 12th and 13th centuries, was born at the castle of Maenor Pyrr near Pembroke, probably in 1147. By his mother he was descended from the princes of South Wales, and the De Barris were one of the most powerful Welsh families. Being a younger brother, and intended for the church, he was sent to St. David's, and educated in the family of his uncle, the bishop of that see. When about twenty years of age he was sent to the University of Paris, where he continued for some years, and, according to his own account, became an excellent rhetorician and lecturer. On his return in 1172 he entered holy orders, and was made archdeacon of Brecknock. Having observed with much concern that his countrymen the Welsh were very backward in paying tithes of wool and cheese, he applied to Richard, archbishop of Canterbury, and was appointed his legate in Wales for remedying this and other disorders. Barry excommunicated all, without distinction, who refused to compound matters with the church, and, in particular, delivered over bodily to the evil one those who withheld the tithes. Not satisfied with enriching, he also attempted to reform the clergy. He delated an aged archdeacon to the archbishop, for the unpardonable crime of matrimony; and on his refusing to put away his wife he was deprived of his archdeaconry, which was bestowed upon the zealous legate. On the death of his uncle, the bishop of St David's, in 1176, he was elected his successor by the chapter; but this choice having been made without the permission and against the will of Henry II., Girald prudently declined to insist upon it, and went again to Paris to prosecute his studies. He speaks with exultation of the prodigious fame which he acquired by his eloquent declamations in the schools, and of the crowded audiences who attended them. Having spent about four years at Paris, he returned to St. David's, where he found everything in confusion; and on the temporary retirement of the bishop, which took place soon after, he was appointed administrator by the advice of the archbishop of Canterbury, and governed the diocese in that capacity till 1184, when the bishop was restored. About the same time he was called to court by Henry II., appointed one of his chaplains and sent into Ireland with Prince John, by whom he was offered the united bishoprics of Fernes and Leighlin. He would not accept them, and employed his time in collecting materials for his *Topography of Ireland*, and his history of the conquest of that Island, which was completed in three books in 1187. In 1188 he attended Baldwin, archbishop of Canterbury, in his progress through Wales, preaching a crusade for the recovery of the Holy Land,—an employment in which he tells us, with his usual modesty, that he was far more successful than the primate, adding significantly, that the people were most affected with Latin sermons (which they did not understand), melting into tears, and coming in crowds to take the cross. On the accession of Richard I. in 1189 he was sent by that monarch into Wales to preserve the peace of that country, and was even joined in commission with William Longchamp, bishop of Ely, as one of the regents of the kingdom. He failed, however, to improve this favorable opportunity; and having fixed his heart on the see of St. David's, the bishop of which was very old and infirm, he refused the bishopric of Bangor in 1190, and that of Llandaff the year following. But in 1192 the state of public affairs became so unfavorable to Barri's interest at court that he determined to retire. He proceeded to Lincoln, where William de Monte read lectures in theology with great applause; and here he spent about six years in the study of divinity, and in composing several works. At last the see of St. Davids, which had long been the object of his ambition, became vacant, and he was unanimously elected by the chapter, but met with so powerful an adversary in Hubert, archbishop of Canterbury, that it involved him in a litigation which lasted five years. He died in 1220.

BARRIE, capital of Simcoe county, Ontario, Canada, is situated on Kempenfeldt Bay, Lake Simcoe, sixty miles northwest of Toronto. It contains two banks, several churches and schools, woolen factories, flour mills, two newspapers, and a population of 5,000.

BARRINGTON, John Shute, first Viscount, a nobleman distinguished for theological learning, was the youngest son of Benjamin Shute, merchant, and was born at Theobald, in Hertfordshire, in 1678. He died in 1734. Of his large family four were distinguished.

The eldest, William Wildman, second Viscount Barrington (born 1717, died 1793), held important Government offices.

The Hon. Daines Barrington, the third son, born in 1727, was a distinguished antiquary and naturalist. Among the most curious and ingenious of his papers, are his *Experiments and Observations on the Singing of Birds*, and his *Essay on the Language of Birds*. He died on the 14th March 1800, and was buried in the Temple church.

Samuel Barrington, the fourth son, was born in 1729, and died in 1800. He entered the navy at an early age, and in 1747 had worked his way to a post-captaincy. He was distinguished for his bravery and skill, and in 1778 attained the rank of rear-admiral. He held command for some time in the West Indies, and repulsed a superior French force at Sta Lucia.

Shute Barrington, the youngest son, was born in 1784, and died in 1826. He was educted at Eton and Oxford, and after holding some minor dignities, was made bishop of Llandaff in 1769.

BARRISTERS, in England, are the highest class of lawyers who have exclusive audience in all the superior courts. Every barrister must be a member of one of the four ancient societies called Inns of Court, viz., Lincoln's Inn, the Inner and Middle Temples, and Gray's Inn. The existence of these societies as schools can be traced back to the 13th century, and their rise is

attributed to the clause in Magna Charta, by which the Common Pleas were fixed at Westminster instead of following the king's court, and the professors of law were consequently brought together in London. Associations of lawyers acquired houses of their own in which students were educated in the common law, and the degrees of barrister (corresponding to apprentice or bachelor) and sergeant (corresponding to doctor) were conferred. The schools of law are now represented by the Inns of Court, which still enjoy the exclusive privilege of calling to the bar, and through their superior order of *benchers* control the discipline of the profession.

BARROW-IN-FURNESS, a borough, port, and parish in the hundred of Lonsdale, North-West Lancashire, situated opposite the island of Walney, at the extreme point of the peninsula of Furness, which lies between Morecambe Bay and the estuary of the Duddon. It is distant 35 miles from Lancaster and 91 from Carlisle. The area of the borough, which includes Walney and the islets at its south end, is 17,000 acres, of which 8155 are land, the rest being sand and water.

BARROW, Isaac, an eminent mathematician and divine, was the son of Thomas Barrow, a linen draper in London, where he was born in 1630. He was at first placed for two or three years at the Charter-house school. There, however, his conduct gave but little hopes of his ever succeeding as a scholar, for he was inattentive and extremely fond of fighting. But after his removal from this establishment, his disposition took a happier turn; and having soon made considerable progress in learning, he was in 1643 entered at St. Peter's College, and afterwards at Trinity College, Cambridge, where he applied himself with great diligence to the study of literature and science, especially of natural philosophy. He at first intended to adopt the medical profession, and made some progress in anatomy, botany, and chemistry, after which he studied chronology, geometry, and astronomy. He then travelled in France and Italy, and in a voyage from Leghorn to Smyrna gave proofs of great personal bravery; for the ship having been attacked by an Algerine pirate, Barrow remained upon deck, and fought with the utmost intrepidity, until the pirate, unprepared for the stout resistence made by the ship, sheered off and left her to pursue her voyage.

In July 1662 he was elected professor of geometry in Gresham College, on the recommendation of Dr. Wilkins, master of Trinity College, and afterwards bishop of Chester; and in May 1663 he was chosen a fellow of the Royal Society, at the first election made by the council after obtaining their charter. In 1669 he resigned his mathematical chair to his illustrious pupil Isaac Newton, having now determined to renounce the study of mathematics for that of divinity. In the year 1670 he was created doctor in divinity by mandate; and, upon the promotion of Dr. Pearson, master of Trinity College, to the see of Chester, he was appointed to succeed him by the king's patent, bearing date of 13th February 1672. In 1675 Dr. Barrow was chosen vice-chancellor of the university. He died on the 4th of May 1677, in the 47th year of his age, and was interred in Westminster Abbey, where a monument, surmounted by his bust, was soon after erected by the contributions of his friends. By his English contemporaries Barrow was considered a mathemetician second only to Newton. Continental writers do not place him so high, and their judgment is probably the more correct one.

BARROW, Sir John, Bart., was born near Ulverston, in Lancashire, June 19, 1764. His early opportunities of instruction were limited; but by self-education he matured those powers which eventually were turned to so good an account. He displayed at an early age a decided inclination for mathematical pursuits. He passed some years of his youth as superintending clerk of an iron foundry at Liverpool, and he afterwards taught mathematics at an academy in Greenwich. While in the latter situation he was fortunate in obtaining, through the interest of Sir George Staunton, a place in the first British embassy to China. He was thus enabled to put his foot on the first step of the ladder of ambition; but each step in his subsequent career may be fairly said to have been achieved by himself. The account of the embassy published by Sir George Staunton records many of Barrow's valuable contributions to literature and science connected with China. This work, together with his own subsequently published volume of travels, is ample evidence how well his time had been employed. Few persons could, within the space of a few months, overcome all the practical difficulties of such a language as the Chinese; but Barrow soon began to converse in it, and acquired a complete knowledge of its theory. His papers on the subject in the *Quarterly Review* (to which periodical he was for many years a very frequent contributor) contain a very admirable account of that singular lauguage.

He retired from public life in 1845, in consideration of his advanced years, although still in vigorous possession of all the mental and bodily powers required for the due discharge of the functions of his office.

BARROWS. The custom of constructing barrows, or mounds of stones or earth, over the remains of the dead was the most characteristic feature of the sepulchral systems of primitive times. Originating in the common sentiment of humanity, which desires by some visible memorial to honor and perpetuate the memory of the dead, it was practised alike by nations of high and of low development, and continued through all the stages of culture that preceded the introduction of Christianity. The primary idea of sepulture appears to have been the provision of a habitation for the dead; and thus, in its perfect form, the barrow included a chamber or chambers where the tenant was surrounded with all the prized possessions of his previous life. A common feature of the earlier barrows is the enclosing fence, which marked off the site from the surrounding ground. When the barrow was of earth, this was usually effected by an encircling trench or a low *vallum*. When the barrow was a stone structure, the enclosure was usually a circle of standing stones. Sometimes, instead of a chamber formed above ground, the barrow covered a pit excavated under the original surface, in which the interments had been made. In later times the mound itself was frequently dispensed with, and the interments made under the natural surface, within the enclosure of a trench, a *vallum*, or a circle of standing stones. Usually the great barrows occupy conspicuous sites; but in general the external form is no index to the internal construction, and gives no absolute indication of the nature of the sepulchral usages. Thus, while the long barrow is characteristic of the Stone Age it is impossible to tell without direct examination whether it may be chambered or unchambered, or whether the burials within it may be those of burnt or of unburnt bodies.

In England the long barrow usually contains a single chamber, entering by a passage underneath the higher and wider end of the mound. In Denmark the chambers are at irregular intervals along the body of the mound, and have no passages leading into them. The long barrows of Great Britain are often from 200 to 400 feet in length by 60 to 80 feet wide. Their chambers are rudely but strongly built, with dome-shaped roofs.

formed by overlapping the successive courses of the upper part of the side walls. In Scandinavia, on the other hand, such dome-shaped chambers are unknown, and the construction of the chambers as a rule is megalithic, five or six monoliths supporting a capstone of enormous size. Such chambers denuded of the covering mound, or over which no covering mound has been raised, are popularly known in England as "cromlechs" and in France as "dolmens." The prevailing mode of sepulture in all the different varieties of these structures is by the deposit of the body in a contracted position, accompanied by weapons and implements of stone, occasionally by ornaments of gold, jet, or amber. Vessels of clay, more or less ornate in character, which occur with these early interments of unburnt bodies, are regarded as food vessels and drinking cups, differing in character and purpose from the cinerary urns of the Cremation Period in which the ashes of the dead were deposited.

In the case of the long barrows, the traditional form of the circular chambered barrows was retained through various changes in the sepulchral customs of the people, and we find it used both in connection with burnt and with unburnt burials. It was the natural result of the practice of cremation, however, that it should induce a modification of the barrow structure. The chamber, no longer regarded as a habitation to be tenanted by the deceased, became simply a cist for the reception of the urn which held his ashes. The degradation of the chamber naturally produced a corresponding degradation of the mound which covered it, and the barrows of the Bronze Age, in which cremation was the rule, are smaller and less imposing than those of the Stone Age, but often surprisingly rich in the relics of the life and of the art workmanship of the time. In addition to the varied and beautiful forms of implements and weapons,—frequently ornamented with a high degree of artistic taste,—armlets, coronets, or diadems of solid gold and vases of elegant form and ornamentation in gold and bronze, are not uncommon. The barrows of the Bronze Period, like some of those of the Stone Age, appear to have been used as tribal or family cemeteries. In Denmark as many as seventy deposits of burnt interments have been observed in a single mound, indicating its use as a burying-place throughout a long succession of years.

In the early Iron Age there was a partial return to the more massive construction of the earlier periods. Sometimes chambers are found formed of timber instead of stones, in which the bodies were deposited unburnt, although the custom of cremation was largely continued. In Scandinavia both of these modes of sepulture lingered till the close of the Pagan time. One of the latest examples of the great timber-chambered barrow is that at Jellinge in Jutland, known as the barrow of Thyre Danebod, queen of King Gorm the Old, who died about the middle of the 10th century. It is a mound about 200 feet in diameter, and over 50 feet in height, containing a chamber 23 feet long, 8 feet wide, and 5 feet high, formed of massive slabs of oak. Though it had been entered and plundered in the Middle Ages, a few relics, overlocked by its original violaters, were found when it was recently reopened, among which were a silver cup, ornamented with the interlacing work characteristic of the time, and some personal ornaments. It is highly illustrative of the tenacity with which the ancient sepulchral usages were retained even after the introduction of Christianity that King Herald, son and successor of Gorm the Old, who is said to have Christianized all Denmark and Norway, followed the Pagan custom of erecting a chambered tumulus over the remains of his father, on the summit of which was placed a rude pillar-stone, bearing on one side the memorial inscription in Runes, and on the other a representation of the Savior of mankind distinguished by the crossed nimbus surrounding the head.

The Homeric account of the building of the barrow of Hector (*Il.* xxiv.) brings vividly before us the scene so often suggested by the examination of the tumuli of prehistoric times. During nine days wood was collected and brought, in carts drawn by oxen, to the sight of the funeral pyre. Then the pyre was built and the body laid upon it. After burning for twenty-four hours the smouldering embers were extinguished with libations of wine. The white and calcined bones were then picked out of the ashes by the friends and placed in a metallic urn, which was deposited in a hollow grave, or cyst, and covered over with large well-fitting stones. Finally, a barrow of great magnitude was heaped over the remains, and the funeral feast was celebrated. The obsequies of Achilles, as described in the *Odyssey*, were also celebrated with details which are strikingly similar to those observed in tumuli both of the Bronze and Iron Ages.

Herodotus, describing the funeral customs of the Scythians, states that, on the death of a chief, the body was placed upon a couch in a chamber sunk in the earth and covered with timber, in which were deposited all things needful for the comfort of the deceased in the other world. One of his wives was strangled and laid beside him, his cup-bearer, and other attendants, his charioteer, and his horses, were killed and placed in the tombs which was then filled up with earth, and an enormous mound raised high over all. The barrows which cover the plains of ancient Scythia attest the truth of this description. A Siberian barrow, described by Demidoff, contained three contiguous chambers of unhewn stone. In the central chamber lay the skeleton of the ancient chief, with his sword, his spear, his bow, and a quiver full of arrows. The skeleton reclined upon a sheet of pure gold, extending the whole length of the body, which had been wrapped in a mantle broidered with gold and studded with precious stones. Over it was extended another sheet of pure gold. In a smaller chamber at the chief's head lay the skeleton of a female, richly attired, extended upon a sheet of pure gold, and similarly covered with a sheet of the same metal. A golden chain adorned her neck, and her arms were encircled with bracelets of pure gold. In a third chamber, at the chief's feet, lay the skeleton of his favorite horse with saddle, bridle, and stirrups.

So curiously alike in their general features were the sepulchral usages connected with barrow-burial over the whole of Europe, that we find the Anglo-Saxon Saga of Beowulf describing the chambered tumulus with its gigantic masonry "held fast on props with vaults of stone," and the passage under the mound haunted by a dragon, the guardian of the treasures of heathen gold which it contained. Beowulf's own burial is minutely described in terms which have a strong resemblance to the parallel passage in the *Iliad* and *Odyssey*.

The pyramids of Egypt, the mausolea of the Lydian kings, the sepulchres of the Atreidæ at Mycenæ, and the Etruscan tombs at Cære and Volci, are lineally descended from the chambered barrows of prehistoric times, modified in construction according to the advancement of architectural art at the period of their erection. There is no country in Europe destitute of more or less abundant proofs of the almost universal prevalence of barrow-burials in early times. It can be traced on both sides of the basin of the Mediterranean, in Northern Africa, and in Asia Minor, across the plains of Mesopotamia, in the valley of Cabul, and throughout Western India. But more extended research in the archæology of these vast regions is needed to enable

us to correlate their ancient remains with those of the European continent.

In the New World, as well as in the Old, the same customs prevailed over vast areas from a very remote period. In the great plains of North America the dead were buried in barrows of enormous magnitude, which occasionally present a remarkable similarity to the long barrows of Great Britain. In these mounds cremation appears more frequently than inhumation; and both are accompanied by implements, weapons, and ornaments of stone and bone. The pottery accompanying the remains is often elaborately ornamented, and the mound builders were evidently possessed of a higher development of taste and skill than is evinced by any of the modern aboriginal races, by whom the mounds and their contents are regarded as utterly mysterious.

It is not to be wondered at that customs so widely spread and so deeply rooted as those connected with barrow-burial should have been difficult to eradicate. In fact, compliance with the Christian practice of inhumation in the cemeteries sanctioned by the church, was only enforced in Europe by capitularies denouncing the punishment of death on those who persisted in burying their dead after the Pagan fashion or in the Pagan mounds. Yet even in the Middle Ages kings were buried with their swords and spears, and queens with their spindles and ornaments; the bishop was laid in his grave with his crosier and comb, his chalice and vestments; and clay vessels filled with charcoal (answering to the urns of heathen times) are found with the interments in the churches of France and Denmark.

BARROW'S STRAITS, a portion of the channel which runs W. from Baffin's Bay through the islands of the Arctic archipelago to Melville Sound.

BARRY, Sir Charles, a distinguished English architect, was born at Westminster, May 23, 1795. His masterpiece, and perhaps, notwithstanding all unfavorable criticism, the masterpiece of English architecture of the 19th century, is the new palace at Westminster. After the destruction of the old houses of parliament by fire in October 1834, Barry was the successful competitor for erecting the new palace. The first stone was laid in the spring of 1840; the work was steadily carried on in the face of many difficulties, and through a maze of private dissensions and public complaints, and it was at length completed in 1860. Twenty years seemed long in passing, but once past the time assuredly will no more seem too long to have been employed in the erection, or, we might say, allowed for the growth of this stately and beautiful pile. Sir Charles Barry died in 1806.

BARRY, James, an eminent painter, was born at Cork on October 11, 1741, and died in 1806.

As an artist Barry is more distinguished for the strength of his conceptions, and for his resolute and persistent determination to apply himself only to great subjects, than for his skill in designing or for beauty in his coloring. His ideas were generally fine, but the realization of them was almost without exception unsuccessful. His drawing is rarely good, his coloring frequently wretched.

BARS, a province of Hungary, in the district watered by the Neutra, Gran and Zsitva, which belong to the northern part of the system of the Danube. It is for the most part mountainous and has great mineral wealth, especially in gold and silver. Population, 140,000.

BARTAN, a town in Asiatic Turkey, situated near the mouth of the Bartan-su, which was known to the Greeks as the *Parthenius*, and formed part of the boundary between Bithynia and Paphlagonia. Population, 6,000.

BARTAS, Guillaume de Salluste du, a French poet, was born in 1544, and died in 1590 of wounds received in the battle of Ivry.

BARTER, in commerce and political economy, a term used to express the exchange of one commodity for another, contrasted with the sale of commodities for money. It is simply a primitive form of exchange carried on in countries in which the use of money has not yet been introduced or is not prevalent.

BARTFELD, or Bartfa, a town in Hungary, county of Saros, on the River Tepla. Population, 500.

BARTH, Heinrich, a distinguished African explorer, was born at Hamburg in 1821, and died in 1865. He wrote several works on African explorations.

BARTH, or Bart, Jean, son of a fisherman of Dunkirk, was born in 1651 and died in 1702. He served, when young, in the Dutch navy, but when war broke out between Louis XIV. and Holland, he entered the French service. He gained great distinction in the Mediterranean, where he held an irregular sort of a commission, not being then able from his low birth to receive a command in the navy. His success was so great, however, that he was made a lieutenant. He rose rapidly to the rank of captain, and then to that of admiral. The peace of Ryswick put a close to his active service. Many anecdotes are narrated of the courage and bluntness of the uncultivated sailor, who became the popular hero of the French naval service.

BARTHÉLEMY, Auguste Marseille, a French satirical poet, was born at Marseilles in 1796, and died in 1867.

BARTHÉLEMY, Jean Jacques, a celebrated French writer, was born on the 20th January 1716, at Cassis, a little seaport on the shores of the Mediterranean. He was educated, first at the college of the Oratory in Marseilles, and afterwards at that of the Jesuits in the same city. While completing the course of study requisite for the church, which he intended to join, he devoted much attention to Oriental languages, in which he became very proficient. After assuming the ecclesiastical habit, he resided with his family at Aubagne, and during this period of his life was introduced by his friend, M. Cary of Marseilles, to the study of classical antiquities, particularly in the department of numismatics. In 1744 he repaired to Paris, carrying with him a letter of introduction to M. Gros de Boze, perpetual secretary of the Academy of Inscriptions and Belles Letters, and keeper of the medals. He became assistant to De Boze, and on the death of the latter in 1753, was appointed his successor. In the following year he was enabled to pay a visit to Italy, and spent some time in that country, inspecting its rich treasures of classical remains. While on his journey he made the acquaintance of the French ambassador, M. de Stainville, afterwards duc de Choiseul, and of his wife. The minister conceived a great regard for Barthélemy, and on his accession to power loaded the scholar with benefits. In 1759 he gave him a pension on the archbishopric of Albi; in 1765 he conferred on him the treasurership of St. Martin de Tours, and, in 1768, made him secretary-general to the Swiss guards. In 1789 he was elected to the academy, and died in 1795.

BARTHELEMY SAINT-HILAIRE, Jules, French savant and statesman, was born at Paris, August 19, 1805. At the *coup d' etat* he was imprisoned. On his release he resigned his chair, as he could not take the oath of allegiance to Napoleon III., and returned to his studies, especially Sanskrit and ancient Indian philosophy. Elected in 1871 to the Assembly at Bordeaux, he gave constant support to Thiers. In 1876 he was elected a Life-Senator by the Assembly; and he held the Portfolio of Foreign Affairs in Ferry's Ministry—1880-1881. He died January 27, 1889.

BARTHEZ, or BARTHES, PAUL JOSEPH, one of the most celebrated physicians of France, was born December 11, 1734, at Montpellier. He commenced the study of medicine at Montpellier in 1750, and in 1753, when he had only attained his nineteenth year, he received his doctor's degree. In 1761 he obtained a medical professorship at Montpellier. His *Traitement des Maladies Goutteuses*, in two vols. 8vo, appeared in 1802, and he afterward occupied himself in preparing for the press a new edition of his *Elemens de la Science de l' Homme*. He died October 15, 1806.

BARTHOLINUS, GASPARD, a learned Swede, born in 1585, at Malmoë. His precocity was extraordinary; at three years of age he was able to read, and in his thirteenth year he composed Greek and Latin orations, and delivered them in public. In 1613 he was chosen professor of medicine in the University of Copenhagen, and filled that office for eleven years, when, falling into a dangerous illness, he made a vow, that if it should please God to restore him, he would apply himself solely to the study of divinity. He recovered, observed his vow, and obtained the professorship of divinity, with the canonry of Rothschild. He died July 13, 1630.

BARTHOLINUS, THOMAS, a physician, son of the above, was born at Copenhagen in 1619, and died December 14, 1680.

BARTHOLOMEW, ST., one of the twelve apostles, supposed to be the same person as Nathanael. According to the traditional record of Eusobius, he carried Christianity into India. The church at Rome bearing his name claims to preserve his relics. The Roman church holds his festival August 24; the Greek, June 11.

BARTHOLOMEW, MASSACRE OF ST. (Fr. *La St. Barthelemy*), the appellation given to the massacre of the Huguenots in Paris on the night of St. Bartholomew's Day, August 24, 1572. After the death of Francis II. in 1560, Catharine de' Medici assumed the management of affairs, as regent for her son, Charles IX., and showed throughout a more than Italian craft and faithlessness, as well as a cruelty almost without parallel in modern history. In order to annoy the Catholic party of the Duke Francis of Guise, she granted an edict of toleration to the Reformed, at whose head was the Prince of Condé. Both parties took up arms, and there ensued a war which lasted for eight years, the cruelties of which, through mutual exasperation, are almost incredible. Guise was assassinated and Condé was taken prisoner in the battle of Jarnac and shot (1569). His nephew, young Henry, of Bearn, afterward Henry IV., then became leader of the Huguenots, along with Admiral Coligny. It was not till the strength of both sides was exhausted that the peace of St. Germain-en-laye was made in 1570, whereby the Huguenots obtained the free exercise of their religion. Catharine de' Medici now expressed much friendliness toward them, and even endeavored to lull them into negligence by the marriage of the youthful Henry of Bearn with her daughter Margaret, August 18, 1572. Admiral Coligny was drawn to Paris, and the king not only made him costly presents, but gave him an important office in the Council of State. When, by means of the marriage of Prince Henry, the most eminent of the Huguenots had been allured to Paris, Admiral Coligny was wounded by a shot from a window of the palace, August 22, 1572. The king, indeed, hastened to him and swore to avenge him; but, on the very same day the king was persuaded by his mother that the admiral sought his life. "By God's death!" he exclaimed, "let the admiral be slain, and not him only, but all the Huguenots, till not one remains that can give us trouble!" That night Catharine held a council, and appointed St. Bartholomew's Day for carrying into effect the long-contemplated massacre. After Coligny had been murdered a bell in the tower of the royal palace at the hour of midnight gave the signal to the assembled companies of citizens for a general massacre of the Huguenots, in which it is estimated that over 4,000 perished. The king himself is popularly represented as having fired from his palace upon those that were fleeing past, but of this there is no proof. The Prince of Condé and the King of Navarre only saved their lives by going to mass, and appearing to conform to the Catholic church. The pope celebrated the events of St. Bartholomew's Day by a procession to the Church of St. Louis, a grand *Te Deum*, the striking of a medal, and the proclamation of a year of jubilee.

BARTLETT, JOHN RUSSELL, American author, was born at Providence, R. I., October 23, 1805. He was employed by the United States government in 1850-53 as a commissioner for determining the Mexican boundary line, and in 1854 published an account of his explorations and adventures in that capacity. In 1855 he became secretary of state of Rhode Island and in 1861-62 was its acting governor. He died May 28, 1886.

BARTOLINI, LORENZO, an Italian sculptor, was born in 1777, of very humble parents, at Vernio in Tuscany. After various vicissitudes in his youth, during which he had acquired great skill and reputation as a modeller in alabaster, he came to Paris in 1797. His great patron, however, was Napoleon, for whom he executed a colossal bust, and who sent him to Carrara to found a school of sculpture. He remained in Carrara till after the fall of Napoleon, and then took up his residence in Florence, where he continued to reside till his death in 1850. His works, which include an immense number of busts, are numerous and varied.

BARTOLOZZI, FRANCESCO, a distinguished engraver, was born at Florence in 1725, or, according to some authorities, in 1730. For nearly forty years he resided in London, and produced an enormous number of engravings, the best being those of Clytie, after Annibale Carracci, and of the Virgin and Child, after Carlo Dolce. A great proportion of them are from the works of Cipriani and Angelica Kauffmann. Bartolozzi also contributed a number of plates to Boydell's *Shakespeare Gallery*. In 1802 he was invited to Lisbon to superintend a school of engraving in that city. He remained in Portugal till his death, at an advanced age, about the year 1816.

BARTOLUS, professor of the civil law at the University of Perugia, and the most famous master of the dialectical school of jurists, was born in 1314, at Sasso Ferrato, in the duchy of Urbino, and hence is generally styled Bartolus de Saxo Ferrato. His father was Franciscus Severi, and his mother was of the family of the Alfani. He studied the civil law first of all under Cinus at Perugia, and afterwards under Oldradus and Jacobus de Belvisio at Bologna, where he was promoted to the degree of doctor of civil law in 1334. His great reputation dates from his appointment to a chair of civil law in the University of Perugia, 1343, where he lectured for many years, raising the character of the law school of Perugia to a level with that of Bologna. He died in 1357 at Perugia, where a magnificent monument recorded the interment of his remains in the church of San Francisco, by the simple inscription of "Ossa Bartoli."

BARTON, BENJAMIN SMITH, M.D., an American naturalist, who was the first professor of botany and natural history in a college in the United States. He was born in Pennsylvania in 1766, studied for two years at Edinburgh, and afterwards graduated at Göttingen. He settled at Philadelphia, and soon obtained a considerable practice. In 1789 he was appointed to the professorship above mentioned in Philadelphia College; he

was made professor of materia medica in 1795, and on the death of Dr. Rush in 1813 he obtained the chair of practical medicine. In 1802 he was chosen president of the American Philosophical Society. Barton was the author of various works on natural history, botany, and materia medica. By his lectures and writings he may be said to have founded the American school of natural history. He died in 1815.

BARTON, ELIZABETH, the "Maid of Kent," belonged to the village of Aldington in Kent. She was a pious, nervous, and enthusiastic person, subject to epilepsy; and her enthusiasm, unfortunately for herself, took a political turn at a somewhat critical period in English history. When all England was excited with the attempts made by Henry VIII. to obtain a divorce from Queen Catherine, Elizabeth Barton saw visions and heard speeches, all of which related to the contemplated divorce. These she confided to her parish priest, Richard Masters, and he made them known to Dr. Bockling, a canon of Canterbury. Through these men they became widely known, and were everywhere proclaimed to be divine revelations. The chapel at Aldington became the centre of many pilgrimages, and the scene of many excited and tumultuous assemblies. Elizabeth Barton was commonly believed to be a prophetess, and was called the "holy maid of Kent." Meanwhile her visions continued; she saw letters written in characters of gold sent to her by Mary Magdalene, which contained both revelations and exhortations. Among other things she declared that it was revealed to her that if the contemplated divorce took place, the king would be a dead man within seven months. The principal agents for the Pope and for Queen Catherine lent themselves to fan the excitement. Even such men as bishops Fisher and Warham and Sir Thomas More corresponded with the Maid of Kent. At last the king's wrath was aroused. In 1533 Elizabeth with her principal supporters, Masters, Bockling, and several others, were examined before parliament, and sentenced to be executed. She was beheaded at Tyburn April 21, 1534.

BARUCH, son of Neriah, was the friend and amanuensis of the prophet Jeremiah. After the temple at Jerusalem had been plundered by Nebuchadnezzar, he wrote down Jeremiah's prophecies respecting the return of the Babylonians to destroy the state, and read them in the temple before the assembled people at the risk of his life. The roll having been burned by the king's command, Jeremiah dictated the same again. When the temple was destroyed, Baruch went to Egypt with Jeremiah, having been blamed as the prompter of the threatening prophecies uttered by the latter. Nothing certain is known as to his death,—some accounts representing him as dying in Egypt, others in Babylonia. The Talmud adopts the latter opinion, making him the instructor of Ezra, to whom he is said to have communicated the traditions he had received from Jeremiah.

The BOOK OF BARUCH belongs to the Apocrypha, according to Protestants, and to the deutero-canonical productions, according to Roman Catholics.

Much difference of opinion prevails regarding the original language. Some are for a Greek original, others for a Hebrew one; while Fritzsche and Ruetschi think that the first part was composed in Hebrew, the second in Greek. The original seems to have been Hebrew, though Jerome says that the Jews had not the book in that language; and Epiphanius asserts the same thing. The testimony of the former resolves itself into the fact that the original had been supplanted by the Greek; and that of the latter is not of much value, since he gives Baruch, along with Jeremiah and the Lamentations, in a second list of the canonical books. We rely on the statement that the work was meant to be publicly read in the temple (i. 14) as favorable to a Hebrew original, as well as on the number and nature of the Hebraisms, which are sometimes so peculiar that they cannot be resolved into the authorship of a Greek-speaking Jew. That the writer was a Palestinian appears from various passages, such as ii. 17, "For the dead that are in the graves, whose souls are taken from their bodies, will give unto the Lord neither praise nor righteousness;" "Hearken, O ye that dwell about Zion" (iv. 9); "Ye have forgotten the everlasting God that brought you up; and ye have grieved Jerusalem that nursed you" (iv. 8). Both the latter passages betray a Palestinian. Besides, the conception of Wisdom in iii. 12, &c., is Palestinian rather than Alexandrian; for the words in iii. 37 do not refer to the incarnation of the Logos, but to personified Wisdom, as in Sirach xxiv. 10. This points to a Hebrew original. The version seems to be free, especially in the latter part. Who was the translator? A comparison of the Septuagint translation of Jeremiah with that of Baruch will suggest the answer. The agreement between the two is remarkable. Constructions, phrases, and words are the same in them, so that we may conjecture with Ewald and Hitzig that the same translator appears.

Though Baruch professes to have written the book, a later writer speaks in his name. Jeremiah's faithful friend is said to have composed it at Babylon. This view is untenable on the following grounds: —

1. The work contains historical inaccuracies. Jeremiah was living in the fifth year after the destruction of Jerusalem, yet the epistle is dated that year at Babylon. It is unlikely that Baruch left Jeremiah, since the two friends were so united. According to Baruch i. 3, Jeconiah was present in the great assembly before which the epistle was read, whereas we learn from 2 Kings xxv. 27 that he was kept a prisoner as long as Nebuchadnezzar lived. Joakim is supposed to be high priest at Jerusalem (i. 7). But we learn from 1 Chron. vi. 15 that Jehozadak filled that office the fifth year after Jerusalem was destroyed. In i. 2 there is an error. The city was not burned when Jehoiachim was carried away. And if the allusion be to the destruction of the city by Nebuchadnezzar, the temple and its worship are supposed still to exist in i. 8–10. The particulars narrated are put into the fifth year of the exile; yet we read, "Thou art waxen old in a strange country" (iii. 10).

2. Supposing Baruch himself to have been the writer, books later than his time are used in the work. Nehemiah is followed, as in ii. 11 (comp. Nehem. ix. 10). But Eichhorn's language is too strong in calling the contents "a rhapsody composed of various writings belonging to Hebrew antiquity, especially Daniel and Nehemiah."

According to Jerome and Epiphanius, the Jews did not receive the book into their canon; nor is it in the lists given by Josephus, Melito, and others. It has been thought, however, that Origen considered it canonical, because in his catalogue of sacred books he gives Lamentations and "the epistle" along with Jeremiah; and Jeremiah's epistle formed a part of Baruch. The testimony of Origen on this point is perplexing; but it is conceivable that *some* Jews may have thought very highly of the book in his time, though its authority was not generally admitted among the co-religionists. From the position which the book occupied in the Septuagint, *i.e.*, either before or after Lamentations, it was often considered an appendix to Jeremiah by the early Christians, and was regarded in the same light, and of equal authority. Hence the words of it were often quoted as Jeremiah's by Irenæus, Clemens Alexandrinus, and Tertullian.

The versions are the two Latin, a Syriac, and an Arabic. The Latin one in the Vulgate belongs to a time prior to Jerome, and is tolerably literal.

Epistle of Jeremy.—An epistle of Jeremiah's is often appended to Baruch, forming the sixth chapter. According to the inscription, it was sent by the prophet by God's command to the Jews who were to be carried captive to Babylon. The writer describes the folly and absurdity of idolatry in a declamatory style, with repetitions somewhat like refrains. Thus, in verses 16, 23, 29, 65 occurs the sentence, "Whereby they are known not to be gods; therefore fear them not;" "How should a man then think and say that they are gods," in 40, 44, 56, 64, 69; "How then cannot men perceive that they be no gods," in 49, 52. These and other repetitions are unlike Jeremiah's. The concluding verse is abrupt.

BARYTES, or BARYTA, an oxide of the metal barium, usually prepared from the two most common ores of the substance, the sulphate and the carbonate of baryta. It is a highly caustic alkaline poisonous body, which with water forms a hydrate of baryta. On a commercial scale baryta is prepared from the native carbonate (Witherite) by exposing the mineral, mixed with one-tenth of its weight of lamp black, to a very high heat. It is now largely employed in the beet sugar manufacture for separating crystallized sugar from the molasses. A solution of the hydrated oxide, under the name of baryta-water, is of very great use in the chemical laboratory for precipitating metallic oxides, and on account of its sensitiveness to carbonic acid. Sulphate of baryta, or heavy spar, the cawk of miners, is a mineral of very high specific gravity, found abundantly in veins in the mountain limestone of England and frequently associated with metallic ores. When reduced to powder the white varieties are sometimes used as a pigment, but the powder is more frequently applied as an adulterant to white lead. Heavy spar is also used in the manufacture of pottery. The powdered carbonate of baryta is used to some extent in the manufacture of glass, taking the place of a part of the alkali in plate glass, and some portion of red-lead in flint glass. Cassel green, or Rosenstiehl's green, is a pigment manufactured from the calcined manganate of baryta. Both the nitrate and the chloride are of great value as chemical reagents. The nitrate and chlorate are also used to produce a green light in pyrotechny.

BASALT. Basalt rocks are of igneous origin, and are composed essentially of plagioclase feldspar, augite, olivine, and generally magnetic or titaniferous iron. They show all varieties of texture, from smooth compact up to coarsely crystalline; and vary in color from pale blue up to dark-grayish blue, brownish and black. The older basalt-rocks have frequently undergone some changes, owing to the chemical action of percolating water. There are volcanic masses of Tertiary age which occur in such regions as the Thüringer Wald, Erzgebirge, the Eifel, Italy, etc., which closely resemble basalt-rocks. Basalt rocks, especially the compact varieties, often assume a columnar structure. This structure, however, is not confined to basalt-rocks. The columns vary in the number of their angles from three to twelve, but they have most commonly from five to seven sides. In some cases they are more or less perfectly hexagonal. Two of the best known and finest examples of columnar structure in basalt-rocks are Fingal's Cave in the Island of Staffa, on the west coast of Scotland, and the Giant's Causeway.

BASE-BALL. The national game of America, is an evolution of the old English school-boy pastime known as "rounders." It was but a boy's game in this country prior to about 1860, but has been extended throughout the United States, and has secured a strong foothold in Canada. The game needs little introduction to the American reader. It is played on a level field of convenient size, upon which a space 90 feet square is marked out in the form of a diamond, as per diagram. Upon each angle of the diamond are marked the bases — home, first, second and third. The players, nine on each side, are as follows: Pitcher, catcher, first baseman, second baseman, third baseman, right-fielder, left-fielder, centre-fielder and shortstop. The first man to bat takes his position, and the pitcher of the opposite party delivers a ball. This, to be fair, must pass fairly over the home base, not lower than the batsman's knee nor higher than his shoulder. If three good balls are delivered he must strike or go out; if four unfair balls are pitched, he gets a base, and the second man comes in. If he strikes the ball, he must run to at least one base, and, if the hit will allow it, may make all four; thus achieving a home run. Supposing the first man to have reached first base, he

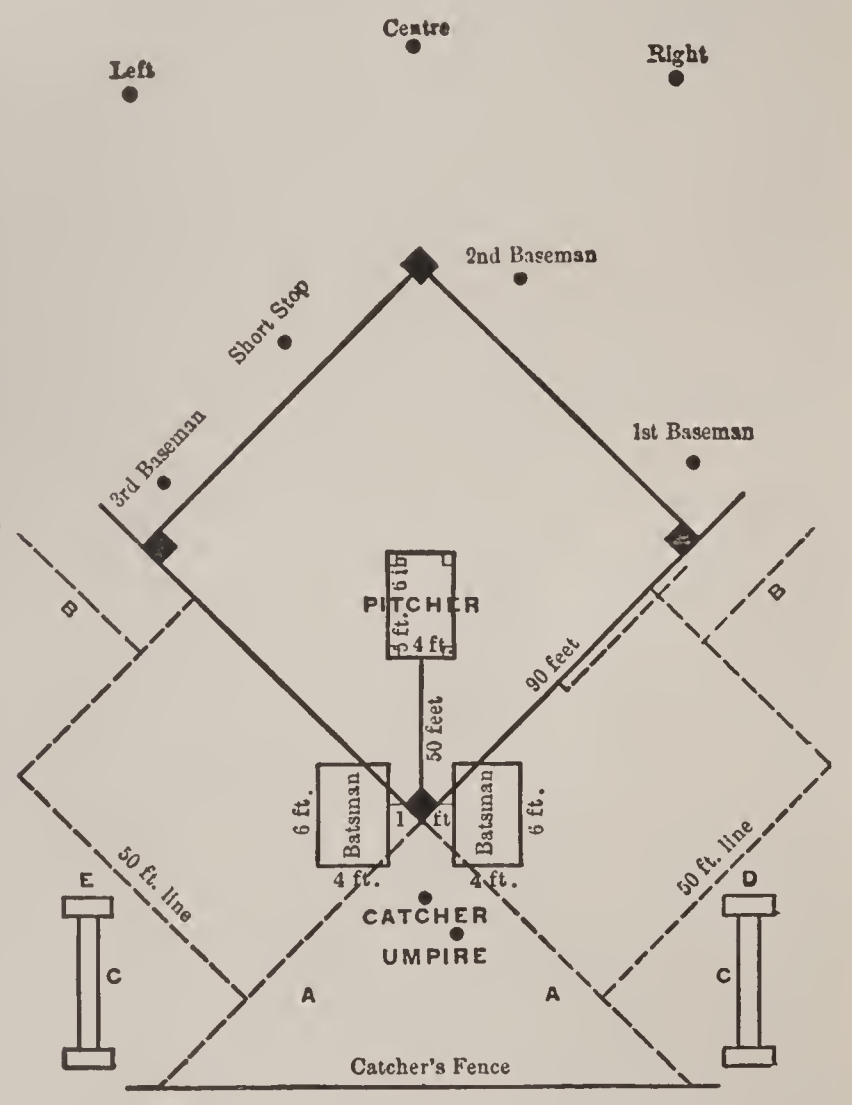

DIAGRAM OF A BASE-BALL GROUND.

AA—Ground reserved for umpire, batsman and catcher. BB—Ground reserved for captain and assistant. CC—Players' bench. D—Visiting players' bat-rack. E—Home players' bat-rack.

must run further on when his successor makes a strike, or he can steal a run to another base if the fielders are negligent. The pitcher's aim is to so deliver the balls as to bring them within the fair line and still to bother the batsman, which he does by putting a twist or curve upon the ball by a peculiar turn of the wrist, very difficult to attain, and answering to "side" or "English" at billiards, or to "inwick" or "outwick" in curling. But in this case the pitcher has only the resistance offered to the ball by the air to rely upon, supplemented of course by his own skill in giving it a rotary motion. If the batsman strikes the ball and the catcher can secure it before it grounds, the batsman is out; and, so, too, if it is taken by a fielder under similar circumstances. A ball hit behind the lines of the diamond is "foul," but the batsman may be caught out on such a ball, though

he cannot run upon it. The nine players go to bat in succession, but when three are caught out, struck out, or run out, the innings is over and the opposite side take their turn at the bat; the first team supplanting them in the field. Two men may be put out at once—*e.g.*, the batsman may be caught and the man on base may fail to reach the next stopping place. Nine innings are played by each side, the one securing the most runs winning the game. If there is a tie an additional inning or more is played. The bat used in League or Association matches must not be more than 42 inches long, nor have a greater diameter than 2½ inches. The ball is from 5 to 5¼ ounces in weight, and from 9 to 9¼ inches in circumference.

BASEDOW, JOHANN BERNHARD, a German author, born at Hamburg 11th September 1723, and died Magdeburg on the 25th July 1790.

BASEL, BÂLE, or BASLE (the first being the German, the others the French and Old French forms of the name), a canton in the N.W. of Switzerland, with an area of 184 English square miles. It is bounded on the N.W. by Alsace, N. by the grand-duchy of Baden, E. by the canton of Aargau, and S. and S.W. by those of Solothurn and Berne. The canton is traversed by the Jura chain, the highest peaks of which rise to from 4000 to 5000 feet. With the exception of the Rhine and its tributaries,—the Birse and the Ergolz,—there are no streams of any magnitude. The soil is for the most part fertile and well cultivated, the mountain sides affording excellent pasturage. The principal pursuits of the people are agricultural and pastoral, though here and there, as at Liestal, Sissach, and Münchenstein, coal-mining is carried on. The chief manufactures are ribbons, woollen, linen, and cotton goods, and iron and steel wares. Politically the canton consists of two divisions, one urban and the other rural (Basel-stadt and Basel-landschaft), each with its own constitution and laws. The former sends two members to the National Council; its legislative power is in the hands of a Great Council which consists of 134 members, chosen for six years, and its executive power belongs to a Lesser Council of 15 members. In the rural division the legislative body (or *Landrath*) is chosen for three years, and has the ultimate authority over all departments; the executive council consists of five members elected for the same period; it sends three members to the National Council. The prevailing language is German. Population of Basel-stadt 48,000, and of Basel-landschaft, 55,000.

BASEL, or BÂLE, the capital of the above canton, and next to Geneva, the largest city in Switzerland, is situated on both sides of the Rhine, 43 miles N. of Berne. Great Basel or the city proper, lies on the south side of the river, and is connected with Little Basel on the north side by a handsome bridge 800 feet long, which was originally erected in 1229. The city is generally well built, but there are fewer remarkable edifices than in many other Continental cities of similar size. The fine old Gothic cathedral, founded 1010, still stands, and contains a number of interesting monuments, besides the tombs of Erasmus Œcolampadius, and other eminent persons. A re-decoration was skilfully effected in 1852–1856. Among other ecclesiastical buildings of interest may be mentioned St. Martin's, restored in 1851; St. Alban's, formerly a monastery; the church of the Bare-footed Friars, which now serves as a store house; Elizabeth Church, of modern erection; and St. Clara's in Little Basel. The town-hall was built in 1508 and restored in 1826. A post-office, a new bank, and an hospital are of recent erection. Besides the university, which was founded by Pope Pius II. in 1459, and reorganized in 1817, Basel possesses a public library of 95,000 vols., with a valuable collection of MSS., a picture-gallery, a museum, a theological seminary for missionaries (established in 1816), a gymnasium, an industrial school, a botanical garden, an orphan-asylum, an institution for deaf-mutes, and various learned societies. Of these may be mentioned the Society for the Propagation of Useful Knowledge, founded in 1777 by Iselin, the Society of Natural History, the Society of National Antiquities, and the Bible Society, which dates from 1804 and was the first of the kind on the Continent. Basel is the seat of an active transit-trade between France, Germany, and Switzerland, and possesses important manufactures of silk, linen, and cotton, as well as dyeworks, bleach-fields, and iron-works, the most valuable of all being the ribbon-trade. Basel was the birthplace of Euler, Bernouilli, Iselin, and perhaps of Holbein; and the names of Erasmus, Œcolampadius, Grynæus, Merian, De Wette, Hagenbach, and Wacknernagel, are associated with the university. Population in 1880, 53,000.

Basel (*Basilia*) first appears in the 4th century as a Roman military post. On the decay of the neighboring city of *Augusta Rauracorum*, the site of which is still marked by the village of Augst, it began to rise into importance, and, after numerous vicissitudes, became a free city of the empire about the middle of the 10th century, and obtained a variety of privileges and rights. In 1356 the most of its buildings were destroyed by an earthquake.

BASEL, THE COUNCIL OF (1431–1443), was the last of the three great reforming councils of the 15th century, coming after the councils of Pisa (1409) and Constance (1414–18). In these three councils the aim of the majority was to reform the church by destroying the absolute supremacy of the Pope, and by curbing the rule of the Roman curia; and the acts of these councils were all designed to re-establish the power of the episcopate by asserting the supremacy of œcumenical councils. At Pisa these aims were only indicated; at Constance they were so far successful that schismatic popes were deposed, and the council practically showed its superiority to the Pope by bestowing the papal chair on Martin V.; and although the fathers of Constance were compelled to separate before they could do much else in the way of reform, they practically laid the foundation by insisting that councils should be held frequently, and by ordering a new council to be called at the end of five years. The council summoned in obedience to this command was the Council of Basel, but the results of its meeting were simply to show the helplessness of the episcopate and the power of the Roman curia. At Basel the labors of Pisa and Constance were undone, and after this council thoughtful men began to see that the church could not be reformed without destroying the Papacy.

The Council of Basel was summoned by Martin V. (1431). He first appointed it to meet at Pavia, then at Siena, but Basel was at last fixed upon. At the very beginning Martin died, but his successor, Eugenius IV., sanctioned all his decrees; and the council accordingly met at Basel on the 23d of July 1431, under the presidency of Cardinal Julian Cesarini. At first all went well. The bishops took care so to arrange the organization of the council and its method of procedure as to make it a true and fair representative of the whole Catholic Church. The members of the council were divided into four equal classes, each consisting of about the same number of cardinals, archbishops, bishops, abbots, &c., and each completely organized, with its president, secretaries, and other officers. This was done to neutralize the votes and prevent the intrigues of the Italian bishops, who were very numerous, and for the most part under the power of the Roman curia. To each of the four was assigned the investigation of a special

class of subjects. Each section met separately in its own hall thrice a week. Each section elected three of its number to form a committee of business. One-third of this committee was changed every month. All the business had to pass through this committee, and it sent down special subjects to be discussed in each of the sections. When the section had discussed the matter it sent its decision with the reasons of it to each of the other sections, who then discussed the matter and gave their opinion upon it. If three sections were agreed upon it, the subject was brought before the whole council for general discussion and a final decision.

The three subjects which were specially assigned to this council were the reunion of the Greek and Latin Churches, the reconciliation of the Bohemians, and the reform of the church according to the resolutions come to at Constance. Soon after the beginning of the council the Roman curia took alarm at the zeal and determination of the assembled bishops, and by intrigues compelled the Pope, who was really anxious for reform, to do all he could to hinder the work of the fathers at Basel. Eugenius twice tried to dissolve the council; but it resisted, maintaining that a council being superior to the Pope could not be dissolved, and the Pope yielded. The bishops refused to admit the Pope's legatees until they admitted the supremacy of the council and promised to obey its decrees.

The first business to which the members addressed themselves was to curb the power of the Pope and of the Roman curia. They tried to do this by attempting to stop the flow of money from all parts of Europe to Rome. They abolished the annates; they declared it illegal in a bishop to send the sum of money commonly presented on his investiture, &c.; and they passed many laws to restrain the luxury and vice of the clergy. These proceedings so alarmed Eugenius that he resolved either to bring the council within the reach of his influence or to dissolve it. The occasion for interference arose out of a debate which the subject of reunion with the Greek Church gave rise to. The Emperor John Palæologus, induced principally by fear of the Turks, had written both to the Pope and to the council on the subject of the reunion of Christendom, and both had entertained his proposals. The majority, however, of the bishops in the council maintained that this subject could not properly be discussed in Italy, and that the deliberations must take place in France, Savoy, or Basel, far from the influence of the Pope. To this Eugenius would not agree; and when the council decided against him, he resolved to assemble another council, which met first at Ferrara and afterwards at Florence.

The rest of the proceedings of the Council of Basel is simply a record of struggles with the Pope. In 1437 the council ordered the Pope to appear before them at Basel. The Pope replied by dissolving the council; the bishops, backed by the emperor and the king of France, continued their deliberations, and pronounced the Pope contumacious for not obeying them. When Eugenius tried to take away the authority of the council by summoning the opposition Council of Florence, the bishops at Basel deposed him. Eugenius replied by a severe bull, in which he excommunicated the bishops, and they answered by electing a new Pope, Amadeus, duke of Savoy, who assumed the name of Felix V. The greater part of the church adhered to Eugenius, but most of the universities acknowledged the authority of Felix and the Council of Basel. Notwithstanding the opposition of Eugenius and his adherents, the Council of Basel continued to pass laws and degrees until the year 1443; and when the bishops separated they declared publicly that they would reassemble at Basel, Lyons, or Lausanne. In 1447 Eugenius died and was succeeded by Nicholas V., who tried to bring about a reconciliation between the parties in the church. A compromise was effected, by which Felix resigned the pontificate, and the fathers of Basel having assembled at Lausanne, ratified the abdication of Felix, and directed the church to obey Nicholas, while Nicholas confirmed by his sanction the acts and decrees of the Council of Basel.

BASHAN, a country lying to the east side of the Jordan valley, towards its northern extremity, often mentioned in Jewish history. The name is understood to be derived from a root signifying *fertile*, or, according to some, *basaltic;* and in some of the ancient versions of the Old Testament it is occasionally rendered by a word indicating fertility. When we first hear of this region in the days of Abraham it is occupied by the Rephaim, whose chief city is Ashteroth Karnaim (Gen. xiv. 5). These Rephaim, with kindred tribes spread over the trans-Jordanic region, were in great part subdued and supplanted by the children of Lot (Deut. ii, 10, 11, 19–21), who in their turn were invaded and displaced by the Amorities (Num. xx. 26–30). By this people, at the time of the Exodus, the whole region north of the Arnon was occupied; and they formed two kingdoms, the most northerly embracing all Bashan and a part of Gilead (Deut. iii. 8, 13; Josh. xii. 4, 5). Og, who is described as a man of gigantic statue, belonging to the race of the Rephaim, was, at the time referred to, the ruler of this kingdom; and having come out against the Israelities, he was overthrown in battle at Edrei, one of his own cities. Subsequently, his country became the allotment of the half tribe of Manasseh (Josh. xiii. 29–31).

The history of Bashan, after its conquest by the Israelites, merges into the general history of that nation, and of Western Asia. It is last mentioned in the Old Testament, in 2 Kings x. 33, in connection with the attacks made by Hazael, the king of Damascus, upon the territory of Israel. Throughout the Psalms and the Prophets Bashan is celebrated for its fertility and luxuriance, its rich pastures, its strong bulls, its fatlings "of rams, of lambs, and of goats, of bullocks;" its oaks and its firs (Ps. xxii. 12; Amos iv. 1; Isa. ii. 13; Jer. l. 19; Ezek. xxxix. 18, xxvii. 6); and its extraordinary fertility is attested by the density of its population (Deut. iii. 4, 5, 14)—a density proved by the unparalleled abundance with which ruined towns and cities are now strewn over the whole country. In the disturbed period which followed the breaking up of the empire of Alexander, its possession was an object of continued contest. Idumæan princes, Nabathæan kings, Arab chiefs, ruled in their turn.

Both in its natural and its archæological aspects, the country of Bashan is full of interest. The Lejâh is one of the most remarkable regions on the earth's surface. It is, in fact a lava bed; a stone torrent poured out . . . over the ruddy yellow clay and the limestone floor of the Haurân valley, high raised by the ruins of repeated eruptions, broken up by the action of fumaroles or blow holes, and cracked and crevassed when cooling by earthquakes, and by the weathering of ages.

In regard to the architectural monuments of the Haurân, the striking feature, says Count de Vogué is the exclusive use of stone. The country produces no wood, and the only rock which can be obtained is a basalt, very hard and very difficult to work. The walls are formed of large blocks, carefully dressed, and laid together without cement, and often let into one another with a kind of dovetail. Roofs, doors, stairs, and windows, are all of stone. This, of course, imparts to the buildings great massiveness of appearance and great solidity, and in multitudes of cases the houses, though

"without inhabitants," are as perfect as when first reared. Since buildings so strong are apparently capable of enduring for any length of time, and since some of these are known, from the inscriptions upon them, to date from before the commencement of the Christian era, it is not unnatural to regard them as, in fact, the work of the earliest known inhabitants of the land, the Amorites of the Rephaim. This however, is contested, on the ground that the extant inscriptions and the architectural style point to a much later date, and must be regarded as at least unproved. Many inscriptions have been found in this region, — most of them composed in Greek, a considerable number in two forms of Shemitic writing (the Palmyrenian or Aramæan, and the Sinaitic or Nabathæan), and some in an unknown character, resembling the Himyaritic. Arabic inscriptions are numerous on buildings of more recent date. The oldest recognizable Greek record bears the name of Herod the Great; and the Nabathæan kings, of the dynasty of Aretas, who reigned from about 100 B.C. at Bozrah have also left memorials.

BASHKIRS, a people who inhabit the Russian governments of Orenburg, Perm, and Samar, and parts of Viatka, especially on the slopes and confines of the Ural, and in the neighboring plains. The Bashkirs are a Tatarized Finnish race, and are called Eestyak by the Kirghiz, in allusion to their origin from a mixture of Ostyaks and Tatars. The name Bashkir or Bash-kûrt appears for the first time in the beginning of the 10th century in the writings of Ibn-Foslan, who, describing his travels among the Volga-Bulgarians, mentions the Bashkirs, as a warlike and idolatrous race. The name was not used by the people themselves in the 10th century, but is a mere nickname. It probably points to the fact that the Bashkirs, then as now, were distinguished by their large, round, short, and, possibly, close-cropped heads. In 1556 they voluntarily recognized the supremacy of Russia, and, in consequence, the city of Upha was founded to defend them from the Kirghiz, and they were subjected to a fur-tax. In 1786 they were freed from taxes; and in 1798 an irregular army was formed from among them. They are now divided into thirteen cantons, and each canton into yûrts or districts, the whole being under the jurisdiction of the Orenburg governor-general. Almost their sole occupation is the rearing of cattle; and they attend to that in a very negligent manner, not collecting a sufficient store of winter fodder for all their herds, but allowing part of them to perish. The Bashkirs are usually very poor, and in winter live partly on a kind of gruel called yûryu, and badly prepared cheese named skûrt. They are hospitable but suspicious, apt to plunder, and to the last degree lazy. They have large heads, black hair, eyes narrow and flat, small fore-heads, ears always sticking out, and a swarthy skin. In general, they are strong and muscular, and capable of enduring all kinds of labor and privation. They profess Mahometanism, but are little acquainted with its doctrines. In intellectual development they do not stand high.

BASIL THE GREAT, an eminent ecclesiastic in the 4th century. He was a leader in the Arian controversy, a distinguished theologian, a liturgical reformer; and his letters to his friends, especially those to Gregory of Nazianzus, give a great amount of information about the stirring period in which he lived. Basil came of a somewhat famous family, which gave a number of distinguished supporters to the church of the 4th century. His eldest sister, Macrina, was celebrated for her saintly life; his second brother was the famous Gregory of Nyssa; his youngest was Peter, bishop of Sebaste; and his eldest brother was the famous Christian jurist Naucratius. It has been observed that there was in the whole family a tendency to ecstatic emotion and enthusiastic piety. Basil was born about 330, at Cæsarea in Cappadocia. While he was still a child, the family removed to Pontus; but he soon returned to Cappadocia to live with his mother's relations, and seems to have been brought up by his grandmother Macrina. It was at Cæsarea that he became acquainted with his life-long friend Gregory of Nazianzus, and it was there that he began that interesting correspondence to which reference has been made. Basil did not from the first devote himself to the church. He went to Constantinople in pursuit of learning, and spent four or five years there and at Athens. It was while at Athens that he seriously began to think of the church, and resolved to seek out the most famous hermit saints in Syria and Arabia, in order to learn from them how to attain to that enthusiastic piety in which he delighted, and how to keep his body under by maceration and other ascetic devices. After this we find him at the head of a convent near Arnesi in Pontus, in which his mother Emmilia, now a widow, his sister Macrina, and several other ladies, gave themselves to a pious life of prayer and charitable works. He was not ordained presbyter until 365, and his ordination was probably the result of the entreaties of his ecclesiastical superiors, who wished to use his talents against the Arians, who were numerous in that part of the country, and were favored by the Arian emperor, who then reigned in Constantinople. In 370 Eusebius, bishop of Cæsarea, died, and Basil was chosen to succeed him. It was then that his great powers were called into action. Cæsarea was an important diocese, and its bishop was, *ex officio*, exarch of the great diocese of Pontus. Basil was threatened with confiscation of property, banishment, and even death, if he did not relax his regulations against the Arians; but he refused to yield, and in the end triumphed. He died in 379. The principal theological writings of Basil are his *De Spiritu Sancti* and his three books against Eunomius. He was a famous preacher, and we possess at least seventeen homilies by him on the Psalms and on Isaiah. His principal efforts as a reformer were directed towards the improvement of the Liturgy (the *Liturgy of the Holy Basil*), and the reformation of the monastic orders of the East.

The name BASIL also belongs to several distinguished churchmen besides Basil the Great. (1.) Basil, bishop of Ancyra (336–360), a semi-Arian, highly favored by the Emperor Constantine, and a great polemical writer; none of his works are extant. (2.) Basil of Seleucia (fl. 448–458), a bishop who shifted sides continually in the Eutychian controversy, and who wrote extensively; his works were published in Paris in 1622. (3.) Basil of Ancyra, fl. 787; he opposed image worship at the second council of Nicæa, but afterwards retracted. (4.) Basil, the founder of a sect of mystics who appeared in the Greek Church in the 12th century (*cf.* Anna Comnena, *Alexiad*, bk. 15).

BASILICA, a term denoting (1) in civil architecture, a court of law, or merchants' exchange, and (2) in ecclesiastical architecture, a church of similar form and arrangement.

The name *basilica*, "a royal portico," or "hall," is evidence of a Greek origin. The portico at Athens in which the second archon, sat to adjudicate on matters touching religion, and in which the council of Areŏpagus sometimes met, was known as Basilike. From this circumstance the term appears to have gained currency as the designation of a law-court, in which sense it was adopted by the Romans. The introduction of *basilicæ* into Rome was not very early. Livy expressly tells us, when describing the conflagration of the city, 210 B.C., that there were none such then. The earliest named is

that erected by M. Porcius Cato, the censor, 183 B.C., and called after its founder *basilica Porcia*. When once introduced this form of building found favor with the Romans. As many as twenty basilicæ are recorded to have existed within the walls of Rome, erected at different periods, and bearing the names of their founders, *e.g.* — *Æmilia*, *Julia*, *Sempronia*, *Ulpia* or *Trajani*, &c. The basilicas were always placed in the most frequented quarter of the city, in the immediate vicinity of a forum, and on its sunniest and most sheltered side, that the merchants and others who resorted thither might not suffer from the severity of the weather. Originally, the bascilicas, like the Royal Exchange in London and the Bourse at Antwerp, were unroofed, consisting of a central area surrounded simply by covered porticoes, without side walls. Subsequently, side walls were erected and the central space was covered by a roof, which was generally of timber, the beams being concealed by an arched or covered ceiling, ornamented with *lacunaria*. Some baslicas (*e.g.* that of Maxentius or "the Temple of Peace") were vaulted.

In plan the basilicas were large rectangular halls, the length of which, according to the rules laid down by Vitruvius, was not to be more than three times or less than twice its width. In any cases where, from the necessity of the locality, the length exceeded these proportions, the excess was to be masked by the construction of small apartments at the further end, on both sides of the tribunal. On each side of the central area was one, or sometimes, as in the Ulpian and Æmilian basilicas, two rows of columns. These were returned at either end, cutting off a vestibule at one extremity, and the tribunal or court proper, forming a kind of transept, elevated above the nave, at the other. Above the aisles thus formed (*porticus*) were galleries, formed by a second row of columns supporting the roof, approached by external staircases, for the accommodation of the general public — men on one side, women on the other. They were guarded by a parapet wall between the columns, high enough to prevent those in the galleries from being seen by those below. Sometimes, as in Vitruvius's own basilica at Fanum, and in that at Pompeii, instead of a double there was only a single row of columns, the whole height of the building, on which the roof rested. In this case the galleries were supported by square piers behind the main columns. The building was lighted with windows in the side walls, and at the back of the galleries. In the centre of the end-wall were the seats of the judge and his assessors, generally occupying a semicircular apse, the prætor's curule chair standing in the centre of the curve. When the assessors were very numerous (according to Pliny *u.s.*, they sometimes amounted to one hundred and eighty), they sat in two or three concentric curves arranged like the seats of a theatre. The advocates and other officials filled the rest of the raised platform, divided from the rest of the building by a screen of lattice-work (*cancelli*). In the centre of the chord of the apse stood an altar on which the *judices* took an oath to administer true justice. The tribunal sometimes ended square instead of apsidally. This is so in the basilica at Pompeii, where the tribunal is parted from the body of the hall by a *podium* bearing a screen of six columns, and is flanked by staircases to the galleries and by the *chalcidica*. The larger and more magnificent basilicas were sometimes finished with an apse at each extremity.

The plans of Trajan's basilica usually give this arrangement.

The fragment of the ground-plan in the marble tablets preserved in the Capitol, usually called that of the Æmilian, but really, as Canina has shown, that of the Ulpian basilica, also shows an apse, designated (*Atrium*) *Libertatis*. This, we know from many ancient authorities, was the locality for the manumission of slaves; and, therefore, the tribunal must have been at the other end, and, doubtless, also apsidal. The basilica of Trajan was one of the largest and most magnificent in Rome. From its existing remains we learn that it was 174 feet in breadth, and more than twice as long as it was broad. The nave, 86 feet in breadth, was divided from the double aisles by rows of granite columns, 35 feet high. An upper row of columns in front of the galleries above the aisles supported a ceiling, covered with plates of gilt bronze. The total internal height was about 120 feet. The walls were cased with white marble from Luna. It was paved with giallo antico and purple breccia. A side court, which enclosed the well-known memorial column to Trajan, was flanked by libraries. The basilica of Maxentius (or of Constantine), usually known as the *Temple of Peace*, in the Forum at Rome, was on an entirely different plan from those already described. The internal colonnades were dispensed with, the central space being covered by a vast quadripartite brick vault, in three bays; and the aisles were roofed with three huge barrel vaults, each 72 feet in span. Columns were only used for ornament. The tribunal was apsidal. Its width was 195 feet, but it was 100 feet shorter than Trajan's basilica. A good example of a provincial basilica remains at Trèves. It is a plain hall, about 90 feet long, the walls, being 100 feet high, without aisles, and it has an apsidal tribunal elevated considerably above the floor. Under the empire, when architectural magnificence reached a hitherto unparalleled height *basilicæ* formed a part of the plan of the palaces erected by the emperors and nobles of Rome. A beautiful example on a small scale, the *Basilica Jovis*, has been recently excavated in the ruins of the palace of the Cæsars on the Palatine. Only the lower part of the walls remains, but the arrangements of the building are singularly perfect, even to the pierced marble *cancelli*, and throw the clearest light on the construction of these halls.

On the establishmen. of Christianity as the imperial religion, these vast halls furnished exactly what was wanted for the religious assemblies of the Christian community. The basilica was, in fact, a ready-made church, singularly adapted for its new purpose. The capacious nave accommodated the ordinary congregations, the galleries or aisles the females and the more dignified worshippers; while the raised tribunal formed the sanctuary, separated by lattice-work from the less sacred portion below, the bishop and his clergy occupying the semicircular apsis. The prætor's curule chair became the episcopal throne, the curved bench of his assessors the seat for the presbyters of the church. The inferior clergy, readers, and singers took the place of the advocates below the tribunal; while on the site of the heathen altar rose the holy table of the Eucharistic feast, divided from the nave by its protecting lattice-work screen, from which were suspended curtains guarding the sacred mysteries from the intrusive gaze of the profane.

The words of Ausonius to the Emperor Gratian, in which he speaks of "the basilicas once full of business, but now of prayers for the emperor's preservation," are a testimony to the general conversion of these civil basilicas into Christian churches. We know this to have been the case with the basilicas of St. Cross and St. Mary Major's at Rome, which were halls in the Sessorian and Liberian palaces respectively, granted by Constantine to the Christians. We may adduce also as evidence of the same practice a passage from the theological romance known as *The Recognitions of Clement*

(bk. x. ch. 71), probably dating from the early half of the 3d century, in which we are told that Theophilus of Antioch, on his conversion by St. Peter, made over "the basilica of his house" for a church. But however this may have been, with, perhaps, the single exception of St. Cross, the existing Christian basilicas were erected from the ground for their sacred purpose. At Rome the columns, friezes, and other materials of the desecrated temples and public buildings furnished abundant materials for their construction. The decadence of art is plainly shown by the absence of rudimentary architectural knowledge in these reconstructions. Not only are columns of various heights and diameters made to do duty in the same colonnade, but even different orders stand side by side; while pilasters assume a horizontal position, and serve as entablatures, as at St. Lawrence's. There being no such quarry of ready-worked materials at Ravenna, the noble basilicas of that city are free from these defects, and exhibit greater unity of design and harmony of proportions. In all cases, however, the type of the civil basilica, which had proved so suitable for the requirements of Christian congregations, was adhered to with remarkable uniformity.

An early Christian basilica may be thus described in its main features:— A porch supported on pillars (as at St. Clement) gave admission into an open court or *atrium*, surrounded by a colonnaded cloister (St. Clement, Old St. Peter's, St. Ambrose at Milan, Parenzo). In the centre of the court stood a cistern or fountain (*cantharus*, *phiale*), for drinking and ablutions. In close contiguity to the atrium, often to the west, was the baptistery, usually octagonal (Parenzo). The church was entered through a long narrow porch (*narthex*), beyond which penitents, or those under ecclesiastical censure, were forbidden to pass. The narthex was sometimes internal (St. Agnes), sometimes an external portico (St. Lawrence's, St. Paul's). Three or four lofty doorways, according to the number of the aisles, set in marble cases, gave admission to the church. The doors themselves were of rich wood, elaborately carved with scriptural subjects, or of bronze similarly adorned and often gilt. Magnificent curtains, frequently embroidered with sacred figures or scenes, closed the entrance, keeping out the heat of summer and the cold of winter.

The interior consisted of a long and wide nave, often 80 feet across, terminating in a semicircular apse, with one or sometimes (St. Paul's, Old St. Peter's, St. John Lateran) two aisles on each side, separated by colonnades of marble pillars supporting horizontal entablatures (Old St. Peter's, St. Mary Major's, St. Lawrence's) or arches (St. Paul's, St. Agnes, St. Clement, the two basilicas of St. Apollinaris at Ravenna). Above the pillars the clerestory wall rose to a great height, pierced in its upper part by a range of plain round-headed windows. The space between the windows and the colonnade (the later triforium-space) was usually decorated with a series of mosaic pictures in panels (Old St. Peter's, St. Paul's, St. Mary Major's, St. Apollinaris within the walls at Ravenna). The upper galleries of the secular basilicas were not usually adopted in the West, but we have examples of this arrangement at St. Agnes, St. Lawrence's, and the Quattro Santi Coronati. They are much more frequent in the East. The colonnades sometimes extended quite to the end of the church (St. Mary Major's), sometimes ceased some little distance from the end, thus forming a transverse aisle or transept (St. Paul's, Old St. Peter's, St. John Lateran). Where this transept occurred it was divided from the nave by a wide arch, the western face and soffit of which were richly decorated with mosaics. Over the crown of the arch we often find a bust of Christ or the holy lamb lying upon the altar, and, on either side, the evangelistic symbols, the seven candlesticks, and the twenty-four elders. Another arch spanned the semicircular apse, in which the church always terminated. This was designated the *arch of triumph*, from the mosaics that decorated it, representing the triumph of the Saviour and His church. The conch or semi-dome that covered the apse was always covered with mosaic pictures on a gold ground, usually paintings of our Lord, either seated or standing, with St. Peter and St. Paul, and other apostles and saints, on either hand. The beams of the roof were generally concealed by a flat ceiling, richly carved and gilt. The altar, standing in the centre of the chord of the apse on a raised platform, reached by a flight of steps, was rendered conspicuous by a lofty canopy supported by marble pillars (*Ciborium*, *baldacchino*), from which depended curtains of the richest materials. Beneath the altar was the *confessio*, a subterranean chapel, containing the body of the patron saint, and relics of other holy persons. This was approached by descending flights of steps from the naves or aisles. The *confessio* in some cases reproduced the original place of interment of the patron saint, either in a catacomb-chapel or in an ordinary grave, and thus formed the sacred nucleus around which the church arose. We have good examples of this arrangement at St. Peter's, St. Paul's, St. Pudenziana, and St. Lawrence. It was copied, as we will see hereafter, in the original Cathedral of Canterbury. The bishop or officiating presbyter advanced from his seat in the centre of the semicircle of the apse to the eastern side (ritually) of the altar, and celebrated the Eucharist with his face to the congregation below. At the foot of the altar steps a raised platform occupying the upper portion of the nave formed a choir for the singers, readers and other inferior clergy. This oblong space was separated from the aisles and from the western portion of the nave by low marble walls or railings. From these walls projected *ambones*, or pulpits with desks, also of marble, ascended by steps. That for the reader of the gospel was usually octagonal, with a double flight of steps westward and eastward. That for the reader of the epistle was square or oblong.

The exterior of the basilicas was usually of a repulsive plainness. The vast brick walls were unrelieved by ornament, without any compensating grace of outline or beauty of proportion. An exception was made for the west front, which was usually covered with plates of marble mosaices or painted stucco (Old St. Peter's, St. Lawrence's). This part was frequently crowned with a hollow projecting cornice (St. Lawrence's, Ara Cœli). But in spite of any decorations the external effect of a basilica must always have been heavy and unattractive.

To pass from general description to individual churches, the first place must be given, as the earliest and grandest examples of the type, to the world-famous Roman basilicas; those of St. Peter, St. Paul, and St. John Lateran. It is true that no one of these exists in its original form, Old St. Peter's having been entirely removed in the 16th century to make room for its magnificent successor; and both St. Paul's and St. John Lateran having been greatly injured by fire, and the last named being so completely modernized as to have lost all interest. Of the two former, however, we possess drawings, and plans, and minute descriptions, which give an accurate conception of the original buildings. As to St. Peter's, the church was entered through a vast colonnaded *atrium*, 212 feet by 235 feet, with a fountain in the centre,— the atrium being preceded by a porch mounted by a noble flight of steps. The church was 212 feet wide by 380 feet long; the nave,

80 feet in width, was six steps lower than the side aisles, of which there were two on each side. The four dividing colonnades were each of twenty-two Corinthian columns. Those next the nave supported horizontal entablatures. The inner colonnades bore arches, with a second clerestory. The main clerestory walls were divided into two rows of square panels containing mosaics, and had windows above. The transept projected beyond the body of the church,— a very unusual arrangement. The apse, of remarkably small dimensions, was screened off by a double row of twelve wreathed columns of Parian marble, of great antiquity, reported to have been brought from Greece, or from Solomon's Temple. The pontifical chair was placed in the centre of the curve of the apse, on a platform raised several steps above the presbytery. To the right and left the seats of the cardinals followed the line of the apse. At the centre of the chord stood the high altar beneath a ciborium, resting on four pillars of porphyry. Beneath the altar was the subterranean chapel, the centre of the devotion of so large a portion of the Christian world, believed to contain the remains of St. Peter; a vaulted crypt ran round the foundation wall of the apse in which many of the popes were burried. The roof showed its naked beams and rafters.

The cathedral on the island of Torcello near Venice, originally built in the 7th century, but largely repaired *circa* 1000 A.D., deserves special attention from the fact that it preserves, in a more perfect state than can be seen elsewhere, the arrangements of the seats in the apse.

Another very remarkable basilicia, less known than it deserves to be, is that of Parenzo in Istria, *circa* 542 A.D. Few basilicas have sustained so little alteration.

In the Eastern church, though the erection of St. Sophia at Constantinople introduced a new type which almost entirely superseded the old one, the basilican form, or as it was then termed *dromical*, from its shape being that of a race-course, was originally as much the rule as in the West. The earliest church of which we have any clear account, that of Paulinus at Tyre, 313–322 A.D., described by Eusebius, was evidently basilican, with galleries over the aisles, and had an atrium in front. That erected by Constantine at Jerusalem, on the site of the Holy Sepulchre, 333, followed the same plan, as did the original churches of St. Sophia and of the Apostles at Constantinople. Both these buildings have entirely passed away, but we have an excellent example of an Oriental basilica of the same date still standing in the church of the Nativity at Bethlehem, rebuilt by Justinian in the 6th century.

Constantinople still preserves a basilican church of the 5th century, that of St. John Studios, 463, now a mosque.

BASILICA, a code of law, drawn up in the Greek language, with a view to put an end to the uncertainty which prevailed throughout the empire of the East in the 9th century as to the authorized sources of law. This uncertainty had been brought about by the conflicting opinions of the jurists of the 6th century as to the proper interpretation to be given to the legislation of the Emperor Justinian, from which had resulted a system of teaching which had deprived that legislation of all authority, and the imperial judges at last were at a loss to know by what rules of law they were to regulate their decisions. An endeavor had been made by the Emperor Leo the Isaurian to remedy this evil, but his attempted reform of the law had been rather calculated to increase its uncertainty; and it was reserved for Basilius the Macedonian to show himself worthy of the throne, which he had usurped by purifying the administration of justice and once more reducing the law into an intelligible code. There has been considerable controversy as to the part which the Emperor Basilius took in framing the new code. There is, however, no doubt that he abrogated in a formal manner the ancient laws, which had fallen into desuetude, and the more probable opinion would seem to be, that he caused a revision to be made of the ancient laws which were to continue in force, and divided them into forty books, and that this code of laws was subsequently enlarged and distributed into sixty books by his son Leo the Philosopher. A further revision of this code is stated to have been made by Constantinus Porphyrogenitus, the son and successor of Leo, but this statement rests only on the authority of Theodorous Balsamon, a very learned canonist of the 12th century, who, in his preface to the *Nomocanon* of Patriarch Photius, cites passages from the Basilica, which differ from the text of the code as revised by the Emperor Leo. The weight of authority, however, is against any further revision of the code having been made after the formal revision which it underwent in the reign of the Emperor Leo, who appointed a commission of jurists under the presidency of Sympathius, the captain of the body-guard, to revise the work of his father, to which he makes allusion in the first of his *Novellæ*. This latter conclusion is the more probable from the circumstance, that the text of the code, as revised by the Emperor Leo, agrees with the citations from the Basilica which occur in the works of Michael Psellus and Michael Attaliates, both of them high dignitaries of the court of Constantinople, who lived a century before Balsamon, and who are silent as to any second revision of the code having taken place in the reign of Constantinus Porphyrogenitus, as well as with other citations from the Basilica, which are found in the writings of Mathæus Blastares and of Constantinus Hermenopulos, both of whom wrote shortly after Balsamon, and the latter of whom was far too learned a jurist and too accurate a lawyer to cite any but the official text of the code.

Authors are not agreed as to the origin of the term Basilica, by which the code of the Emperor Leo is now distinguished. The code itself appears to have been originally entitled *The Revision of the Ancient Laws.*

BASILICATA, or, as it is also called, POTENZA, a province of Italy, bounded on the N. by Capitanata, N.E. by Terra di Bari, E. by Otranto and the Gulf of Taranto, S. by Calabria Citra, S.W. by the Mediterranean, W. by Principato Citra, and N.W. by Principato Ultra. It has an area of 4120 English square miles, and is divided into the four districts of Lagonegro, Matera, Melfi, Potenza.

BASILIDES, one of the most celebrated of the Gnostics, flourished probably about 120 A.D. Extremely little is known of his life. He is said to have been born in Syria and to have studied at Alexandria, and this is probably correct. There is, to some extent, a corresponding uncertainty with regard to the precise doctrines held by him.

BASILISK,— of the Greeks, and Tsepha (cockatrice) of the Hebrews,— a name applied by the ancients to a horrid monster of their own imagination, to which they attributed the most malignant powers and an equally fiendish appearance. The term is now applied, owing to a certain fanciful resemblance, to a genus of Lizards belonging to the family *Iguanidæ*, the species of which are characterized by the presence of a membraneous bag on the crown of the head, which they can distend or contract at will, and of a fin-like ridge along the back and part of the tail. Both appendages are admirably adapted for aiding the basilisk in swimming, while they do not impede its movements on land,— its mode of life being partly aquatic, partly arboreal. The Mitred Basilisk occurs in Guiana, the Hooded Basilisk in Amboyna.

BASINGSTOKE, a market and borough town in the county of Hants, 45 miles from London.

BASKERVILLE, JOHN, a celebrated printer, and the introducer of many improvements in type-founding, was born at Wolverley in Worcestershire in 1706, and died in 1775.

BASKET, a utensil made of twigs, rushes, or strips of wood, as well as of a variety of other materials, interwoven together, and used for holding or carrying any commodity. Modern ingenuity has applied many substances before unthought of to the construction of baskets, such as iron and even glass. But wicker-work being the oldest as well as the most universal invention, it alone will be treated of in the present article. The process of interweaving twigs, seeds, or leaves, is practiced among the rudest nations of the world; and as it is one of the most universal of arts, so also does it rank among the most ancient industries, being probably the origin of all the textile arts of the world. A bundle of rushes spread out may be compared to the warp of a web, and the application of others across it to the woof, also an early discovery; for basket-work is literally a web of the coarsest materials. The ancient Britons appear to have excelled in the art of basket-making, and their baskets were highly prized in Rome as we learn from Martial. Among many uncivilized tribes at the present day baskets of a superior order are made and applied to various useful purposes. The North American Indians prepare strong water-tight "Wattape" baskets from the roots of a species of *Abies*, and these they frequently adorn with very pretty patterns made from the dyed quills of their native porcupine. The Indians of South America weave baskets equally useful from the fronds of the Carnahuba and other palms. The Kaffres and Hottentots of South Africa are similarly skillful in using the Ilala reed and the roots of plants; while the tribes of central Africa and the Abyssinians display great adroitness in the art of basket-weaving.

Basket-making, however, has by no means been confined to the fabrication of those simple and useful utensils, from which its name is derived. Of old, the shields of soldiers were fashioned of wicker-work, either plain or covered with hides; and the like has been witnessed among modern savages. In Britain, the shields of the ancient warriors, and also their huts, even up to the so-called palaces of the Saxon monarchs, were made of wicker-work; and their boats of the same material, covered with the skins of animals, attracted the notice of the Romans. Herodotus mentions boats of this kind on the Tigris and Euphrates, but with this difference, that the former seem to have been of the ordinary figure of a boat, whereas the latter were round and were covered with bitumen. Boats of this shape, about 71 feet in diameter, are used at the present day on these rivers and boats of analogous construction are employed in crossing the rivers of India which have not a rapid current. Nothing can be more expeditious or more simple than the fabrication and materials of these vessels, if they merit that name. One may be made by six men in as many hours — only two substances, hides and bamboo, almost always accessible, being used. Window screens, perambulators, chairs, &c., are now largely made of basket-work, and the light pony basket carriages in general use are the representatives of the Continental Holstein wagon of the early part of the century, which was a two-horse basket carriage of considerable size. In Berlin and Kiel there now exist large factories of basket furniture, devoted to the manufacture of basket-work, chairs, tables, stands, frames, screens, &c., and the use of this description of furniture is very general in Continental houses.

The materials which are actually employed in the construction of basket-work are numerous and varied, and to the principal of these allusion will be made below. As it is, however, from various species of willow that the largest supply of basket-making materials is produced, we shall first confine our attention to this source. Willows for basket-work are extensively grown in Holland, Belgium, France, and Germany, whence large quantities are exported to Great Britain and even to the United States. The willows of France are highly esteemed by basket-makers as firm, clean rods; and the Dutch produce are lowest in value, being soft and pithy. No Continental rods equal those of English growth for their tough and leathery texture, and the finest of all basket-making willows are now cultivated in large quantities in the valleys of the Thames and the Trent.

The genus *Salix*, to which all willows and osiers belong, is extremely complex in its botanical characters, and the species and varieties, as systematically arranged, are very numerous.

It was long supposed that willows flourish nowhere but with abundance of water. Undoubtedly the osier class thrive well with a considerable degree of humidity, but a dry well-drained soil is best suited for all hard-wooded varieties. For the laying out of a willow holt, the land should be well drained, cleared and tilled to a depth of about one foot. Willows are propagated solely from cuttings, which retain their vitality long, and strike with great facility. The cuttings are made about 9 inches long, and two or three may be obtained from a single rod. They should be planted in rows from 16 to 18 inches apart, the plants in each row being placed at intervals of from 8 to 12 inches according to the size of the willow under cultivation; and the entire length of the cutting should be pushed into the ground. The planting may be done at any time from late autumn to early spring during the period of plant rest, when the ground is free from frost. At the end of each year the shoots are to be cut down close to the ground, manure is laid on between the rows and ploughed in, and the soil should be kept as open and free from weeds as arable land. The produce of the first year will, as a rule, be of little value; nevertheless, in Mr. Scaling's opinion, it is of consequence that the rods should be cut down. The second year's crop should yield a good return; in the third year the plants are at their best, and for the ten following years they should exhibit undiminished productiveness, after which they gradually decline in strength.

The rods intended for basket-making are either taken entire, cut from the root, split asunder, or stripped of their bark, according to the work to be produced; but in all cases they are previously soaked in water, and indeed sometimes boiled. The stripping is performed by drawing the willows through a bifurcated iron implement called a brake, which removes the bark, and the willows are then cleaned, as far as necessary, by manual operation with a knife. When they are boiled previous to peeling a very nice light brown color is developed in the wood by the action of the tannin contained in the bark, and rods thus prepared are much more durable than those peeled white. Next they are exposed to the sun and air, and afterwards placed in a dry situation. But it is not the less necessary to preserve willows with their bark in the same manner; for nothing can be more injurious than the humidity inherent in the plant; and previous to use they must be soaked some days in water also. The barked or white osier is then divided into bundles or faggots according to the size; the larger being reserved to form the strong work in the skeleton of the basket, and the smaller for weaving the

bottom and sides. Should the latter be applied to ordinary work, they are taken whole; but for implements of slight and finer texture, each osier is divided into splits and skains of different degrees of size. Splits are osiers cleft into four parts, by means of an implement employed for that purpose called a cleaver, which is a wedge-shaped tool inserted at the point or top end of the rod and run down through its entire length. These are next drawn through an implement resembling the common spoke-shave, keeping the grain of the split next the iron or stock of the shave, while the pith is presented to the steel edge of the instrument, which is set in an oblique direction to the wood; and in order to bring the split into a shape still more regular, it is passed through another implement called an upright, consisting of a flat piece of steel, each end of which is fashioned into a cutting edge, like that of an ordinary chisel. The flat is bent round, so that the two edges approach each other at a greater or less interval by means of regulating screws, and the whole is fixed into a handle. By passing the splits between the two edges they are reduced to skains, the thickness of which is determined by the interval between the edges of the tool.

The implements required by a basket-maker are few and simple. They consist, besides the preceding, of knives, bodkins, leads for keeping the work steady while in process; and where the willows are worked as rods a heavy piece of iron called a beater is employed to beat them close as they are woven in. On the Continent, where fancy baskets are made, blocks are required on which the webs of wicker-work are set to particular shapes.

From the simplicity of this manufacture, a great many individuals, independent of professed basket-makers, are occupied in it; and it affords suitable employment to the blind in the several asylums and workshops established for their reception in this and other countries.

In addition to willows, a large variety of other materials is employed in the fabrication of wicker-work. Among the most important of these are splits of various species of bamboo, with which the Japanese and Chinese manufacture baskets of unequalled beauty and finish. The bamboo wicker-work with which the Japanese sometimes encase their delicate egg-shell porcelain is a marvellous example of manipulation, and they and the Chinese excel in the application of bamboo wicker-work to furniture. The "canes" or rattans of commerce, stems of species of *Calamus* and *Dæmonorops* are scarcely less important as a source of basket materials. In India "Cajan" baskets are extensively made from the fronds of the Palmyra palm, *Borassus flabelliformis;* and this manufacture has in recent years been established in the Black Forest of Germany, where it is now an important and characteristic staple.

BASNAGE, JACQUES, pastor of the Walloon Church at the Hague, was born at Rouen in Normandy on the 8th of August 1653. He was the son of Henri Basnage, one of the ablest advocates in the parliament of Normandy. At the age of seventeen, having acquired a good knowledge of the Greek and Latin authors, as well as of the English, Spanish, and Italian languages, he went to Geneva, where he began his theological studies under Mestrezat, Turretin, and Tronchin; he completed them at Sedan, under the professors Jurieu and Leblanc de Beaulieu. He then returned to Rouen, where he was received as pastor in September 1676; and in this capacity he remained till the year 1685, when, the exercise of the Protestant religion being suppressed at Rouen, he obtained leave of the king to retire to Holland. He settled at Rotterdam, and continued a minister pensionary there till 1691, when he was chosen pastor of the Walloon Church of that city. In 1709, the pensionary Heinsius secured his election as one of the pastors of the Walloon Church at the Hague, intending to employ him not only in religious but also in civil affairs. Accordingly he was engaged in a secret negotiation with Marshal d'Uxelles, plenipotentiary of France at the congress of Utrecht,—a service which he executed with so much success, that he was afterwards instrusted with several important commissions, all of which he discharged with such ability and address that Voltaire said of him that he was fitter to be a minister of state than the minister of a parish. The Abbé Dubois, who represented France at the Hague in 1716, in negotiating a defensive alliance between France, England, and the States-General, received instructions to consult with Basnage; they accordingly acted in concert, and the alliance was concluded in January 1717. He died on the 22d September 1723.

BASQUE PROVINCES (*Provincias Vascongadas*). The three Spanish provinces known by this name, which are distinguished from all the other divisions of Spain by the character, language, and manners of the inhabitants, and by the enjoyment of political privileges which make the form of their government nearly republican, are Biscay (Vizcaya), Guipuzcoa, and Alava. The territory occupied by them is in the form of a triangle, bounded on the N. by the Bay of Biscay, S. by Soria, E. by Navarra and part of France, and W. by Santander and Burgos. It comprises an area of 2958 square miles; population in 1857, 414,146. These three provinces are more particularly described under their respective heads. The French Basque provinces now form the arrondissements of Bayonne and Mauleon. The Basque language which is also prevalent in Navarre, is still spoken by about 600,000 Spaniards and French. Its native name is *Eskuara*. It cannot be classed with any Indo-European or Semitic tongue, and appears to be of earlier origin, presenting some grammatical analoligies with Mongol, North American, and certain East African languages. No written Basque is known of earlier date than the 15th century, and little genuine literature exists; the orthography is therefore arbitrary, and the earliest writings are difficult to interpret. All that has yet been noticed regarding manners, customs, institutions, and legends may be paralled by those of other Pyrenean peoples, or traced to foreign influences. But, through their moral qualities, physical situation, and historical circumstances the Basques have built up and preserved a body of customs and institutions highly original in the mass. Each province is governed by a parliament composed of representatives selected partly by election, partly by lot, among the householders of each country parish or town. A deputation named by the parliament, ensures the strict observance of the special laws and customs of the province, and negotiates with the representatives of the Spanish crown. Delegates from the three parliaments meet annually to consider the common interests of the provinces; they employ a seal representing three interlaced hands, with the motto *Iruracbat*, "the three are one" but no written federal pact exisits. Much speculation regarding the origin of the Basques has been indulged in without sufficient special knowledge. The belief that they originally occupied great part of Spain and Southern France, founded on the apparently Basque character of certain local names, is very generally accepted.

BASS ROCK, an islet of greenstone and trap tuff, about a mile in circumference, on the coast of East Lothian near the entrance to the Firth of Forth.

BASS'S STRAITS, the channel which separates Tasmania from Victoria. It is about 180 miles in length from E. to W., and about 140 from N. to S.

BASSÁHIR, a Rájput hill state in Hindustán, under the political superintendence of the Lieutenant-Governor of the Panjáb, is bounded on the N. by the Spiti valley, on the E. by Chinese Tartary, on the S. by the district of Garhwál, and on the W. by several small hill states.

BASSANO, a city in Italy in the province of Vincenza. It stands on the river Brenta, over which there is a bridge 180 feet in length, built by Palladio. It is surrounded with walls, and has six gates, one of which, also by Palladio, is very much admired. Population, 13,254.

BASSANO, GIACOMO DA PONTE, a Venetian painter, born in 1510 at Bassano. His compositions, though they have not much eloquence or grandeur, have abundance of force and truth; the local colors are well observed, the carnations are fresh and brilliant, and his chiaroscuro and perspective are unexceptionable. He is said to have finished a great number of pictures; but his genuine works are somewhat rare and valuable,—many of those which are called originals being copies either by the sons of Bassano, or by others. He died in 1592, aged eighty-two.

BASSE-TERRE, the capital of St. Christopher's, one of the British West India Islands. Population, 8500. See SAINT CHRISTOPHER'S

BASSE-TERRE, formerly the capital of Guadeloupe, one of the French West India Islands. Population, 9480. See GUADELOUPE.

BASSEIN, a British district on the eastern coast of the Bay of Bengal, under the jurisdiction of the Chief Commissioner of Burmah, is bounded on the N. by the districts of Kyouk Phoo and Myanoung, on the E. by the district of Rangoon, and on the S. and W. by the Bay of Bengal.

BASSEIN, the principal place of the district of the same name, on the eastern bank of the Bassein River, one of the main arteries by which the waters of the Irawadi discharge themselves into the sea. It forms an important seat of the rice trade, and has great capabilities both from a mercantile and a military point of view, as it commands the great outlet of the Irawadi. It fell before the British arms, in May 1852, during the second Burmese war.

BASSELIN, OLIVIER, an old French poet or writer of verses, was born in the Val-de-Vire in Normandy about the middle of the 14th century, and died about 1418 or 1419.

BASSI, LAURA MARIA CATERINA, an Italian lady, eminently distinguished for her learning, was born at Bologna in 1711. On account of her extraordinary attainments she received a doctor's degree, and was appointed professor in the philosophical college, where she delivered public lectures on experimental philosophy till the time of her death. She was elected member of many literary societies, and carried on an extensive correspondence with the most eminent European men of letters. She was well acquainted with classical literature, as well as with that of France and Italy. In 1738 she married Giuseppe Verrati, a physician, and left several children. She died in 1778.

BASSIANUS, JOANNES, a distinguished professor in the law school of Bologna, the pupil of Bulgarus and the master of Azo.

BASSOON, a musical wind instrument of the reed order, made of wood, and played through a bent mouthpiece of metal.

BASSO-RILIEVO. See SCULPTURE, page 5305, Vol. IX.

BASTAR, a feudatory state in the Central Provinces of British India, bounded on the N. by the Kanker zamíndárí and Ráipur district; on the E. by the Bendrá Nawágarh zamíndárí and Ráipur, Jaipur state and Sabarí River; on the S. by the Sironchá district; and on the W. by the Indrávatí River and the Aherí zamíndárí.

BASTARD is a person born out of lawful wedlock, *i.e.*, whose parents have not been married previous to his birth. The rules by which legitimacy is determined vary chiefly as to the effect to be assigned to the subsequent marriage of the bastard's parents. The law of Scotland, and of most Continental countries, following the rules of the civil and canon law, legitimizes the bastard whose parents afterwards marry. The same principle was at one time advocated by the clergy in England, but summarily rejected by the famous statute of Merton. The English law, however, takes no account of the interval between the marriage and the birth; provided the birth happens after the marriage, the offspring is legitimate. The presumption of law is in favor of the legitimacy of the child of a married woman, and at one time it was so strong that Lord Coke held that "if the husband be within the four seas, *i.e.*, within the jurisdiction of the king of England, and the wife hath issue, no proof shall be admitted to prove the child a bastard unless the husband hath an apparent impossibility of procreation." It is now settled, however, that the presumption of legitimacy may be rebutted by evidence showing non-access on the part of the husband, or any other circumstance showing that the husband could not in the course of nature have been the father of his wife's child. If the husband had access, or the access be not clearly negatived, and others at the same time were carrying on a criminal intercourse with the wife, a child born under such circumstances is legitimate. If the husband had access intercourse must be presumed, unless there is irresistible evidence to the contrary. Neither husband nor wife will be permitted to prove the non-access directly or indirectly. Children born after a divorce *a mensa et thoro* will be presumed to be bastards unless access be proved. A child born so long after the death of a husband that he could not in the ordinary course of nature have been its father is illegitimate. The period of gestation is presumed to be *about* nine calendar months; and if there were any circumstances from which an unusually long or short period of gestation could be inferred, special medical testimony would be required. A marriage between persons within the prohibited degrees of affinity was before 1835 not void, but only voidable, and the ecclesiastical courts were restrained from bastardizing the issue after the death of either of the parents. Lord Lyndhurst's Act declared all such existing marriages valid, but all future marriages between persons within the prohibited degrees of consanguinity or affinity were made null and void, and the issue illegitimate. (See MARRIAGE.)

The incapacities attaching to a bastard consist principally in this, that he cannot be heir to any one; for being *nullius filius*, he is therefore of kin to nobody, and has no ancestor from whom an inheritable blood can be derived. Therefore, if there be no other claimant upon an inheritance than such an illegitimate child, it escheats to the lord. And as bastards cannot be heirs themselves, so neither can they have any heirs but those of their own bodies; for as all collateral kindred consists in being derived from the same common ancestor, and as a bastard has no legal ancestor, he can have no collateral kindred, and consequently no legal heirs, except such as claim by a lineal descent from himself. And hence, if a bastard purchase land, and die seised thereof without issue and intestate, the land escheats to the lord of the fee. Originally a bastard was deemed incapable of holy orders, and disqualified by the fact of his birth from holding any dignity in the church;

but this doctrine is now obsolete, and in all other respects there is no distinction between a bastard and another man.

BASTÍ, a district of British India, in the Benares division, under the jurisdiction of the Lieutenant-Governor of the N. W. Provinces. It is bounded on the N. by the independent state of Nepál, on the E. by the district of Gorakhpur, on the S. by the Ghagrá River, and on the W. by the district of Gondá in Oudh.

BASTIA, a fortified town and seaport on the eastern coast of the island of Corsica, and the capital of an arrondissement. It occupies a very picturesque situation, rising from the sea in the form of an amphitheatre; but the town itself is ill-built, and the streets are narrow and crooked. The harbor, which is defended by a citadel, has a narrow and difficult entrance. Bastia is the seat of a royal court for the island, and of tribunals of commerce and primary jurisdiction, and has a theatre, a military and a civil hospital, a communal college, a model school, a museum, and a library of 30,000 volumes.

BASTIAT, FREDERICK, the son of a merchant of Bayonne, was born in that town on the 19th of June 1801. After being educated at the colleges of Saint-Sever and of Soréze, he entered in 1818 the counting-house of his uncle at Bayonne. Here his intensely active mind soon began to interest itself in the study of the principles of commerce, but he felt no enjoyment in the practical routine of mercantile life, and in 1825 retired to a property at Mugron, of which he became posssessor on the death of his grandfather. Thus withdrawn from society, he devoted himself with eagerness to meditation and study, mastering the English and Italian languages and literatures, speculating on the problems of philosophy and religion, digesting the doctrines of Adam Smith and Say, of Charles Compte and Dunoyer, cultivating music, experimenting in farming, and talking over all that he read, thought and desired, with his able, dearly loved, and life-long friend, M. Felix Coudroy. He welcomed with enthusiasm the Revolution of 1830.

In 1845 he came to Paris in order to superintend the publication of his *Cobden et la Ligue, ou l'agitation Anglaise pour la liberté des échanges*, and was very cordially received by the economists of the capital; from Paris he went to London and Manchester, and made the personal acquaintance of Cobden, Bright, and other leaders of the league. When he returned to France he found that his writings had been exerting a powerful influence; and in 1846 he assisted in organizing at Bordeaux the first French Free Trade Association.

He wrote in rapid succession a series of brilliant and effective pamphlets and essays, showing how socialism was connected with protection, and exposing the delusions on which it rested. While thus occupied he was meditating the composition of a great constructive work, meant to renovate economical science by basing it on the principle that "interests, left to themselves, tend to harmonious combinations, and to the progressive preponderance of the general good." The first volume of this work *Les Harmonies Économiques* was published in the beginning of 1850. In the autumn of that year, when working on the second volume, the increase of his malady compelled him to repair to Italy. After lingering at Pisa and Florence he reached Rome, but only to die there on the 24th of December 1850, in the fiftieth year of his age. An affecting account of the last days of this illustrious martyr to the cause of economical science and political justice was published by his friend, M. Paillottet.

The life-work of Bastiat, in order to be fairly appreciated, requires to be considered in three aspects. (1.) He was the advocate of free trade, the opponent of protection. The general theory of free trade had, of course, been clearly stated and solidly established before he was born, and his desire to see its principles acted on in France was quickened and confirmed by the agitation of the Anti-Corn-Law League for their realization in England, but as no one denies it to have been a great merit in Cobden to have seen so distinctly and comprehensively the bearing of economical truths which he did not discover, no one should deny it to have been also a great merit in Bastiat. He did far more than merely restate the already familiar truths of free trade. He showed as no one before him had done how they were applicable in the various spheres of French agriculture, trade, and commerce. Now, the abstract theory of free trade is of comparatively little value; its elaboration so as to cover details, its concrete application, and its varied illustration are equally essential. And in these respects it owes more, perhaps, to Bastiat than to any other economist. In the *Sophismes Économiques* we have the completest and most effective, the wisest and the wittiest exposure of protectionism in its principles, reasonings, and consequences which exists in any language. (2.) He was the opponent of socialism. In this respect also he had no equal among the economists of France. He alone fought socialism hand to hand, body to body, as it were, not caricaturing it, not denouncing it, not criticzing under its name some merely abstract theory, but taking it as actually presented by its most popular representatives, considering patientiy their proposals and arguments, and proving conclusively that they proceed on false principles, reasoned badly, and sought to realize generous aims by foolish and harmful means. Nowhere will reason find a richer armory of weapons available against socialism than in the pamphlets published by Bastiat between 1848 and 1850. These pamphlets will live, it is to be hoped, at least as long as the errors which they expose. (3). He attempted to expound in an original and independent manner political economy as a science. In combating, first, the Protectionists, and, afterwards, the Socialists, there gradually rose on his mind a conception which seemed to him to shed a flood of light over the whole of economical doctrine, and, indeed, over the whole theory of society, viz., the harmony of the essential tendencies of human nature. The radical error, he became always more convinced, both of protectionism and socialism, was the assumption that human interests, if left to themselves, would inevitably prove antagonistic and anti-social, capital robbing labor, manufactures ruining agriculture, the foreigner injurying the native, the consumer the producer, &c.; and the chief weakness of the various schools of political economy, he believed he had discovered in their imperfect apprehension of the truth that human interests, when left to themselves, when not arbitrarily and forcibly interfered with, tend to harmonious combination, to the general good. Such was the point of view from which Bastiat sought to expound the whole of economical science. The sphere of that science he limited to exchange, and he drew a sharp distinction between utility and value. Political economy he defined as the theory of value, and value as "the relation of two services exchanged." The latter definition he deemed of supreme importance. It appeared to him to correct what was defective or erroneous in the conflicting definitions of value given by Adam Smith, Say, Ricardo, Senior, Storch, &c., to preserve and combine what was true in them, and to afford a basis for a more consistent and developed economical theory than had previously been presented. It has, however, found little acceptance, and Roscher, Cairnes, and others seem to have shown it to be ambiguous and misleading. A consequence of it on which he

laid great stress was that the gratuitous gifts of nature, whatever be their utility, are incapable of acquiring value,—what is gratuitous for man in an isolated state remaining gratuitous in a social condition. Thus, land, according to Bastiat, is as gratuitous to men at the present day as to their first parents, the rent which is paid for it—its so-called value—being merely the return for the labor and capital which have been expended on its improvement. In the general opinion of economists he has failed to establish this doctrine, failed to show that the properties and forces of nature cannot be so appropriated as to acquire value. His theory of rent is nearly the same as Mr. Carey's, *i. e.*, decidedly anti-Ricardian. His views on the growth of capital and interest, on landed property, competition, consumption, wages, and population, are independent, and, if not unqualifiedly true, at least richly suggestive.

BASTILLE (from *bastir*, now *bâtir*, to build), in the earlier use of the word, was any fortified building forming part of a system of defence or attack; and the name was especially applied to several of the principal points in the ancient fortifications of Paris. In the reign of king John, or even earlier, the gate of Saint Antoine was flanked by two towers; and in 1369 Hugues Aubriot, at the command of Charles V., changed it into a regular bastille or fort by the addition of six others of massive structure, the whole united by thick walls and surrounded by a ditch 25 feet wide. Various extensions and alterations were afterwards effected; but the building remained substantially what it was made by the vigorous provost, a strong and gloomy structure, with eight stern towers. As the ancient fortifications of the city were superseded, the use of the word bastille as a general designation gradually died out, and it became restricted to the castle of Saint Antoine, the political importance of which made it practically, long before it was actually, the only bastille of Paris. The building had originally a military purpose, and it appears as a fortress on several occasions in French history. When Charles VII. retook Paris from the English in 1436, all his opponents in the city took refuge in the Bastille, which they were prepared to defend with vigor, but the want of provisions obliged them to capitulate. In 1588 the duke of Guise took possession of the Bastille, gave the command of it to Bussy-Leclerc, and soon afterwards shut up the whole parliament within its walls, for having refused their adherence to the League. When Henri IV. became master of Paris he committed the command of the Bastille to Sully, and there he deposited his treasures, which at the time of his death amounted to the sum of 1,870,000 livres. On the 11th of January 1649, the Bastille was invested by the forces of the Fronde, and, after a short cannonade, capitulated on the 13th of that month. The garrison consisted of only twenty-two men. The Frondeurs concluded a peace with the court on the 11th of March; but it was stipulated by treaty that they should retain possession of the Bastille, which, in fact, was not restored to the king till the 21st of October 1651. In that year took place the famous fight of the Porte St. Antoine between Condé and Turenne, on which occasion the forces of Condé owed their safe retreat into Paris to the cannon of the Bastille.

At a very early period, however, the Bastille was employed for the custody of state prisoners, and it was ultimately much more of a prison than a fortress. According to the usual account, which one is tempted to ascribe to the popular love of poetical justice, the first who was incarcerated within its walls was the builder himself, Hugues Aubriot. Be this as it may, the duke of Nemours spent thirteen years there in one of those iron cages which Louis XI. called his *fillettes* and Jacques d'Armagnac, Poyet, and Chabot were successively prisoners. It was not till the reign of Louis XIII. that it became recognized as a regular place of confinement; but from that time till its destruction it was frequently filled to embarrassment with men and women of every age and condition.

Of the treatment of prisoners in the Bastille very various accounts have been given even by those who speak from personal experience, for the simple reason that it varied greatly in different cases. The prisoners were divided into two main classes, those who were detained on grounds of precaution or by way of admonitory correction, and those who lay under presumption or proof of guilt. The former were subject to no investigation or judgment, and the length of their imprisonment depended on the will of the king: the latter were brought to trial in the ordinary courts or before special tribunals, such as that of the Arsénal,—though even in their case the interval between their arrest and their trial was determined solely by the royal decree, and it was quite possible for a man to grow old in the prison without having the opportunity of having his fate decided. Until guilt was established, the prisoner was registered in the king's name, and—except in the case of state prisoners of importance, who were kept with greater strictness and often in absolute isolation—he enjoyed a certain degree of comfort and freedom. Visitors were admitted under restrictions; games were allowed; and, for a long time, at least, exercise was permitted in open parts of the interior. Food was both abundant and good, at least for the better class of prisoners; and instances were not unknown of people living below their allowance and, by arrangement with the governor, saving the surplus. When the criminality of the prisoner was established, his name was transferred to the register of the "commission," and he became exposed to numerous hardships and even barbarities, which, however, belonged not so much to the special organization of the Bastille as to the general system of criminal justice then in force.

At the breaking out of the Revolution the Bastille was attacked by the Parisians, taken and razed to the ground on the 14th July 1789. At the time of its capture only seven prisoners were found in it. A very striking account of the siege will be found in Carlyle's *French Revolution*, vol. i. The site of the building is now marked by a lofty column of bronze, dedicated to the memory of the patriots of July 1789 and 1830. It is crowned by a gilded figure of Mercury spreading his pinions in the act of flight.

BASTROP, the capital of the county of the same name, in central Texas, is situated on the left bank of the Colorado river, thirty-six miles below Austin, and is an important shipping point for cotton. It contains a cotton mill and other factories, six churches, a number of schools, and a newspaper office, and has a population of 5,500.

BASTWICK, Dr. John, born at Writtle, in Essex, in 1593, was a physician at Colchester, whose celebrity rests on his strong opposition to the Roman Catholic ceremonial. He died in 1646.

BAT, the common name of a well marked group of Mammals forming the order *Cheiroptera* (*i.e.*, wing-handed), distinguished from all other members of their class by the possession of true organs of flight. These consist of a delicate membrane stretching from limb to limb on both sides of the body, enclosing the greatly elongated digits of the hand, and in many cases extending beyond the posterior limbs so as to include the tail. Their whole structure bears evidence of special adaptation to the purpose of sustained flight, while their mode of progression on the ground is as awkward as

their aerial movements are graceful. The eyes of the bat are usually small, but the organs of the other senses in most cases attain extraordinary development. The external ear is generally large, as in the Long-eared Bat of Britain (*Plecotus auritus*), in which it is equal to the entire length of the body. In the group to which the Horse-shoe Bats (*Rhinolophus ferrum equinum*) belong, the nose is surrounded with leaf-like appendages, the purpose of which is by no means well determined, but which, probably, are as useful to the organ of smelling as is the greatly elongated auricle to that of hearing. In all bats the wing-membrane affords a vast expansion of the sense of touch, which is of such exquisite delicacy that bats which have been deprived of their sight, and as far as possible of hearing and smelling, are yet able by it alone to fly about in perfect security, avoiding, with apparent ease, all the obstacles that may be placed in their way.

BATAVIA, a flourishing post village in Claremont county, O., 24 miles east of Cincinnati. It has five churches, a national bank and three newspapers, besides several industries of growing importance.

BATAVIA, a town of Kane county, Ill., on the Fox river, thirty-six miles west of Chicago, with which it has direct railroad communication. It possesses valuable water-power, which is utilized for paper-mills, wind-mill factories, and other manufactures. The surrounding country is one of the richest agricultural and grazing portions of the State, and extensive dairy interests are carried on, most of the products of which find a ready market at Chicago. Batavia has a national bank, a newspaper, eight churches and good schools, and a population (1890) of 3,613.

BATAVIA, the capital of Genesee county, N. Y., is situated on Tonawanda creek, thirty-two miles southwest of Rochester, and thirty-six miles northeast of Buffalo, and enjoys superior railroad accommodations. It contains two national and two other banks, three newspaper offices, nine churches, a public library, a convent and ample school accommodation. It is the seat of the State Arsenal, of the New York State Institute for the Blind, and of the Union School. It has important manufactures of plows and agricultural implements, steam-engines, sash and blinds, and other products, and a population (1890) of 7,200.

BATAVIA, a large city and seaport on the north coast of the island of Java, and the capital of all the Dutch settlements in the East. It is situated on both sides of the river Jacatra or Tjiliwong, in a swampy plain at the head of a capacious bay. The streets are for the most part straight and regular, and many of them have a breadth of from 100 to 200 feet. In several cases there is a canal in the centre lined with stone, and defended by low parapets or banks, while almost every street and square is fringed with trees. The old town has greatly changed from what it was in the 18th century. It was then surrounded by strong fortifications, and contained a number of important buildings, such as the town-house (built in 1652 and restored in 1706), the exchange, the infirmary and orphan asylum, and the European churches. But the ramparts were long ago demolished.

The population of Batavia is very varied,— the Dutch residents being a comparatively small class, and greatly intermixed with Portuguese and Malays. Here are found members of the different Indian nations, originally slaves; Moors and Arabs, who are principally engaged in navigation, but also inhabit the Rua Malacoa district, and trade in gold and precious stones; Javanese, who are cultivators; and Malays, chiefly boatmen and sailors, and adherents of Mahometanism. But, perhaps, the most important Asiatic element is the Chinese, who are both numerous and industrious.

Batavia is still a great commercial depôt, though it has had to contend against the rivalry of Singapore. The bay is rendered secure by a number of islands at its mouth, and is capacious enough for a much larger traffic than it has ever seen; but it unfortunately grows very shallow towards the shore. Ships of 300 or 400 tons anchor about a mile and a half out; the river is navigable a couple of miles inland for vessels of 30 or 40 tons, but the entrance is narrow, and requires continual attention to keep it open.

The exports from Batavia to the other islands of the archipelago, and to the ports in the Malayan peninsula, are rice, sago, coffee, sugar, salt, oil, tobacco, teak timber and planks, Java cloths, brass wares, &c., and European, Indian, and Chinese goods. The produce of the Eastern Islands is also collected at its ports for re-exportation to India, China, and Europe,— namely, gold-dust, diamonds, camphor, benzoin, and other drugs; edible bird-nests, trepang, rattans, bees' wax, tortoise-shell, and dyeing woods from Borneo and Sumatra; tin from Banca; spices from the Moluccas; fine cloths from Celebes and Bali; and pepper from Sumatra. From Bengal are imported opium, drugs, and cloths; from China, teas, raw silk, silk piece-goods, varnished umbrellas, coarse China wares, nankeen, paper, and innumerable smaller articles for the Chinese settlers. British manufactures also are largely introduced. The number of British ships that entered in 1870 was 103, with a tonnage of nearly 31,000 tons, the total number of vessels of all nationalities being 783, with a tonnage of nearly 194,000.

Almost the only manufactures of any importance are the distillation of arrack, which is principally carried on by Chinese, the burning of lime and bricks, and the baking of pottery; and even the brick-making is in a decaying condition.

Batavia owes its origin to the Dutch general John Petersen Coen, who, in 1619, took the town of Jacatra (which had been built on the ruins of the old Javanese town of Sunda Calappa), destroyed it, and founded in its stead the present city, which soon acquired a flourishing trade and increased in importance. The ruins of Jacatra are to be found between Batavia and Anjol. In 1699 Batavia was visited by a terrible earthquake, and the streams were choked by the mud from the volcano of Gunong Salak (7244 feet high), by which the climate was so affected that the city became notorious for its unhealthiness, and was in great danger of being altogether abandoned. In the twenty-two years from 1730 to 1752, 1,100,000 deaths are said to have been recorded. General Daendals, who was governor from 1808 to 1811, caused the ramparts of the town to be demolished, and began to form a nucleus of a new city at Weltevreden. By 1816 nearly all the Europeans had left the old town. In 1811 a British armament was sent against the Dutch settlements in Java, which had been incorporated by France, and to this force Batavia surrendered on the 8th of August. It was restored, however, to the Dutch by the treaty of 1814. Population, 100,000.

BATES, WILLIAM, D.D., an eminent Nonconformist divine, born in November 1625, and died in July 1699, in the 74th year of his age.

BATH, the chief town of Somersetshire, and, from the elegance of its buildings and the beauty of its situation, one of the finest cities in England, is situated mainly on the right bank of the river Avon, though a considerable extension has also taken place on the left.

According to the legend to which the inhabitants adhered till the middle of the 18th century, Bath was

founded by the British king Bladud; but its origin cannot be historically traced to an earlier date than the 1st century, when the Romans established here the city of *Aquæ Solis*, numerous remains of which have at various times been discovered. During the Saxon period the chief events in its annals are the foundation of an abbey by Offa in 775, and the coronation of Edgar in 973. In the reign of William Rufus the city was reduced to ashes, but it soon recovered its prosperity under its abbot John of Villula, and his successors. Richard Cœur de Lion granted its first charter as a free borough, and about the same time the foundations were laid of its wool manufactures. In 1297 the city was first represented in parliament; in 1447 it obtained a charter from Henry VI., and one from Queen Elizabeth in 1590. In the 18th century it became the most fashionable watering-place in England, and was greatly extended under the direction of the architect Wood. Population, 60,000.

BATH, a city and port of the United States, being the chief town of the county of Sagadahock, in Maine. It is situated on the west bank of the Kennebec, about twelve miles from the sea, and forms a station on the branch railway from Brunswick to Rockland. The prosperity of the town depends almost entirely on its shipping and fisheries; and its manufacturing industries are nearly all auxiliary to the one department, shipbuilding, in which it competes with the chief American centres of the trade. It has a fine custom-house built of granite. The city was settled in 1756, incorporated in 1780, and raised to the rank of a city in 1850. Population (1890 census), 8,713.

BATH, the county seat of Steuben county, N. Y., is situated on Conhocton creek, thirty-seven miles north-west of Elmira, and on the Rochester division of the Erie railroad. It contains one national and two other banks, carriage factories and other industrial enterprises, five churches, a Union school, an orphan asylum, and the New York State Soldiers' Home, and has a population (1890) of 5,200.

BATH, KNIGHTS OF THE. See HERALDRY and KNIGHTHOOD.

BATHGATE, a town of Scotland, in the county of Linlithgow, 19 miles from Edinburgh, and 26 from Glasgow, with both of which it has direct communication by railway.

BATHS. In the ordinary acceptation of the word a bath is the immersion of the body in a medium different from the ordinary one of atmospheric air.

Ancient Baths.— Bathing, as serving both for cleanliness and for pleasure, has been almost instinctively practiced by nearly every people. The most ancient records mention bathing in the rivers Nile and Ganges. From an early period the Jews bathed in running water, used both hot and cold baths, and employed oils and ointments. So also did the Greeks; their earliest and commonest form of bathing was swimming in rivers, and bathing in them was practiced by both sexes. Warm baths were, according to Homer, used after fatigue or exercise. The Athenians appear for a long time only to have had private baths, but afterwards they had public ones: the latter seem to have originated among the Lacedæmonians, who invented the hot-air bath, at least the form of it called after them, the *Laconicum*. Although the baths of the Greeks were not so luxurious as those of some other nations, yet effeminate people were accused among them of using warm baths in excess; and the bath servants appear to have been rogues and thieves, as in later and larger establishments. The Persians must have had handsomely equipped baths, for Alexander the Great admired the luxury of the baths of Darius.

But the baths of the Greeks, and probably of all Eastern nations, were on a small scale as compared with those which eventually sprung up among the Romans. In early times the Romans used after exercise to throw themselves into the Tiber. Next, when ample supplies of water were brought into the city, large cold swimming baths were constructed, the earliest of which appear to have been the *piscina publica* (312 B.C.), near the Circus Maximus, supplied by the Appian aqueduct, the *lavacrum* of Agrippina, and a bath at the end of the Clivus Capitolinus. Next, small public as well as private baths were built; and with the empire more luxurious forms of bathing were introduced, and warm became far more popular than cold baths.

Public baths or *balneæ* were first built in Rome after Clodius brought in the supply of water from Præneste. After that date baths began to be common both in Rome and in other Italian cities; and private baths, which gradually came into use, were attached to the villas of the wealthy citizens. Mæcenas was one of the first who built public baths at his own expense. After his time each emperor, as he wished to ingratiate himself with the people, lavished the revenues of the state in the construction of enormous buildings, which not only contained suites of bathing apartments, but included gymnasia, and sometimes even theatres and libraries. Such enormous establishments went by the name of *thermæ*. The principal thermæ were those of Agrippa 21 B.C., of Nero 65 A.D., of Titus 81, of Domitian 95, of Commodus 185, of Caracalla 217, and still later those of Diocletian 302, and of Constantine. The technical skill displayed by the Romans in rendering their walls and the sides of reservoirs impervious to moisture, in conveying and heating water, and in constructing flues for the conveyance of hot air through the walls, was of the highest order.

The Roman baths contained swimming baths, warm baths, baths of hot air, and vapor baths.

The water was heated ingeniously. Close to the furnace, about 4 inches off, was placed the *calidarium*, the copper (*ahenum*) for boiling water, near which, with the same interval between them, was the copper for warm water, the *tepidarium*, and at the distance of 2 feet from this was the receptacle for cold water, or the *frigidarium*, often a plastered reservoir. A constant communication was kept up between these vessels, so that as fast as hot water was drawn off from the calidarium a supply was obtained from the tepidarium, which, being already heated, but slightly reduced the temperature of the hotter boiler. The tepidarium, again, was supplied from the frigidarium, and that from an aqueduct. In this way the heat which was not taken up by the first boiler passed on to the second, and instead of being wasted, helped to heat the second — a principle which has only lately been introduced into modern furnaces. In the case of the large thermæ the water of an aqueduct was brought to the *castellum*, or top of the building, and was allowed to descend into chambers over the hypocaustum, where it was heated and transmitted in pipes to the central buildings. Remains of this arrangement are to be seen in the baths of Caracalla.

The arrangements of the *thermæ* were mainly those of the balance on a larger scale. Some idea of their size may be gathered from such facts as these, that in the baths of Diocletian one room has been transmuted into a church of most imposing proportions, and that the outside walls of the baths of Caracalla extend about a quarter of a mile on each of the four sides. A visit to the remains of the baths of Titus, of Diocletian, or of Caracalla impresses the mind strongly with a sense of the vast scale on which they were erected, and Ammianus's designation of them as provinces appears scarcely

exaggerated. It is said that the baths of Caracalla contained 1600, and those of Diocletian 3200 marble seats for the use of the bathers. In the largest of the thermæ there was a stadium for the games of the young men, with raised seats for the spectators. There were open colonnades and seats for philosophers and literary men to sit and discourse or read their productions aloud, or for others to discuss the latest news. Near the porticoes, in the interior open space, rows of trees were planted. There was a *sphæristerium*, or place for playing ball, which was often over the apodyterium; but it must be confessed that the purposes of many portions of these large edifices have not been made out in as satisfactory a way as those of smaller baths.

The magnificence of many of the thermæ and their luxurious arrangements were such that some writers, as Seneca, are quite lost in their descriptions of them. The piscinæ were often of immense size,—that of Diocletian being 200 feet long,—and were adorned with beautiful marbles. The halls were crowded with magnificent columns, and were ornamented with the finest pieces of statuary. The walls, it has been said, were covered with exquisite mosaics that imitated the art of the painter in their elegance of design and variety of color. The Egyptian syenite was encrusted with the precious green marbles of Numidia. The rooms contained the works of Phidias and Praxiteles. A perpetual stream of water was poured into capacious basins through the wide mouths of lions of bright and polished silver; water issued from silver, and was received on silver. "To such a pitch of luxury have we reached," says Seneca, "that we are dissatisfied if we do not tread on gems in our baths."

The richer Romans used every variety of oils and pomades (*smegmata*); they scarcely had true soaps. The poorer class had to be content with the flour of lentils, an article used at this day for the same purpose by Orientals. The most important bath utensil was the strigillus, a curved instrument made of metal, with which the skin was scraped and all sordes removed.

The bath servants assisted in anointing, in using the strigillus, and in various other menial offices. The poorer classes had to use their strigils themselves. The various processes of the aliptæ seem to have been carried on very systematically.

The hot baths appear to have been open from 1 P.M. till dark. It was only one of the later emperors that had them lighted up at night. When the hot baths were ready (for, doubtless, the plunge baths were available at an earlier hour,) a bell was rung for the information of the people. Among the Greeks and Romans the eighth hour, or 1 o'clock, before their dinner, was the commonest hour for bathing. The bath was supposed to promote appetite, and some voluptuaries had one or more baths after dinner, to enable them to begin eating again; but such excesses, as Juvenal tells us, occasionally proved fatal. Some of the most effeminate of the emperors are said to have bathed seven or eight times in the course of a day. In early times there was delicacy of feeling about the sexes bathing together; even a father could not bathe with his sons, but latterly, under most of the emperors, men and women often used the same baths. There frequently were separate baths for the women, as we see at Pompeii, or at Badenweiler; but although respectable matrons would not go to public baths, promiscuous bathing was common during the empire.

The public baths and thermæ were under the more immediate superintendence of the ædiles. The charge made at a public bath was only a quadrons or quarter of an as, about half a farthing. Yet cheap though this was, the emperors used to ingratiate themselves with the populace, by making the baths at times gratuitous.

Wherever the Romans settled, they built public baths; and wherever they found hot springs or natural stufæ, they made use of them, thus saving the expense of heating, as at the *myrteta* of Baiæ, or the *aquæ solis* of Bath. In the cities there appear to have been private baths for hire, as well as the public baths; and every rich citizen had a set of baths attached to his villa, the fullest account of which is given in the *Letters* of Pliny, or in Ansonius's *Account of a Villa on the Moselle*, or in Statius's *De Balneo Etrusco.* Although the Romans never wholly gave up cold bathing, and that practice was revived under Augustus by Antonius Musa, and again under Nero by Charmis (at which later time bathing in the open sea became common), yet they chiefly practiced warm bathing (*calida lavatio*). This is the most luxurious kind of bathing, and when indulged to excess, is enervating. The women were particularly fond of these baths, and were accused, at all events in some provincial cities, of drunkenness in them.

The unbounded licence of the public baths, and their connection with modes of amusement that were condemned, led to their being to a considerable extent proscribed by the early Christians. The early fathers wrote that bathing might be practiced for the sake of cleanliness or of health, but not of pleasure; and Gregory the Great saw no objection to baths being used on Sunday. About the 5th century many of the large thermæ in Rome fell into decay. The cutting off of the aqueducts by the Huns, and the gradual decrease of the population, contributed to this. Still it is doubtful whether bathing was ever disused to the extent that is usually represented. It was certainly kept up in the East in full vigor at Alexandria and at Brusa. Hot bathing, and especially hot air and vapor baths, were adopted by the Mahometans; and the Arabs brought them with them into Spain. The Turks, at a later time, carried them high up the Danube, and the Mahometans spread or, it may be more correct to say, revived their use in Persia and Hindustan. The Crusaders also contributed to the spread of baths in Europe, and hot vapor baths were specially recommended for the leprosy so prevalent in those days. After the commencement of the 13th century there were few large cities in Europe without hot vapor baths. We have full accounts of their regulations,—how the Jews were only allowed to visit them once a week, and how there were separate baths for lepers. In England they were called hothouses. Erasmus, at the date of the Reformation, spoke of them as common in France, Germany, and Belgium; he gives a lively account of the mixture of all classes of people to be found in them, and would imply that they were a common adjunct to inns. They seem after a time to have become less common, though Montaigne mentions them as being still in Rome in his day. In England the next revival of baths was at the close of the 17th century, under the Eastern name of Hummuns, or the Italian name of Bagnios. As these, like more recent revivals of them, were avowedly on the principle of the Turkish baths, that species of bath must be briefly noticed. But before doing so, we must observe that there were several considerable epochs in the history of baths, one in the commencement of the 18th century, when Floyer and others recalled attention to cold bathing, of which the virtues had long been overlooked. In the middle of the century also, Russell and others revived sea-bathing in England, and were followed by others on the Continent, until the value of sea-bathing became fully appreciated. Later in the same century the experiments of Currie on the action of complete or partial baths on the

system in disease attracted attention; and though forgotten for a while, they have borne abundant fruit in more recent times.

Modern Baths.—It is uncertain how far the Turkish and Egyptian and even the Russian baths are to be regarded merely as successors of the Roman baths, because the principle of vapor baths has been known to many nations in a very early period of civilization. Thus the Mexicans and Indians were found using small vapor baths. The ancient inhabitants of Ireland and of Scotland had some notion of their use, and the large vapor baths of Japan, now so extensively employed, are probably of independent origin.

Turkish baths have, with various modifications, become popular in Europe. The Russian baths were introduced into most German towns about half a century ago. They had a certain limited amount of popularity, but did not take firm root. Another class practically owes its origin to Dr. Barter and Mr. Urquhart. It professed to be founded on the Turkish bath, but in reality it was much more of a hot air bath, *i.e.*, more devoid of vapor than either Roman or Turkish baths ever were, for it is doubtful whether in any case the air of the laconicum was free from vapor. These baths, with their various modifications, have become extremely popular in Great Britain, in Germany, and in Northern Europe, but have, curiously enough, never been used extensively in France, notwithstanding the familiarity of the French with Turkish baths in Algiers.

In England hot air baths are now employed very extensively. They are often associated with Turkish and electric baths, and with the usual processes of hydropathic treatment.

Bathing among the ancients was practised in various forms. It was sometimes a simple bath in cold or in tepid water; but at least, in the case of the higher orders, it usually included a hot air or vapor bath, and was followed by affusion of cold or warm water, and generally by a plunge into the piscina. In like manner the order varies in which the different processes are gone through in Turkish baths in modern Europe. Thus in the new baths in Vienna, the process begins by immersion in a large basin of warm water. Sudation is repeatedly interrupted by cold douches at the will of the bathers, and after the bath they are satisfied with a short stay in the cooling-room, where they have only a simple sheet rolled round them. In Copenhagen and in Stockholm the Oriental baths have been considerably modified by their association with hydropathic practices.

This leads us to notice the introduction of hydropathy. Although cold baths were in vogue for a time in Rome, warm baths were always more popular. Floyer, as we have seen, did something to revive their use in England; but it was nearly a century and a half afterwards that a Silesian peasant, Priessnitz, introduced with wonderful success, a variety of operations with cold water, the most important of which was the packing the patient in a wet sheet, a process which after a time is followed by a profuse sudation. Large establishments for carrying out this mode of bathing and its modifications have within the last thirty years been erected in many places on the Continent and in Great Britain, and have enjoyed a large share of popularity.

But the greatest and most important development of ordinary baths in modern times has taken place in England, and has been extending gradually to the Continent. The English had long used affusion and swimming baths freely in India. Cold and hot baths and shower baths have been introduced into private houses to an extent never known before; and from 1842 downwards, public swimming baths, besides separate baths, have been supplied to the public at very moderate rates, and in some cases associated with wash houses for the poorer classes. Their number has increased rapidly in London and in the principal continental cities. Floating baths in rivers, always known in some German towns, have become common wherever there are flowing streams. The better supply of most European cities with water has aided in this movement. Ample enclosed swimming baths have of late years been erected at many sea-side places. When required, the water, if not heated in a boiler, is raised to a sufficient temperature by the aid of hot water pipes or of steam; and gas has been utilized for heating small quantities of water for baths in private houses. As to separate baths, they used to be of wood, painted; they are now most frequently of metal, painted or lined with porcelain enamel. The swimming baths are lined with cement, tiles, or marble and porcelain slabs; and in some of the newest baths a good deal of ornamentation and painting of the walls and ceiling of the apartments, in imitation of the ancients, has been attempted.

We have thus traced in outline the history of baths through successive ages down to the present time. The medium of the baths spoken of thus far has been water, vapor, or dry hot air. But baths of more complex nature, and of the greatest variety, have been in use from the earliest ages. The best known media are the various mineral waters and sea-water. These, and baths impregnated with their gases, cannot here be considered in detail; we can do little more than enumerate a few of the artificial baths. Of baths of *mineral* substances, those of sand are the oldest and best known; the practice of *arenation* or of burying the body in the sand of the seashore, or in heated sand near some hot spring, is very ancient, as also that of applying heated sand to various parts of the body. Within the last few years establishments have been introduced into various European cities where hot dry sand is methodically applied. Baths of *peat* earth are of comparatively recent origin, and are little used out of Germany. The peat earth is carefully prepared and pulverized, and then worked up with water into a pasty consistence, of which the temperature can be regulated before the patient immerses himself in it.

There are various baths that may be termed *chemical*, in which chlorine or nitromuriatic acid is added to the water of the bath, or where fumes of sulphur are made to rise and envelop the body.

Of *vegetable* baths the number is very large. Leys of wine, in a state of fermentation, have been employed. An immense variety of aromatic herbs have been used to impregnate water with. Of late years fuci or seaweed have been added to baths, under the idea of conveying into the system the iodine which they contain; but by far the most popular of all vegetable baths are those made with an extract got by distilling certain varieties of pine leaves. They are pleasant and stimulating.

The strangeness of the baths of *animal* substances, that have been at various times in use, is such that their employment seems scarcely credible. That baths of milk or of whey might not be unpopular is not surprising, but baths of blood, in some cases even of human blood, have been used.

Electrical or *galvanic* baths have been popular of late years, in which galvanic action is communicated to the patient while in baths.

Baths also of *compressed air*, in which the patient is subjected to the pressure of two or three atmospheres, have been in use at certain places for some years.

A *sun* bath, exposing the body to the sun, the head being covered, was a favorite practice among the Greeks and Romans. This list of artificial baths might be readily increased.

We have hitherto spoken of general baths, but there are many varieties of local ones, the use of which has become somewhat more definite than it used to be, before the principles of hydropathy were understood. Some of these are affusion, half-bath, full bath, sitz baths, wave baths, local baths, shower and spray baths, douches, fomentations, injections, wrapping up in the wet sheet. Some of these processes, though by no means of novel origin, require a few words of explanation.

Douches were used by the ancients, and have always been an important mode of applying water to a circumscribed portion of the body. They are, in fact, spouts of water, varying in size and temperature, applied with more or less force for a longer or shorter time against particular parts. A douche exercises a certain amount of friction, and a continued impulse on the spot to which it is applied, which stimulate the skin and the parts beneath it, quicken the circulation of the capillaries, and thus favor the absorption of abnormal deposits. It wakes up the slumbering activity of the tissues and helps to remove congestions from the deeper seated organs. The effects of the douche are so powerful that it cannot be applied for a long time continuously. After every two or three minutes there should be an interval in its use. It is obvious that a douche is capable of many local applications, on the description of which it is here impossible to enter. Nor need we say that the douche must be used with great care in the case of nervous and excitable people, and better not at all when any irritation or inflammation is present. Douches are invaluable in old neuralgias, in the sequelæ of rheumatism, and in thickened joints.

The alternation of hot and cold douches, which for some unknown reason has got the name of *Ecossaise*, is a very powerful remedy from the strong action and reaction which it produces, and is one of very great value. The shower bath may be regarded as a union of an immense number of fine douches projected on the head and shoulders. It has been long in use in England, and produces a strong effect on the nervous system. An ingenious contrivance for giving circular spray baths, by which water is propelled laterally in fine streams against every portion of the surface of the body, is now found in most establishments.

To all these modes of acting on the cutaneous surface and circulation must be added dry rubbing, as practiced by the patient with the flesh glove, but much more thoroughly by the bath attendants, if properly instructed.

Action of Baths on the Human System.—We shall now inquire shortly into the theory of the operation of the baths and of the bathing processes, of which we have briefly traced the history.

The primary operation of baths is the action of heat and cold on the cutaneous surfaces through the medium of water.

The first purpose of baths is simply that of abstersion and cleanliness, to remove any foreign impurity from the surface, and to prevent the pores from being clogged by their own secretions or by desquamations of cuticle. It need scarcely be said that such objects are greatly promoted by the action of alkali of soaps and by friction; that the use of warm water, owing to its immediate stimulation of the skin, promotes the separation of sordes; and that the vapor of water is still more efficient than water itself.

It has been supposed that water acts on the system by being absorbed through the skin. The question has been frequently discussed; but the great majority of observers believe that, under ordinary circumstances, no water is absorbed, or if any, so minute a quantity that it is not worth considering. And further, as we have alluded to medicated baths, it is proper to say that, according to the latest authorities, no foreign bodies, under the ordinary circumstances of a bath, are absorbed into the system; although when a portion of skin has been entirely cleared of its sebaceous secretion, it is possible that a strong solution of salts may be partially absorbed. In the case of medicated baths we therefore only look (in addition to the action of heat and cold, or more properly to the abstraction or communication and retention of heat) to any stimulant action on the skin which the ingredients of the bath may possess.

The powerful influence of water on the capillaries of the skin, and the mode and extent of that operation, depend primarily on the temperature of the fluid; for the influence of the mechanical pressure on the body of the water of a bath, which has been calculated at nearly one pound on each square inch of the surface, has never been accurately determined. Baths have therefore to be considered according to their temperature; and the effects of cold and of hot baths have to be studied. But we may as well first point out one or two general facts. The human system bears changes of temperature of the air much better than changes of the temperature of water. While the temperature of the air at 75° is perhaps too warm for the feelings of many people, a continued bath at that temperature is felt to be cold and depressing. Again, a bath at 98° to 102° acts far more excitingly than air of the same temperature, both because, being a better conductor, water brings more heat to the body, and because it suppresses the perspiration, which is greatly augmented by air of that temperature. Further, a temperature a few degrees below blood heat is that of indifferent baths, which can be borne longest without natural disturbance of the system.

Cold baths act by refrigeration, and their effects vary according to the degree of temperature. The effects of a cold bath, the temperature not being below 50°, are these: — there is a diminution of the temperature of the skin and of the subjacent tissues; the blood at first rises in temperature nearly 4°, but soon subsides again, this diminution of temperature of the blood usually not taking place in the bath, but shortly after leaving it. There is a certain feeling of shock diffused over the whole surface, and if the cold is intense it induces a slight feeling of numbness in the skin. It becomes pale and its capillaries contract. The further action of cold bath reaches the central nervous system, the heart and the lungs, as manifested by the tremor of the limbs it produces, along with a certain degree of oppression of the chest and a gasping for air, while the pulse becomes small and sinks. After a time reaction takes place, and brings redness to the skin and an increase of temperature.

The colder the water is, and the more powerful and depressing its effects, the quicker and more active is the reaction. Very cold baths, anything below 50°, cannot be borne long. Lowering of the temperature of the skin may be borne down to 9°, but a further reduction may prove fatal. The diminution of temperature is much more rapid when the water is in motion, or when the bather moves about; because, if the water is still, the layer of it in immediate contact with the body gets warmed to a certain degree.

The effects of *hydropathy* depend on the power of abstracting heat from the body, and of stimulating it by the application of cold water. The action is depressing or exciting, according as the withdrawal of heat or the stimulation predominates.

A great deal depends on the form of the bath; thus one may have — (1.) Its depressing operation,— with a loss of heat, retardation of the circulation, and feeling of

weariness, when the same water remains in contact with the skin, and there is continuous withdrawal of heat without fresh stimulation. This occurs with full or sitz baths, with partial or complete wrapping up the body in a wet sheet which remains unchanged, and with frictions practiced without removing the wet sheets. (2.) Its exciting operation,—with quickening of the action of the heart and lungs, and feeling of glow and of nervous excitement and of increased muscular power. These sensations are produced when the layer of water next the body and heated by it is removed, and fresh cold water causes fresh stimulus. These effects are produced by full baths with the water in motion used only for a short time, by frictions when the wet sheet is removed from the body, by douches, shower baths, bathing in rivers, &c. The depressing operation comes on much earlier in very cold water than in warmer; and in the same way the exciting operation comes on faster with the colder than with the warmer water. The short duration of the bath makes both its depressing and its exciting action less; its longer duration increases them; and if the baths be continued too long, the protracted abstraction of animal heat may prove very depressing.

We shall not attempt to give more than those few hints about hydropathic processes, and shall merely remark that, under them the system is subjected to alternate periods of excitement and of rest. There is persistent lowering of the temperature of the body, with contraction of the capillaries and local anæmia. This is succeeded by the reverse, or by local hyperæmia. There is powerful excitement of the vascular and nervous systems. The processes of absorption and of excretion are stimulated. There is a great increase of perspiration. The transformation of tissue is materially quickened.

We must next consider the operation of warm baths of different temperatures.

Tepid, 85° *to* 95°.—The effects of a bath of this temperature are confined to the peripheral extremities of the nerves, and are so slight that they do not reach the central system. There is no reaction, and the animal temperature remains unchanged. Baths of this kind can be borne for hours with impunity.

Warm baths from 96° *to* 104°.—In these the action of the heat on the peripheral surface is propagated to the central system, and causes reaction. which manifests itself in moderately increased flow of the circulating fluids to the surface, and in an increased frequency of pulse. It appears to supply a slight stimulus to the renewal of tissue.

With a *hot bath* from 102° up to 110° the central nervous and circulating systems are more affected. The frequency of the pulse increases rapidly, the respiration becomes quickened, and is interrupted by deep inspirations. The skin is congested, and the retained animal heat bursts out, causing a profuse perspiration.

Very hot bath.—Everything above 110° feels very hot; anything above 120° almost scalding. Baths of from 119° to 126° have caused a rise of 2° to 4½° in the temperature of the blood. Such a bath can only be borne for a few minutes. It causes violent reflex action on the heart and the arterial system, excessive congestion of the skin, and violent perspiration.

In the use of hot baths a certain amount of vapor reaches the parts of the body not covered by the water, and is also inhaled.

Vapor baths produce profuse perspiration, and act in cleansing the skin, as powerful hot water baths do. Vapor, owing to its smaller specific heat, does not act so fast as water on the body. A vapor bath can be borne for a much longer time when the vapor is not inhaled. Vapor baths can be borne hotter than water baths, but cannot be continued so long, a vapor, being a bad conductor, prevents radiation of heat from the body. A higher heat than 122° is not borne comfortably. The vapor bath, though falling considerably short of the temperature of the hot air bath, heats the blood considerably more.

Hot air baths differ from vapor baths in not impeding the respiration as the latter do, by depositing moisture in the bronchial tubes. The lungs, instead of having to heat the inspired air, are subjected to a temperature above their own. Hot air baths, say of 135°, produce more profuse perspiration than vapor baths. If very hot, they raise the temperature of the body by several degrees.

Vapor baths, hot air baths, and many hydropathic processes agree in producing violent sudation, and also frequently in subjecting the body, while in a state of perspiration, to the action of water of a comparatively low temperature. Of perspiration we shall only say, that it is sensible and insensible: 30 oz. may be considered to be about its average amount in the twenty-four hours; of this, which is chiefly water, about ⅓ of an oz. consists of urea and of other peculiar substances. A man has been known to lose 3 pounds in a Russian bath; some think more may be lost. As perspiration eliminates water and effete matter from the system, and also aids in respiration, it is obvious that its regulation must have an important effect on the economy.

In comparing the general effects of hot and cold baths, it may be said that while the former tend to check cutaneous transpiration, the latter favor it. It is supposed, but is scarcely proved, that cold baths, by the stimulus they give, increase the reaction of the gastric and other fluids of the stomach, and of the alimentary canal, and that warm baths rather serve to retard it. Either hot or cold baths, but especially the latter, favor the secretion of urine. Whether warm or cold baths, like the breathing of hot or cold air, have any effect on the exhalation of carbonic acid has not been determined.

The warm bath causes swelling and congestion of the capillaries of the surface in the first instance; when the stimulus of heat is withdrawn their contraction ensues. A cold bath, again, first causes a contraction of the capillaries of the surface, which is followed by their expansion when reaction sets in. A warm bath elevates the temperature of the body, both by bringing a supply of heat to it and by preventing the radiation of heat from it. It can be borne longer than a cold bath. It draws blood to the surface, while a cold bath favors internal congestions. There is in both cases increased oxidation or waste of the tissues; but with the warm bath there is less call made on the system, as oxidation depends chiefly on increased heat, which in the case of the warm baths is artificially supplied. The reason why a man when much exhausted feels a hot bath refreshing, while he cannot bear a cold one, may be that the increased heat conveyed to him by the warm bath helps the process of oxidation, and thus relieves his system. Cold refreshes by exciting the functions, heat by physically relieving their action; a hot bath calms by reducing the loss of heat, and by supplying a certain amount of it. Very hot baths, it is true, act like cold baths, as stimulants to the heart and nervous centres; but they do it more gradually and with less shock to the system than cold baths. The general result of this comparison would show that warm are a milder remedy than cold baths, and are applicable often when the system does not possess power of reaction sufficient to make the use of the latter expedient.

As regards the use of baths simply for the promotion of health, it follows, from what has been stated, that

warm baths are best suited for the delicate, for the very young, and for the old; cold baths for the strong and active, in whom the powers of reaction are unimpaired. It would be out of place to say much here about the use of baths in medicine. Warm baths according to their degree of heat are of great value in relaxing spasms, in calming the nervous system, and in neuralgias, chronic rheumatism, and gout. Turkish baths are useful in these last affections, and wherever it is of importance that there should be free action of the skin. Cold baths, again, are more useful when the system requires tonics, and when it can bear the shock of cold affusion; when diseases of the system, especially of the nervous system, are more functional than organic. It is obvious that the cold-water cure, including, as it does, copious sudation, combines in a certain degree the effects of both kinds of baths.

But baths often produce injurious effects when used injudiciously. Long continued warm baths are soporific, and have owing to this action often caused death by drowning. The effects of very hot baths are swimming in the head, vomiting, fainting, congestion of the brain, and, in some instances, apoplexy.

The symptoms seem to point to paralysis of the action of the heart. It is therefore very evident how cautious those should be, in the use of hot baths, who have weak hearts or any obstruction to the circulation. Fat men, and those who are full-blooded or predisposed to epilepsy, should avoid them. Protracted indulgence in warm baths is relaxing, and has been esteemed a sign of effeminacy in all ages. Sleepiness, though it will not follow the first immersion in a cold bath, is one of the effects of protracted cold baths; depression of the temperature of the surface that exceeds 9° becomes dangerous. The risk in cold baths is congestion of the internal organs, as often indicated by the lips getting blue. Extremely cold baths are, therefore, very unsafe wherever there is a tendency to internal congestion; and they are always dangerous when the system is exhausted by fatigue.

We shall conclude with a few words of advice about ordinary bathing for hygienic purposes:—Whenever it is practicable, bathing should be over before 1 p.m. It is not to be thought of when the stomach is loaded, or after much wine. The shorter the bath is, especially if the water be cold, and the bather cannot swim, the better,—say five minutes. He should swim if possible, and then a quarter of an hour is long enough. Bathing should not be practiced more than once a day. When one is over-heated, but not exhausted, it is advisable to bathe at once, without waiting to cool. After hot air or vapor baths care must be taken that cold be not caught, although the more enthusiastic advocates of such baths declare that there is no risk of this.

BATHURST, a town of New South Wales, on the Macquarie River, 122 miles W.S.W. of Sydney, with which it is connected by railway. Population, 10,000.

BATHURST, ALLEN BATHURST, EARL OF, a distinguished statesman in Queen Anne's reign, was born in the year 1684. He died after a few days' illness, at his seat near Cirencester, September 16, 1775, in the ninety-first year of his age.

BATHURST, RALPH, uncle of the preceding, was born in the year 1620. He died June 24, 1704, in his eighty-fourth year.

BATHYCLES, a Greek sculptor, born at Magnesia on the Mæander, known for his sculptures on the throne of the statue of Apollo at Amyclæ near Sparta, which Pausanias saw and describes (iii. 18, 6). His date is uncertain, but cannot well be later than between 563–549 B.C.

BATON-ROUGE, a town in the southeastern part of Louisiana, situated on a bluff on the left bank of the Mississippi, 120 miles above New Orleans. It has a court house, state penitentiary, national arsenal and barracks, military hospital, deaf and dumb asylum, and state university. Baton-Rouge was one of the first settlements of the French. In 1849 it was the State capital, and has recently superseded New Orleans as the seat of government. Occupied by the Federal troops after the capture of that city, it was defended in 1862 by General Williams against the attack of the Confederates under Breckinridge. Population, 10,397.

BATONI, POMPEO GIROLAMO, a native of Lucca, who was regarded in Italy as a great painter in the 18th century, and who unquestionably did much to rescue the art from the intense mannerism into which it had fallen during the century preceding. He was born in 1708, and died at Rome in 1787.

BATRACHIA. See AMPHIBIA, vol. i. p. 292.

BATRACHUS, according to Pliny, the name of a Greek architect who, along with Sauras (both natives of Sparta), was employed by Metellus in the construction of certain temples in Rome.

BATTALION is the tactical unit of infantry. It is the term applied to the most numerous body of dismounted men which one commanding officer can personally superintend. It consists of from four to ten companies, is always commanded by a field officer, and has a normal war strength of about 1000 men. Two or more battalions constitute a regiment; two or more regiments a brigade; two or more brigades a division; two or more divisions a *corps d'armée;* and two or more *corps d'armée* an army. See ARMY.

BATTAS, a people in the northern portion of Sumatra, which regards itself as the oldest in the island, and is distinguished by a pertinacious adherence to ancient customs. The Batta is of middle height, his color is a light brown, and his hair is black and is worn long. He is dirty in his dress and dwelling, and eats any kind of food that presents itself, though he lives chiefly on rice. Cannibalism is practiced.

Batta or Batak Language.—Up to the publication of Dr. H. N. van der Tuuk's essay *Ovar schrift en uitspraak der Tobasche taal* (1855), the first fruits of an eight years' residence amongst the Battas, our knowledge of the Batak language was confined to lists of words more or less complete, chiefly to be found in Marsden's *Miscellaneous Works*. By his exhaustive works that eminent Dutch savant has made the Batak language the most accessible of the various tongues spoken in Sumatra. According to him the Batak language is nearest akin to the Old Japanese and Tagal, whereas a recent writer has endeavored to prove its closer affinity with the Malay proper. Like most languages spoken by less civilized tribes, the Batak is poor in general terms, but abounds in terms for special objects.

BATTERING RAM (*Aries*), a military engine used before the invention of gunpowder, for beating down the walls of besieged fortresses.

BATTERY is the tactical unit of artillery. It is the term applied to the largest number of fully equipped mobile guns which can be personally superintended by one man. Batteries may be divided into four classes of *horse*, *field*, *mountain*, and *position* artillery batteries. In England, France, and Germany batteries consist of six guns; in Austria and Russia of eight guns each. The guns of horse field artillery are drawn by from four to eight horses, the usual number being six. Each battery has a certain number of men told off for the service of the gun called *gunners*, and others to manage the draught called *drivers*. In the horse artillery the gun-

ners are mounted on horses, in field batteries they are carried on the limbers and wagons, in mountain and position batteries both gunners and drivers usually walk. Both horse and field batteries are recognized tactical units of an army, and are maintained in an efficient state in time of peace. Position batteries are organized generally in time of war, are possessed of the heaviest guns consistent with mobility, and are useful in certain special cases, such as the attack or defence of a fortified position, the bombardment of a town, &c. Mountain batteries consist usually of light guns mounted on the backs of mules, and are adapted solely for warfare in the mountainous countries. See ARTILLERY.

BATTERY, as a law term, is the unlawful beating of another. See ASSAULT.

BATTEAUX, CHARLES, a French writer on philosophy and the principals of literature, was born near Vouziers in 1713, and died in 1780.

BATTICALOA, the chief town of a district in the Eastern Province of Ceylon, situated on an island. It is of importance for its haven and the adjacent salt lagoons.

BATTLE, an engagement between two armies, as distinguished from the skirmishes, or minor actions, fought between their smaller sections. A battle is said to be general, where the whole, or the greater part, of each army is brought into action; and partial, where only brigades, divisions, or some corps d'armée out of several upon the ground, are engaged. However the numbers may vary, the great principles to be applied in delivering battle are at root in all ages the same. It is no doubt true that, in the circumstances under which battles are fought, there is nothing invariable; on the contrary, it is scarcely possible to suppose two cases alike in every particular, or even resembling each other in all their leading features. From the very nature of things, the minor data of the problem are variable; but the grand principles — those which depend on moral elements — continue immutably the same. On the other hand, the material elements which enter into the calculations of a general are constantly changing; and it is this circumstance which affords scope for the exercise of his genius, his sagacity, and his military science. But it would be manifestly absurd to maintain that, because the lesser conditions are so frequently altered, the great principles of the art are changed with them. The issue of a battle is indeed always uncertain, — because the calculations of the general may be defective, his combinations unscientific, his foresight limited, or his temperament rash and impetuous; and because, even where none of these causes of failure exist, events which no human sagacity could have divined or provided against may occur to defeat the wisest plans. But all this implies that if every contingency could have been foreseen and properly met, the result would not have been doubtful, and that the grand chances are always on the side of him who, being provided with sufficient means for his end, forms his plan with the greatest sagacity, and executes it with corresponding vigor and ability. For, variable as the results of battles appear, decisive success has in all ages followed the combinations of great commanders; and victory in the long-run has seldom failed to pay homage to science. And this is because those principles which science has established as universally applicable depend on certain fixed laws in human nature, which ages have not changed since history was first written. The undisciplined forces, for example, are easily shaken by panic arising out of any such sudden disaster as the fall of their general, was as true in the day when Ahab, for this reason, disguised himself at Ramoth-Gilead as it is now. That infantry, thoroughly broken up and exposed on open ground, may be taken or destroyed by a very inferior number of cavalry, was illustrated no less by Hannibal at Cannæ than by Murat's charge round the allied right at Dresden. The feeling that there was no safe retreat open in case of disaster was as fatal to the Persians at Marathon as to the French at Leipsic. The crushing effect of heavy columns pressing against a line (which, as only the outer part of the column can act, is purely moral) was quite as conspicuous in the victory of Epaminondas at Mantinea as when Napoleon cut his enemy's centre through at Austerlitz. Above all, military history, from the earliest times, proves two facts of prime importance to commanders in every action: the one, that the best troops become unsteady when their flank is gained. just as a single man in a struggle desires to face fairly the adversary about to rush on him; the other, that a comparatively small body coming fresh into action with troops exhausted by the exertions and nervous tension of a battle, has an advantage over much larger numbers. And being thus fixed, these principles obviously yield certain general rules, to which every prudent commander of any age strives to conform. Circumstances may lead him to violate them, but the examples of Leipsic and Waterloo are there to prove that, even with the greatest of generals, the result may be ruinous. In the first case, the French were forced to fight with their backs to a river; in the second, by a combination they were not prepared, for their flank was struck by the Prussians when they were fully engaged with Wellington in front; and total defeat ensued in both.

A battle is not only the most imposing, but also the most important event in war. It is the consummation to which all previous combinations necessarily tend; it is that grand act which may decide the fate of empires as well as armies. The highest and dearest interests of nations, nay, even of humanity itself, may be involved in its issue. It cannot, therefore, be uninstructive to look briefly at the theory of those received principles by the skilful application of which the fate of battles has in all ages been determined.

All the methods in which a battle can be fought may be reduced to three for abstract purposes, each governed by a distinct principle. The first, the purely defensive, consists in waiting for the enemy, in a position chosen for the purpose, the object being simply that of maintaining it successfully against him. Theorists almost universally condemn this, and that with good apparent reason; for there is something peculiarly trying to the moral endurance of even the best troops in feeling that they are pinned to one spot to await the assaults of the enemy without any prospect of retaliation. But the rule is not without exceptions, as is plainly proved by comparing the two great examples of purely defensive actions fought during the campaigns of 1862–63 in America,— Fredericksburg and Gettysburg. The defender in each case was perfectly successful, beating off his assailant with tremendous loss; but the results were very opposite. Lee's victory at Fredericksburg stopped, indeed, the advance upon Richmond for the time, but did not seriously affect the course of the war. Meade, on the other hand, by beating the Confederates off at Gettysburg, completely turned the tide of the campaign, and compelled Lee to abandon all idea of invading the North and commence a difficult retreat to Virginia; while thenceforth Washington was saved from all danger of being separated from the states that supported the union. This was because the position maintained at Fredericksburg was no more than one point on a single line of advance direct upon Richmond, whereas that of Gettysburg was so completely the key to the whole of the campaign of Maryland, that, whilst it was held by Meade, it was im-

possible for Lee to advance beyond it or any part of the north-eastern states. The failure to carry it therefore paralyzed the whole scheme of the Confederates for transferring the burden of the struggle to hostile soil. And from a comparison of the varying consequences of these actions, so similar in their course, it will be seen that the defensive battle is justified only when the position to be maintained is one of vital consequence for the enemy to seize in order to carry on further operations with success. Lee has been fairly condemned by even friendly critics for not turning his defensive attitude at Fredericksburg into an offensive on the repulse of the enemy's attack. No one blames Meade for the like conduct at Gettysburg, because his holding his ground fully accomplished all that it was necessary for him to do. But such an instance as this last, it should be added, can but rarely occur.

The second system is the entirely offensive,—in plain words, the attacking the enemy wherever found, with all force available. As it carries with it the moral power which in all ages is found to accompany, until some decided check occurs, bodies of disciplined men moving freely forward to the assault, and as it gives the leader the power of choosing the weaker points of his adversary's line on which to concentrate his blows, so it has ever been the favorite with bold and skilful generals leading good troops. Frederick and Napoleon alike preferred it, and won some of their chiefest victories by using it freely. Wellington employed it with marked success in the latest phases of the Peninsular War in 1813–14. Grant adopted it avowedly in his great struggle with Lee in Virginia in 1864. And the Prussians fought on this principle throughout the two great wars of 1866 and 1870–71. History, however, shows that it is only fully justified when the attacking general has a force decidedly superior either in numbers or in moral power; or when, as in the famous case of Frederick at Leuthen, he possesses such extraordinary skill in manœuvering as to give him all the advantages of long odds, although engaged against superior numbers. It has the serious defect that if the defence prove more successful than was expected, the assailant may have to bring up successively and exhaust all his forces, and thus leave himself without any reserve to meet a sudden onset from the opposite side. In such case defeat probably entails the complete wreck of the hitherto offensive army, and with it possibly the loss of the campaign.

It is for this reason that prudent commanders are wont, where the choice lies with them, to select the third mode, the defensive-offensive, or a combination of the two preceding. This consists in taking up a position with the design of awaiting the adversary's attack on it, but also of watching the opportunity afforded by the exhaustion of his army in its assaults, or by his extending it too widely in choosing the best points from which to make them, in order to pass suddenly to the offensive. Wellington is justly famous for the success with which he employed this form of action. But it is one of the highest tests of generalship to know exactly when most fitly to use either. And as Napoleon won three at least of his most striking victories,—Marengo, Austerlitz, and Dresden,—by passing at the right moment suddenly from an apparently passive attitude of defence to a vigorious offensive, so Wellington, after all the world had come to regard him as great only on the defensive used the strictly offensive form, with the like success, at Vitoria, Orthez, and Toulouse, the last of these three actions being one of such apparent temerity as can hardly be paralleled in modern history, and yet perfectly justified by his instinctive knowledge of the demoralized state of the enemy whose position he undertook to force. Marlborough, who as a fighter of great battles has never been surpassed, and who, like Wellington, led a mixed army of English and allies, appears to have always had a decided preference for the offensive;—so little does nationality supply any just rule for selecting either. Marlborough's choice, in all probability, was adopted from the comparatively passive attitude of his various adversaries at Blenheim, Ramillies, and Malplaquet, which tempted a bold offensive on his part. Lee, though certainly addicted to the strictly defensive, which was suited to his inferiority of numbers and to the strong nature of the ground he usually occupied, had the true instinct (as was especially shown in his great victory at Chancellorsville) of seizing any special opportunity offered by the carelessness of an adversary who brought against him apparently overwhelming forces. And in the late war, although the German generals elsewhere continually took that bold offensive which was justified at first by superior numbers, and later by the increasingly high spirits of their troops, yet in the most important and bloodiest action of the whole, Mars-la-Tour, they were content, after it had been well begun by their own attack, to pass to the completely defensive,—it being evident that by merely maintaining the position they had taken up across the French line of retreat from Metz, all the immediate advantage possible from victory would be won.

On the whole, therefore, it may be affirmed that no theory is sound which prescribes or forbids the use of any of the three methods, or lays down strict rules for the application of any of them. Defence is, however, the natural attitude of the weaker party, as Clausewitz, the greatest of all theoretical writers on war, has carefully pointed out under what conditions it is to be accepted, or how long adhered to when once assumed, are problems which it requires true genius to grapple with successfully; for they can only be solved rightly according to the circumstances of the hour, perhaps of the moment. To see a crucial instance illustrated by a failure, we may look at Gravelotte. There Bazaine was forced by the case to fight on the defensive. An opportunity occurred in the day, on the decided repulse of the German right-wing under Steinmetz, of striking such a counterblow as, from Napoleon's hand, would probably have forced a victory over even the great odds possessed by the German commander. But Bazaine had no spark of the instinctive genius needed. He lost the opportunity, and with it the battle,—the loss entailing the last hope of rescuing his host from the dangerous and indeed ignominious position in which previous errors of judgment had placed it.

In conclusion, in order to demonstrate the undying truth of the main principle of battle, which is that, the the general conditions being equal, the moral advantage is invariably at the outset with the offensive rather than the defensive,—with the army that feels itself moving forward rather than that which stands still,—it is well to refer to the recent discussion on the effect of breech-loading arms. It was almost universally assumed by theorists, especially by those of Prussia herself, when she first put the needle-gun into her soldiers' hands, that the power of the new weapon would be most perceptible in defense, for which its more rapid fire seemed so specially adapted. The Prussian instructions, drawn up before 1866, avowedly followed this view. Those who compiled them overlooked the fact that the moral power of the weapon would of itself tend to carry those who bore it forward, and add an additional advantage to those the assailant had before in his greater show of vigor and activity, and his power of searching out the weaker parts of his enemy's position and throwing his troops in force upon them. History has reversed the Prussian theory, and proved afresh how powerful for

victory is the moral element in the soldiers' character. For, out of the opening events of 1866, and the vast encouragement the Prussians experienced in their first collisions with Benedek's army, has been evolved the most audacious and aggressive series of actions any nation ever fought. Certain Prussian writers have since the war of 1870–71 gone almost to the opposite extreme, and claimed absolute superiority for the offensive under all circumstances, forgetting that, against a stronger army, or even one perfectly equal in all other respects and well posted, it must inevitably be as dangerous as it proved when confidently tried by Napoleon's marshals against British troops under Wellington.

The various so-called "orders of battle" of which theoretical writers treat, believing that they see a close similarity in the dispositions of well-led armies from the days of the Grecians down to our own, are, so far as such similarity really exists, founded entirely on one or other of the moral elements already mentioned, above all, on the desire to gain the enemy's flank. The late General Winfield Scott, one of the few commanders who could boast that he had more than once seen the back of English infantry in fair fight, declared that this desire is so instinctive that it is impossible to array two bodies of disciplined troops against each other without one at least soon striving for this advantage. But so far as this and other like universal principles are applied to the actual drawing up of an army at any period in a special order of battle, the arrangements must in practice vary with the arms and discipline.

BATTLE CREEK, a city of Michigan, in Calhoun county, 45 miles southwest of Lansing and 163 miles east-northeast of Chicago. It is situated on the Kalamazoo river at the mouth of the creek for which it is named, and from which it derives extensive and valuable water power. The principal manufactures are of threshing machines and agricultural implements, furniture and carriages, and the town is an important shipping point. It has several flour and grist mills, iron foundries and machine shops. There is an opera house, several hotels, nine churches, a high school and a full complement of graded schools. One daily and four weekly newspapers are published here. Population (1890), 13,090.

BATTLE, a market-town in the county of Sussex, on the South-Eastern Railway, 56 miles from London. It derives its name from the great battle of Senlac (or Hastings), fought October 14, 1066, between the Saxon king Harold and William, duke of Normandy.

BATTUS, the founder of the Greek colony of Cyrene in Libya, whither he had been directed by the oracle at Delphi (about 650 B.C.). The Greeks who accompanied him were, like himself, natives of Thera (Santorin), and partly descended from the race of the Minyæ.

BATU, a thickly-wooded island lying off the north-western coast of Sumatra, 40 miles in length by 10 in average breadth, almost immediately under the equinox.

BATUM, a seaport town of Asiatic Turkey, in the pashalic of Trebizond, and 110 miles N. E. of the city of that name. It is situated on the Black Sea, not far from the mouth of the Chorak, and the harbor is the safest and most important on the eastern coast. Pop., 2,000.

BAUDELAIRE, CHARLES, who would have been pleased to be considered as a master in the French Satanic school of poetry, was born at Paris in April 1821, and died in 1867 at the age of forty-six. He will possibly be best remembered for his translation of the works of Edgar Allen Poe, one of the most accurate and brilliant translations in literature.

BAUHIN, GASPARD, the son of an eminent French physician, who had to leave his native country on becoming a convert to Protestantism, was born at Basel in 1560. In 1582 he was appointed to the Greek professorship in the university of that city, and in 1588 to the chair of anatomy and botany. He was afterwards made city physician, professor of the practice of medicine, rector of the university, and dean of his faculty. He published several works relative to botany, of which the most valuable is his *Pinax Theatri Botanici*. The confusion that began to rise at this time from botanical writers describing the same plant under different names rendered such a task highly necessary; and though there are many defects in the execution, the *Pinax* of Bauhin is still a useful key to all the writers before his time. He died in 1624.

BAUHIN, JEAN, brother of the above, was born at Basel in 1541. He studied at Tübingen under the celebrated botanist Fuchs, and afterwards travelled with Conrad Gesner, and collected plants in the Alps, in France, and in Italy. His great work on plants was not completed at his death, which happened in 1613. A society at Yverdun published in 1619 the "Prodromus;" but it was not till 1650 and 1651 that the work itself appeared. It was long considered a standard work, and, with all its defects, it entitles its author to a high place among the founders of botanical science.

BAUMÉ, ANTOINE, a French chemist, distinguished for his success in the practical application of the science, was born at Senlis in 1728, and died in 1804.

BAUMGARTEN, ALEXANDER GOTTLIEB, a German philosopher, born at Berlin in 1714. He studied at Halle, and afterwards became professor of philosophy at Frankfort on the Oder, in which city he died in the year 1762. He was a disciple of Leibnitz and Wolff, and was particularly distinguished for his æsthetical speculations, having been the first to develop and establish the *Theory of the Beautiful* as an independent science.

BAUMGARTEN-CRUSIUS, LUDWIG FRIEDRICH OTTO, a distinguished German theologian, was born in July 1788 at Merseburg. In 1805 he entered the university of Leipsic, and studied theology and philosophy. In 1812 he was appointed extraordinary professor of theology at Jena, where he remained to the end of his life, rising gradually to the head of the theological faculty. In the midst of his labors as professor and author, he was struck down with apoplexy, and died on the 31st May, 1843.

BAUR, FERDINAND CHRISTIAN, the distinguished leader of the Modern Tübingen School of Theology, was born in the neighborhood of Cannstadt on the 21st June 1792. The son of a Würtemberg pastor he entered, at the age of thirteen, the well-known seminary at Blaubeuren, to which his father had some years before been transferred as a deacon. Thence he passed, in the year 1809, to the university at Tübingen. Solid and somewhat reserved in character, he was indefatigable in his studies, but did not come prominently to the front till near the close of his academic career. His intellectual development proceeded slowly from step to step. For a time he was attracted and considerably influenced by the study of Bengel, the great head of the preceding orthodox school, which had given Tübingen its reputation in the 19th century. Both Bengel himself in his noble personality, and the historical character of his critical labors on the New Testament, remarkable for their time, had a charm for the youthful student of the 19th century. With historical interest Baur combined a special interest in the philosophy of religion, but as yet without betraying any opposition to the supernatural stand-point of the older theology.

In 1817 he was called as professor to Blaubeuren, which he had left as a pupil eight years before. There

appeared his *Symbolik und Mythologie*, in 1824. This was his first elaborate work, the precursor of all his special studies in religious history and the development of religious thought.

This publication drew attention to Baur's marked abilities, and, on a vacancy occurring in the theological faculty at Tübingen, he was promoted after some hesitation to the chair of historical theology in that famous university, destined from his labors to acquire a yet more notable reputation. This took place in 1826; and for thirty-four years Baur's life was passed at Tübingen in an unceasing round of academic work, — while his name continued to gather from his successive writings an increasing lustre and influence. All accounts agree in testifying to his marvellous industry and unceasing toil of research, his conscientiousness and self-sacrifice as a teacher, and the unobtrusive enthusiasm and dignity with which he discharged all the duties entrusted to him, not only as a professor, but as for some time the head of the *Stift*, or college of residence for the Protestant divinity students.

Baur at first, like almost all his contemporaries, owned the influence of Schleiermacher. The *Glaubenslehre* of the latter which appeared in 1821, is said to have affected him deeply, and moulded his thought for some time. But there was too little affinity betwixt the men, — the one mystic and spiritual, the other intellectual and objective, — to permit this influence to be permanent. From Schleiermacher Baur passed to Hegel, whose commanding genius laid its spell upon him as upon others.

It was not, however, till nearly ten years after his settlement at Tübingen that his theological views underwent a decided change, and that the special tendency known as that of the Modern Tübingen School was fully developed.

The second and distinctive period of his intellectual development is dated from the year 1835, when Strauss's *Leben Jesu* appeared, and spread commotion in the theological mind of Germany. In the same year Baur published his great work on Gnosticism, in which he had obviously quite passed beyond the influence of Schleiermacher. A brief work on the *So-called Pastoral Epistles* in the same year showed him at work in an independent critical direction, and ready to take a new start in theological inquiry. This start, or at least the lengths to which it carried him, have been by many attributed to the effect of Strauss's work. But he has himself plainly denied this, and claimed an independent origin for his own speculations. "I had begun," he says (*Kirchengeschichte des 19 Jahrhunderts*, 395), "my critical inquiries long before Strauss, and set out from an entirely different point of view. My study of the two epistles to the Corinthians led me first to seize clearly the relation of the apostle Paul to the other apostles. I was convinced that in the letters of the apostle themselves there was enough from which to infer that this relation was something very different from that usually supposed,— that, in short, instead of being a relation of harmony it was one of sharp opposition, so much so that on the part of the Jewish Christians the authority of the apostle was held everywhere in dispute. A closer investigation of the Pseudo-Clementine homilies, to whose significance in reference to the earliest period of Christian history Neander first drew attention, led me to a clearer understanding of this opposition; and it always became more evident to me that the contrast of the two parties in the Apostolic and sub-Apostolic age must be traced not merely in the formation of the Petrine tradition but as having exercised an important influence upon the composition of the Acts of the Apostles.

This supposed conflict betwixt Petrinism and Paulinism, or, in other words, betwixt Jewish and Gentile Christianity, lies at the foundation of all Baur's critical labors. His speciality as a New Testament scholar and critic was the firmness with which he laid hold of what he believed to be the only genuine foundation of historical Christianity in St. Paul, and his four great epistles to the Corinthians, to the Galatians, and to the Romans. These epistles were to him alone unchangeable as the authentic writings of the great apostle of the Gentiles, and the antagonism of which he made so much appeared to him everywhere to pervade them. The epistles to the Ephesians, the Colossians, and to the Philippians, and the short letter to Philemon, were at the best doubtfully genuine. They seemed to him to bear traces of a later Anosticism in many of their expressions, while he altogether rejected the apostolical character of the Pastoral Epistles. These letters, as well as the Acts of the the Apostles, were to him writings not of the 1st but of the 2d century, proceeding not from the Pauline School, but from the Catholic and Conciliatory School, which towards the middle and end of the 2d century sought to adjust and harmonize the earlier conflicting elements of Petrinism and Paulinism. This impress of conciliation and compromise appeared to him to be specially stamped upon the Acts of the Apostles, and to be the true explanation of the relations there depicted betwixt St. Peter and St. Paul.

Such were the views advocated by Baur in a succession of writings on the Pastoral Epistles (1835) and the Epistle to the Romans (1836); but especially in his great work on the Apostle Paul (1845), which may be said to sum up the result of his critical labors on the Pauline writings.

Then in a further series of critical investigations he turned his attention to the Gospels. He dealt with them as a whole, "their relation to one another, their origin, and character," in a treatise which appeared in 1847, and in 1851 he devoted a special volume to the Gospel of St. Mark. The result of his investigations in this direction was to satisfy him that all the Gospels owe their origin more or less to the same tendencies or traces of party design, which he everywhere discovers in the first Christian age. Our present Gospels are not, in his view, the most ancient documents of the kind possessed by the church. Before them there was a primary cycle of evangelical tradition, known by various names — as the gospel of the Hebrews, of St. Peter, of the Ebionites, of the Egyptians, &c. In the existing canon the Gospel of St. Matthew resembles those earlier narratives most closely. It reproduces most completely the character of the primitive Jewish Christianity, yet not without important later modifications. The Gospel of St. Luke is, of course, of Pauline origin, yet also retouched with a view to the conciliatory tendencies of the Church of the 2d century and the influence of the Petrine tradition. That of St. Mark is of later date than either, and bears the most evident traces of adaptation. Of all the gospels it is the most suspected by the Tübingen School. The Fourth Gospel, on the other hand, is a definite work, but of the 2d, not of the 1st century. An examination of its contents, its mode of composition, and its general plan clearly reveals its dogmatic and idealistic character. The historical data are merely a background to the speculative ideas which it unfolds. The prologue by itself is sufficient proof of its logical method and purpose, while the contrasts which everywhere pervade it betwixt light and darkness, life and death, the Spirit and the flesh, Christ and the children of the devil, and the dramatic force and propriety with which these contrasts are handled throughout, point to the same conclusion. Further, the differences betwixt the Apocalypse

and the Fourth Gospel are held to show conclusively that they could not have proceeded from the same author.

His death took place on the 2d December 1860. He lies buried in the cemetery at Tübingen, not far from the poet Uhland, with the simple inscription on his tomb, "F. C. Baur, Theolog."

Such an amount and variety of authorship sufficiently shows Baur's indefatigable industry and enthusiasm as a theologian; and when it is remembered that all his works are of a strictly scientific character, indicating everywhere original research, and a penetrating and systematic intelligence which never slumbers, however it may be mistaken, it is evident that there are few names in the recent history of theology that claim more significance than that of Ferdinand Christian Baur. Of the value of his labors and the extent to which his theological views may be said to have verified themselves in the modern mind which has continued profoundly agitated by the problems which he started, this is not the place to speak. It need only be said that, while many of his opinions are strongly contested, and some of the most enlightened recent investigations prove that he has greatly exaggerated the antagonisms of the early church, and post-dated most of the writings of the New Testament, it is at the same time admitted by all advanced scholars that he has, even, in his exaggerations, contributed to a clearer view of the great principles at work in the 1st and 2d centuries and the lines of spiritual movement along which the Christian church moved to its historical formation and development.

BAUTAIN, Louis Eugène Marie, a French philosopher and theologian, was born at Paris, in February 1796, and died in October 1867.

BAUTZEN (in Wendish *Budissin*, which is equivalent to "town"), the capital of Saxon Upper Lausatia, occupies an eminence on the right bank of the Spree, 680 feet above the level of the sea, and 32 E.N.E. from Dresden. Bautzen was already in existence when Henry the Fowler conquered Lausatia in 928. It became a town and fortress under Otto I., his successor, and speedily attained considerable wealth and importance, for a good share of which it was indebted to the pilgrimages which were made to the "Arm of St. Peter," preserved in one of the churches. The battle of Bautzen was fought here on the 21st and 22d of May 1813, bebetween the French under Napoleon and the allied forces of Russia and Prussia, in which, after severe losses on both sides, the latter were defeated.

BAVARIA (in German, *Bayern*), a kingdom of Southern Germany, forming part of the German Empire, consists of two distinct portions, Bavaria proper and the Palatinate of the Rhine, which are separated by the grand duchies of Baden and Hesse. Bavaria proper contains an area of about 26,895 miles, and the Palatinate rather less than 2282, making the whole extent of the kingdom about 29,177 square miles.

The frontier of Bavaria proper on the north-east, towards Bohemia, consists of a long range of mountains known as the Böhmerwald; while the north is occupied by the Fichtelgebirge and the Frankenwald, which separate Bavaria from Ruess, Meiningen, and Hesse-Darmstadt. The ranges last named seldom exceed the height of 3000 or 4000 feet; but the ridges in the south, towards the Tyrol, form part of the system of the Alps, and frequently attain an elevation of 9000 or 10,000 feet. On the west it is bounded by Würtemberg, Baden, and Hesse-Darmstadt. The whole of the country belongs to the basins of the Danube and the Main; by far the greater portion being drained by the former river, which, entering from Swabia as a navigable stream, traverses the entire breadth of the kingdom, with a winding course of 200 miles, and receives in its passage the Iller, the Lech, the Isar, and the Inn from the south, and the Naab, the Altmühl, and the Wörnitz from the north. The Inn is navigable before it enters the Bavarian territory, and afterwards receives the Salza, a large river flowing from Upper Austria. The Isar does not become navigable till it has passed Munich; and the Lech is a stream of a similar size. The Main traverses the northern regions, or Upper and Lower Franconia, with a very winding course, and greatly facilitates the trade of the provinces. The district watered by the southern tributaries of the Danube consists for the most part of an extensive plateau, with a mean elevation of 2390 feet. In the mountainous parts of the country there are numerous lakes, and in the lower portions considerable stretches of marshy ground. The climate of Bavaria differs greatly, according to the character of the region, being cold in the vicinity of the Tyrol but warm in the plains adjoining the Danube and the Main. On the whole, the temperature is in the winter months considerably colder than that of England, and a good deal hotter during summer and autumn.

The extent of forest forms more than a fourth of the total area of Bavaria. This is owing to various causes —the extent of hilly and mountainous country, the thinness of the population, and the necessity of keeping a given extent of ground under wood for the supply of fuel. Nearly a third of the forests are public property, and furnish a considerable addition to the revenue. They are principally situated in the provinces of Upper Bavaria, Lower Bavaria, and the Upper Palatinate. The level country, including both Lower Bavaria (extending northwards to the Danube), and the western and middle parts of Franconia, is very productive in rye, oats, wheat, barley, and millet, and also in hemp, flax, hops, madder, and (in warm situations) in vines. The last are grown chiefly in the vicinity of the Lake of Constance and on the banks of the Main, in the lower part of its course, while the most extensive hop-growing district is central Franconia. Potatoes are cultivated in all the provinces, but especially in the Palatinate and in the Spessart district, which lies in the northwest within a curve of the Main. The southern division of Swabia and Upper Bavaria, where pastureland predominates, form a cattle-breeding district, and the dairy produce is extensive, no less than 11,000 tons of cheese and 2386 tons of butter being sold in the course of a year. The former finds a market all over Germany, and is also exported to Austria, France, and other countries, while Northern Germany is the chief consumer of the latter. The greater proportion of the land throughout the kingdom is in the hands of peasant proprietors, the extent of the separate holdings differing very much in different districts. The largest peasant property may be about 170 English acres, and the smallest, except in the Palatinate, about 50.

The exports of Bavaria consist chiefly of salt, timber, cattle, pigs, corn, and madder; and the imports comprise sugar, tobacco, raw cotton, cotton-goods, silks and linen, iron and iron-wares. As most of the imports are introduced indirectly through other Zollverein states, no custom-house register is kept of the total amount.

The Bavarians proper form a distinct section of the German race, speaking a well-defined dialect of the High German, but a large portion of the population of the country is of Swabian origin. The national character resembles that of the Austrians, being generally marked by fidelity and loyalty. In matters of religion they are credulous and even superstitious; and the will of their superiors is received by the lower orders with great deference both in political and ecclesiastical affairs.

Independence of thought and action have, however, been gradually increasing; and now that the country has become part of the German empire, a rapid transfusion of intellectual and political life is apparently taking place.

The present form of government is founded partly on long-established usage and partly on a constitutional act, passed in May 1818, and modified by subsequent acts, of which the most important was passed in 1848-9. The monarchy is hereditary, with a legislative body of two houses. The title of the sovereign is simply king of Bavaria; that of his presumptive heir is crown-prince of Bavaria. The executive power is vested altogether in the king, whose person is declared inviolable, the responsibility rests with the ministers, whose functions are nearly the same as those of ministers in England; and there are offices for foreign affairs for the home department, for religion and education, for the treasury, the army, and the administration of justice. These are all situated in Munich, the capital. The upper house of the Bavarian parliament, known as the Chamber of the *Reichsräthe*, comprises the princes of the blood-royal, the two archbishops, the barons or heads of certain noble families, a Roman Catholic bishop and Protestant clergyman appointed by the Crown, and any other members whom the king may nominate either as hereditary peers or as counsellors for life; but these last must not exceed a third of the hereditary members. The lower house, or Chamber of Representatives (*Wahlkammer*), consists of about 150 deputies, who formerly were chosen in definite proportions from the different classes of the community, an eighth part from the nobility, another eighth from the clergy, a fourth part from the burghers, and the remaining half from the landed proprietors; but since 1848 they may be selected without any such restrictions. A general election takes place once in six years, one deputy being allowed for every 7000 families in the kingdom. The election, however, is indirect,—electoral proxies, or *Wahlmänner*, to whom the real election is entrusted, being chosen by the general body of electors at the rate of one proxy to every 500 men. The king generally convenes the parliament once a year, and by the constitution it is obligatory on him to do so at least once in three years.

The Bavarian army forms, since the 23d November 1870, a separate portion of the army of the German empire, with a distinct administration; but its organization is subject to the general imperial rules, and in time of war it is placed under the command of the emperor. It comprises two *corps d'armée*, each divided into two divisions. In time of peace its infantry consists of 26,590 men, distributed in sixteen regiments; besides which there are ten battalions of *chasseurs*, 5500 strong, and thirty-two battalions of *landwehr*; the cavalry numbers 7200 men divided into ten regiments, and the artillery amounts to 5528 men in six regiments; there are also two battalions of pioneers and as many of the military train. In time of war the total force is raised to 149,892, or rather more than trebled.

The districts of Lower Bavaria, Upper Bavaria, and the Upper Palatinate are almost wholly Catholic, while in the Rhine Palatinate, Upper Franconia, and especially Middle Franconia, the preponderance is on the side of the Protestants. The exercise of religious worship in Bavaria is altogether free. The Protestants have the same civil rights as the Catholics, and the sovereign may be either Catholic or Protestant. Of the Roman Catholic Church the heads are the two archbishops of Munich-Freising and Bamberg, and the six bishops of Eichstädt, Spire, Würzburg, Augsburg, Regensburg, and Passau, of whom the first three are suffragans of Bamberg. The "Old Catholic" party has recently taken considerable hold of the country, and has organized congregations in all the more important towns. Among the Protestants the highest authority is the general consistory of Munich. The proportion of the different religions in 1885 was as follows: Roman Catholics, 3,839,168; Protestants, 1,521,114; Jews, 53,679, lesser Christian sects, 5,453; other religions, 379.

Bavaria was formerly as backward in regard to education as Austria, or any part of the south of Germany; but latterly considerable efforts have been made to lessen the prevailing ignorance. At Munich there are scientific and literary academies, as well as a university, a lyceum, a gymnasium, and other public schools. The university has a very numerous attendance of students, ranking third in the new German empire; and there are two provincial universities on a small scale, one (Catholic) at Würzburg, the other (Protestant) at Erlangen in Franconia.

The duchy of Bavaria during the Middle Ages consisted of the southern half of the present kingdom, and lay almost all to the south of the Danube, extending about 100 miles from that river to the Tyrol, and somewhat more from Swabia on the west to Austria on the east. The addition in 1623 of the Upper Palatinate, a province of full 3000 square miles, to the north of the Danube, gave the elector a territory of about 15,000 square miles, with a population of less than 1,000,000, which in a century and a half had increased to about 1,500,000. In 1778 the succession of the Rhenish branch of the reigning family added the Palatinate of the Rhine, and in 1806 a large augmentation was effected by Napoleon, who presented the king with the districts of the Lower Main and the Rezat, and with part of those of the Upper Main and the Upper Danube; not to mention Tyrol, which was afterwards restored to Austria. Some slight changes have taken place in the extent of the kingdom since then; but its general character has not been affected. The most important cession of recent years was that of part of Franconia in 1866 to Prussia, amounting to 291 square miles, with a population of 32,976 inhabitants.

The name in German, *Bayern*, or *Baiern*, is derived, like Latin *Boiaria*, from Boii, the name of a Celtic people by whom the country, which then formed part of Rhætia, Vindelicia, and Noricum, was inhabited in the time of Augustus. After the fall of the Roman power the natives were governed by chieftains of their own till the era of Charlemagne, who subjugated this as well as most other parts of Germany. After his death Bavaria was governed by one of his grandsons, whose successors bore the title of Margrave, or Lord of the Marches. In the year 920 the ruling margrave was raised to the rank of duke, which continued the title of his successors for no less than seven centuries. During this period Bavaria was connected with Germany nationally by language and politically as a frontier province, but in civilization was almost as backward as Austria, and was greatly behind Saxony, Franconia, and the banks of the Rhine. At last, in 1620, the reigning duke, having rendered great service to Austria against an insurrection in Bohemia, received an important accession of territory at the expense of the Elector Palatine, and was appointed one of the nine electors of the empire. His successors continued faithful members of the Germanic body and allies of Austria until 1771, when the elector Max Emanuel began to assist Louis XIV. of France by threatening and attacking Austria, so as to prevent her from co-operating efficiently with England and Holland. This induced the duke of Marlborough, in the spring of 1704, to march his army above 300 miles from the banks of the Meuse to invade Bavaria, the fate of which was decided by the battle of Blenheim on the 13th August

1704. For ten years from this date the elector and his remaining forces served in the French armies, and his country was governed by imperial commission until the peace of Utrecht, or more properly that of Baden, in 1714, reinstated him in his dominions.

His son Charles Albert, who succeeded him in 1726, untaught by these disasters, renewed his connection with France; and, in 1740, on the death of the emperor of Germany, came forward as a candidate for the imperial crown. He obtained the nomination of a majority of the electors, and overran a considerable part of the Austrian territory; but his triumph was of small duration, for the armies of Maria Theresa not only repulsed the Bavarians, but obtained in 1744 possession of the electorate. The elector died soon after, and his son Maximilian Joseph recovered his dominions only by renouncing the pretensions of his father.

Bavaria now remained tranquil above thirty years, until 1777, when, by the death of Maximilian, the younger line of the house of Wittelsbach, the line which had long ruled in Bavaria, became extinct. The next heir was Charles Theodore the Elector Palatine, the representative of the elder line of Wittelsbach; but Austria unexpectedly laid claim to the succession, and took military possession of part of the country. This called into the field, on the side of Bavaria, Frederic II. of Prussia, then advanced in years; but, before any blood had been shed, Austria desisted from her pretensions, on obtaining from Bavaria the frontier district which bears the name of Innviertel, or the Quarter of the Inn.

Bavaria again remained at peace until the great contest between Germany and France began in 1793, when she was obliged to furnish her contingent as a member of the empire. During three years her territory was untouched; but in the summer of 1796, a powerful French army under Moreau occupied her capital, forced her to sign a separate treaty with France, and to withdraw her contingent from the imperial army. The next war between France and Austria, begun in 1799, ending disastrously for the latter, the influence of France in the empire was greatly strengthened, so that, when the Austrians once more took up arms, in 1805, Bavaria was the firm ally of France, and for the first time found advantage in the connection,—its elector, Maximilian Joseph, receiving from Napoleon the title of king and several additions of territory.

Bavaria continued to support the French interest with her best energies till 1813, when, on condition of her late acquisitions being secured to her, she was led to join the Allies, and her forces contributed largely to the ultimate defeat of Bonaparte. In 1818 Maximilian presented his country with a constitution, of rather a mixed character, in which an attempt was made at once to satisfy the growing desire for political liberty and to maintain the kingly power. At the same time several beneficial measures, such as the abolition of serfdom, were effected in the earlier sessions of the new parliament. In 1825 Maximilian was succeeded by his son Louis, who distinguished himself as a promoter of the fine arts, but proved himself destitute of political capacity, and in consciousness of his disagreement with the spirit of his times, abdicated in March 1848 in favor of his son Maximilian II. It was not long before the difficulties of the new king were distinctly brought to view by the insurrection of the democratic party in Westphalia. By the assistance of Prussia the rising was quelled, and punishment was so ruthlessly inflicted by the tribunals that the trials became known as the bloody assizes. An anti-liberal reaction set in, and many of the political gains of former years were consequently lost. In 1864 King Louis was succeeded by his son of the same name (Louis II.); and at this time the great question of the future hegemony of Germany was being agitated throughout the country. In the war of 1866 the Bavarian Government and people threw in their lot with Austria, shared in the contest, and were involved in the defeat and loss. On the withdrawal of Austria from the German confederation a change of policy was introduced, and the Government veered round to the interests of Prussia, a course which was confirmed by the Franco-German War of 1870, when Bavaria took an active part with Prussia against the common enemy. Much ferment, however, remained in the country, and religious elements were introduced into the political discussions. The clerical, or, as it styles itself, the patriot party, is opposed to Prussian influence, and contends for "particularism," wishing to maintain a greater degree of independence for Bavaria than seems to be compatible with imperial unity. For a number of years the Government has been in the hands of the Liberal party. Thus a series of the most important measures have been passed with a liberal tendency, and the country is being gradually assimilated to the more advanced states of Northern Germany. The focus of the Liberal party is the Palatinate of the Rhine, while the "patriots" are mainly recruited from the districts of Old Bavaria. The decisive triumph of the former was marked by the treaty of November 23, 1870, between Bavaria and the Confederation of Northern Germany, which was followed by the recognition of the king of Prussia as the head of a new German empire. At the same time a greater degree of independence was granted to Bavaria than to the other members of the Confederation; it was freed from the domiciliary surveillance of the empire, and allowed to maintain the administration of its own postal and telegraph systems, while its army has a separate organization, and during peace is under the command of the Bavarian king.

BAXAR, or BUXAR, a town of Hindustán, in the province of Behar, district of Sháhábád, on the south bank of the Ganges. Population, 13,446.

BAXTER, ANDREW, an able metaphysician, the son of a merchant in Old Aberdeen, was born in 1686 or 1687, and educated at King's College there. After leaving the university he acted for some years as tutor to various young gentlemen, among others to Lord Gray, Lord Blantyre, and Mr. Hay of Drummelzier. In 1733 he published, in quarto, but without date, *An Inquiry into the Nature of the Human Soul*, wherein its immateriality is deduced from the principles of reason and philosophy. In 1741 he went abroad with Mr. Hay, and resided several years at Utrecht, from which place he made excursions into Flanders, France, and Germany. He returned to Scotland in 1747, and resided at Whittingham, in Haddingtonshire, till his death, which occurred on April 23, 1750.

BAXTER, RICHARD, one of the most eminent of English divines, styled by Dean Stanley "the chief of English Protestant Schoolmen," was born at Rowton in Shropshire, at the house of his maternal grandfather, on November 12, 1615. His family connections were favorable to the growth of piety. But his early education was much neglected, and he did not study at any university, a circumstance worthy of notice, considering the eminent learning to which he afterwards attained. His best instructor was a Mr. John Owen, master of the Free School at Wroxeter. His diligence in the acquirement of knowledge was remarkable; and from the first he had a strong bent towards the philosophy with which religion is concerned,—Mr. Francis Garbet of Wroxeter being the director of these studies. For a short time his attention was turned to a court life, and he went to London under the patronage of Sir Henry Herbert, master of the revels, to follow that course;

but he very soon returned home with a fixed resolve to cultivate the pursuit of divinity. Practical rather than speculative theology seems to have occupied his mind, and he therefore presented himself for ordination without any careful examination of the Church and English system. He was nominated to the mastership of the Free Grammar School, Dudley, in which place he commenced his ministry, having been ordained and licensed by Thornborough, bishop of Worcester. His popularity as a preacher was, at this early period, very great; and he was soon transferred to Bridgnorth, where, as assistant to a Mr. Madstard, he established a reputation for the vigorous discharge of the duties of his office.

During this time he took a special interest in the controversy relating to Nonconformity and the English Church. He soon, on some points, became alienated from the Church; and after the requirement of what is called "the *et cetera* oath," he rejected Episcopacy in its English form. He could not, however, be called more than a moderate Nonconformist; and such he continued to be throughout his life. Though commonly denominated a Presbyterian, he had no exclusive attachment to Presbyterianism, and often manifested a willingness to accept a modified Episcopalianism. All forms of church government were regarded by him as subservient to the true purposes of religion.

One of the first measures of the Long Parliament was to effect the reformation of the clergy; and, with this view, a committee was appointed to receive complaints against them. Among the complainants were the inhabitants of Kidderminster, a town which had become famous for its ignorance and depravity. This state of matters was so clearly proved that an arrangement was agreed to on the part of the vicar, by which he allowed £60 a year, out of his income of £200, to a preacher who should be chosen by certain trustees. Baxter was invited to deliver a sermon before the people, and was unanimously elected as the minister of the place. This happened in 1641, when he was twenty-six years of age.

His ministry continued, with very considerable interruptions, for about nineteen years; and during that time he accomplished a work of reformation in Kidderminster and the neighborhood which is as notable as anything of the same kind upon record. Civilized behavior succeeded to brutality of manners; and, whereas the professors of religion had been but small exceptions to the mass, the unreligious people became the exceptions in their turn. He formed the ministers in the country around him into an association for the better fulfilment of the duties of their calling, uniting them together irrespective of their differences as Presbyterians, Episcopalians, and Independents. The spirit in which he acted may be judged of from *The Reformed Pastor*, a book published in relation to the general ministerial efforts he promoted. It drives home the sense of clerical responsibility with extraordinary power. The result of his action is that, to this day, his memory is cherished as that of the true apostle of the district where he labored.

The interruptions to which his Kidderminster life was subjected arose from the condition of things occasioned by the Civil War. Worcestershire was a cavalier county, and a man in Baxter's position was, while the war continued, exposed to annoyance and danger in a place like Kidderminster. He therefore removed to Gloucester, and afterwards settled in Coventry, where he for the most part remained about two years, preaching regularly both to the garrison and the citizens. After the battle of Naseby he took the situation of chaplain to Colonel Whalley's regiment, and continued to hold it till February 1647.

His connection with the Parliamentary army was a very characteristic one. He joined it that he might, if possible, counteract the growth of the sectaries in that field, and maintain the cause of constitutional government in opposition to the republican tendencies of the time. He regretted that he had not previously accepted an offer of Cromwell to become chaplain to the Ironsides, being confident in his powers of persuasion under the most difficult circumstances. His success in converting the soldiery to his views does not seem to have been very great, but he preserved his own consistency and fidelity in a remarkable degree. By public disputation and private conference, as well as by preaching, he enforced his doctrines, both ecclesiastical and political, and shrank no more from what he conceived to be the truth upon the most powerful officers than he did from instructing the meanest followers of the camp. Cromwell shunned his society; but Baxter, having to preach before him after he had assumed the Protectorship, chose for his subject the old topic of the divisions and distractions of the church, and in subsequent interviews not only opposed him about liberty of conscience, but spoke in favor of the monarchy he had subverted. There is a striking proof of Baxter's insight into character in his account of what happened under these circumstances. Of Cromwell he says, "I saw that what he learned must be from himself." It is worthy of notice that this intercourse with Cromwell occurred when Baxter was summoned to London to assist in settling "the fundamentals of religion," and made the memorable declaration in answer to the objection, that what he had proposed as fundamental "might be subscribed by a Papist or Socinian." "So much the better," was Baxter's reply, "and so much the fitter it is to be the matter of concord."

After the Restoration in 1660 Baxter settled in London. He preached there till the Ejectment Act took effect in 1662, and was employed in seeking for such terms of comprehension as would have permitted the moderate dissenters with whom he acted to have remained in the Church of England. In this hope he was sadly disappointed. There was at that time on the part of the rulers of the church no wish for such comprehension, and their object, in the negotiations that took place, was to excuse the breach of faith which their rejection of all reasonable methods of concession involved. The chief good that resulted from the Savoy Conference was the production of Baxter's *Reformed Liturgy*, a work of remarkable excellence, though it was cast aside without consideration. The same kind of reputation which Baxter had obtained in the country he secured in the larger and more important circle of the metropolis. The power of his preaching was universally felt, and his capacity for business placed him at the head of his party. That he should have been compelled by the activity of party spirit to remain outside the National Church is to be deeply regretted. He had, indeed, been made a king's chaplain, and was offered the bishopric of Hereford, but he could not accept the offer without virtually assenting to things as they were; after his refusal he was not allowed, even before the passing of the Act of Uniformity, to be a curate in Kidderminster, though he was willing to serve that office gratuitously. Bishop Morley even prohibited him from preaching in the diocese of Worcester. The whole case illustrates afresh the vindictive bitterness of ecclesiastical factions in the heat of party contests, and especially in the hour of secular triumph.

From the Ejectment of 1662 to the Indulgence of 1687, Baxter's life was constantly disturbed by persecution of one kind or another. He retired to Acton in Middlesex, for the purpose of quiet study, and was dragged thence to prison on an illegal accusation of keeping a conventicle. He was taken up for preaching in

London after the licences granted in 167 2were recalled by the king. The meeting-house which he had built for himself in Oxendon Street was closed against him after he had preached there but once. He was, in 1680, seized in his house, and conveyed away at the risk of his life; and though he was released that he might die at home, his books and goods were distrained. He was in 1684 carried three times to the sessions' house, being scarcely able to stand, and without any apparent cause made to enter into a bond for £400 in security for his good behavior.

But his worst encounter was with Judge Jeffreys in May 1685. He had been committed to the King's Bench Prison for his *Paraphrase on the New Testament*, which was ridiculously attempted to be turned into a seditious book, and was tried before Jeffreys on this accusation. The scene of the trial is well known as amongst the most brutal perversions of justice which have occurred in England. Jeffreys himself acted like an infuriated madman; but there were among his blackguardisms some sparks of intelligence.

Baxter was sentenced to pay 500 marks, to lie in prison till the money was paid, and to be bound to his good behavior for seven years. It was even asserted at the time that Jeffreys proposed he should be whipped at the cart's tail through London. The old man, for he was now seventy, remained in prison for two years.

During the long time of oppression and injury which followed the Ejectment, Baxter was sadly afflicted in body. His whole life was indeed one continued disease, but in this part of it his pain and languor had greatly increased. Yet this was the period of his greatest activity as a writer. He was a most voluminous author, his separate works, it is said, amounting to 168. A considerable proportion of these, including folios and quartos of the most solid description, were published by him while thus deprived of the common rights of citizenship. How he composed them is matter of wonder. They are as learned as they are elaborate, and as varied in their subject as they are faithfully composed. Such treatises as the *Christian Directory*, the *Methodus Theologiæ Christianæ* and the *Catholic Theology*, might each have occupied the principal part of the life of an ordinary man. One earthly consolation he had in all his troubles; he was attended upon by a loving and faithful wife, whom he had married in the Ejectment year. She was much younger than himself, and had been brought up as a lady of wealth and station; but she adhered to him in all his wanderings, sharing his sufferings, and following him to prison; and she has her reward in that *Breviate of the Life of Mrs. Margaret Baxter*, which, while it records her virtues, reveals on the part of her husband a tenderness of nature which might otherwise have been unknown.

The remainder of Baxter's life, from 1687 onward, was passed in peace and honor. He continued to preach and to publish almost to the end. He was surrounded by attached friends, and reverenced by the religious world. His saintly behavior, his great talents, and his wide influence, added to his extended age, raised him to a position of unequalled reputation. He died in London on the 8th of December 1691; being seventy-six years old, and was buried in Christ Church. His funeral was attended by a very large concourse of people of all ranks and professions, including churchmen as well as dissenters. A similar tribute of general esteem was paid to him nearly two centuries later, when a statue was erected to his memory at Kidderminster in July 1875.

BAYAMO, a considerable town in the Island of Cuba. Its population at the last census amounted to 7,500 people.

BAYARD, Pierre du Terrail, Chevalier de, was born, of a noble family, at the chateau Bayard, Dauphiné, in 1476. He served as a page to the duke of Savoy until Charles VIII., attracted by his graceful bearing, placed him among the royal followers under the count de Ligny. As a youth he was distinguished for comeliness, affability of manner, and skill in the tilt-yard. In 1494 he accompanied Charles VIII. into Italy, and was knighted after the battle of Fornova, where he had captured a standard. Shortly afterwards, entering Milan alone in pursuit of the enemy, he was taken prisoner, but was set free without a ransom by Ludovic Sforza. His powers and daring were conspicuous in the Italian wars of this period. On one occasion it is said, single-handed, he made good the defence of a bridge over the Garigliano against about 200 Spaniards, an exploit that brought him such renown that Pope Julius II. sought to entice him into the Papal service, but unsuccessfully. The captaincy of a company in the royal service was given him in 1508, and the following year he led a storming party at the siege of Brescia. Here his intrepidity in first mounting the ramparts cost him a severe wound, which obliged his soldiers to carry him into a neighboring house, the residence of a nobleman, whose wife and daughters he protected from threatened insult. On his recovery he declined a gift of 2500 ducats, with which they sought to reward him. At this time his general was the celebrated Gaston de Foix, who acted greatly in accordance with his advice, and, indeed, fell at the battle of Ravenna through neglecting it. In 1513, when Henry VIII. of England routed the French at the battle of the Spurs, Bayard, in trying to rally his countrymen, found his escape cut off. Suddenly riding up to an English officer who was resting unarmed, he summoned him to yield, and, the knight complying, Bayard in return gave himself up to his prisoner. He was taken into the English camp, but on relating this gallant incident was immediately set free by the king without ransom. On the accession of Francis I. in 1515 he was made lieutenant-general of Dauphiné; and after the victory of Marignano, to which his valor largely contributed, he had the honor of conferring knighthood on his youthful sovereign. When war again broke out between Francis I. and Charles V., Bayard, with 1000 men, held Mézières, a town which had been declared untenable, against an army of 35,000, and after six weeks compelled Nassau to raise the siege. This stubborn resistance saved Central France from invasion, as the king had not then sufficient forces to withstand the imperialists. All France rang with the achievement. Parliament thanked Bayard as the savior of his country; the king made him a knight of the order of St. Michael, and commander in his own name of 100 gens d'armes, an honor till then reserved for princes of the blood. After allaying a revolt at Genoa, and striving with the greatest assiduity to check a pestilence in Dauphiné, Bayard was sent, in 1523, into Italy with Admiral Bonivet, who, being defeated at Rebec, implored him to assume the command and save the army. He repulsed the foremost pursuers, but in guarding the rear at the passage of the Sesia was mortally wounded. He had himself placed against a tree that he might die facing the enemy, and to Bourbon who came up and expressed pity for him, he replied, "My lord, I thank you, but pity is not for me, who die a true man, serving my king; pity is for you who bear arms against your prince, your country, and your oath." He expired after repeating the *Miserere*. His body was restored to his friends and interred near Grenoble. Chivalry, deprived of fantastic extravagance, is perfectly mirrored in the character of Bayard. He combined the merits of a skilful tactician with the romantic heroism, piety, and

magnanimity of the ideal knight-errant. Even adversaries experienced the fascination of his virtues, and joined in the sentiment that he was, as his contemporaries called him, "Le chevalier sans peur et sans reproche."

BAYAZID, or BAJAZID, a city of Turkish Armenia in the pashalic of Erzeroum, 50 miles S.S.W. of Erivan, situated on the side of a rugged mountain that forms, as it were, a bastion of the Ala-dagh chain.

BAY CITY, a flourishing city in the State of Michigan, in Bay County. Its population at last census was 27,826. It is a terminus of several railroads, and does an immense business in lumber and salt. Bay City contains two national and two other banks, seventeen churches, a high school, and a regular school system. The city is supplied with water by the Holly system, and is lighted by gas and electricity.

BAYEUX, formerly the capital of the Bessin, and now the chief town of an arrondissement in the department of Calvados, in France.

BAYLE, PIERRE, author of the famous *Historical and Critical Dictionary*, was born on the 18th November 1647, at Carlat-le-Comte, near Foix, in the south of France. After a short residence at home he entered a Jesuit College at Toulouse. While there he devoted much of his time to controversial works on theology, and ended by abjuring Calvinism and embracing the Roman Catholic faith. In this, however, he continued only seventeen months, abruptly resuming his former religion. To avoid the punishment inflicted on such as relapsed from the Catholic Church, he withdrew to Geneva, where he resumed his studies, and for the first time became acquainted with the philosophical writings of Descartes. For some years he acted as tutor in various families; but in 1675, when a vacancy occurred in the chair of philosophy at the Protestant university of Sedan, he was prevailed upon to compete for the post, and was successful. In 1681 the university at Sedan was suppressed, but almost immediately afterwards Bayle was appointed professor of philosophy and history at Rotterdam. Here in 1682 he published his famous letter on comets, and his critique of Maimbourg's work on the history of Calvinism. After a long quarrel Bayle was deprived of his chair in 1693. He was not much depressed by this misfortune, being at the time closely engaged in the preparation of his great Dictionary, which appeared in 1697. A second edition was called for in 1702. The few remaining years of Bayle's life were devoted to miscellaneous writings, arising in many instances out of criticisms made upon his Dictionary. He died on the 28th December, 1706.

BAYONET. See ARMS AND ARMOR.

BAYONNE, probably the ancient *Lapurdum*, *Baiotium civitas*, or *Baioticum*, a first-class fortified city of France, and the capital of an arrondissement, in the department of the Lower Pyrenees. It is well built, and agreeably situated at the confluence of the Nive and Adour, about three miles from the sea. The citadel is one of the finest works of Vauban, and the cathedral is a large and elegant Gothic structure. Population, 27,000.

BAYONNE, a town of New Jersey, in Hudson county. Pop. (1890), 18,996. It is an important shipping point for coal, and contains several refineries, paint works, and manufactories of chemicals. The town has banks, railroads, telegraphs, schools, churches, newspapers, etc., and is increasing steadily in importance.

BAZA (the mediæval *Bastiana*), a city of Spain in the province of Granada, situated in a fruitful valley in the Sierra Nevada, not far from the river of its own name.

BAZARD, ARMAND, a French socialist, the founder of a secret political society in France, corresponding to the Carbonari of Italy, and a warm adherent of St. Simon, was born in Paris in 1791. He took part in the defence of Paris in 1815, and afterwards occupied a subordinate situation in the prefecture of the Seine. About the year 1820 he united some patriotic friends into a society, which was called *Amis de la Vérité*. From this was developed a complete system of Carbonarism, the peculiar principles of which were introduced from Italy by two of Bazard's friends.

BÁZÍGARS, a tribe of Indians, inhabiting different parts of the peninsula of Hindustán. They are recognized by several appellations, as Bázígars, Panchpíri, Kunjrá, or Nats; they follow a mode of life distinguishing them from the Hindus, among whom they dwell; they abstain from intermixing their families with the Hindus, and from any intercourse by which they can be united. They are dispersed throughout the whole of India, partly in wandering tribes, partly adhering to fixed residences, but the greater proportion lead a nomadic life.

The Bázígars are supposed to present many features analogous to the gipsies scattered over Europe and Asia, where they subsist as a race distinct from all the other inhabitants of the countries frequented by them. The Bázígars, as well as the gipsies, have a chief or king; each race has a peculiar language, different from that of the people among whom they reside; and the analogy of the languages is so decided, that it is difficult to deny that they have had a common origin. Another resemblance, which has probably been lost in the lapse of time, is supposed to consist in the three-stringed viol introduced into Europe by the jugglers of the 13th century, which is exactly similar to the instrument now used in Hindustán. Disjointed, these analogies may not carry conviction of the identity of the European gipsies with the Indian Bázígars; but, on combining the whole, it does not seem unlikely, that if Asia was their original country, or if they have found their way from Egypt to India, they may also have emigrated farther at a period of remote antiquity, and reached the boundaries of Europe.

BAZZI, GIOVANNI. See SODDOMA.

BDELLIUM, a fragrant gum-resin of a dark-reddish color, bitter and pungent to the taste. It is closely allied to myrrh, and like it is produced from one or more species of *Balsamodendron*,—the Googul resin, or Indian bdellium, yielded by *B. nukul*, being considered by Dr. Birdwood to be the bdellium of Scripture.

BEACHY HEAD, a promontory on the coast of Sussex, between Hastings and Brighton, near which the French defeated the English and Dutch fleet in 1690.

BEACONSFIELD, a market-town in the county of Buckingham, 23 miles from London, on the road to Oxford. It consists of four streets crossing each other at right angles, and before the opening of the railways was rather a busy place. At one time, indeed, it was the seat of a considerable manufacture of ribbons. The poet Waller and Edmund Burke lived in the neighborhood, and both are buried in the town. Beaconsfield gave the title of viscountess to the late wife of the Right Hon. B. Disraeli. Population of parish in 1889, 1524.

BEAD, a small globule or ball used in necklaces, and made of different materials, as pearl, steel, garnet, coral, diamond, amber, glass, rock-crystal, and seeds. The Roman Catholics make great use of beads in rehearsing their *Ave-Marias* and *Pater-nosters*, and a similar custom obtains among the religious orders of the East. A string of such beads is called a rosary. Glass beads were used by the Spaniards to barter with the natives of South America for gold when they first established

themselves on that continent, and to this day they are a favorite article of traffic with all savage nations. Beads of glass are sent in enormous quantities to Zanzibar, and to all other ports from which a trade with the interior of Africa is carried on, as they form almost the only convenient medium of exchange with the native tribes. The qualities and varieties recognized in the Zanzibar market are said to number more than 400, and the trade there is almost entirely in the hands of the Banyans. Large quantities are also sent to India, the Eastern Archipelago, and the Polynesian Islands; and in the more primitive parts of Europe beads are in considerable demand. Under the name of bugles a very great quantity of small, mostly cylindrical, beads are used in lace-making, and for the ornamentation of ladies' dresses, the demand in this form fluctuating greatly according to the demands of fashion. Venice is the principal centre of the manufacture of glass beads of all kinds.

BEAN, the seed of certain leguminous plants cultivated for food all over the world, and furnished chiefly by the genera *Faba*, *Phaseolus*, *Dolichos*, *Cajanus*, and *Soja*. The common bean, in all its varieties, as cultivated in Britain and on the continents of Europe and America, is the produce of the *Faba vulgaris*. The French bean, kidney bean, or haricot, is the seed of the *Phaseolus vulgaris;* but in India several other species of this genus of plants are raised, and form no small portion of the diet of the inhabitants. From the genus *Dolichos*, again, the natives of India and South America procure beans or pulse, of no small importance as articles of diet, such as the *D. ensiformis*, or sword bean of India, the Lima beans, &c. Besides these there are numerous other pulses cultivated for the food both of man and domestic animals, to which the name beans is frequently given. The common bean is even more nutritious than wheat; and it contains a very high proportion of nitrogenous matter under the form of legumin, which amounts on an average to 24 per cent. It is, however, a rather coarse food, and difficult of digestion, and is chiefly used to feed horses, for which it is admirably adapted.

BEAR, the common name of the *Ursidæ*, a typical family of Plantigrade Mammals, distinguished by their massive bodies, short limbs, and almost rudimentary tails. With the single exception of the Honey Bear, all the species have forty-two teeth, of which the incisors and canines closely resemble those of the purely carnivorous mammals; while the molars, and especially that known as the "carnassial," have their surfaces tuberculated so as to adapt them for grinding vegetable substances. As might have been supposed from their dentition, the bears are truly omnivorous; but most of the family seem to prefer vegetable food, including honey, when a sufficient supply of this can be had. The Grizzly Bear, however, is chiefly carnivorous; while the Polar Bear, in a state of nature, is believed to be almost wholly so. The strength and ferocity of different species and of different individuals of the same species seem to depend largely on the nature of their diet,— those restricted to purely vegetable food showing an approach to that mildness of disposition characteristic of herbivorous animals.

Bears are five-toed, and are provided with formidable claws, but these are not retractile as in the cats, and are thus better fitted for digging and climbing than for tearing. Most of the bears climb trees, which they do in a slow, lumbering fashion, and, in descending, always come hindquarters first. The Grizzly Bear is said to lose this power of climbing in the adult state. In northern countries the bear retires during the winter season into caves and the hollows of trees, or allows the falling snow to cover it, where it remains dormant till the advent of spring, about which time the female usually produces her young. These are born naked and blind, and it is commonly five weeks before they see, or become covered with hair. Before hibernating they grow very fat, and it is by the gradual consumption of this fat — known in commerce as bear's grease — that such vital action as is necessary to the continuance of life is sustained.

The bear family is widely distributed, being found in every quarter of the globe except Australia, and in all climates, from the highest northern latitudes yet reached by man to the warm regions of India and Malaya. In the north-west corner of Africa the single representative of the family found on that continent occurs. Of the remaining species described in Gray's recent monograph of this family, three are European, six American, and eight Asiatic; while one species — the Polar Bear — is common to the Arctic regions of both hemispheres. In addition to these, the best known species are peculiarly rich in varieties. Bears have been recently divided into three groups,— sea bears, land bears, and honey bears.

(1.) Sea bears, of which the Polar or White Bear (*Thalassarctos maritimus*) is the only species known, are distinguished from the other groups by having the soles of the feet covered with close-set hairs,— a beautiful instance of special adaptation to the wants of the creature, the bear being thereby enabled to walk more securely on the slippery ice. In the whiteness of its fur also, it shows such an assimilation in color to that of surrounding nature as must be of considerable service in concealing it from its prey. These bears are strong swimmers, Captain Sabine having found one "swimming powerfully forty miles from the nearest shore, and with no ice in sight to afford it rest." They are often carried on floating ice to great distances, and to more southern latitudes than their own, no fewer than twelve Polar bears having been known to reach Iceland in this way during one winter. The female always hibernates, but the male may be seen abroad at all seasons. In bulk the White Bear exceeds all other members of the family, measuring nearly 9 feet in length, and often weighing 1600 lb.

(2.) Land bears have the soles of their feet destitute of hair, and their fur more or less shaggy. Of these the Brown Bear is found in one or other of its varieties all over the temperate and north temperate regions of the eastern hemisphere, from Spain to Japan. Its fur is usually of a brownish color, but there are black, blackish-gray, and yellowish varieties. It is a solitary animal, frequenting the wooded parts of the regions it inhabits, and living on a mixed diet of fruits, vegetables, honey, and the smaller animals. In winter it hibernates, concealing itself in some hollow or cavern.

The American Black Bear (*Ursus Americanus*) occurs throughout the wooded parts of the North American continent, whence it is being gradually driven to make room for man. It is similar in size to the Brown Bear, but its fur is of a soft even texture, and of a shining black color, to which it owes its commercial value. At the beginning of the present century Black Bears were killed in enormous numbers for their furs, which at that time were highly valued.

The Grizzly Bear (*Ursus horribilis*) approaches the Polar Bear in size, while it exceeds that, and all other American mammals in ferocity of disposition and in muscular strength. It is said to attack the bison, and has been known to carry off a carcase weighing 1000 lb. for a considerable distance to its den, there to devour it at leisure. It also eats fruit and other vegetables. Its fur is usually of a yellowish brown color, coarse and

grizzled, and of little value commercially, while its flesh, unlike that of other bears, is uneatable even by the Indians. It is found in great abundance on the eastern slopes of the Rocky Mountains.

(3.) Honey bears are distinguished from the other groups by the absence of two upper incisors, and the very extensile character of the lips. Of these there is but one species, the Sloth or Honey Bear (*Melursus labiatus*).

BEAR LAKE, GREAT, an extensive sheet of fresh water in the north-west of Canada, between 65° and 67° N. lat., and 117° and 123° W. long. It is of a very irregular shape, has an estimated area of 14,000 square miles, and is upwards of 200 feet above the sea. The Bear Lake River carries its waters into the Mackenzie River.

BEARD. The tradition that Adam was created with a beard (which may be described as bushy rather than flowing), is recorded on ancient monuments, and especially on an antique sarcophagus, which is one of the ornaments of the Vatican. The Jews, with the Orientals generally, seem to have accepted the tradition for a law. The beard was a cherished and a sacred thing. Israel brought it safe out of the bondage of universally shaven Egypt, and the beard was the outward and visible sign of a true man. To rudely touch his beard was to cruelly assail his dignity. Children and other kinsfolk might gently touch it as a sign of love ; a fugitive might reverentially raise his hand to it when praying for succor ; and he who put his hand on his own beard and swore by it bound himself by the most solemn of oaths, to violate which would render him infamous among his fellow-men. To touch the beard in the allegiance of love established peace and trustfulness between the two parties. When Joab went in to Amasa he took the beard of the latter to kiss him, saying the while, "Art thou in health, my brother?" Therefore it was that Amasa took no heed of the sword in Joab's hand, which Joab at once thrust beneath the other's fifth rib. The Scriptures abound with examples of how the beard and its treatment interpreted the feelings, the joy, the sorrow, the pride, or the despondency of the wearer.

Although the Jews carried their beards with them from their bondage in Egypt, the Egyptians were not at all insensible of the significance of that appendage. They did not despise the type of manhood. Accordingly, on days of high festival they wore false beards, as assertions of their dignity in the scheme of creation, and they represented their male deities with beards "tip-tilted" at the ends. The general reader having laudable curiosity on this matter may be safely referred to the pages of Herodotus,—a writer who has much to say pertinently to the subject, and who, after being maligned as the second father of lies, is now praised for his modesty, and relied on for his trustworthiness.

The modern Mahometans, especially those who have most come in contact with Europeans, have a good deal fallen away from old conservative ideas respecting the beard. Once this glorious excrescence, as it was held to be, was made, by the followers of Islam, a help to salvation. The hairs which came from it in combing were preserved, broken in two, and then buried. The breaking was a sort of stipulation with some angel who was supposed to be on the watch, and who would look to the safe passage of the consigners of the treasure into the paradise of never-failing sherbet and ever-blooming houris. The first sultan who broke through the orthodox oppression of beardedness was Selim I. (1512–20). This act was a violent shock to the whole body of the faithful, and especially of the Mufti. The very highest priest alone could dare to remonstrate with so absolute a monarch. Selim put aside the remonstrance with a joke. "I have cut off my beard," he said, "in order that my vizier may have nothing to lead me by!"

If we turn to Europe and begin with classical times, we may remember that the Greeks and Romans once styled as barbarians, or bearded, unshaven savages, all nations who were out of the pale of their own customs and religion. Nevertheless, the young Roman, anxious for beard and moustache, used to apply the household oil to his chin and cheeks, in order to bring thereon that incipient fringe which would entitle him to be called "barbatulus." The full-furnished man was "barbatus." It was not till the beard ceased to be universally worn, and Sicilian barbers set up in Rome (about 300 B.C.), that the Romans began to apply the word, translated "barbarous," to the rude men and manners of the early ages, and of the beard universal. But, after all, we may still see, in old counterfeit presentments, that the fashionable, clipped beard of young Roman "swells" in the last days of the Republic, and of some of the emperors from the time of Hadrian, is not nearly so majestic as the overflowing hair depending from the chin of Numa Pompilius. Nero offered some of the hair of his beard to Jupiter Capitolinus, who could have furnished a dozen emperors from his own. Homer, Virgil, Pliny, Plutarch, Strabo, Diodorus, Juvenal, Persius, are among the writers who furnish material for a volume on beards. One Roman emperor, Julian, wrote a work on the subject, which is commonly supposed to be as fierce a denunciation against beards, as King James's *Blast* was against tobacco; but Julian in his *Misopogon*, or *Enemy of the Beard*, descants satirically "with pleasure and even with pride," says Gibbon, "on the length of his nails and the inky blackness of his hands, protests that although the greatest part of his body was covered with hair, the use of the razor was confined to his head alone, and celebrated with visible complacency the shaggy and *populous* beard which he fondly cherished, after the examples of the philosophers of Greece." Persius undoubtedly associated wisdom with the beard. He exhausted the whole vocabulary of praise when he designated Socrates by the term *Magister Barbatus*. In this, however, there is less wit than in the rejoinder of the young ambassador to a king, who had expressed his wrath at having a beardless youth sent to him as an envoy. "If," said the latter, "my master had thought you would have laid so much account on a beard he would have sent you a goat."

Goth is equivalent for the older term of *Barbarian*. One is about as unjust in its application as the other. Gothic rudeness is often illustrated by the case of the "ugly rush" made by the northern warriors into the Capitol, where the conscript fathers sat in silence and fearlessness, waiting events. One of these unlettered soldiers lifted his hand to the beard of an old legislator, who, taking it for insult, smote the Goth to the ground. Let us do the Goth the justice of believing that, awed by the stern mute majesty of the senators, he raised his hand reverentially to the beard. At all events, the taking it with such prompt and painful action was dearly paid for in the swift retaliation which followed.

If the phrase be not too light for use, we would say that as beards existed before barbers, the Europeans, like all other people, were originally a bearded people. The beard is perhaps more general now in Germany than elsewhere in Europe; and Germany affords an example of the longest beard known, out of fairy story, in the person of the painter Johan Mayo, whose beard was so long that when he stood upright it still trailed on the ground; accordingly, he often doubled it up in his girdle. Germany knows him as John the Bearded, just as it does one of its emperors as Frederick Bar-

barossa; but many nations, ancient and modern, can boast of men and monarchs who have been nicknamed from their beards.

When Peter the Great levied a tax on Russian beards, he was only following a precedent which once existed in England. Noble chins were assessed at a rouble; your commoner chin at a copec. It caused commotion, and there was much compulsory shaving of those who did not pay. Beards are not now valued in Russia. He who wears one seems to acknowledge that he has no very high place in the social scale. On the other hand, beards were highly treasured in Spain till the time of Philip V., who was unable to cultivate one. As was to be expected, this infirmity set the fashion of affecting the infirmity; but beardless dons were wont to exclaim with a sigh, "Since we have lost our beards, we have lost our souls!" Thus, they unconsciously adopted something akin to the superstition of the Roskolniki, a sect of schismatics who obstinately maintained that the divine image resided in the beard. Portugal was not behind Spain in appreciating the beard. When the Portuguese admiral, Juan de Castro, borrowed a thousand pistoles from the city of Goa, he lent in pledge one of his whiskers, saying, "All the gold in the world cannot equal this natural ornament of my valor." In these modern days one would not think much of the security of such a material guarantee, nor of the modesty of the admiral who might have the face to offer it.

As Spaniards denuded their chins because their king could not grow a beard, so the French grew beards, long after they had gone out of fashion, because their king found it necessary to do so. Francis the First, having wounded his chin, concealed the ugly scar by covering it with a beard; and all loyal chins forthwith affected to have scars to conceal. But when fashion and loyalty were united the beard was carefully tended. It was not as in the time of the idle, helpless, and long haired kings, who were less potential than their chief officers, when the wild, dirty, and neglected beard was a type of that majesty, made up of shreds and patches, which used to be paraded before the people on a springless cart. Three hairs from a French king's beard under the waxen seal stamped on royal letter or charter, were supposed to add greater security for the fulfilment of all promises made in the document itself. In course of time fashion complimented majesty; a certain sort of moustache was called a "royal," and the little tuft beneath the lower lip was known by the term "imperial." As a rule the French chin assumed the appearance of that of the king for the time being. The royal portrait reflects a general fashion from which only the disloyal or the indifferent departed. On the subject of shaving, Talleyrand once drew a fine distinction. Rogers asked him if Napoleon shaved himself. "Yes," replied the statesman; "one born to be a king has some one to shave him; but they who acquire kingdoms shave themselves." Tradition has exaggerated accounts of bearded prisoners in the Bastille, but there was an official there whose duty consisted in keeping the captives without beards. Some years before the Revolution the celebrated lawyer and political writer Linguet was incarcerated there. On the morning after his being locked up, an individual entered his room who announced himself as the barber of the Bastille. "Very well," said the sharp-witted Linguet, "as you are the barber of the Bastille — rasez-la."

Among the men of whom it was said of old that they would be known by their love for one another, the beard has been a cause of much fierce uncharitableness. The Greek Church, advocating the beard, and the Roman Church, denouncing it, were not more forgetful of ever-blessed charity than the Belgian Reformers, the close-shaven of whom wished the bearded members to be expelled as non-Christians. The tradition concerning the Master whom both proposed to follow was logically pleaded by the wearers of beards. As a general rule, in the earlier time, the man who wore his hair short and his beard long, was accounted as at least bearing the guise of respectability — looking like a priestly personage. There is a series of medals of the popes at Naples, from Clement VII. (1523-34) to Alexander VIII. (1689-91). All these are bearded. Clement's beard is long and dark; Alexander wears beard and moustaches. Perhaps Clement Giulio de' Medici set the fashion. Certain it is that a few years before, his kinsman, Giovanni de' Medici, Leo X. (1513-22), was always close-shaven, and beards were not to be seen on the chin of Leo's clerics and courtiers.

In the 13th century beards are said to have first come into fashion in England. If we may judge from the 15th century brasses in England, few men of distinction enough to be so commemorated wore beards. Hotspur's fop had his "chin new reaped." In the reign of Henry VIII. the fashion had so revived among lawyers that the authorities of Lincoln's Inn prohibited wearers of beards from sitting at the great table, unless they paid double commons; but in all probability this was before that sovereign ordered (1535) his courtiers to "poll their hair," and he let that crisp beard grow which is familiar to us all. Thence came a fiscal arrangement; beards were taxed, and the levy was graduated according to the condition of the wearer. In the Burghmote Book of Canterbury (quoted in *Notes and Queries*) there is the following entry: — "2nd Ed. vi. The Sheriff of Canterbury and *another* paid their dues for wearing beards, 3s. 4d. and 1s. 8d." In the next reign, and in the year 1555, Queen Mary sent four agents to Moscow; all were bearded, but one of them, a certain George Killingworth, was especially distinguished by a beard 5 feet 2 inches long, at sight of which a smile crossed the grim features of Ivan the Terrible himself. George's beard was thick, broad, and yellow; and, after dinner, Ivan played with it, as with a favorite toy. Most of the Protestant martyrs were burnt in their beards. Sir Thomas More, on the other hand, put his out of the way, as he laid his head on the block, with the innocent joke so well known. Elizabeth introduced a new impost with regard to beards. Every beard of above a fortnight's growth was subject to yearly tax of 3s. 4d. The rate was as heavy as the law authorizing it was absurd. It was made in the first year of her reign, but it proved abortive. Fashion stamped it out, and men laughed in their beards at the idea of paying for them. The law was not enforced, and the Legislature left the heads of the people alone till much later times, when necessity and the costs of war put that tax on hair-powder which even now contributes a few thousands a year to the British Exchequer. The Vandyke beard, pointed (as Charles the First and the illustrious artist, with most cavaliers, wore it), was the most universally worn for a time. Beaumont and Fletcher, in the *Queen of Corinth*, make allusion, doubtless, to a fashion of wearing moustache and beard, common to the reign of the first James as well as that of Charles.

John Taylor, the water-poet, notices the T beard, and mentions at least a score of the various ways of wearing beards in his time, not forgetting the contemporary proverb, "Beard natural, more hair than wit." Soon after this time, however, the beard in England was everywhere kept down by the razor. At the close of last century the second Lord Rokeby (Mat. Robineau) endeavored to restore the fashion. "His beard," says a contemporary, "forms one of tho most conspicuous traits of his person." But too short a period had

elapsed since Lord George Gordon, the hero of "the Riots," had turned Jew and let his beard grow, to allow of any favor being awarded to an appendage which seemed a type of infamy. To the literature of the beard a remarkable addition was made in the present century by James Ward, R.A., the celebrated animal painter. Mr. Ward published a *Defence of the Beard*, on scriptural grounds; he gave eighteen reasons why man was bound to grow a beard, unless he was indifferent as to offending the Creator and good taste; for the artist asserted himself as much as the religious zealot, and the writer asked, "What would a Jupiter be without a beard? Who would countenance the idea of a shaved Christ?" Mr. Ward had what the French call "the courage of his opinions," and wore a beard of the most Jupiter-like majesty. Mr. Muntz, M.P. for Birmingham, followed the example, but it was not adopted by many others. A new champion, however, appeared in 1860, but on peculiar ground. "Theologos" expressed his views in the title-page of his work, namely,—*Shaving: a breach of the Sabbath, and a hindrance to the spread of the Gospel.* A carrying out of the views of the writer would lead to the full practice which prevailed among the Essenes, who never did on the Sabbath anything whatever that they were in the regular habit of doing on other days.

BEARDSTOWN, a growing city of Illinois, in Cass county, 46 miles from Springfield, is situated on the Illinois river and at the intersection of several railroads. It contains two banks, several churches and schools, and two weekly newspapers are published. It has good telegraph connections. The industries are varied and include iron and brass foundries, agricultural implement and machine-shops, a woolen-mill and several other manufactories. The population (1890) is 4,500.

BÉARN, formerly a small frontier province in the south of France, now included within the department of Basses-Pyrénées, was bounded on the W. by Soule and Lower Navarre, on the N. by Chalosse, Tursan, and Astarac, E. by Bigorre, and S. by the Pyrenees. Its name can be traced back to the town of Beneharnum, which first appears in the Antonine Itinerary. The population is mainly of Basque origin, with possibly a certain mixture of Greek blood from the ancient colonies of that people. The Basque language, in spite of the diffusion of French, is still maintained in the district; and it is asserted that traces of old Hellenic names are not infrequent.

BEATON, DAVID, archbishop of St. Andrews, and cardinal, was a younger son of John Beaton of Balfour in the county of Fife, and is said to have been born in the year 1494. The great ability of Beaton and the patronage of his uncle, the archbishop of Glasgow, ensured his rapid promotion to high offices in the church and Kingdom. He was sent by King James V. on various missions to France, and in 1528 was appointed keeper of the privy seal. He took a leading part in the negotiations connected with the king's marriages, first with Magdalen of France and afterwards with Mary of Lorraine. At the French court he was held in high estimation by King Francis I., and was presented to the bishopric of Mirepoix in Languedoc, to which he is said to have been consecrated on 5th December 1537. On the 20th of December 1538 he was appointed a cardinal priest by Pope Paul III., under the title of St. Stephen in the Cœlian Hill. He was the only Scotsman who had been named to that high office by an undisputed right, Cardinal Wardlaw, bishop of Glasgow, having received his appointment from the Antipope Clement VII. On the death of Archbishop James Beaton in 1539, the cardinal was raised to the primatial see of Scotland.

Beaton was one of King James's most trusted advisers and is said to have taken a part in dissuading him from his proposed interview with Henry VIII. at York. On the death of James in December 1542 he attempted to assume office as one of the regents for the infant sovereign Mary, founding his pretensions on an alleged will of the late king; but his claims were disregarded, and the Earl of Arran, head of the great house of Hamilton, and next heir to the throne, was raised to the regency. The cardinal was imprisoned by order of the regent, but after some time was set at liberty. He was subsequently reconciled to Arran, and in September 1543 crowned the young queen at Stirling. Soon afterwards he was raised to the highest office under the regent, that of Chancellor of Scotland, and was appointed legate *a latere* by the Pope.

The two questions which agitated Scotland at this time were the struggle for ascendency between the supporters of English and French influence, and that between the friends of the hierarchy and the teachers of the Reformed opinions,—questions which frequently became complicated in consequence of the assistance given by France to the bishops, and the encouragement which, for political reasons, the king of England secretly gave to the adherents of the Reformation. In this contest the cardinal supported the interests of France, resolutely opposing the selfish intrigues of King Henry and his party, which had for their object the extinction of the ancient independence of the Scottish kingdom and its subjection to the supremacy of England. Had he been content with this he would have won for himself the gratitude of his countrymen; but his evil deeds as an ecclesiastic made them overlook his patriotic exertions as a statesman. During the lifetime of his uncle he had taken his share in the persecuting policy of the hierarchy, and the same line of conduct was still more systematically adopted after his elevation to the primacy. Having won over the regent to his opinions he became more open and severe in his proceedings. The popular accounts of the persecution are no doubt exaggerated, and it sometimes ceased for considerable periods so far as capital punishments were concerned. When the sufferers were of humble rank general attention was not much directed to them. It was otherwise when a more distinguished victim was selected in the person of George Wishart. This preacher, whose ecclesiastical opinions resembled those of Patrick Hamilton and Hamilton's teacher, Francis Lambert, returned to Scotland after an absence of several years about the end of 1544. His sermons produced a great effect, and he was protected by several of the barons who were leading men in the English faction. These barons, with the knowledge and approbation of King Henry, were engaged in a plot against the cardinal, in which his assassination was contemplated as the speediest mode of removing the chief obstacle to the influence of England. Of the reality of the plot and the intentions of the conspirators there can be no doubt; whether Wishart was aware of these has been a matter of controversy during the present century. There are strong suspicions against him but no sufficient evidence; and all the presumptions which may be drawn from his personal character are entirely in his favor. The cardinal, though ignorant of the details of the plot, perhaps suspecting Wishart's knowledge of it, and in any event desirous to seize one of the most eloquent supporters of the new opinions, endeavored, with the aid of the regent, to apprehend him, but was baffled in his efforts for some time. He was at last successful in seizing the preacher, and bringing him a prisoner to his castle of St. Andrews. On the 28th of February 1546 Wishart was brought to trial within the cathedral church, before the cardinal

and other ecclesiastical judges, the regent declining to take any active part. He defended his opinions with temper and moderation; but as he admitted certain of them which were held by his judges to be heretical, he was condemned to death and burnt.

The prosecution of Wishart, and the meekness with which he bore his sufferings, produced a deep effect on the mind of the Scottish people, and the cardinal became an object of general dislike. Those who hated him on other grounds were encouraged to proceed with the design they had formed against him. Naturally resolute and fearless, he seems to have undervalued the strength and character of his enemies, and even to have relied on the friendship of some of the conspirators. He crossed over to Angus, and took part in the magnificent ceremonials of the marriage of his illigitimate daughter with the heir of the Earl of Crawford. On his return to St. Andrews he took up his residence in the castle. The conspirators, the chief of whom were Norman Leslie, Master of Rothes, and William Kirkaldy of Grange, contrived to obtain admission at daybreak of the 29th of May 1546, and murdered the cardinal under circumstances of horrible mockery and atrocity. The assassination excited very different feelings among the partisans on either side. The zealous adherents of the Church of Rome, as a matter of course, viewed it as a cruel murder aggravated by sacrilege; the most violent of the Protestant party justified and even applauded it. Those who, without any strong feeling either way, disliked the cardinal on account of his arrogance and cruelty, spoke of the deed as a wicked one, but hardly professed to regret the victim. Ignorant of the treasonable designs of his enemies, viewing him as the champion of ecclesiastical supremacy, and attributing to him all the evils of the unsuccessful war with England, they looked upon his death as an advantage to the Scottish kingdom.

BEATRICE, a city of Nebraska, the capital of Gage county, is situated on the Big Blue river, forty miles south of Lincoln, the State capital. It has a branch railroad connecting with the main line, and is a busy shipping point. Beatrice has a United States land office, two banks, six churches, graded schools, two newspaper offices, and a population of 13,921. Large quarries of limestone exist, and furnish building material and lime. There are also flour and lumber mills, etc.

BEATTIE, James, a Scottish poet and writer on philosophy, was born at Laurencekirk on the 25th October 1735. His father, a small farmer and shopkeeper, died when he was very young; but an elder brother took charge of the boy, and observing his aptitude for learning sent him to Marischal College, Aberdeen, where he gained a bursary. In 1770 Beattie published his *Essay on the Nature and Immutability of Truth*, in which he attacked Helvetius and Hume, and advocated the doctrine afterwards familiarly known as that of Common Sense. The work had an astonishing success, and its author, when on a visit to London in 1773, was received with the greatest honor by the king himself. About the same time he received a pension of £200 a year. In 1773 and 1774 he published the first and second parts of *The Minstrel*, which were received with great favor, and gained for the author a fresh accession of popularity. His later writings are partly literary, such as the *Essays*, 1776; *Dissertations*, 1783, partly philosophical; *Evidences of Christianity*, 1781; *Elements of Moral Science*, 1790–93. He died on the 18th August 1803. Beattie's fame rests now solely on his poems.

BEAUCAIRE, a town of France, department of Gard, and arrondissement of Nîmes. It is situated on the right bank of the Rhone, opposite Tarascon, with which it is connected by a magnificent suspension bridge of four spans and 1456 feet in length.

BEAUCHAMP, Alphonse de, French historian and man of letters, was born at Monaco in 1767, and died in 1832.

BEAUFORT, a city of North Carolina, the capital of Cartaret county, is situated at the mouth of the Newport river, forty miles from New Berne. It is a port of entry, and has a good harbor, defended by Fort Macon. Population (1890), 2,500.

BEAUFORT, the capital of the county of the same name in South Carolina, is situated on Port Royal Island, fourteen miles from the Atlantic. It has a good harbor, and considerable export trade in cotton, lumber, and phosphates. Population (1890), 3,000.

BEAUHARNAIS, Eugène de, step-son of Napoleon I., was born at Paris September 3, 1781. His father, the Vicomte Alexander de Beauharnais, had been a member of the National Convention, and for some time commanded the republican army of the north. His want of success in the field, however, brought him under the suspicion of the revolutionary leaders; he was tried on a charge of treason, and was executed on the 23d June, 1794. After the marriage of Napoleon with the Vicomtesse Josephine Beauharnais, her son Eugène accompanied the army of Italy and acted as aide-de-camp to his stepfather, by whom he was treated with the greatest affection and favor. He was rapidly promoted, and after the establishment of the empire, was made prince and viceroy of Italy. In 1806 he was adopted by Napoleon. During the great campaign of 1809 he had the command of the Italian army, and by his skilful conduct materially contributed to the success of the emperor. In 1812 he commanded a corps of the grand army; and after the departure of Napoleon and flight of Murat, had the entire charge of the broken French forces. The disastrous campaigns of 1813 and 1814 deprived him of his viceroyalty, and he retired to Munich, the capital of the king of Bavaria, whose daughter he had married in 1806. There he continued to reside, with the title of duke of Leuchtenberg, till his death in 1824.

BEAUMANOIR, Philippe de, a distinguished writer on French law, was born in the early part of the 13th century, and died in 1296.

BEAUMARCHAIS, Pierre Augustin Caron, better known by his acquired title De Beaumarchais, the most distinguished of French comic dramatists next to Molière, and a man of much importance during the pre-Revolutionary period, was born at Paris in 1732. At the age of twenty-one he invented a new escapement for watches, which was pirated by a rival maker. Young Caron at once published his grievance in the newspapers, and had the matter referred to the Academy of Sciences, who decided in his favor. It was his earnest desire to obtain a footing at court. Nor was it long before his wish was accomplished. The wife of an old court official, conceiving a violent passion for young Caron, persuaded her husband to make over his office to his rival, and on her husband's death, a few months later, married the handsome watchmaker. Caron at the same time assumed the title De Beaumarchais; and four years later, by purchasing the office of secretary to the king, obtained a title of nobility.

While employed at court his musical talents brought him under the notice of the king's sisters, who engaged him to teach them the harp. In this way he obtained access to the best society of the court, and by a fortunate accident was enabled to make use of the princesses' friendship to confer a slight favor on the great banker Paris-Duverney. Duverney testified his gratitude in a most substantial manner; he bestowed shares in several of his speculations upon Beaumarchais, and the latter,

whose business talents were of a high order, soon realized a handsome fortune. In 1764 he took a journey to Spain, partly with commercial objects in view, but principally on account of the Clavijo affair, which was afterwards made famous by the Goezman memoirs, and by Goethe's drama. Four years later he made his first essay on the stage with the sentimental drama *Eugénie*, which was followed after an interval of two years by *Les Deux Amis*. Neither had more than moderate success, and it was clear that, though the author might be unaware of it, his strength did not lie in the grave and sentimental. Meantime the clouds of the first great storm in Beaumarchais's life were gathering round him. He was very generally disliked as an upstart, and there were many ready to seize the first opportunity of hurling him from the position he had attained. Duverney, his great benefactor, died in 1770; but some time before his death a duplicate settlement of the affairs between him and Beaumarchais had been drawn up, in which the former acknowledged himself debtor to the latter for 16,000 francs. Duverney's heir, Count la Blache, a bitter enemy of Beaumarchais, denied the validity of this document, though without directly stigmatizing it as a forgery. The matter was put to trial. Beaumarchais gained his cause, but his adversary at once carried the case before the parliament, and in the early part of 1773 that body was preparing to give its decision on the report of one of its members, M. Goezman. Beaumarchais was well nigh in despair; ruin stared him in the face; he was looked upon not only with dislike but with suspicion and contempt. Worst of all, he was unable to obtain an interview with Goezman, in whose hands his fate rested. At last, just before the day on which the report was to be given in, he was informed privately that, by presenting 200 louis to Mme. Goezman and 15 to her secretary, the desired interview might take place; if the result should prove unfavorable the money would be refunded. The money was sent and the interview obtained; but the decision was adverse, and 200 louis were returned, the 15 going as business expenses to the secretary. Beaumarchais, who had learned that there was no secretary save Mme. Goezman herself, insisted on restitution of the 15 louis, and the lady, in her passion, denied all knowledge of the affair. Her husband, who seems not to have been cognizant of the transaction at first, and who, doubtless, thought the defeated litigant would be easily put down, at once brought an accusation against him in parliament for an attempt to corrupt a judge. The battle was fought chiefly through the *Mémoires*, or reports published by the adverse parties, and in it Beaumarchais's success was most complete. All his best qualities were drawn forth by the struggle; his wit, energy, and cheerfulness seemed to be doubled; and for vivacity of style, fine satire, and broad humor, his famous *Mémoires* have never been surpassed. Even Voltaire was constrained to envy them. Nor was the effect of the struggle apparent only in Beaumarchais himself. He was attacking the parliament through one of its members, and the parliament was the universally detested body formed by the chancellor Maupeou. The *Mémoires* were, therefore hailed with general delight; and the author, from being perhaps the most unpopular man in France, became at once the idol of the people. The decision in the case, however, so far as law went, was against him. The parliament condemned him *au blâme*,— *i.e.*, to civic degradation; but he obtained restitution of his rights within two years, and finally triumphed over his adversary La Blache.

During the next few years his employment was of a somewhat singular nature. He was engaged by the king in secret service, principally to destroy certain scurrilous pamphlets concerning Mme. du Barry, the publication of which had been threatened. His visits to England, on these missions, in which he was very successful, led him to take a deep interest in the impending struggle between the colonies and the mother country. His sympathies were entirely with the Americans; and by his unwearied exertions he succeeded in inducing the French Government to give ample, though private assistance in money and arms to the insurgent colonists. He himself, partly on his own account and partly as an agent, carried on an enormous traffic with America. During the same period he had laid the foundations of a more enduring fame by his two famous comedies, the best of their class since those of Molière. The earlier, *Le Barbeir de Seville*, after a short prohibition, was put on the stage in 1775. The first representation was a complete failure. Beaumarchais had overloaded the last scene with allusions to the facts of his own case and the whole action of the piece was labored and heavy. But with undaunted energy he set to work, cut down and remodelled the piece in time for the second representation, when it achieved a complete success. The intrigues which were necessary in order to obtain a license for the second and more famous comedy *Le Marriage de Figaro* are highly amusing, and throw much light on the unsettled state of public sentiment at the time. The play was completed in 1781, but the opposition of Louis XVI., who saw its dangerous tendencies, was not overcome till 1784. The comedy had an unprecedented success. The principal character in both plays, the world-famous *Figaro*, is a completely original conception; and for mingled wit, shrewdness, gaiety, and philosophic reflection, may not unjustly be ranked alongside of the great Tartuffe. To English readers the Figaro plays are generally known through the adaptations of them in the grand operas of Mozart and Rossini; but in France they long retained popularity as acting pieces. Beaumarchais's later productions, the bombastic opera *Tarare*, and the drama *The Guilty Mother*, which was very popular, are hardly worthy of his genius.

By his writings Beaumarchais contributed greatly, though quite unconsciously, to hurry on the events that led to the Revolution. At heart he hardly seems to have been a republican, and the new state of affairs did not benefit him. His popularity had been somewhat lessened by the affairs Bergasse and Mirabeau, and his great wealth and splendid mansion exposed him to the enmity of the envious. A speculation into which he entered, to supply the Convention with muskets from Holland, proved a ruinous failure. He was charged with treason to the Republic, and was obliged for some time to take refuge in Holland and England. His memoirs entitled, *Mes Six Époques*, detailing his sufferings under the Republic, are not unworthy of the Goezman period. His courage and happy disposition never deserted him; he was gay and hopeful up to the time of his death, which took place suddenly in May 1799.

BEAUMARIS (formerly Bonorvor, and deriving its present French name of Beau Marais from Edward I.), a borough and market-town of Anglesea, North Wales.

BEAUMONT AND FLETCHER. Six or seven years before the birth of his brother in art, John Fletcher was born in December 1579 at Rye in Sussex. Richard Fletcher, his father, afterwards queen's chaplain, dean of Peterborough, and bishop successively of Bristol, Worcester, and London, was then minister of the parish in which the son was born who was to make their name immortal. That son was just turned of seven when the dean distinguished and disgraced himself as the spiritual tormentor of the last moments on earth of Mary Stuart. When not quite twelve he was admitted pensioner of Bene't College, Cambridge,

and two years later was made one of the Bible-clerks: of this college Bishop Fletcher had been president twenty years earlier, and six months before his son's admission had received from its authorities a first letter of thanks for various benefactions, to be followed next year by a second. Four years later than this, when John Fletcher wanted five or six months of his seventeenth year, the bishop died suddenly of over much tobacco and the displeasure of Queen Elizabeth at his second marriage,— this time, it appears, with a lady of such character as figures something too frequently on the stage of his illustrious son. He left eight children by his first marriage in such distress that their uncle, Dr. Giles Fletcher, author of a treatise on the Russian commonwealth which is still held in some repute, was obliged to draw up a petition to the queen on their behalf, which was supported by the intercession of Essex, but with what result is uncertain. From this date we know nothing of the fortunes of John Fletcher, till the needy orphan boy of seventeen reappears as the brilliant and triumphant poet whose name is linked for all time with the yet more glorious name of Francis Beaumont, third and youngest son of Sir Francis Beaumont of Grace-Dieu, one of the justices of the Common Pleas,— born, according to general report, in 1586, but, according to more than one apparently irrefragable document, actually born at least a year earlier. The first record of his existence is the entry of his name, together with those of his elder brothers Henry and John, as a gentleman-commoner of Broadgates Hall, Oxford, now supplanted by Pembroke College. But most lovers of his fame will care rather to remember the admirable lines of Wordsworth on the "eager child" who played among the rocks and woodlands of Grace-Dieu; though it may be doubted whether even the boy's first verses were of the peaceful and pastoral character attributed to them by the great laureate of the lakes. That passionate and fiery genius which was so soon and for so short a time to "shake the buskined stage" with heroic and tragic notes of passion and of sorrow, of scorn and rage and slighted love and jealousy, must surely have sought vent from the first in fancies of a more ardent and ambitious kind; and it would be a likelier conjecture that when Frank Beaumont (as we know on more authorities than one that he was always called by his contemporaries, even in the full flush of his adult fame—"never more than Frank," says Heywood) went to college at the ripe age of twelve, he had already committed a tragedy or two in emulation of *Tamburlaine Andronicus*, or *Jeronymo*. The date of his admission was 4th February 1597; on April 22d of the following year his father died; and on the 3d of November 1600, having left Oxford without taking his degree, the boy of fifteen was entered a member of the Inner Temple, his two brothers standing sponsors on the grave occasion. But the son of Judge Beaumont was no fitter for success at the bar than the son of Bishop Fletcher for distinction in the church: it is equally difficult to imagine either poet invested with either gown. Two years later appeared the poem *Salmacis and Hermaphroditus*, a voluptuous and voluminous expansion of the Ovidian legend, not on the whole discreditable to a lad of seventeen, fresh from the popular love-poems of Marlowe and Shakespeare, which it naturally exceeds in long-winded and fantastic diffusion of episodes and conceits. At twenty-two Beaumont prefixed to the magnificent masterpiece of Ben Jonson some noticeable verses in honor of his "dear friend" the author; and in the same year (1607) appeared the anonymous comedy of *The Woman-Hater*, usually assigned to Fletcher alone; but being as it is in the main a crude and puerile imitation of Jonson's manner, and certainly more like a man's work at twenty-two than at twenty-eight, internal evidence would seem to justify, or at least to excuse, those critics who in the teeth of high authority and tradition would transfer from Fletcher to Beaumont the principal responsibility for this first play that can be traced to the hand of either. As Fletcher also prefixed to the first edition of *Volpone* a copy of commendatory verses, we may presume that their common admiration for a common friend was among the earliest and strongest influences which drew together the two great poets whose names were thenceforward to be forever indivisible. During the dim eleven years between the death of his father and the dawn of his fame, we cannot but imagine that the career of Fletcher had been unprosperous as well as obscure. From seventeen to twenty-eight his youth may presumably have been spent in such painful struggles for success, if not for sustenance, as were never known to his younger colleague, who, as we have seen, was entered at Oxford a few months after Fletcher must in all likelihood have left Cambridge to try his luck in London; a venture most probably resolved on as soon as the youth had found his family reduced by the father's death to such ruinous straits that any smoother course can hardly have been open to him. Entering college at the same age as Fletcher had entered six years earlier, Beaumont had before him a brighter and briefer line of life than his elder. But whatever may have been their respective situations when, either by happy chance or, as Mr. Dyce suggests, by the good offices of Jonson, they were first brought together, their intimacy soon became so much closer than that of ordinary brothers that the household which they shared as bachelors was conducted on such thoroughly communistic principles as might have satisfied the most trenchant theorist who ever proclaimed, as the cardinal point of his doctrine, a complete and absolute community of bed and board, with all goods thereto appertaining.

Hardly eight years of toil and triumph, of joyous and glorious life, were spared by destiny to the younger poet between the date assigned to the first radiant revelation of his genius in *Philaster* and the date which marks the end of all its labors. On the 6th of March 1616 Francis Beaumont died,— according to Jonson and tradition, "ere he was thirty years of age," but this we have seen to be inconsistent with the registry of his entrance at Oxford. If we may trust the elegiac evidence of friends, he died of his own genius and fiery overwork of brain; yet from the magnificent and masculine beauty of his portrait one should certainly never have guessed that any strain of spirit or stress of invention could have worn out so long before its time so fair and royal a temper for so bright and affluent a soul. That spring of 1616, we may note in passing, was the darkest that ever dawned upon England or the world; for, just forty-eight days afterwards, it witnessed, on the 23d of April, the removal from earth of the mightiest genius that ever dwelt among men. Scarcely more than a month and a half divided the death-days of Beaumont and Shakespeare. Dying when just four months short of forty-six, Fletcher had thus, as well as we can now calculate, altogether some fourteen years and six months more of life than the poet who divides with him the imperial inheritance of their common glory.

The perfect union in genius and in friendship which has made one name of the two names of these great twin brothers in song is a thing so admirable and so delightful to remember, that it would seem ungracious and unkindly to claim for either a precedence which we may be sure he would have been eager to disclaim. But if a distinction must be made between the Dioscuri of English poetry, we must admit that Beaumont was

the twin of heavenlier birth. Few things are stranger than the avowal of so great and exquisite a critic as Coleridge, that he could trace no faintest line of demarcation between the plays which we owe mainly to Beaumont and the plays which we owe solely to Fletcher. In the plays which we know by evidence surer than the most trustworthy tradition to be the common work of Beaumont and Fletcher, there is indeed no trace of such incongruous and incompatible admixture as leaves the greatest example of romantic tragedy — for *Cymbeline* and the *Winter's Tale*, though not guiltless of blood, are in their issue no more tragic than *Pericles* or the *Tempest* — an unique instance of glorious imperfection, a hybrid of heavenly and other than heavenly breed, disproportioned and divine. But throughout these noblest of the works inscribed generally with the names of both dramatists we trace on every other page the touch of a surer hand, we hear at every other turn the note of a deeper voice, than we can ever recognise in the work of Fletcher alone. Although the beloved friend of Jonson, and in the field of comedy his loving and studious disciple, yet in that tragic field where his freshest bays were gathered Beaumont was the worthiest and the closest follower of Shakespeare. In the external but essential matter of expression by rhythm and metre he approves himself always a student of Shakespeare's second manner, of the style in which the graver or tragic part of his historical or romantic plays is mostly written; doubtless, the most perfect model that can be studied by any poet who, like Beaumont, is great enough to be in no danger of sinking to the rank of a mere copyist, but while studious of the perfection set before him is yet conscious of his own personal and proper quality of genius, and enters the presence of the master not as a servant but as a son. The general style of his tragic or romantic verse is as simple and severe in its purity of note and regularity of outline as that of Fletcher's is by comparison lax, effusive, exuberant. The matchless fluency and rapidity with which the elder brother pours forth the stream of his smooth swift verse gave probably the first occasion for that foolish rumor which has not yet fallen duly silent, but still murmurs here and there its suggestion that the main office of Beaumont was to correct and contain within bounds the over-flowing invention of his colleague. The poet who while yet a youth had earned by his unaided mastery of hand such a crown as was bestowed by the noble love and the loving "envy" of Ben Jonson was, according to this tradition, a mere precocious pedagogue, fit only to revise and restrain the too liberal effusions of his elder in genius as in years. Now, in every one of the plays common to both, the real difficulty for a critic is not to trace the hand of Beaumont, out to detect the touch of Fletcher. Throughout the better part of every such play, and above all of their two masterpieces, *Philaster* and *The Maid's Tragedy*, it should be clear to the most sluggish or cursory of readers that he has not to do with the author of *Valentinian* and *The Double Marriage*. In those admirable tragedies the style is looser, more fluid, more feminine. From the first scene to the last we are swept as it were along the race of a running river, always at full flow of light and buoyant melody, with no dark reaches or perilous eddies, no stagnant pools or sterile sandbanks; its bright course only varied by sudden rapids or a stronger ripple here and there, but in rough places or smooth still stirred and sparkling with summer wind and sun. But in those tragic poems of which the dominant note is the note of Beaumont's genius a subtler chord of thought is sounded, a deeper key of emotion is touched, than ever was struck by Fletcher. The lighter genius is palpably subordinate to the stronger, and loyally submits itself to the impression of loftier spirit. It is true that this distinction is neve grave enough to produce a discord: it is also true that th plays in which the predominance of Beaumont's mind an style is generally perceptible make up altogether but small section of the work that bears their names co jointly; but it is no less true that within this sectio the most precious part of that work is comprised. Ou side it we shall find no figures so firmly drawn, no suc clearness of outline, no such cunning of hands as w recognize in the three great studies of Bellario, Evadn and Aspatia. In his male characters, as for instance i the parts of Philaster and Arbaces, Beaumont also apt to show something of that exaggeration or incon sistency for which his colleague is perhaps more fre quently and more heavily to blame; but in these the is not a jarring note, not a touch misplaced; unless indeed, a rigid criticism may condemn as unfeminin and incongruous with the gentle beauty of her patheti patience the device by which Aspatia procures herse the death desired at the hand of Amintor. The nobl scene of regicide, which it was found expedient t cancel during the earlier years of the Restoration, ma indeed be the work of Fletcher; but the part of Evadn must undoubtedly be in the main assigned to the mor potent hand of his fellow. There is a fine harmony c character between her naked audacity in the second ac and her fierce repentance in the fourth, which is no unworthy a disciple of the tragic school of Shakespeare Fletcher is less observant of the due balance, less heed ful of the nice proportions of good and evil in a fault and fiery nature, compounded of perverse instinct an passionate reaction. From him we might have had figure as admirable for vigor of handling, but hardly i such perfect keeping as this of Beaumont's Evadne the murderess-Magdalen, whose penitence is of on crimson color with her sin. Nor even in Fletcher' Ordella, worthy as the part is throughout even of th precious and exquisite praise of Lamb, is there an such cunning touch of tenderness or delicate perfum of pathos as in the parts of Bellario and Aspatia These have in them a bitter sweetness, a subtle pun gency of mortal sorrow and tears of divine delight beyond the reach of Fletcher. His highest studies c female character have dignity, energy, devotion of th heroic type; but they never touch us to the quick, neve waken in us any finer and more profound sens than that of applause and admiration. There is a modes pathos now and then in his pictures of feminin submission and slighted or outraged love; but thi submission he is apt to make too servile, this lov too dog-like in its abject devotion to retain tha tender reverence which so many generations o readers have paid to the sweet memories o Aspatia and Bellario. To excite compassion wa enough for Fletcher, as in the masculine parts of hi work it was enough for him to excite wonder, to sus tain curiosity, to goad and stimulate by any vivid an violent means the interest of readers or spectators The single instance of noble pathos, the one scene whic he has left us which appeals to the higher and pure kind of pity, is the death of the child Hengo in *Bonduca* — a scene which of itself would have sufficed to enrol his name for ever on the list of our great tragic poets To him we may probably assign the whole merit of tha fiery and high-toned tragedy, with all its spirit an splendor of national and martial passion; the conscious and demonstrative exchange of courtesy between Roma and Briton, which is one of the leading notes of th poem, has in it a touch of the overstrained and artificia chivalry characteristic of Fletcher; yet the parts o Caratach and Pœnius may be counted among the lofties

and most equal of his creations. But no surer test or better example can be taken of the distinctive quality which denotes the graver genius of either poet than that supplied by a comparison of Beaumont's *Triumph of Love* with Fletcher's *Triumph of Death*. Each little play, in the brief course of its single act, gives proof of the peculiar touch and special trick of its author's hand: the deeper and more delicate passion of Beaumont, the rapid and ardent activity of Fletcher, have nowhere found a more noticeable vent for the expression respectively of the most tender and profound simplicity of quiet sweetness, the most buoyant and impatient energy of tragic emotion.

In the wider field of their comic or romantic drama it is yet easier to distinguish the respective work of either hand. The bias of Fletcher was towards mixed comedy; his lightest and wildest humor is usually crossed or tempered by an infusion of romance; like Shakespeare in this one point at least, he has left no single play without some touch on it of serious interest, of poetic eloquence or fancy, however slight and fugitive. Beaumont, evidently under the imperious influence of Ben Jonson's more rigid theories, seems rather to have bent his genius with the whole force of a resolute will into the form or mold prescribed for comedy by the elder and greater comic poet. In pure comedy, varied with broad farce and mock-heroic parody, Beaumont was the earliest as well as the ablest disciple of the master whose mantle was afterward to be shared among the academic poets of a younger generation, the Randolphs and Cartwrights who sought shelter under the shadow of its voluminous folds. The best example of the school of Jonson to be found outside the ample range of his own work is *The Scornful Lady*, a comedy whose exceptional success and prolonged popularity must have been due rather to the broad effect of its forcible situations, its wealth and variety of ludicrous incidents, and the strong gross humor of its dialogue, than to any finer quality of style, invention, or character. It is the only work of Beaumont and Fletcher which a critic who weighs the meaning of his words can admit to be as coarse as the coarsest work of Ben Jonson. They are prone, indeed, to indulge elsewhere in a wanton and exuberant license of talk; and Fletcher, at least, is liable to confuse the shades of right and wrong, to deface or efface the boundary lines of good and evil, to stain the ermine of virtue and palliate the nakedness of vice with the same indecorous and incongruous laxity of handling. Often, in mere haste to despatch the business of a play, to huddle up a catastrophe or throw out some particular scene into sharp and immediate relief, he will sacrifice all seemliness and consistency of character to the present aim of stage effect, and the instant impression of strong incident or audacious eloquence. But in this play both style and sentiment are throughout on a lower level, the action and emotion are of a baser kind than usual; the precept of Aristotle and the practice of Jonson have been so carefully observed and exaggerated that it might almost be said to offer us in one or two places an imitation not merely of the sorrier but of the sorriest qualities of human nature; and full as it is of spontaneous power and humorous invention, the comedy extolled by the moral Steele (with just as much of reservation as permits him to deprecate the ridicule cast upon the clerical character) is certainly more offensive to artistic law and æsthetic judgment by the general and ingrained coarseness of its tone, than the tragic comedy denounced by the immoral Dryden as exceeding in licence his own worst work and that of his fellow playwrights; an imputation, be it said in passing, as groundless as the protest pleaded on their behalf is impudent; for though we may hardly agree with the uncompromising panegyrist who commends that play in particular to the approval of "the austere scarlet" (remembering, perhaps, that Aristophanes was the chosen bedfellow of Chrysostom), there is at least no such offense against art or taste in the eccentricity of its situations or the daring of its dialogue. The buoyant and facile grace of Fletcher's style carries him lightly across quagmires in which a heavier-footed poet, or one of slower tread, would have stuck fast, and come forth bemired to the knees. To Beaumont his stars had given as birthright the gifts of tragic pathos and passion, of tender power, and broad strong humor; to Fletcher had been allotted a more fiery and fruitful force of invention, a more aerial ease and swiftness of action, a more various readiness and fulness of bright exuberant speech. The genius of Beaumont was deeper, sweeter, nobler than his elders; the genius of Fletcher more brilliant, more supple, more prodigal, and more voluble than his friend's. Without a taint or a shadow on his fame of such imitative servility as marks and degrades the mere henchman or satelite of a stronger poet, Beaumont may fairly be said to hold of Shakspeare in his tragedy, in his comedy of Jonson; in each case rather as a kinsman than as a client, as an ally than as a follower; but the more special province of Fletcher was a land of his own discovering, where no later colonist has ever had power to settle or to share his reign. With the mixed or romantic comedy of Shakspeare it has nothing in common except the admixture or alternation of graver with lighter interest, of serious with humorous action. Nothing is here of his magic exaltation or charm of fairy empire. The rare and rash adventures of Fletcher on that forbidden track are too sure to end in pitiful and shameful failure. His crown of praise is to have created a wholly new and wholly delightful form of mixed comedy or dramatic romance, dealing merely with the humors and sentiments of men, their passions and their chances; to have woven of all these a web of emotion and event with such gay dexterity, to have blended his colors and combined his effects with such exquisite facility and swift light sureness of touch, that we may return once and again from those heights and depths of poetry to which access was forbidden him, ready as ever to enjoy as of old the fresh incomparable charm, the force and ease and grace of life, which fill and animate the radiant world of his romantic invention. Neither before him nor after do we find, in this his special field of fancy and of work, more than shadows or echoes of his coming or departing genius. Admirable as are his tragedies already mentioned, rich in splendid eloquence and strong in large grasp of character as is the Roman history of *The False One*, full of interest and vigor as is the better part of *Rollo Duke of Normandy*, and sublime in the loveliness of passion as is the one scene of perfect beauty and terror which crowns this latter tragedy, Fletcher may claim a yet higher and more special station among his great dramatic peers by right of his comic and romantic than by right of his tragic and historic plays. Even in these he is more a romantic than a tragic poet. The quality of his genius, never sombre or subtle or profound, bears him always towards fresh air and sunshine. His natural work is in a midday world of fearless boyish laughter and hardly bitter tears. There is always more of rainbow than of storm in his skies; their darkest shadow is but a tragic twilight. What with him is but the noon of night would seem as sunshine on the stage of Ford or Webster. There is but one passage in all these noble plays which lifts us beyond a sense of the stage, which raises our admiration out of speech into silence, tempers and transfigures our emotions with a touch of awe. And this we owe to the genius of Beaumont, exalted for an instant to the very tone and man-

ner of Shakespeare's tragedy, when Amintor stands between the dead and the dying woman whom he has unwittingly slain with hand and tongue. The first few lines that drop from his stricken lips are probably the only verses of Beaumont or Fletcher which might pass for Shakespeare's even with a good judge of style—

"This earth of mine doth tremble," &c.

But in Fletcher's tragedy, however we may be thrilled and kindled with high contagious excitement, we are never awed into dumb delight or dread, never pierced with any sense of terror or pity too deep or even deep enough for tears. Even his Brunhalts and Martias can hardly persuade us to forget for the moment that "they do but jest, poison in jest." A critic bitten with the love of classification might divide those plays of Fletcher usually ranked together as comedies into three kinds: the first he would class under the head of pure comedy, the next of heroic or romantic drama, the third of mixed comedy and romance; in this, the last and most delightful division of the poet's work the special qualities of the two former kinds being equally blended and delicately harmonized. The most perfect and triumphant examples of this class are *The Spanish Curate*, *Monsieur Thomas*, *The Custom of the Country*, and *The Elder Brother*. Next to these, and not too far below them, we put *The Little French Lawyer*, *The Humorous Lieutenant*, *Women Pleased*, *Beggars' Bush*, and perhaps we might add *The Fair Maid of the Inn;* in most if not in all of which the balance of exultant and living humor with serious poetic interest of a noble and various kind is held with even hand and the skill of a natural master. In pure comedy *Rule a Wife and Have a Wife* is the acknowledged and consummate masterpiece of Fletcher. Next to it we might class, for comic spirit and force of character, *Wit without Money*, *The Wildgoose Chase*, *The Chances*, and *The Noble Gentleman*,—a broad poetic farce to whose overflowing fun and masterdom of extravagance no critic has ever done justice but Leigh Hunt, who has ventured, not without reason, to match its joyous and preposterous audacities of superlative and sovereign foolery with the more sharp-edged satire and practical merriment of *King and no King*, where the prosaic humor of Bessus and his swordsmen is as typical of the comic style in which Beaumont had been trained up under Ben Jonson as the high interest and graduated action of the serious part of the play are characteristic of his more earnest genius. Among the purely romantic plays of Fletcher, or those in which the comic effect is throughout subordinate to the romantic, *The Knight of Malta* seems most worthy of the highest place for the noble beauty and exaltation of spirit which informs it with a lofty life, for its chivalrous union of heroic passion and Catholic devotion. This poem is the fairest and first example of those sweet fantastic paintings in rose-color and azure of visionary chivalry and ideal holiness, by dint of which the romance of more recent days has sought to cast the glamour of a mirage over the darkest and deadliest "ages of faith." The pure and fervent eloquence of the style is in perfect keeping with the high romantic interest of character and story. In the same class we may rank among the best samples of Fletcher's workmanship *The Pilgrim*, *The Loyal Subject*, *A Wife for a Month*, *Love's Pilgrimage*, and *The Lover's Progress*,—rich all of them in exquisite writing, in varied incident, in brilliant effects and graceful or passionate interludes. In *The Coxcomb* and *The Honest Man's Fortune*—two plays which, on the whole, can hardly be counted among the best of their class—there are tones of homelier emotion, touches of a simpler and more pathetic interest than usual; and here, as in the two admirable first scenes between Leucippus and Bacha, which relieve and redeem from contempt the tragic burlesque of *Cupid's Revenge*, the note of Beaumont's manner is at once discernible.

Even the most rapid revision of the work done by these great twin poets must impress every capable student with a sense of the homage due to this living witness of their large and liberal genius. The loss of their names from the roll of English poetry would be only less than the loss of the few greatest inscribed on it. Nothing could supply the want of their tragic, their comic or romantic drama; no larger or more fiery planet can ever arise to supplant or to eclipse the twin lights of our zodiac. Whatever their faults of shortcoming or excess there is in their very names or the mere thought of their common work a kind of special and personal attraction for all true lovers of high dramatic poetry.

BEAUNE, the chief town of an arrondissement in France, in the department of Côte-d'Or, situated on the River Bourzeoise, twenty-three miles S.S.W. of Dijon, on the railway from Paris to Lyons.

BEAUSOBRE, ISAAC DE, a learned Protestant writer, of French origin, was born at Niort in 1659 and died in 1738, aged seventy-nine, after having published several works.

BEAUVAIS, a town of France, capital of an arrondissement in the department of Oise.

BEAVER, the English name of a genus of Mammals belonging to the order *Rodentia*, the two known species of which are among the largest members of that group. Both beavers, European and American, measure about 2 feet in length, exclusive of the tail, which is about 10 inches long, and are covered with the fur to which they owe their chief commercial value. This consists of two kinds of hair,—the one close-set, silky, and of a greyish color; the other much coarser and longer, and of a reddish brown. Beavers are essentially aquatic in their habits, never traveling by land unless driven to it by necessity. Their hind feet are webbed to the nails, and in swimming those only are used, the front legs remaining motionless by the side. They differ from all other rodents in possessing a broad horizontally flattened tail, somewhat oval in form and covered with scales, which they use as an aid to their progress through the water, and not as a trowel for plastering their mud houses as was formerly supposed. The front incisor teeth in each jaw have a sharp chisel-like edge, and are so formed as to preserve this through life. They consist of an outer layer of orange-colored enamel, and a broad inner layer of a softer substance. As the creature gnaws, the softer material is worn away more rapidly than the enamel, which thus protrudes in a sharp ridge. There is a continuous growth at the roots of those teeth to repair the constant waste that goes on at the cutting edge, so that should one of the incisors be destroyed, the opposite tooth, meeting with no check to its enlargement, will grow to an enormous length; and beavers have been found in which this abnormal growth had proved fatal by preventing the other teeth from coming together. The enamel is exceedingly hard; and, until superseded by files, those teeth, fixed in wooden handles, were used by the North American Indians in carving their weapons of bone.

The European Beaver (*Castor fibre*) was at one time an inhabitant of the British Isles, having been found, according to Pennant, in certain Welsh rivers as late as the 12th century, while fossil remains of it occur in various parts of the country. In Scandinavia beavers are now extinct,—the last known specimen having been killed in 1844. Isolated pairs are still occasionally met with on the banks of the Rhone, the Weser, and the Elbe; and a considerable number are to be found in

one of the parks belonging to the emperor of Austria, on the banks of the Danube, where they are strictly preserved.

The American Beaver (*Castor canadensis*) extends over that part of the American continent included between the Arctic circle and the tropic of Cancer; owing, however, to the gradual spread of population over part of this area, and still more to the enormous quantity of skins that, towards the end of last century and the beginning of the present, were exported to Europe, numbering about 200,000 annually, this species was in imminent danger of extirpation. More recently the employment of silk and of the fur of the South American Coypu in the manufacture of hats, so lessened the demand for beaver skins that the trapping of these animals became unprofitable; and being thus little sought after for many years, they have again become abundant in such of their old haunts as have not yet been occupied by man, so that the trade in beaver skins has now nearly attained its former proportions. The American Beaver is essentially social, inhabiting lakes, ponds, and rivers, as well as those narrrow creeks which connect the lakes together. They generally, however, prefer flowing waters, probably on account of the advantages afforded by the current for transporting the materials of their dwellings. They also prefer deepish water, no doubt because it yields a better protection from the frost. When they build in small creeks or rivers, the waters of which are liable to dry or to be drained off, instinct leads them to the formation of dams. These differ in shape according to the nature of particular localities. Where the water has little motion the dam is almost straight; where the current is considerable it is curved, with its convexity towards the stream. The materials made use of are drift wood, green willows, birch, and poplars; also mud and stones intermixed in such a manner as must evidently contribute to the strength of the dam; but there is no particular method observed, except that the work is carried on with a regular sweep, and that all the parts are made of equal strength. "In places," says Hearne, "which have been long frequented by beavers undisturbed, their dams, by frequent repairing, become a solid bank, capable of resisting a great force both of ice and water; and as the willow, poplar, and birch generally take root and shoot up, they by degrees form a kind of regular planted hedge, which I have seen in some places so tall that birds have built their nests among the branches." Their houses are formed of the same materials as the dams, with little order or regularity of structure, and seldom contain more than four old, and six or eight young beavers. It not unfrequently happens that some of the larger houses have one or more partitions, but these are only posts of the main building left by the sagacity of the builders to support the roof, for the apartments, as some call them, have usually no communication with each other except by water. The beavers carry the mud and stones with their fore-paws, and the timber between their teeth. They always work in the night, and with great expedition. They cover their houses late every autumn with fresh mud, which freezing when the frost sets in, becomes almost as hard as stone, and thus neither wolves nor wolverines can disturb them in the enjoyment of their well-earned repose.

BEAVER DAM, a town of Dodge county, Wis., possessed of water-power and good railroad facilities, and a population of 4,300. There are six factories, with an invested capital of $500,000 and an annual product of $600,000; four public schools and thirteen churches.

BEAVER FALLS, a town of Beaver county, Penn., on the Beaver river, which affords valuable water-power. Coal abounds and natural gas is found in the immediate vicinity, and used in the factories. There are large manufactures of paper, files, cutlery, axes and shovels, with an invested capital of $3,000,000. Population (1890), 9,734. It is a railroad and telegraph center, and is well supplied with churches and schools.

BEBEL, Ferdinand August, was born at Cologne in 1840, removed to Leipzig in 1860 and engaged in business as a wood turner. He became connected with the socialistic movement and in 1867 was elected to the North German Diet. In 1871 he became a member of the Reichstag, and the following year was sentenced to two years' imprisonment for his socialistic utterances.

BECCAFICO, a little bird of the family of Warblers (*sylviadæ*), abundant in Southern Europe and especially in Italy, where it is greatly in demand for the table.

BECCAFUMI, Domenico, was a distinguished painter, of the school of Siena at the beginning of the 16th century. In the early days of the Tuscan republics Siena had been in artistic genius, and almost in political importance, the rival of Florence. But after the great plague in 1348 the city declined; and though her population always comprised an immense number of skilled artists and artificers, yet her school did not share in the general progress of Italy in the 15th century. About the year 1500, indeed, Siena had no native artists of the first importance; and her public and private commissions were often given to natives of other cities. But after the uncovering of the works of Raphael and Michael Angelo at Rome in 1508, all the schools of Italy were stirred with the desire of imitating them. Among those accomplished men who now, without the mind and inspiration of Raphael or Michael Angelo, mastered a great deal of their manner, and initiated the decadence of Italian art, several of the most accomplished arose in the school of Siena. (See articles Peruzzi and Sodoma.) Among these was Domenico, born about 1488, of a peasant, one Giacomo di Pace, who worked on the estate of a well-to-do citizen named Lorenzo Beccafumi. Seeing some signs of a talent for drawing in his laborer's son, Lorenzo Beccafumi took the boy into his service and presently adopted him, causing him to learn painting from masters of the city. Known afterwards as Domenico Beccafumi, or by the nickname of Mecarino, signifying the littleness of his stature, the peasant's son soon gave proof of extraordinary industry and talent. In 1509 he went to Rome and steeped himself in the manner of the great men who had just done their first work in the Vatican. The work by which he will longest be remembered is that which he did for the celebrated pavement of the cathedral of Siena. For a hundred and fifty years the best artists of the state had been engaged laying down this pavement with vast designs in *commesso* work,—white marble, that is, engraved with the outlines of the subject in black, and having borders inlaid with rich patterns in many colors. From the year 1517 to 1544 Beccafumi was engaged in continuing this pavement. He made very ingenious improvements in the technical processes employed, and laid down multitudinous scenes from the stories of Ahab and Elijah, of Melchisedec, of Abraham, and of Moses. These are not so interesting as the simpler work of the earlier schools, but are much more celebrated and more jealously guarded. Such was their fame that the agents of Charles I. of England, at the time when he was collecting for Whitehall, went to Siena expressly to try and purchase the original cartoons. He died in 1551.

BECCARIA, Cesar Bonesana, Marquis, a celebrated writer on the principles of jurisprudence and national economy, was born at Milan in the year 1735, and died in 1793.

BECCARIA, Giovanni Battista, a distinguished

electrician and practical astronomer, was born at Mondovi on the 2d of October 1716, and died on the 27th of May 1781. Beccaria's name is associated with no great discovery in physical science; but he did much, both in the way of experiment and exposition, to spread abroad the researches of Franklin and others in the science of electricity.

BECCLES, a market-town and municipal borough, in the county of Suffolk, on the right bank of the River Wavency, 32 miles N.N.E. of Ipswich. Population in 1890, 6,200.

BECERRA, GASPAR, a distinguished Spanish painter and sculptor, was born at Balza in 1520. His best work was a magnificent figure of the Virgin, which was destroyed during the French war. Becerra died in 1570. The most competent judges assigned to him the chief share in the establishment of the fine arts in Spain.

BECHE-DE-MER, or TREPANG, an important food luxury among the Chinese, Japanese, and other Eastern peoples, connected with the production of which a very considerable commerce exists in the Eastern Archipelago, the coasts of New Guinea, and generally on the coral reefs of the Pacific. It consists of several species of echinoderms, generally referred to the genus *Holothuria;* but very many varieties, widely distributed in Eastern seas, are prepared and sold in Chinese and Japanese markets. The creatures, which exist on coral reefs, have bodies from 6 to 15 inches long, shaped like a cucumber, hence a name they receive,—sea cucumbers. The skin is sometimes covered with spicules or prickles, and sometimes quite smooth, and with or without "teats" or ambulacral feet disposed in rows.

BECHER, JOHANN JOACHIM, a celebrated chemist, born at Spire in 1635, and died in 1682, it is said at London.

BECHWANA, BETJUANA, the name of a nation extending over a large tract of the interior of South Africa. There are remains as well as traditions indicating that they once occupied lands further to the south and north of their present boundaries. The country is bounded on the W. by what may be called the southern Sahara; on the E. by the Limpopo, and on the N. by the Matebele, a tribe which escaped the power of the Chaka, the bloody chief of the Zulus.

The number of the Bechwana has been variously estimated, and according to some amounts to more than 200,000. Their language is copious, with but few slight dialectic differences, being entirely free of the Hottentot elements found in the Kaffre and Zulu. The power of the language which, like the Kaffre and Zulu, belongs to the Ba-nta family, formerly unwritten, may be conceived when it is known, that, besides elementary and educational works, the whole of the Bible has been translated into it, and is now read by thousands.

The Bechwana are divided into numerous tribes, all independent of each other, and each governed by its own chiefs and councillors. The names of some of the principal tribes are Batlapee, Barolong, Bangwaketse, Bakhatla, Bakuena, Bamangwato, and Batauana, the last living near the lake Ngami, first visited by Dr. Livingstone. There are numerous minor divisions, with laws and customs very similar. With the exception of the Balala (the poor inhabiting the country), they are not nomadic, but live in towns of considerable size, containing from 5000 to 40,000. Doubtless, their former warlike habits had the tendency to induce them to congregate for security; for latterly they live, for the sake of agriculture and pasturage, in many formerly uninhabited places.

Though from time immemorial they had been engaged in constant strife with each other, and thus inured to warfare, they were no match for the warlike Kaffre and butchering Zulu and Matebele. Since the introduction of Christianity among the Bechwana, their clannish strifes have ceased; and, being a people of industrious habits, and acute observers of whatever may increase their property and comfort, they go in great numbers to Cape Colony and other parts where they can obtain labor and wages, being prized as servants. This enables them to return enriched to their homes in a few years.

BECK, or BEEK, DAVID, an eminent portrait painter, born in 1621, at Arnheim in Guelderland. He was trained by Vandyck, from whom he acquired the fine manner of pencilling and sweet style of coloring peculiar to that great master. He possessed likewise that freedom of hand and readiness, or rather rapidity of execution, for which Vandyck was so remarkable, insomuch that when King Charles I. observed the expeditious manner of Beck's painting, he exclaimed, "Faith! Beck, I believe you could paint riding post." He was appointed portrait-painter and chamberlain to Queen Christina of Sweden, and he executed portraits of most of the sovereigns of Europe to adorn her gallery. He lived in the highest favor with his royal mistress, and with difficulty obtained a short leave of absence from her court. He died soon after (1656) at the Hague, not without suspicion of having been poisoned.

BECKER, WILHELM ADOLF, a classical archæologist of distinction, was born at Dresden in 1796, and died at Meissen in September 1846.

BECKET, or À BECKET, THOMAS. See À BECKET.

BECKFORD, WILLIAM, an English author, the son of Alderman Beckford, who was noted for his manly reply to George III. on the presentation of an address from the city of London, was born in 1761, and died in 1844. He was a powerful and original writer.

BECKMANN, JOHANN, the author of the *History of Inventions*, was born in 1739 at Hoya in Hanover, where his father was postmaster and receiver of taxes. His mother, who was left a widow before he was seven years of age, sent him to school at Stade; and in 1759 he repaired to the University of Göttingen with the intention of studying theology, which, however, he soon abandoned in favor of natural science. The death of his mother in 1762 having deprived him of his former means of support, he accepted, at the offer of Busching, the professorship of natural history in the Lutheran Academy, St. Petersburg. This office he soon relinquished, and journeyed through Sweden, where he inspected the manner of working the mines, and formed the acquaintanceship of Linnæus at Upsala. In 1766 he was appointed professor at Göttingen. There he lectured on various arts and on political and domestic economy, and was in the habit of leading his students into the workshops that they might acquire a practical as well as a theoretical knowledge of different processes and handicrafts. While thus engaged he determined to trace the history and describe the present condition of each of the arts and sciences on which he was lecturing, being perhaps incited by the *Bibliothecæ* of Haller. But even Beckmann's industry and ardor were unable to overtake the amount of study necessary for this task. He therefore confined his attention to several practical arts and trades; and to these labors we owe his *Notices on the History of Discoveries in the Common Arts of Life*,—a work in which he relates the origin, history, and recent condition of the various machines, utensils, &c., employed in trade and for domestic purposes.

BEDARRIEUX, a town of France, in the department of Hérault, situated on the River Orb, with a

station on the branch railway from Béziers to Graissesac.

BEDDOES, THOMAS, a physician and scientific writer, was born at Shiffnall, in Shropshire, 13th April 1760. After studying at Bridgnorth grammar school and Plymhill, in Staffordshire, he entered, when about sixteen years of age, at Pembroke College, Oxford. There he proved himself an excellent linguist, while especially devoting himself to science. Having taken his bachelor's degree at twenty-one, he studied at London for the medical profession under Sheldon. In 1783 he became master of arts, and in 1784 he removed to Edinburgh, where he remained about three years. In 1784 he published a translation of Spallanzani's *Dissertations on Natural History*, and in 1785 produced a translation, with original notes, of Bergman's *Essays on Elective Attractions*. He took his degree of doctor of medicine at Oxford in 1786, and, after visiting Paris, where he became acquainted with Lavoisier, was appointed reader in chemistry at Oxford University. His lectures there attracted large and appreciative audiences; but his advocacy of the French Revolution exciting a clamor against him, he resigned his readership in 1792, and took up his abode with a friend at Ketley, in Shropshire. While resident there he published *Observations on the Nature of Demonstrative Evidence*, in which he maintains that geometry is founded on experiment, and the *History of Isaac Jenkins*, a story which powerfully exhibits the evils of drunkenness, and of which 40,000 copies are reported to have been sold. He endeavored for many years subsequently to realize his project of a pneumatic institution, in which the efficacy of certain gases in curing diseases could be tested. While working for this object he was assisted by the father of Maria Edgeworth, Richard Lovell Edgeworth, one of whose daughters became his wife in 1794. He was ultimately enabled by the liberality of Wedgwood, to establish the proposed institution (1798), and was fortunate in securing as its superintendent Mr. (afterwards the famous Sir Humphrey) Davy, who had already given proofs of uncommon endowments, and many of whose discoveries were made in its laboratory. Among the first results of the pneumatic institution was the discovery of the chemical properties of nitrous oxide, in regard to which, as in many other cases, Beddoes showed himself over-sanguine and speculative. The original aim of the institution was gradually abandoned; it became an ordinary sick-hospital, and was relinquished by its projector in the year before his death, which occurred in 1808.

BEDDOES, THOMAS LOVELL, a modern English dramatist of peculiar and almost unique genius, was the son of the preceding, and was born at Clifton, 20th July 1803. He received his education at the Charter House, and subsequently at Pembroke College, Oxford, at both of which places he displayed a rugged independence of character combined with eccentricity of demeanor and an aversion to the ordinary course of study. While still an undergraduate he published his *Bride's Tragedy*, a piece less characterized by originality than his subsequent performances, and altogether in the taste of the Elizabethan revival of the day initiated by the publication of Lamb's *Specimens*. The notice it obtained from Barry Cornwall and other representatives of this school, encouraged him to devote himself altogether to the cultivation of dramatic poetry; and he speedily produced a number of superb fragments, ranging down from the ambitious but unfinished sketches for tragedies to be entitled *Torrismond* and *The Second Brother*, to short descriptive passages of a few lines each, unsurpassed for originality of conception and condensed force. His genius, unfortunately, though highly poetical, was in no respect dramatic; he entirely lacked the power of constructing a plot and deducing character from action; and his endeavors to achieve a complete work proved abortive until 1829, when the strangely fascinating but fantastic and incoherent drama of *Death's Jest-Book, or The Fool's Tragedy*, was laboriously put together from a series of abortive attempts. By this time Beddoes had become a resident in Germany, and a zealous student of physiology, which, by affording another outlet for that intense curiosity respecting the mysteries of life and death which had hitherto been the mainspring of his poetical efforts, greatly contributed to repress the external manifestations of his genius. Dissatisfaction with his tragedy, which he never cared to publish during his lifetime, and the gradual disuse of his native language, conspired to reduce him to silence. He led for several years an unsettled life on the Continent, devoted to anatomical research, and actively participating in liberal and democratic movements in Germany and Switzerland, until his death in 1849 from the effects of an accident.

BEDE, BEDA, or BÆDA (commonly called The Venerable Bede), the father of English history, the most learned Englishman and most eminent writer of his age, was born about the year 673, in the neighborhood of Monkwearmouth, in the N.E. of the county of Durham. The story of his life is told by himself at the conclusion of his most famous and most important work: "Thus much of the Ecclesiastical History of Britain, and more especially of the English nation, as far as I could learn either from the writings of the ancients, or the tradition of our ancestors, or of my own knowledge, has, with the help of God, been digested by me, Bede, the servant of God, and priest of the monastery of the blessed apostles Peter and Paul, which is at Wearmouth and Jarrow; who being born in the territory of that same monastery, was given, at seven years of age, to be educated by the most reverend Abbot Benedict, and afterwards by Ceolfrid; and spending all the remaining time of my life in that monastery, I wholly applied myself to the study of Scripture; and, amidst the observance of regular discipline, and the daily care of singing in the church, I always took delight in learning, teaching and writing. In the nineteenth year of my age I received deacon's orders; in the thirtieth, those of the priesthood. . . . From which time, till the fifty-ninth year of my age, I have made it my business, for the use of me and mine, to compile out of the works of the venerable Fathers, and to interpret and explain according to their meaning these following pieces" (a list of his writings follows).

Bede's industry was marvelous, alike in acquiring and in communicating his stores of knowledge. Besides the usual manual labors of the monastery, the duties of the priest, and his additional occupation as a teacher, he succeeded in writing upwards of forty distinct treatises, which together form what may be looked upon as an early encyclopædia. His Biblical works are principally made up of extracts from the Fathers, especially from St. Augustine—his interpretations following the allegorical mode of the Middle Ages, as suggested by his own declaration: "He who knows how to interpret allegorically will see that the inner sense excels the simplicity of the letter, as apples do leaves." The scientific treatises are founded on the Bible, and the science of the ancients as contained in such writers as Pliny. Bede's historical works, on the other hand, and especially his great historical work, are remarkable for the patience indicated in the search after all trustworthy sources of information, for his careful statement of these various sources, for the sincerity and love of truth manifest throughout, and for the pleasant artlessness with which the story is told.

A long letter of his pupil Cuthbert has been preserved,

giving a simple and touching account of his death, which probably took place in 735.

BEDELL, WILLIAM, bishop of Kilmore and Ardagh, in Ireland, was born at Black Notley, in Essex, in 1570. He died on the 7th February, 1642. His life was written by Burnet.

BEDFORD, the county town of Bedfordshire, England, a municipal and parliamentary borough and market-town. Population, 16,850.

BEDFORD, the capital of Lawrence county, Ind., seventy-one miles northwest of New Albany. It is noted for its extensive stone-quarries. Bedford has one national bank, a woolen mill, two planing mills, carriage factories, several churches, two schools and a college, and a population approximating 3,500. It has good railroad accommodations.

BEDFORD, capital of the Pennsylvania county of the same name, is situated on a mountain ridge, one mile from Bedford Springs. It contains several churches and schools, a bank, a foundry, flouring and saw mills, and a population of 5,000.

BEDFORD LEVEL, the name given to a flat district on the eastern coast of England, comprising the greater part (amounting to 450,000 acres) of the marshy district called the *Fens*, the whole Isle of Ely in Cambridgeshire, and a portion of the north of that county, 30,000 acres of Suffolk, 63,000 acres of Norfolk, 57,000 of Huntingdon, about 8000 of Northamptonshire, and the south-eastern portion of Lincolnshire.

BEDFORDSHIRE, one of the south midland counties of England, surrounded by the counties of Buckingham, Northampton, Huntingdon, Cambridge, and Hertford. Its area is 461 square miles; its extreme length 47 and its breadth 21 miles. It contains one navigable river, the Ouse, and many smaller streams. Few English counties are better supplied with railroads. In the valley of the Ouse there is much rich pasturage and great attention is paid to the raising of stock. The remainder of the county is devoted to the growth of cereals, the farms are generally large for England, and machinery is employed, Bedfordshire being the home of "model farms." Engineering works and agricultural implement factories on a large scale are located at BEDFORD (*q.v.*) and Luton (pop. 20,000). But the principal industry of the county is that of straw-plait making and the manufacture of pillow lace. Dunstable and Luton are the headquarters of these industries, which are carried on entirely by females. Owing to this fact the female population largely exceeds the male. In 1889 there were 15,000 male laborers, 25,000 female straw-plaiters and 7,000 lace-makers out of a total population of 150,000.

Bedfordshire returns two members to parliament, and the county town, Bedford, also sends two. Among the show-places of the county is Woburn Abbey, the historic seat of the house of Russell (dukes of Bedford). It contains magnificent collections of paintings and statuary.

BEDLAM, a corruption of Bethlehem, the London-Eng., lunatic asylum, originally founded in the thir, teenth century, and now situated in St. George's Fields, Lambeth. Lunatics are often called "Bedlamites."

BEDNOR, a town in Mysore, India, now almost in ruins.

BED OF JUSTICE (Fr. *lit de justice*), literally the seat or throne occupied by the French kings when presiding over the so-called deliberations of parliament. The theory of the old French constitution being that all power was derived from the crown, the king while thus sitting was enabled to override all the actions of parliament. The last "bed of justice" was held by Louis XVI. at Versailles in 1787, when all the representatives were ordered to be imprisoned.

BEDOUINS, the portion of the Arab race that live in the desert in tents. See ARABIA.

BED-SORES, a troublesome complication of disease, to which a patient is subject when confined to bed for a long time, without being able to change his position. They attack the skin over bony prominences, producing ulcers. Cleanliness and careful nursing and the use of the WATER-BED (*q.v.*) are the best protections against bed-sores.

BEE. The bee, from its singular instincts, its active industry, and the useful products resulting from its labors, has, from the remotest times, attracted general attention and interest. No nation upon earth has had so many historians as this remarkable class of insects.

The leading feature in the natural history of bees, and one which distinguishes them from almost all other insects is their singular distribution into three different kinds, constituting to all appearance so many different modifications of sex. The drone, which is characterized by a thicker body, a round head, a more flattened shape, and more obtusely terminated abdomen, within which are contained the male organs of generation, is undoubtedly the male of the species. It is distinguished also by the absence of a sting, and by the humming noise that accompanies its flight. The queen bee, which is unequivocally recognized as the female, is larger than any of the others, has the abdomen of greater length, and is provided with a sting and two ovaria of considerable size. The worker bees compose the third class, and are distinguished by the smallness of their size, their lengthened proboscis, the peculiar structure of their legs and thighs, which are adapted to the collection of certain materials obtained from vegetables, and by the apparent absence of every trace of generative organs,—we say *apparent*, because, as will be shown, rudiments of ovaria do exist, which, however, are not perceptible without a very minute and careful dissection. Till recently the worker bees were regarded as devoid of sex, and were accordingly termed *neuters*. It is their function to perform all the laborious offices for the community, to construct the interior of their habitation, to explore the country in search of nourishment and other materials, to collect and bring them to the hive, and apply them to different purposes, to attend upon the queen, and supply all her wants, to defend the hive from the attacks of depredators, and to carry on hostilities against the various enemies of the tribe. The life of the queen is chiefly engrossed with the duties of laying eggs. The drones producing neither wax nor honey, and depending on the rest for their subsistence, are idle spectators of the others' labors. They appear to be formed only for the momentary but important duty of impregnation, since they perish when this purpose is accomplished. There is commonly only one perfect queen existing at a time within each hive, and she usually appears to be treated by all the other bees with every mark of affection and of deference. The number of workers is very different in different hives; sometimes there are only a few thousands; at other times from twenty to forty, or even fifty thousand. The drones, even in the spring, seldom compose more than one-thirtieth or one-fortieth of the whole; and, at other seasons, there are none to be found in the hive when a fertile queen is present.

Notwithstanding the difference in conformation, instincts, and offices between the queen-bee and the workers, it is now established on the most incontrovertible evidence that they both originally proceed from the same kind of egg or larva, which is capable of being converted, according to circumstances, either into a worker or a queen. It has been proved that the former,

although exhibiting no appearance of sexual organs on a superficial examination, are in reality females, and have the rudiments of these organs, which, however, not being developed, are incapable of exercising their proper functions, although it sometimes happens that they become sufficiently so to enable a worker to lay unfecunded eggs. It may be remarked that the idea of the worker bees being radically females had been suggested long ago by Dr. Warder in his *Monarchy of Bees*, in which he terms them "True Amazons;" but no attention had been paid to his opinion. The real merit of this great discovery, which affords a key to a multitude of hitherto inexplicable facts, unquestionably belongs to Schirach. When first announced to the world it was received with suspicion by the greater number of naturalists, and with complete incredulity by others. It was, indeed, at variance with the whole tenor of the observations of Swammerdam, Maraldi, and Reaumur. Wilhelmi, the brother-in-law of Schirach, though an eye-witness of the experiments from which this theory had been deduced, for a long time refused to admit the doctrine, but at length became one of its most strenuous supporters. It is noticed in a vein of sarcastic ridicule by John Hunter in his otherwise excellent paper on bees in the *Philosophical Transactions*. Needham wrote a *Memoir* for the Imperial Academy of Brussels in 1777 for the express purpose of refuting it, and he then inveighs in strong language against those naturalists who had deigned to give it the least countenance. Bonnet, after exercising a laudable scepticism, and making a diligent inquiry, in which he displays a genuine spirit of philosophy, yielded a reluctant assent. But the truth of the doctrine has since been placed beyond the reach of controversy by a multiplied series of observations and experiments in different parts of Europe and America.

In considering the physiology of the bee, the first function that claims our notice is that of nutrition. The food of bees is principally of two kinds, namely, the fluid secretions of vegetables contained in the nectaries of the flowers, and the dust of anthers, which has been termed by botanists the pollen, but which, when collected by the bees, has received a variety of appellations, such as farina, bee-bread, &c. Occasionally, however, we find bees feeding upon other saccharine substances besides honey, such as honey-dew, syrup, &c.

The organs by which they collect food are extremely complex, comprising instruments adapted to the reception of liquid aliment as well as those fitted for the division of solid materials. Reaumur has given a most elaborate description of these organs, and corrects some errors into which Swammerdam had fallen. For the purpose of taking up fluids, bees are provided, in common with all hymenopterous insects, with a long and flexible proboscis or trunk, which may be considered as a lengthened tongue, though, strictly speaking, it is formed by a prolongation of the under lip. It is not tubular, as Swammerdam had supposed, but solid throughout; and the minute depression at its extremity is not the aperture of any canal through which liquids can be absorbed. The trunk of the bee performs strictly the office of a tongue, and not that of a tube for suction; for when it takes up honey or any other fluid aliment, the under or the upper surfaces are more immediately applied to it, and rolled from side to side, and the bee thus licks up what adheres to it, while the extremity of the trunk is frequently not applied at all to the substance taken up. The trunk is supported on a pedicle, which admits of being bent back or propelled forwards, and thus can retract or stretch out the trunk to a considerable extent. Protection is given to it by a double sheath; the external part consisting of two scales furnished by the expansion of one of the portions of the labial palpi, and the internal formed by the prolongation of the two external portions of the jaw.

For the purpose of mechanically dividing solid materials, the mouth is furnished with two strong mandibles and four palpi; they are but little employed in eating, but are of great use in enabling the insect to seize and break down hard substances for other purposes. In the worker bee all these parts are of larger dimensions than in the other kinds. The teeth are two in number, and have the form of concave scales with sharp edges; they are fixed to the ends of the jaws, and play horizontally as in other insects. Reaumur describes and delineates a larger aperture above the root of the proboscis, which is so surrounded with fleshy parts as not to be readily seen unless the proboscis be extended and bent downwards. This he considers as the mouth or orifice of the gullet; on the upper side of which, and of course opposite to the root of the proboscis, a small fleshy and pointed organ is seen, which he regards as the tongue, assisting in the deglutition of the food. Through this orifice, it is presumed, all the aliment, whether liquid or solid, passes; the former being conveyed to it by the trunk, which, by its contractile power, presses forward the fluids it has collected between itself and the inner sheath, and the latter being received directly after its comminution by the teeth, behind which it is situated. Latreille, however, whose authority is great on a point of this nature, thinks that Reaumur has deceived himself with regard to such an aperture, and disbelieves its existence. He conceives that the food simply passes on by the sides of the tongue, finding its way from thence into the œsophagus and so on to the stomach.

The bee has two stomachs. The first is a large transparent membraneous bag, pointed in front and swelling out into two pouches behind. It performs an office in some respects analogous to that of the crop in birds; for it receives and retains for a time the fluid of the nectaries, which does not appear to differ in any respect from honey. Hunter observes that whatever time the contents of this reservoir may be retained he never found them altered so as to give the idea of digestion having taken place. The coats of this reservoir are muscular, by which means it is capable of throwing up the honey into the mouth, so that it is regurgitated into the honey cells or imparted to other bees. None of it ever passes out from the extremity of the trunk as Swammerdam had believed. For the purpose of digestion a second stomach is provided, which takes its origin from the middle of the two posterior lobes of the former, and is of a lengthened cylindrical shape. Its communication with the intestine is not direct, but takes place by a projecting or inverted pylorus, thickest at its most prominent part, with a very small opening in the centre, of a peculiar construction. This inward projecting part is easily seen through the coats of the reservoir, especically if full of honey. A similar kind of structure takes place at the communication of the first with the second stomach, and having the properties of a valve, must effectually prevent all regurgitation from the latter into the former.

The pollen, or fertilizing dust of flowers is collected by the bees for the purpose of feeding the young. It is stored in the cells until required, and then partly digested by the nurses with honey, and a kind of chyle formed of it. When natural pollen cannot be obtained the bees will eagerly take farina, either of rye, chestnuts, or pease, as a substitute, which appears to answer the same purpose. The bees, by means of the pencil of hair which grows on the tarsi, first collect a certain quantity of pollen, and then knead it together into a

ball, and place it in the space situated at the middle joint or tibia of the hinder leg, which has been termed the basket. This portion of the leg is smooth and concave, somewhat like the bowl of a spoon, with stout hairs of moderate length rising from its left edge and nearly straight. Other hairs on the right side are much longer and are curved, rising up with a high arch and crossing more than half the width of the hollow, making a large basket-like enclosure for a load of pollen. In order to gather large quantities at once, the bees are sometimes observed to roll their bodies on the flower, and then brushing off the pollen which adheres to them with the feet, form it into two masses, which they dispose of as before mentioned; and it is said that in moist weather, when the particles of pollen cannot be readily made to adhere, they return to their hive dusted all over with pollen, which they then brush off with their feet. The part in Nature's economy thus unconsciously performed by the bee in common with other insects is most important. By this means the pollen is carried from flower to flower, or from stamens to the pistils, and plants are made fertile which without such aid would often remain barren.

It was long the received opinion that wax was but a modification of pollen, which required for this conversion only a slight pressure and a kind of kneading by the feet of the bees. But it has been completely proved, by the researches of Duchet, Hunter, and Huber, that wax is a secretion from the abdomen of the bee, and that it depends not at all on the pollen which the insect may consume (indeed, it is doubtful if it consumes any), but on the quantity of honey or other saccharine substance which it receives into its stomach. The first light thrown on this subject was in a letter of Wilhelmi to Bonnet in 1768, in which he says that wax, instead of being ejected by the mouth, exudes from the rings which enclose the posterior part of the body. Of this we may satisfy ourselves by drawing out the bee from the cell in which it is working with wax, by means of the point of a fine needle; and we may perceive, in proportion as the body is elongated, that the wax will make its appearance under the rings in the form of small scales. Duchet, in his *Culture des Abeilles*, gives a full statement of the principal circumstances attending the production of wax, which he very justly ascribes to the conversion of honey into this substance in the body of the bee. These facts appear to have been entirely overlooked till the subject was again brought forward by Hunter, in his paper in the *Philosophical Transactions* for 1792. Huber was engaged in prosecuting his inquiries on this subject at the same period with Hunter, and discovered, in 1793, the existence of regular receptacles or pouches, from the coats of which the wax is secreted, and within which it accumulates till its edges raise the scales, and become apparent externally. These plates of wax are withdrawn by the bee itself, or some of its fellow-laborers, and are applied in a manner hereafter to be described.

Huber has shown, by a series of well conducted experiments, that, in a natural state, the quantity of wax secreted is in proportion to the consumption of honey, but that an equal or even greater quantity will be formed if the bee be fed on a solution of sugar in water. Warmth and rest promote this process of secretion; for the bees, after feeding plentifully on saccharine food, hang together in a cluster without moving, for several hours, at the end of which time large plates of wax are found under the abdominal rings. This happened when bees were confined and restricted from any other sort of nourishment, whilst those that were fed on pollen and fruits alone did not produce any wax. In the second volume of Huber's *Nouvelles Observations sur les Abeilles*, he describes minutely the anatomy of the pouches or receptacles for the wax, which are parts peculiar to the working bees, being totally absent in the males and queens. The cavities are lined with a membrane, which presents a number of folds, forming an hexagonal net-work, not unlike the appearance in the second stomach of ruminant quadrupeds, and evidently destined to perform the office of secretion.

Among the secretions peculiar to the bee, the poison which is poured into the wounds made by the sting deserves to be noticed. It is said to owe its mischievous efficacy to certain pungent salts. If a bee is provoked to strike its sting against a plate of glass, a drop of poison will be discharged; and if this is placed under a microscope, the salts may be seen to concrete, as the liquor dries, into clear, oblong, pointed crystals. The sting consists of a finely pointed tubular instrument, open along the whole length of its upper surface, this opening being closed by two slender horny barbs each having about ten serrations on its outer edge. These barbs are not projected in advance of the sting as usually described, neither are they within the sting, but complete its outer tubular surface, down the centre of which the poison is injected from a little bag at the root of the sting. The serrations prevent the worker bee from withdrawing its sting from an enemy; and, consequently, it is torn from the body, with a portion of the intestines, causing the death of the bee.

Respiration is effected by means totally different from those which are usual in the higher classes of the Animal Kingdom. As the blood, or fluid corresponding to the blood, cannot be presented to the air in any separate organ, the air must be conducted to the blood wherever such a fluid is met with. For this purpose tracheæ, or air-tubes, having several external openings or spiracles, are made to ramify like arteries, and are distributed in an infinite number of branches to every part of the body. The condition of a hive of bees in which many thousand individuals, full of animation and activity, are crowded together in a confined space, having no communication with the external air but by means of a very small aperture in the lowest part, which aperture is frequently obstructed by a throng of bees passing in and out during sultry weather, would without some precautions be of all possible conditions the one least favorable to life. Bees cannot exist in an impure atmosphere any more than creatures of a larger growth. And on examining the air of a populous hive it is found scarcely to differ in purity from the surrounding atmosphere. The means by which this is effected observation has shown is by the rapid vibration of the bees' wings, a certain number being told off to imitate the action of flying, for which purpose they fasten themselves with their feet to the floor of the hive, so that the whole effect of that impulse which, were they at liberty, would carry them forwards with considerable velocity is exerted on the air, which is therefore driven backwards in a powerful current. Some bees occasionally perform these ventilating motions on the outside of the hive, near the entrance, but a still greater number are employed in this office within doors. Sometimes twenty are thus occupied at once, and each bee continues its motions for a certain time, occasionally for nearly half an hour, and is then relieved by another, which takes its place. So rapid a motion of the wings is thus produced that they cannot be seen except at the two extremities of the arc of vibration, which is at least one of 90°. This is the occasion of that humming sound which is constantly heard from the interior of the hive when the bees are in a state of activity. The immediate cause of these actions is probably some

impression made on their organs by the presence of vitiated air, for a bee may be made to ventilate itself by placing near it substances which have to it an unpleasant odor.

The connection between an active respiration and a high temperature is remarkably exemplified in bees, among which, in consequence of their collecting together in large numbers, the heat is not readily dissipated, and admits also of being easily ascertained by the thermometer. Hunter found it to vary from 73° to 84° Fahr.; and Huber observed it on some occasions to rise suddenly from about 92° to above 104°.

The physiology of the external senses in a class of animals of a nature so remote from our own species must necessarily be very imperfectly understood by us. The infinite diversity of character presented by the different tribes of insects, as well as of other animals, naturally suggests the idea that external objects produce on their sentient organs impressions widely different from those which they communicate to ourselves. The notions we form of their senses must not only be liable to great inaccuracy, but may often be totally inadequate representations of the truth. A finer organization and more subtile perceptions would alone suffice to extend the sphere of their ordinary senses to an inconceivable degree, as the telescope and the microscope have with us extended the powers of vision. But they possess in all probability other organs appropriated to unknown kinds of impressions, which must open to them avenues to knowledge of various kinds to which we must ever remain total strangers. Art has supplied us with many elaborate modes of bringing within our cognizance some of the properties of matter which nature has not immediately furnished us with the means of detecting. But who will compare our thermometers, spectroscopes, or hygrometers, however elaborately constructed, with those refined instruments with which the lower orders of animals, and particularly insects, are so liberally provided.

The antennæ, which are so universally met with in this class of animals, are doubtless organs of the greatest importance in conveying impressions from without. Their continual motion, the constant use which is made of them in examining objects, the total derangement in the instincts of those insects which have been deprived of them, point them out as exquisite organs of sense. To impressions of touch arising from the immediate contact of bodies they are highly sensitive, but their motions evidently show that they are affected by objects at some distance. They are, no doubt, alive to all the tremulous movement of the surrounding air, and probably communicate preceptions of some of its other qualities. Composed of a great number of articulations, they are exceedingly flexible, and can readily embrace the outline of any body that the bee wishes to examine, however small its diameter. Newport, in a paper published in the *Transactions of the Entomological Society*, says he is convinced from experiments that the antennæ are auditory organs; and that however varied may be their structure, they are appropriated to the perception and transmission of sound. The majority of modern physiologists and entomologists coincide in this view, and the weight of authority in favor of it is certainly very great, comprising as it does Sulzer, Scarpa, Schneider, Borkhausen, Bonsdorf, Carus, Straus-Durckheim, Oken, Burmeister, Kirby and Spence, Lespès, and Hicks. Nevertheless, other eminent entomologists, as, for instance, Lyonet, Kûster, Robineau-Desvoidy, Vogt, and Erichson, regard these organs as the seat of smell. The question may be considered as yet undetermined, and it is possible that they are the organs of some sense of which we know nothing, and which we consequently cannot describe. It is by these instruments that the bee is enabled to execute so many works in the interior of the hive, from which the light must be totally excluded. Aided by them it builds its combs, pours honey into its magazines, feeds the larvæ, and ministers to every want which it appears to discover and judge of solely by the sense of touch. The antennæ appear also to be the principal means employed for mutual communication of impressions. The different modes of contact constitute a kind of language which seems to be susceptible of a great variety of modifications, capable of supplying every sort of information for which they have occasion.

The sense residing in the antennæ appears to be on many occasions supplementary to that of vision, which in bees, as in other insects, is less perfect than in the larger animals. During the night, therefore, they are chiefly guided in their movements by the former of these senses. In full daylight, however, they appear to enjoy the sense of vision in great perfection. A bee alights unerringly on the flowers in search of nectar or pollen, and as truly at its own hive's entrance on its arrival there. When returning from the fields to its hive it seems to ascertain the proper direction by rising with a circular flight into the air; it then darts forward with unfailing precision, passing through the air in a straight line with extreme rapidity, and never failing to alight at the entrance of its own hive, though whether its course be determined by vision alone we are unable to say.

Their perceptions of heat and cold are extremely delicate. The influence of the sun's rays excites them to vigorous action. Great cold will reduce them to a state of torpor, and inferior degrees of cold are unpleasant to them; a temperature of 40° Fahr. will so benumb a bee as to deprive it of the power of flight, and it will soon perish unless restored to a warmer atmosphere. When, however, bees are in the usual winter's cluster in the hive, they will bear a very great degree of cold without injury. In America hives often stand where the external temperature is as low as 20° below zero, and from the condensed vapor within the hive, the bees may be found in a solid lump of ice, and yet, with returning spring, they awake to life and activity. The degree of cold which bees can endure has not been ascertained, though it is no doubt considerable. They survive the winter in many cold parts of Russia, in hollow trees, without any attention being paid to them; and their hives are frequently made of the bark of trees, which does not afford a very complete protection from the effects of frosts. Many bees which are thought to die of cold in winter die in reality of famine or damp. A rainy summer and cold autumn often prevent their laying in a sufficient store of provisions; and the hives should, therefore, be carefully examined in the afterpart of the season, and the amount of food ascertained. Mr. White judiciously observes, that bees which stand on the north side of a building whose height intercepts the sun's beams all the winter will waste less of their provisions than others which stand in the sun; for, coming forth seldom, they eat little, and yet are as forward in the spring to work and swarm as those which had twice as much honey left with them the preceding autumn. They show by their conduct that they are sensible of changes in the state of the weather for some time before we can perceive such alterations. Sometimes when working with great assiduity they will suddenly desist from their labors, none will stir out of the hive, while all the workers that are abroad hurry home in crowds, and press forward so as to obstruct the entrance of the hive. Often, when they are thus

warned of the approach of bad weather, we can distinguish no alteration in the state of the atmosphere. Gathering clouds sometimes produce this effect on them; but perhaps they possess some species of hygrometrical sense unconnected with any impression of vision. Huber supposes that it is the rapid diminution of light that alarms them, for if the sky be uniformly overcast they proceed on their excursions, and even the first drops of a shower do not make them return with any great precipitancy.

Their taste is, perhaps, the most imperfect of their senses. They use scarcely any discrimination in the collection of honey from different flowers. They are not repelled by the scent or flavor of such as are extremely offensive to our organs, and scruple not to derive supplies from such as are highly poisonous. In some districts in America it is well known that honey acquires in this way very deleterious properties. The qualities of honey are observed to vary much according to the particular situation from which it is obtained. In their selection of flowers they are guided by the quantity of honey they expect to meet with, and in no respect by its quality. That gathered from ivy blossoms in England is sometimes so bitter and nauseous as to be useless for our eating, although the bees consume it readily. But their smell must be sufficiently acute to enable them to discover honey at great distances, and in concealed situations direct experiment has indeed proved this to be the case. Huber found that they proceeded immediately towards boxes which contained honey concealed from view; and such, in fact, is the situation of the fluid of the nectaries in flowers. Some odors, and especially all kinds of smoke, are highly obnoxious to them; and this is also the case with ammonia and other volatile chemical agents, upon receiving the impression of which they immediately set about ventilating themselves in the usual manner. The odor of the poison of their sting produces similar effects, exciting them to immediate rage and hostility. It has been observed that bees recognize the presence of a stranger in their hive by the smell; and in joining two stocks into one, if the bees are united without precautions, a battle will probably ensue. To obviate this bee-keepers are in the practice of strongly scenting both families by means of peppermint, tobacco smoke, or other strong-smelling agent; this overpowering the bees' natural scent, they are unable to distinguish their own party from the intruders, and peace is insured. The sense of vision does not appear to aid them, for even where Ligurians are added to common black bees the effect is the same, although in color the two varieties are very different. In the introduction of an alien queen to a stock it is also usual to imprison the new sovereign within the hive which she is to rule until she has acquired the peculiar scent of her future subjects, who will then make no objections to her, while had she been at once set at liberty she would probably have met her death.

Although it is clear that insects possess the power of smell, yet the particular organ of this sense has never been accurately ascertained, and the opinions of naturalists have been much divided on the subject. These opinions have been supported more by arguments drawn from the analogy of what happens in other classes of animals than by direct experiments on insects themselves. We know that in all animals respiring by means of lungs, the organs of smell are placed at the entrance of the air-passages; and it has often been concluded that in like manner the stigmata, or the orifices of the air-tubes, are the seat of this sense in insects. Huber's opinion was that in the bee this sense resides in the mouth itself, or in its immediate vicinity. Here, indeed, would be its proper station if this faculty be intended, as we may reasonably suppose it to be, to apprise the individual of the qualities of the food prior to its being eaten. When the mouth of a bee was plugged up with paste, which was allowed to dry before the insect was set at liberty, it remained quite insensible to the same odors to which he had before manifested the strongest repugnance.

It is generally supposed that bees possess the sense of hearing. The common practice of making a loud noise by drums and kettles in order to attract a swarm is founded on this supposition. But the evidence is by no means conclusive, for we find that they are not disturbed by a loud clap of thunder, or by the report of a gun, or by any other noise that may happen to arise around them. Sir John Lubbock, who has made a great many observations in this direction, says that he could never find them take notice of any sound he made even when he was close to them. He tried them with a violin, dog whistle, shrill pipe, and set of tuning forks, also by shouting, &c., close to their heads, but in spite of his utmost efforts the bees took no notice, not even by a twitch of the antennæ showing they heard. It is, however, certain that they are capable of emitting a variety of sounds which appear expressive of anger, fear, satisfaction, and other passions; and it would seem that they are even capable of communicating certain emotions to one another in this manner.

A certain cry or humming noise from the queen will strike with sudden consternation all the bees in the hive, and they remain for a considerable time motionless and stupified. Hunter has noticed a number of modulations of sound emitted by bees under different circumstances, and has instituted an inquiry concerning the means employed by them in producing these sounds.

If the function of sensation in insects be involved in doubt and obscurity, the knowledge of those more interior faculties, which are the springs of voluntary action, is hid in still deeper mystery. Buffon refuses to allow bees any portion of intelligence, and contends that the actions we behold, however admirably they are directed to certain ends, are in fact merely the results of their peculiar mechanism. Other philosophers, such as Reaumur and Brougham, have gone into the opposite extreme, and have considered them as endued with extraordinary wisdom and foresight, as animated by a disinterested patriotism, and as uniting a variety of moral and intellectual qualities of a higher order. The truth, no doubt, lies between these overstrained opinions; but it is nevertheless extremely difficult to decide in what degree these respective principles operate in the production of the effects we witness. The term *instinct* should properly be regarded, not as denoting a particular and definite principle of action, whose operation we can anticipate in any new or untried combination of circumstances, but as expressive of our inability to refer the phenomena we contemplate to any previously known principle. Thus the actions which an animal performs in obedience to the calls of appetite are not properly said to be instinctive; nor can the term be applied to actions which are the consequence of acquired knowledge, and of which the object is with certainty foreseen by the agent. But when an animal acts apparently under a blind impulse, and produces effects useful to itself or to the species, which effects it could not have previously contemplated as resulting from those actions, it is then customary to say that it is under the guidance of instinct, that is, of some unknown principle of action. It will be proper, therefore, to keep this distinction in view in judging of the voluntary actions of the lower animals.

In no department of natural history is it more necessary to be aware of the proper import of the term instinct, than in studying the phenomena presented by the

bee; for nowhere is it more difficult to discriminate between the regular operation of implanted motives and the result of acquired knowledge and habits. The most striking feature of their history, and the one which apparently lays the foundation for those extraordinary qualities which raises them above the level of other insects, is the disposition to social union. It may in general, indeed, be remarked, that animals which associate together so as to form large communities, display a higher degree of sagacity than those which lead a solitary life. This is especially observable among insects. The spider and *Formica leonis* may exhibit particular talents, or practise particular stratagems in the pursuit and capture of their prey; but their history is limited to a single generation, and embraces none of those interesting relations which exist between individuals composing the gregarious tribes, such as the ant, the wasp, and the bee. Among these we trace a community of wants and desires, and a mutual intelligence and sympathy, which lead to the constant interchange of good offices, and which, by introducing a systematic division of labor, amidst a unity of design, leads to the execution of public works on a scale of astonishing magnitude. The attachment of bees to their hive, which they defend with a courage and self-devotion truly admirable, their jealousy of intruders, their ready co-operation in all the labors required for the welfare of the community, their tender care of their young, the affection and homage which they bestow on their queen, imply qualities such as we could hardly persuade ourselves could animate a mere insect, on which we are in the habit of proudly looking down as placed in one of the lowest orders of created beings.

We shall content ourselves at present with these general observations, as the instances which serve to illustrate their moral and intellectual character belong properly to the history of the different processes they follow in the construction of their combs, the hatching and rearing of their progeny, and the mode of conducting their migrations. To these subjects, therefore, we shall now proceed; and in order to present the most connected and complete account of their economy, we shall begin the history from the period when a new swarm has just occupied a hive, and when all the arrangements for their habitation, and the constructions of the cells in which their eggs and provisions are to be deposited, are yet to be effected.

The first care of the worker bees, on their settlement in their new abode, is to clean it out thoroughly. While one set of bees is thus employed, another is distributed about the country in order to procure the proper materials for blocking up the small holes and chinks of the hive, and for laying a firm foundation for the edifice which is to be constructed within it. The substance which is principally employed in this preliminary stage is *propolis*, a species of glutinous resin, of an agreeable aromatic odor, and reddish-brown color, in process of time becoming darker, and acquiring a firmer consistence.

The propolis adheres so strongly to the legs and feet of the bee which has collected it, that it cannot be detached without the assistance of its fellow-laborers. For this purpose the bee that is loaded presents its legs to the workers in the hive, which carry off with their jaws this adhesive substance and immediately apply it, while yet ductile, all round the interior of the hive, and particularly over all the projecting parts; hence its name, of Greek derivation, signifying *before the city*.

The next object of their labors is the construction of the combs, the future receptacles for the eggs with which the queen is pregnant and which are now to be laid. The material employed is wax; and the bees, for the purpose of secreting this, are actively employed in collecting honey. When they have filled their crops with honey they hang together in a thick cluster from the top of the hive, and thus remain in a state of inactivity for a considerable period, during which time the secretion of wax is proceeding. It may be seen collected in laminæ under the abdominal scales, whence it is removed by the hind legs of the bee, transferred to the fore legs, and from thence taken up by the jaws. In this operation they are often assisted by their companions, who even sometimes directly sieze upon the wax from under the abdomen of those who are before them. When a sufficient quantity of material has thus been collected together, the process of building is commenced; but in order to understand the subsequent operations it is necessary to have a correct idea of the form of the cells which compose the combs. We shall, therefore, proceed to give some account of the structure when it has attained its perfect state.

The combs of a bee-hive are formed in parallel vertical strata, each of which is about an inch in thickness, the distance between the surfaces of adjoining strata being about half an inch, a space which allows for the passage of the bees over both services. The combs generally extend the whole breadth of the hive, and nearly the whole length from the top to the bottom.

Royal cells are only formed when it is necessary that queens should be reared, either from their being required to lead off swarms, or from the fact of the colony being queenless through accidental circumstances.

The comb of the hive may be said to be the furniture and storehouse of the bees, which by use must wear out; but independently of this, it will in time become unfit for use, by the accumulations of cocoons, which are never removed. These line the whole cell, sides and bottom. Hunter counted above twenty different linings in one cell, and found the cell about one-quarter or one-third filled up.

The regularity of the cells is often disturbed in consequence of the admixture of rows of larger cells with those of smaller dimensions; but the pyramidal partitions are adapted by successive gradations to these changes, so that in many rows of what may be called cells of transition, the bottom presents four planes instead of three, two being trapeziums, and the other two irregular hexagons. These irregularities are met with chiefly in the combs most distant from the central one. When an abundant supply of honey induces the bees to lay up a large quantity in store, they build up for this purpose the walls of common cells, so as to give them a greater depth. The royal cells, are often raised from the ruins of a number of other cells, which are destroyed to make room for them; they are usually built on the edge of some of the shorter combs, and often in the very centre of the hive. Sometimes there is but one; at other times as many as sixteen have been counted in the same hive. They are formed of a mixture of propolis and wax; their form is oblong, resembling that of a pear; their position is always vertical, so that when they rise from the midst of other cells, they are placed against the mouths of those cells, and project beyond the common surface of the comb. They are perfectly smooth on the inner surface, while their outer side is covered with a kind of hexagonal fret-work, as if intended for the foundation of regular cells.

The impregnation of the queen-bee was formerly involved in the deepest obscurity, and has given rise to a multitude of very fanciful opinions. Some have denied that any intercourse with the male was necessary for the fecundation of the eggs. It has since been clearly proved that copulation takes place in the air during flight, and if the queen is confined to the hive either by bad weather, or malformation or mutilation of her

wings, although she may be surrounded by drones, she never becomes impregnated; and if she does not find a mate within three weeks of her birth, the power of sexual intercourse seems to become lost. If a hive containing a virgin queen be attentively watched on fine days the queen will be observed preparing for her matrimonial flight, and after having attentively surveyed her home so as to be able to recognize it again she flies to a considerable height in the air; and if her errand is successful, in half an hour she returns to the hive with unequivocal proofs of the intercourse that has taken place, for she has in fact robbed the drone of the organs concerned in this operation; and the drone, thus mutilated, is left to perish on the ground. From its being necessary that the queen should fly to a distance in order to be impregnated, Huber infers the necessity of a great number of drones being attached to the hive, that there may be a sufficient chance of her meeting one of them during her aërial excursion.

The fact that the eggs of an unimpregnated queen will hatch and produce drones may be easily verified, and is now undisputed. By depriving a colony of its queen late in the year, a young queen will be reared; and the drones having been killed long before, no impregnation can take place, yet the queen will infallibly lay eggs which hatch into drones; these eggs are laid indiscriminately in drone and worker cells, the bees bred in the latter being stunted in their growth. If now the spermatheca be examined, no spermatozoa will be found present. The same result will be found if, in the summer, the virgin queen be deprived of her wings and so made unable to fly.

If the impregnation of the queen be delayed beyond, as elsewhere stated, the twenty-first day of her life, she becomes incapable of receiving impregnation, and begins soon after to lay the eggs of drones, and produces no other kind of eggs during her life. This very curious and unexpected fact was discovered by Huber; and has been satisfactorily established by his very numerous and varied experiments, although its explanation is perhaps attended with insuperable difficulties. The abdomen of a queen that is unimpregnated is much more slender than that of one which is completely fertile; but, on dissection, the ovaries are found expanded and full of ova.

One of the most remarkable facts concerning the generation of bees, is the existence occasionally of prolific workers, the discovery of which we owe to Reims. Although it was doubted by Bonnet, its reality has been fully confirmed by the researches of Huber and subsequent observers, and it explains what was before inexplicable — the production of eggs in hives absolutely destitute of a queen. It is also remarkable that the eggs thus produced are always those of drones, but this is explained by the fact that these fertile workers have not received, and, in fact, are unable to receive, impregnation from the drone. The origin of these abnormal egg-layers is accounted for from their having passed the larva state in cells contiguous to the royal ones, and from their having at an early period devoured some portion of the stimulating jelly which was destined for the nourishment of the royal brood, their ovaries thus receiving a partial development; or when a colony is deprived of its queen late in the autumn, and an attempt to raise a queen from some unknown cause has failed, a larva has sufficiently advanced to develop into a fertile worker.

As soon as a sufficient number of cells have been constructed, the queen begins to deposit her eggs. Unlike most insects the queen bee deposits eggs ten or eleven months in the year in temperate climates, although it is probable this is not the case when the winter is much more severe than in Britain. Young queens ordinarily commence ovipositing thirty-six hours after impregnation. What power, if any, the queen has in determining the sex of her eggs is unknown, but, as already noticed, eggs that will produce workers or queens will always be found laid in worker cells, and those that will produce drones will also be found in their appropriate cells. A queen of a new swarm will rarely produce drones the first year; instinct, seemingly, teaching her they will not be required. In the early spring, if a clean empty piece of drone comb be put into the centre of the brood nest, the queen will usually fill it with drone eggs, and this circumstance is taken advantage of by scientific apiarians to secure a supply of drones for the impregnation of early hatched queens. When the eggs are about to hatch, the bees eagerly seek for that species of nourishment on which the larvæ are to be fed. This consists of pollen with a proportion of honey and water, which is partly digested in the stomach of the bees, and made to vary in its quality according to the age of the young. The egg of a bee is of a lengthened oval shape with a slight curvature and of a bluish white color. It is hatched without requiring any particular attention on the part of the bees, except that a proper temperature be kept up, in which case three days are sufficient for the exclusion of the larva. This has the appearance of a small white worm without feet, which remains generally coiled up at the bottom of the cell. The bees feed it with great assiduity with the kind of chyle above described, and in every respect exhibit towards it the greatest care and attention. Hunter says a young bee might easily be brought up by any person who would be attentive to feed it. As it grows up it casts its cuticle like the larvæ of other insects. In the course of five or six days it has attained its full size, and nearly fills the cell in which it is lodged. It now ceases to eat, and the bees close up its cell with a covering of wax, or rather an admixture of wax and propolis, which they possess the art of amalgamating. During the next thirty-six hours the larva is engaged in spinning its cocoon, and in three days more it assumes the pupa state. It is now perfectly white, and every part of the future bee may be distinguished through its transparent covering. In the course of a week it tears asunder its investing membrane, and makes its way through the outer wall of its prison in its perfect form. Reckoning from the time that the egg is laid, it is only on the twenty-first day of its existence that this last metamorphosis is completed. No sooner has it thus emancipated itself than its guardians assemble around it, caress it with their tongues, and supply it plentifully with food. They clean out the cell which it had been occupying, leaving untouched, however, the greater part of the web, which thus serves to bind together still more firmly the sides of the comb. The color of the bee when it quits the cell is a light grey. For several days, sometimes a week or two after birth, the worker bees occupy themselves within the hive, not flying abroad during that time, their principal employment then being that of nurses; and many old observers thought them a different class altogether from the honey-gatherers and wax-makers. The metamorphosis of the male bee follows the same course, but requires four days longer for its completion, occupying twenty-five days from the time of the egg being laid to the attainment of the perfect state.

When from the egg or young larva it is the intention of the bees to raise a queen, their attention is more incessantly bestowed upon it, the cell being enlarged as elsewhere described. It is supplied with a peculiar kind of food, which appears to be more stimulating than that of ordinary bees. It has not the same mawkish taste, and is evidently acid. It is furnished to the royal larva in greater quantities than can be consumed, so that a portion always remains behind in the cell after the trans-

formation. As a proof that any worker egg or young larva not more than three days old may be made to produce a queen, the experimenter has only to supply to such an one, a portion of royal jelly, and the nurses will enlarge its cell and continue so to feed it, when in due time a queen will be produced. The growth of the larva and the development of all its organs are very much accelerated by this treatment, so that in five days it is prepared to spin its web, and the bees enclose it by building up a wall at the mouth of its cell. The web is completed in twenty-four hours; two days and a half are spent in a state of inaction, and then the larva transforms itself into a pupa. It remains between four and five days in this state, and thus on the sixteenth day after the egg has been laid, the perfect insect is produced. When this change is about to take place, the bees gnaw away part of the wax covering of the cell till at last it becomes pellucid from its extreme thinness. This not only must facilitate the exit of the bee, but may possibly be useful in permitting the evaporation of the superabundant fluids.

But the queen bee, although perfectly formed, is not always at liberty to come out of her prison, for if the queen-mother be still in the hive waiting a favorable state of the weather to lead forth another swarm, the bees do not suffer the young queens to stir out; they even strengthen the covering of the cell by an additional coating of wax, perforating it with a small hole through which the prisoner can thrust out her tongue in order to be fed by those who guard her. The royal prisoners continually utter a kind of plaintive cry, called by bee-keepers "piping," and this appears to be answered by the mother queen. The modulations of this piping are said to vary. The motive of this proceeding on the part of the bees who guard them is to be found in the implacable hatred which the old queen bears against all those of her own sex, and which impels her to destroy without mercy all the young queens that come within her reach. The workers are on this account very solicitous to prevent her even approaching the royal cells while there is any prospect of a swarm being about to issue. They establish themselves as a guard around these cells; and, forgetting their allegiance on this occasion, actually beat her off as often as she endeavors to come near them. If, on the other hand, the swarming season is over, or circumstances prevent any further swarms from being sent off, the bees do not interpose any obstacle to the fury of the old queen, which immediately begins the work of destruction, transfixing with her sting one after the other the whole of the royal brood, while they are yet confined in their cells. It is observed by Huber, that the royal larvæ construct only imperfect cocoons, open behind, and enveloping only the head, thorax, and first ring of the abdomen; and he conceives that the intention of Nature in this apparent imperfection is, that they may be exposed to the mortal sting of the queen, to whom they may be given up as a sacrifice.

When the old queen has taken her departure along with the first swarm, the young queens are liberated in succession, at intervals of a few days, in order to prevent their attacking and destroying one another, which would be the infallible consequence of their meeting. This exterminating warfare is prevented by the vigilance of the bees which guard them, so long as new swarms are expected to go off. When a young queen is liberated, she is, like others of her sex, anxious to get rid of her rivals, and even at that early age seeks to destroy her sisters, which are still confined in the other royal cells; but as often as she approaches them she is bit, pulled, and chased without ceremony by the sentinels. But when the season is too far advanced for swarming, or if two or more queens should happen to emerge at the same moment, they mutually seek each other and fight till one is killed, and the survivor is immediately received as the sovereign of the hive. The bees, far from seeking to prevent these battles, appear to excite the combatants against each other, surrounding and bringing them back to the charge when they are disposed to recede from each other, and when either of the queens shows a disposition to approach her antagonists, all the bees forming the cluster instantly give way to allow her full liberty for the attack. The first use which the conquering queen makes of her victory is to secure herself against fresh dangers by destroying all her future rivals in the royal cells; while the other bees, which are spectators of the carnage, share in the spoil, greedily devouring any food which may be found at the bottom of the cells, and even sucking the fluid from the abdomen of the pupæ before they toss out the carcasses.

We are now to direct our attention to the migrations of bees, by which new colonies similar to that which had originally peopled the parent hive are founded. The final causes of this phenomenon are sufficiently obvious, but it does not so clearly appear to what circumstances it is immediately owing. The increasing population of a hive probably occasions inconvenience from want of room; the increase of heat and the greater vitiation of the air become still more serious as the summer advances. The spring is, accordingly, the commencement of the swarming season. No swarming, indeed, will ever take place while the weather is cold, or until the hive is well stocked with eggs. The queen-bee, in consequence of the great number of eggs she has been laying, is now reduced to a more slender shape, and is well fitted for flight; her aversion for the royal brood, which she seems to foresee will in a short time become able to dispute the throne with her, and the vain attempts she makes to destroy them in the cradle, in which attempts she is invariably repelled by the bees who guard them, produce in her a constant restlessness and agitation which, as Huber represents it, rises to a degree of delirium. This frenzy, from whatever cause it may originate, is communicated to the workers; they may be seen hurrying to and fro in the combs with evident marks of impatience. The heat of the hive is increased by their tumultuous movements; it sometimes rises suddenly on these occasions from 92° to above 104°. A general buzz is heard throughout the hive. This state of things occurs from time to time for some days before the swarm is actually on the wing; and the interval is occupied in making preparations for the approaching expedition; provisions are collected in greater quantity by the workers. Hunter killed several of those that came away, and found their crops full, while those that remained in the hive had their crops not nearly so.

On the day on which the swarm quits the hive, few of the workers roam to any distance, but several are seen performing circles in the air round the hive. The noise is on a sudden hushed, and all the bees enter the hive; this silence announces their immediate departure. A few workers appear at the door, turn towards the hive, and striking with their wings, give, as it were, the signal for flight. All those which are to accompany the expedition rush towards the door, and issue forth with wonderful rapidity, rising in the air and hovering for some time, as if in order to wait for the assemblage of the whole troop; then, having selected a rallying point, generally on some tree or bush, some alight, being joined immediately by others until the whole number is collected in one mass of bees. It does not always happen that the queen is the first to alight or is with the cluster at all; but if she be not there the bees soon discover it

and disperse in search of her — if they fail to find her they return to the parent hive. Thither the queen sometimes, from weakness or other causes, returns, and is immediately attended by the rest. But if the weather be fine, the expedition is only deferred for one or two days, and they again take their departure. If their return be owing to the loss of their queen, they remain a fortnight or longer before the attempt to migrate is renewed, and then the swarm is much larger than before, which renders it probable that they have waited for the queen that was to go off with the next swarm. Sometimes, when everything indicates an approaching emigration, the passage of a cloud across the sun will suspend all their operations, and the previous bustle gives place to a state of perfect calm. But, if the day be not far advanced, the breaking out of sunshine will renew the commotion, and determine the moment of actual flight.

The swarm having rested for some time on the first landing-place, and collected the whole of its numbers, soars again in the air, keeping in a close phalanx, and directing its course with great velocity to the spot which their guides had selected,—giving out, at the same time, a loud and acute-toned hum by the action of their wings.

The parent hive, thus deserted by its queen and a large proportion of its inhabitants, is busily occupied in repairing its loss. The bees which remain quietly pursue their labors; the young brood, soon arriving at maturity, quickly fill up every deficiency; and young queens, being allowed their liberty, one after the other, conduct in their turns new swarms, in the same manner as the first. The second swarm is not sent off till after the space of from five to ten days after the first. The following swarms succeed quicker to each other, but consist of smaller numbers than the earlier ones. If it happen that two queens are found in a swarm, either the swarm divides itself into two, and have separate destinations, or a single combat between the queens decides on which of them the empire is to devolve. Sometimes, indeed, they appear not to perceive eaeh other, and the parties belonging to each construct separate combs within the same hive; but no sooner do these combs come in contact, and thus give occasion to queens meeting each other, than a contest begins which terminates only by the death of one of the rival queens. Successive swarms are sent off as long as the increase of population permits; and the number thus produced in a season depends on a variety of circumstances, such as the abundance of flowers, the warmth of the climate, and the capacity of the hive. Bosc, while he was French consul in Carolina, found a stock of bees in the woods which had been robbed of its wax and honey by the negroes; he contrived to convey the bees in his hat to a hive in his garden. He obtained from his hive eleven swarms before the end of the autumn; and these, again gave him the same number of secondary swarms, so that by the end of the year he had twenty-two hives stocked from the one he had thus saved from destruction. In Britain a hive commonly sends off only two and sometimes three swarms in the course of the summer; and prudent apiarians will be satisfied with one swarm only, returning all subsequent ones to the parent hive, which would otherwise become very weak. When the bar-frame hives are used, the issue of after-swarms is easily and surely prevented by destroying all queen-cells but one after the issue of the first swarm.

Very few drones accompany the new colonies, so that almost all those produced in the spring remain in the hive. But when the queens are impregnated, and new swarms are about to take place, the workers, who had till then suffered them to live unmolested in the hive, are on a sudden seized with a deadly fury toward them, and a scene of carnage ensues. This usually happens in June, July, or August. They chase their unhappy victims in every quarter, till they seek a refuge at the bottom of the hive, where they collect in crowds, and are indiscriminately, and without a single exception, massacred by the working bees, who, with implacable fury, bite, maim, and throw them out of the hive. So great is their antipathy to all the race of drones, that they destroy, at the same time, the male eggs and larvæ, and tear open the cocoons of their pupæ, in order to devote them to one common destruction. This sacrifice of the males is not, however, the effect of a blind and indiscriminating instinct; for if a hive be deprived of its queen, the massacre does not take place, while the hottest persecution rages in all the surrounding hives. In this case the males are allowed to survive the winter.

Having thus got rid of the useless mouths which consumed, without any advantage to the public, a large portion of their provisions, the bees spend the remainder of the summer in collecting stores of honey and of pollen for the ensuing winter. Their gleanings are now less abundant than in the spring, and require more labor in the search and collection. But at this season the leaves of many kinds of trees, which are covered in the morning with a saccharine fluid that exudes from them, furnish them with a species of nourishment, which though of very inferior quality to the nectarial fluid, still contributes to their support. Fruit is also attacked by bees, after the cuticular covering has been broken through by birds or snails. They also find nutriment in the *honey-dew*, which is an excrementitious fluid deposited on the leaves of plants by certain species of aphides. Often, however, these resources fail, and the hive is threatened with famine. On these occasions the distressed bees frequently betake themselves to plunder; and if a weak or queenless hive can be discovered they begin a furious onset, which costs great numbers their lives. If the invaders should fail in their attempt to force the entrance they retreat, and are not pursued by those whom they have assailed; but if they succeed in making good the assault, the war continues to rage in the interior of the hive until one side finds itself beaten, in which case, should the conquerors be the invaders, the invaded will generally join their forces, and help their late enemies to carry off their plunder, and at once become members of the lately hostile hive.

The life of a queen-bee will sometimes extend to three or four years, but her fertility decreases after her second breeding season. When absent from the hive on her matrimonial excursions she very often becomes a prey to a bird, and not seldom on her return mistakes her hive, when she is probably killed by the stranger bees, or by the queen on whose territory she has intruded. Drones seldom die a natural death; there is no evidence of the duration of the lives of individuals, but normally they are hatched about May and slaughtered by the workers in June, July, or August; should the hive be queenless, however, the workers do not harm the drones, and some will then live far into the winter or even to the following spring. The life of a worker is greatly dependent on the season of the year and the amount of labor performed. The modern method of introducing a fertile Ligurian queen (*Apis ligustica*) into a queenless stock of the common black bee (*Apis mellifica*), in order to obtain pure stocks of the former variety, has plainly demonstrated the short life of the worker bee. If the Ligurian queen be introduced in May, when bees are busy and work abundant, in from six to eight weeks thereafter scarcely a black bee will be found in the hive, although at the time of the introduction multitudes of young larvæ were present,

which probably would not all be fully developed for nearly three weeks; therefore in the season of hardest work, the inhabitants of the hive would seldom attain the age of six weeks. But if the experiment of the queen's introduction be deferred until October, then not until the following May will the black bees have become extinct. And it is a curious fact that if a hive be deprived of its queen in October (and none other supplied), then the workers, having no labor to perform either in replenishing stores or attending on the larvæ, will possibly in May be found still living, although somewhat reduced in numbers. Such a colony, however, generally becomes a victim to robbers when the activity of spring arrives, for a queenless stock rarely makes much defence of its stores. In fine winter days, when the sun shines brightly, numbers of bees are tempted abroad, which easily become benumbed by cold, fall to the ground, and die. Insectivorous birds also make victims of great numbers at such times, other insect food being scarce; so that, probably in winter and early spring, more workers die from accident than by natural decay. The fecundity of the queen-bee is, however, adequate not only to repair these losses, but to multiply the population in a very high progression. *Apis ligustica* has the reputation of being more prolific than *A. mellifica;* and a young and vigorous queen will, in the fine weather of a warm May and June, deposit as many as 2000 eggs per day for several weeks in succession, and this fertility is of much longer continuance in America and other warm climates than in England. In England, eggs are deposited and young reared ten or eleven months in the year, when the colony is strong in numbers and well supplied with stores; but the increase in the cold months seldom equals the decrease by deaths.

The loss of the queen is an event which has the most marked influence on the conduct of the workers. Although the queen is constantly an object of attention and of affection to the whole community, they are not immediately sensible to her absence when she is removed from the hive. The ordinary labors are continued without interruption, and it is not till a whole hour has elapsed that symptoms of uneasiness are manifested, and it is even then only partially displayed. The inquietude begins in one part of the hive, the workers become restless, abandon the young which they were feeding, run to and fro, and, by striking each other with their antennæ, communicate the alarming intelligence very quickly to their companions. The ferment soon extends to the whole community; the bees rush precipitately out of the hive, and seek for their lost queen in every direction. This state of confusion continues for a day or two, after which tranquillity is again established; they return to their labors; and, selecting an egg, or one of the larvæ that is not more than three days old, they break down two of the contiguous cells, sacrificing the larvæ contained in them, and proceed to build up one royal cell from their ruins. They then supply the worm with the food necessary to promote its quick growth, and leaving untouched the rhomboidal bottom they raise around it a cylindrical enclosure. In three days the lava has grown to such a size as to require an extension of its lodging, and must inhabit a cell nearly of a pyramidal figure, and hanging perpendicularly. A new pyramidal tube is therefore constructed with the wax of the surrounding cells, which is soldered at right angles to the first, and the bees, working downwards, gradually contract its diameter from the base, which is very wide, to the point. In proportion as the worm grows, the bees labor in extending the cell, and bring food, which they place before its mouth and round its body, forming a kind of coiled zone around it. The worm, which can move only in a spiral direction, turns incessantly to take its food before its head; it insensibly descends, and at length arrives at the orifice of the cell. It then transforms itself into a pupa, is enclosed with a covering of wax, as before described, and, in the space of ten to sixteen days the original loss is thus repaired by the birth of a new queen. Schirach found that, if a number of bees be confined with even a single larva, which in the natural course would have become a worker bee, they immediately set about giving it the royal education above described, and thus raise it to the dignity of queen.

The discovery that queens may be reared at will has been confirmed by recent experiment, and is now largely taken advantage of by apiarians both in Europe and America, to facilitate the making of artificial swarms and otherwise increase the production of bees. By the aid of small frame hives called nucleus boxes, which only materially differ from the larger or mother hive by containing frames less in number and in size (generally three), a stock of fertile queens is kept on hand ready to supply any colony requiring a sovereign, or to exchange an old queen for a young one, or a Ligurian queen for an ordinary English one.

In Switzerland, Italy, and Germany a large business is done in Ligurian queen-raising for export. Great numbers of those queens come to England and America in little wooden boxes, accompanied by sufficient workers to develop enough heat. The price in Italy varies, according to the season, from five francs in October to twelve francs in March; but few are raised until May, owing to the difficulty of their obtaining impregnation. To overcome this difficulty in the autumn some colonies are purposely kept queenless, whose drones remain in existence. The advantage of having fertile queens at the bee-master's disposal is very great. When a swarm issues the young queen is not usually mature, and has to become impregnated. Should unfavorable weather ensue, a still further delay occurs; and the virgin queen, on her excursion, is liable to be lost or killed. Should no such accident occur, it may still be two or three weeks before ovipositing again commences, and this in the very height of the breeding season; while if the skilful bee-master, first taking the precaution to destroy any existing queen cells, can immediately, on the issue of the swarm, introduce the queen and her retinue from a nucleus hive, no time is lost, and probably 20,000 to 40,000 eggs will be deposited in the time that would otherwise have been lost. By this system of nucleus queen-rearing, it may be fairly calculated that the increase of population may be doubled. While the hive remains without a queen swarming can never take place, be the hive ever so crowded.

Bees are subject to few diseases, but these few are sometimes very fatal. Dysentery occasionally commits great havoc in a hive, and is usually caused by the neglect of sanitary measures, by close confinement, want of ventilation, and damp.

In the management of bees a great deal must, of course, depend on supplying them with an abundant pasture. A rich corn country is well known to be to them as a barren desert during a great portion of the year. Hence the judicious practice of shifting them from place to place according to the circumstances of the season.

In many parts of France floating bee-houses are also common; there are on board one barge three to five score of bee-hives, well defended from the inclemency of an accidental storm. The owners allow their barges to float gently down the river, the bees continually choosing their flowery pasture along the banks

of the stream, and thus a single floating bee-house yields the proprietor a considerable income.

On the continents of Europe and America bee-keeping is carried on in a much larger and more scientific manner than in the United Kingdom, where the cottagers still, in the greater majority of instances, use only the ancient straw skep or hive, and know no other method of depriving the colonies of their stores than the barbarous and wasteful practice of smothering them with brimstone.

The principal objects to be considered in the construction and management of an apiary, are, first, to secure the prosperity and multiplication of the colonies, and then to increase the amount of their productive labor, and to obtain their products with facility and with the least possible detriment to the stock. The apiary should afford to the bees shelter against moisture and the extremes of heat and cold, and especially against sudden vicissitudes of temperature. The hives should render every facility for constructing the combs and rearing the young; they should allow of every part of the combs being occasionally inspected, and of their being removed when necessary; and, while due attention is paid to economy, they should be made of materials that will insure durability. Much ingenuity has been displayed by different apiarians in the construction of hives to unite in the greatest possible degree all these advantages; but there is still great room for improvement on the hives that are in common use.

While some cultivators of bees have been chiefly anxious to promote their multiplication, and prevent the escape of the swarms in the natural way by procuring what are termed "artificial swarms," which is effected by various means, others have taken into consideration only the abundance of the products which they yield, and the best way of extracting them from the hive, without showing any particular solicitude as to the preservation of the bees themselves; still another class of apiarians have had more particularly in view the prosecution of researches in the natural history and economy of bees. The hive invented by Huber was in his time a great advance for the purpose last named. It had, however, many inconveniences which are remedied in some hives of more modern construction, and Huber's leaf-hive is now rarely used, although it may claim the distinction of having been the first of the frame hives which are now, with many modifications, generally acknowledged to be the only ones capable of giving the maximum of prosperity to the bees and producing a large honey harvest, combined with affording facilities for observation and manipulation. The old cylindrical straw skep or hive is still generally used among the cottagers of England, although abandoned in many other countries. While very excellent for warmth and ventilation, it has the disadvantage that its interior is inaccessible for information; and the fixity of its combs precludes many manipulations which the skilful apiarian is called upon to perform. This was well known to the ancients, who, to remedy it, fitted the crowns of their hives with movable wooden bars, from which the bees built their combs, but still they were attached by their sides to the hive and required to be cut away before they could be removed,—these operations greatly disturbing the bees. In 1851, Dzierzon in Germany, and Langstroth in America, two of the most skilful apiarians of the present day, simultaneously designed or invented the bar-frame hive, the principle of which, with many varieties of detail, is found in all the best hives now in use.

Many improvements have been made on the Woodbury hive, tending still further to the comfort and well-being of the bees, as well as to the furtherance of scientific study; and, perhaps, the hive that may be said to combine most of these advantages is one designed by Mr. Frank Cheshire, and known as the "Cheshire Hive." To afford the bees the maximum of comfort and to economize their heat, the walls of this hive are made double, enclosing an air space. The Woodbury frames are used, but rest on the thin edge of a strip of zinc within the hive at the back and front, which prevents the bees fixing them with propolis. The floor-board is constructed to slide in a groove beneath the hive, and the entrance can be enlarged or diminished at pleasure by a pair of sliding-shutters; the hive is complete with stand and roof, and altogether leaves little to be desired.

The adoption of frame hives has greatly facilitated the scientific study of the insects' habits, the artificial multiplication of colonies, and the appropriation of their surplus stores without injury to the bees. It is quite a secondary consideration what size or pattern of frame is used, or how the frames are suspended in the hive, provided the principle of movable frames be adopted; and although much ingenuity has been exercised by scientific men to design a hive embracing every possible advantage regardless of cost, the roughest timber and coarsest workmanship will give as good results as the most elaborate. Frame hives are exceedingly well calculated for procuring artificial swarms.

Bee-Keeping.

A description has already been given of examples of the best movable bar and frame hives, and the system they represent should alone be adopted, *i.e.*, every comb in the hives should be movable and interchangeable. In stocking these it is usual, first, to hive the swarm in an old-fashioned straw skep; and in the evening, after all the bees are quietly settled, suddenly to shake them down against the entrance of the hive or on the top of the frames, when the astonished insects will immediately take refuge in their future home. Should continuous bad weather occur after hiving a swarm, the bees must be fed, for, as they have as yet no stores, they will otherwise starve.

For feeding bees a multitude of appliances have been invented, but they may all give place to a common wide mouth pickle bottle; this is filled with syrup, the mouth tied over with a double fold of net, or placed inverted on a piece of perforated zinc or vulcanite over the feeding-hole of the crown-board of the hive. The supply can be regulated to the bees by the number and size of the holes through which they are allowed to suck.

An abundant supply of water is essential to the healthy condition of bees. They consume a large quantity, and often stop to drink at the edge of stagnant pools, and seem even to prefer putrid and urinous waters to purer streams, as if their saline and pungent qualities were grateful to them.

Where the bee-keeper has the use of a honey-extractor, and a large produce of honey is his desideratum, the combs can be emptied as fast as they are filled; and at the close of the season the bees may be deprived of the whole of their honey if syrup be supplied to them in its place. This is of much less value, and answers every purpose for winter stores. No hive should be trusted to the exigencies of winter with a less weight of sealed comb than 15 lb.

We conclude by observing that the honey-bee is supposed to be of Asiatic origin. It was imported from Europe to America, where it is now found wild in great numbers, and at a vast distance from human habitations.

BEECH, a well-known tree, the *Fagus sylvatica*. Beech-mast, the fruit of the beech tree, was formerly known in England as buck; and the county of Buckingham is so named from its fame as a beech-growing

country. Buckwheat derives its name from the similarity of its angular seeds to beech-mast. The generic name *Fagus* is derived from *φάγω*, I eat; but the *φηγὸς* of Theophrastus was probably the sweet chestnut (*æsculus*) of the Romans. Beech-mast has been used as food in times of distress and famine; and in autumn it yields an abundant supply of food to park-deer and other game, and to pigs, which are turned into beech-woods in order to utilize the fallen mast. In France it is used for feeding pheasants and domestic poultry. Well-ripened beech-mast yields from 17 to 20 per cent. of a non-drying oil, suitable for illumination, and said to be used in some parts of France and other Continental countries in cooking, and as a substitute for butter.

BEECHEY, FREDERICK WILLIAM, a distinguished naval officer and navigator, son of Sir William Beechey, R.A., was born in London, in 1796. In 1806, at the age of ten, he entered the navy, and was for several years engaged in active service during the war with France and America. In 1818 he served under Franklin in Buchan's Arctic expedition, of which at a later period he published a narrative; and in the following year he accompanied Parry in the "Hecla." In 1821 he took part in the survey of the Mediterranean coast, under the direction of Captain, afterwards Admiral, Smyth. He and his brother, H. W. Beechey, made an overland survey of the north coast of Africa, of which a full and valuable account was published in 1827. In 1825 he was appointed to the "Blossom," which was intended to explore Behring's Straits in concert with Franklin and Parry. He passed Behring's Straits and penetrated as far as lat. 71° 23′ 31″ N., and long. 156° 21′ 30″ W., reaching a point only 146 miles west of hat reached by Franklin's expedition from the Mackenzie River. In 1854 he was made rear-admiral, and in the following year was elected president of the Geographical Society. He died on the 20th Nov. 1856.

BEECHEY, SIR WILLIAM, R.A., a fashionable portrait painter, born at Burford in December 1753. His works are generally vigorous, but are wanting in grace and dignity. He was a good, but not an eminent portrait painter. He died January 1839, at the advanced age of eighty-six.

BEELZEBUB. The name of the supreme god among all the Syro-Phœnician peoples was Baal, *i.e.*, *lord* or *owner;* and by adding to it *zebub*, insect, the proper name Baalzebub was formed, the god of Ekron according to 2 Kings i. 2, the fly-god, the averter of insects. Hug's hypothesis that this Philistine god was the dung-beetle, the *Scarabæus pillularius*, worshipped in Egypt, cannot be accepted. Beelzebub was so named not from his form, but from his supposed power of driving away noxious flies. In the New Testament the word is applied to Satan, the ruler or prince of the demons. But the best Greek MSS. read *Βεελξεβούλ*, Beelzeboul, in the Gospels, — an orthography followed by the latest critical editions, though the Syriac and Vulgate versions have Beelzebub, which is also recommended by Jerome. The most obvious derivation of it is *Baal* (or *lord of*) *the dwelling*, a name of Saturn among the Phœnicians, according to Movers. So it may mean *Baal of the heavenly dwelling* or *habitation*, just as Satan is termed in the epistle of the Ephesians (ii. 2) "prince of the power of the air." Others suppose that Beelzebul arose from Beelzebub by a pun on the part of the later Jews, who wished to throw ridicule on idols by forming the appellation *lord of dung*. This is improbable, because Beelzebul was not a current name in Jewish literature.

BEER. See BREWING.

BEERSHEBA, now BIR-ES-SEBA, a place in the southernmost part of Canaan, 27 miles S.E. from Gaza, celebrated for the sojourn of the patriarch. The name, signifying the *well of the oath*, was bestowed in allusion to the covenant made there between Abraham and Abimelech, and is frequently referred to in the Scriptures in describing the extent of the country — "*from Dan to Beersheba.*"

BEET. A considerable number of varieties of the genus *Beta* (Nat. Ord. *Chenopodiaceæ*) are cultivated for use on account of their large fleshy roots. The beets which are grown as root-plants, under the names of mangel-wurzel or mangold, field-beet, and garden beet, are generally supposed to be cultivated varieties of the sea-beet (*B. maritima*). The cultivation of beet as a field crop is treated under AGRICULTURE, and in relation to the production of sugar, for which purpose certain varieties of beet stand next in importance to the sugar cane. See SUGAR.

BEETHOVEN, LUDWIG VAN, is in music what Shakespeare is in poetry, a name before the greatness of which all other names, however great, seem to dwindle. He stands at the end of an epoch in musical history, marking its climax; but his works at the same time have ushered in a new phase of progress, from which everything that is great in modern music has taken its rise. This historic side of his genius will have to be further dealt with when the progress of musical art is traced in its continuity. At present we have to consider Beethoven chiefly as a man and an individual artist, showing at the same time the reciprocal relations between his life and his work. For although the most ideal artist in that most ideal of arts — music — he is always inspired by the deepest sense of truth and reality. The grand note of sadness resounding in his compositions is the reverberation of personal suffering. He was a great artist only because he was a great man, and a sad man withal.

The family of Beethoven is traceable to a village near Lowen in Belgium, in the 17th century. In 1650 a member of this family, a lineal ancestor of our composer, settled in Antwerp. Beethoven's grandfather, Louis, owing to a quarrel with his family, left Belgium for Germany, and came to Bonn in 1732, where his musical talents and his beautiful voice did not long remain unnoticed. The archbishop of Cologne, an art-loving prelate, received him among his court-musicians; and the same position afterwards was held by Ludwig's son, Johann, our composer's father. The latter was married to Maria Magdalena Keverich, daughter of a cook, and widow of a *valet-de-chambre* of the elector of Treves. The day of our composer's birth is uncertain; he was baptised Dec. 17, 1770, and received the name of his paternal grandfather Louis, or, in its Germanized form, Ludwig. Beethoven himself seems to have considered the 16th December of the said year his birthday, but documentary evidence is wanting. At one period of his life he believed himself to have been born in 1772, being most likely deceived on the point by his father, who tried to endow his son and pupil with the *prestige* of miraculous precocity. No less uncertain than the date is the exact place of the great composer's birth; two houses in Bonn claim the honor of having been the scene of the important event. The youth of Beethoven was passed under by no means happy circumstances. His father was of a rough and violent temper, not improved by his passion for intoxicating drink, nor by the dire poverty under which the family labored. His chief desire was to reap the earliest possible advantage from the musical abilities of his son, who, in consequence, had at the age of five to submit to a severe training on the violin under the father's supervision. Little benefit was derived from this unsystematic mode

of instruction, which, fortunately, was soon abandoned for a more methodical course of pianoforte lessons under a musician of the name of Pfeffer. Under him and two other masters, Van der Eden and Neefe, Beethoven made rapid progress as a player of the organ and pianoforte; his proficiency in the theoretical knowledge of his art the aspiring composer soon displayed in a set of Variations on a March published in 1783, with the inscription on the title-page, "*par un jeune amateur, Louis van Beethoven, âgé dix ans*," a statement the inaccuracy of which the reader will be able to trace to its proper source. In 1785 Beethoven was appointed assistant of the court-organist Neefe; and in a *catalogue raisonné* of the musicians attached to the court of the archbishop, he is described as "of good capacity, young, of good, quiet behavior, and poor." The elector of Cologne at the time was Max Franz, a brother of the Emperor Joseph, who seems to have recognized the first sparks of genius in the quiet and little communicative youth. By him Beethoven was, in 1787, sent for a short time to Vienna, to receive a few lessons from Mozart, who is said to have predicted a great future for his youthful pupil. Beethoven soon returned to Bonn, where he remained for the next five years in the position already described. Little remains to be said of this period of apprenticeship. Beethoven conscientiously studied his art, and reluctantly saw himself compelled to alleviate the difficulties of his family by giving lessons. This aversion to making his art useful to himself by imparting it to others remained a characteristic feature of our master during all his life. Of the compositions belonging to this time nothing now remains; and it must be confessed that, compared with those of other masters, of Mozart or Handel, for instance, Beethoven's early years were little fertile with regard either to the quantity or the quality of the works produced. Amongst the names connected with his stay at Bonn we mention only that of his first friend and protector, Count Waldstein, to whom it is said Beethoven owed his appointment at the electoral court, and his first journey to Vienna. To the latter city the young musician repaired a second time in 1792, in order to complete his studies under Haydn, the greatest master then living, who had become acquainted with Beethoven's talent as a pianist and composer on a previous occasion. The relation of these two great men was not to be fruitful or pleasant to either of them. The mild, easy-going nature of the senescent Viennese master was little adapted to inspire with awe, or even with sympathy, the fiery Rhenish youth. Beethoven in after life asserted that he had never learned anything from Haydn, and seems even to have doubted the latter's intention of teaching him in a proper manner. He seems to have had more confidence in the instruction of Albrechtsberger, a dry but thorough scholar. He, however, and all the other masters of Beethoven agree in the statement, that being taught was not much to the liking of their self-willed pupil. He preferred acquiring by his own toilsome experience what it would have been easier to accept on the authority of others. This autodidactic vein, inherent, it seems, in all artistic genius, was of immense importance in the development of Beethoven's ideas and mode of expression.

In the meantime his worldly prospects seemed to be of the brightest kind. The introductions from the archbishop and Count Waldstein gave him admittance to the drawing-rooms of the Austrian aristocracy, an aristocracy unrivalled by that of any other country in its appreciation of artistic and especially musical talent. Vienna, moreover, had been recently the scene of Mozart's triumphs; and that prophet's cloak now seemed to rest on the shoulders of the young Rhenish musician. It was chiefly his original style as a pianist, combined with an astonishing gift of improvisation, that at first impressed the amateurs of the capital; and it seems, indeed, that even Haydn expected greater things from the executive than from the creative talent of his pupil. It may be added here, that, according to the unanimous verdict of competent witnesses, Beethoven's greatness as a pianoforte player consisted more in the bold, impulsive rendering of his poetical intentions than in the absolute finish of his *technique*, which particularly in his later years, when his growing deafness debarred him from self-criticism, was somewhat deficient.

As a composer Beethoven appeared before the public of the Austrian capital in 1795. In that year his Three Trios for Pianoforte and Strings were published. Beethoven called this work his *Opus* 1, and thus seems to disown his former compositions as juvenile attempts unworthy of remembrance. He was at that time twenty-five, an age at which Mozart had reaped some of the ripest fruits of his genius. But Beethoven's works are not like those of the earlier master, the result of juvenile and all but unconscious spontaneity; they are the bitter fruits of thought and sorrow, the results of a passionate but conscious strife for ideal aims. Before considering these works in their chief features, we will add a few more remarks as to the life and character of their author. The events of his outward career are so few and of so simple a kind that a continuous narrative seems hardly required. The numerous admirers whom Beethoven's art had found amongst the highest circles of Vienna,—Archduke Rudolf, his devoted pupil and friend, amongst the number,—determined him to take up his permanent residence in that city, which henceforth he left only for occasional excursions to Baden, Mödling, and other places in the beautiful surroundings of the Austrian capital. It was here, in his lonely walks, that the master received new impulse from his admiring intercourse with nature, and that most of his grandest works were conceived and partly sketched. Except for a single artistic tour to Northern Germany in 1796, Beethoven never left Vienna for any length of time. A long-projected journey to England, in answer to an invitation of the London Philharmonic Society, was ultimately made impossible by ill-health. Beethoven's reputation as a composer soon became established beyond the limits of his own country, notwithstanding that charges of abstruseness, unpopularity, and the like, which he, like most men of original power, had to submit to from the obtuse arrogance of contemporary criticism. The summit of his fame, so far as it manifested itself in personal honors conferred upon him, was reached in 1815, when Beethoven celebrated by a symphony the victories of the Allies over the French oppressor, and was rewarded by the applause of the sovereigns of Europe, assembled at the Congress of Vienna. In the same year he received the freedom of that city, an honor much valued by him. After that time his immediate popularity began to some extent to decline before the ephemeral splendor of the composers of the day; and the great master seemed henceforth to speak more to coming generations than to his ungrateful contemporaries. When, however, on rare occasions he emerged from his solitude, the old spell of his overpowering genius proved to be unbroken. In particular, mention must be made of that memorable *Academie* (concert) in 1824, at which his 9th Symphony, and parts of the grand *Missa Solemnis*, were performed, producing a storm of applause — inaudible, alas! to the composer, who had to be turned round by one of the singers to realize, from the waving of hats and handkerchiefs, the effect of his work on the excited multitude.

The last-mentioned incident leads us to one of the

most tragic features of Beethoven's life. By the bitter irony of fate, he who had given to thousands enjoyment and elevation of the heart by the art of sound, was himself deprived of the sense of hearing. The first traces of beginning deafness showed themselves as early as 1797, and were perceived by the master with an anxiety bordering on despair. Physicians and quacks were consulted with eagerness, but all their efforts (partly impaired, it must be confessed, by the unruly disposition of the patient) proved unable to stem the encroaching evil. The Royal Library of Berlin possesses a melancholy collection of ear-trumpets and similar instruments, partly made expressly for Beethoven to assist his weakened sense, but all to no avail. In his latter years conversation with him could be carried on by writing only, and of the charms of his own art he was wholly deprived. But here, again, the victory of mind over matter,—of genius over circumstance,—was evinced in the most triumphant manner. It has been asserted, not without reason, that the euphonious beauty of some of Beethoven's vocal compositions has suffered through his inability to listen to them; but how grand is, on the other hand, the spectacle of an artist deprived of all intercourse with what to him in this world was dearest, and yet pouring forth the lonely aspirations of his soul in works all the more sublime as we seem to hear in them the voice of the innermost spirit of mankind, inaudible to the keen ears of other mortals. If in this manner the isolation of Beethoven further sublimated his efforts as an artist, it, on the other hand, poignantly intensified his sufferings as a man. His was a heart open to the impressions of friendship and love, and, in spite of occasional roughness of utterance, yearning for the responsive affection of his kind. It is deeply touching to read the following words in the master's last will, written during a severe illness in 1802:—"Ye men," Beethoven writes, "who believe or say that I am inimical, rough, or misanthropical, how unjust are you to me in your ignorance of the secret cause of what appears to you in that light. . . . Born with a fiery, lively temper, and susceptible to the enjoyment of society, I have been compelled early to isolate myself and lead a lonely life; whenever I tried to overcome this isolation, oh! how doubly bitter was then the sad experience of my bad hearing, which repelled me again; and yet it was impossible for me to tell people, 'Speak louder, shout, for I am deaf.'"

Domestic troubles and discomforts contributed in a minor degree to darken the shadow cast over our master's life by the misfortune just alluded to. Although by no means insensible to female beauty, and indeed frequently enraptured in his grand, chaste way, with the charms of some lady, Beethoven never married, and was, in consequence, deprived of that feeling of home and comfort which only the unceasing care of refined womanhood can bestow. His helplessness and ignorance of worldly matters completely exposed him to the ill-treatment of servants, frequently, perhaps, excited by his own morbid suspicions and complaints. On one occasion the great master was discovered with his face bleeding from the scratches inflicted by his own valet. It was from amidst such surroundings that Beethoven ascended to the sublime elevation of such works as his *Missa Solemnis* or his 9th Symphony. But his deepest wounds were to be inflicted by dearer and nearer hands than those of brutal domestics. Beethoven had a nephew, rescued by him from vice and misery, and loved with a more than father's affection. His education the master watched with unceasing care. For him he hoarded with anxious parsimony the scanty earnings of his artistic labor. Unfortunately, the young man was unworthy of such love, and at last disgraced his great name by an attempt at suicide, to the deepest grief of his noble guardian and benefactor.

Beethoven died on March 27, 1827, during a terrible thunderstorm. It ought to fill every Englishman's heart with pride that it was given to the London Philharmonic Society to relieve the anxieties of Beethoven's deathbed by a liberal gift, and that almost the last utterances of the dying man were words of thanks to his friends and admirers in England.

Beethoven's compositions, 138 in number, comprise all the forms of vocal and instrumental music, from the sonata to the symphony,—from the simple song to the opera and oratorio. In each of these forms he displayed the depth of his feeling, the power of his genius; in some of them he reached a greatness never approached by his predecessors or followers. His pianoforte sonatas have brought the technical resources of that instrument to a perfection previously unknown, but they at the same time embody an infinite variety and depth of emotion. His nine symphonies show a continuous climax of development, ascending from the simpler forms of Haydn and Mozart to the colossal dimensions of the *Choral Symphony*, which almost seems to surpass the possibilities of artistic expansion, and the subject of which is humanity itself with its sufferings and ideals. His dramatic works—the opera *Fidelio*, and the overtures to *Egmont* and *Coriolanus*—display depth of pathos and force of dramatic characterization. Even his smallest songs and pianoforte-pieces reflect a heart full of love, and a mind bent on thoughts of eternal things.

Beethoven's career as a composer is generally divided into three periods of gradual progress, and his works are generally classified by critics with reference to this progression.

BEETLE, a name commonly applied to those insects which form the order *Coleoptera* ("sheathwinged"), and which are readily distinguished from all others by the nature of the two upper wings. These are formed of a hard, horny substance known as *chitin;* and, although useless in flight, they serve as shields for the protection of the delicate wings underneath, while in many cases their hardness protects the beetle itself from the attacks of insectivorous birds. In some instances the *elytra*, as those upper wings are called, are firmly soldered together, and such species are thus rendered incapable of flight. Owing to the beauty of many of the exotic species, and the ease with which they can be preserved, beetles have been collected with great diligence by entomologists, so that nearly 80,000 species, it is estimated, have already been described.

BEGAS, KARL, a distinguished German historical painter, was born at Heinsberg in 1794, and died in 1854.

BEGBAZAAR, or BEIBAZAAR, a town of Asiatic Turkey, in the Anatolian province of Angora, situated on the Sangarius or Sakaria, about 52 miles W. of the provincial capital. Population, 4750.

BEGHARDS AND BEGUINES. The nature and history of the Beghards is one of the obscurest problems in mediæval times, and nothing very certain has been ascertained. During the Middle Ages there were formed, alongside of the regular orders, companies of men and women who devoted themselves to a religious life, but did not bind themselves by strict vows. The design was to enable men and women, who did not mean to separate themselves entirely from the world, to lead, nevertheless, what, in the Middle Ages, was esteemed *the* religious life. Such companies were the Tertiarii of the Dominican and Franciscan orders, and at first the Beghards and Beguines were similarly constituted. The first notices we have of them tell us that

in the end of the twelfth century, in several of the towns of the Netherlands, companies of women formed themselves together, under a simple rule, for the purpose of taking care of the sick and for other charitable objects. They were generally widows and maidens of high rank, and they were called Beghinæ, or Beguinæ, or Beguttæ.

BEGONIA. This genus of plants contains a large number of species, cultivated in greenhouses and potted out in our flower-beds and public gardens. They are conspicuous for their remarkable unequal-sided and colored leaves. They are almost all tropical plants, but some species will stand a good deal of hardship.

BEGUM, an Indian title of honor corresponding to "princess," conferred on the mothers, sisters and wives of native rulers.

BEHAM, Hans Sebald and Barthel, brothers, flourished in Nuremberg in the first half of the sixteenth century, and were well-known as painters and engravers.

BEHAR, a province of British India, under the jurisdiction of the Lieutenant-Governor of Bengal, comprises the districts of Champáran, Tirhut, Sháhábád, Sárán, Patná, Purniah, Bhágalpur, and the Santál parganás; and is bounded on the north by the independent kingdom of Nepál; on the east by the Rájsháhi and Bardwán divisions of Bengal proper; on the south by the Chhotá Nágpur division; and on the west by the North-Western Provinces. The general aspect of the country is flat except in the district of Monghir, where detached hills occur, and in the southeast of the province, where the Rájmahal and Santál ranges abut upon the plains.

In ancient times Bahar comprised the dominions of the kings of Magadha, who at one time were the lords paramount of India, and whose court is represented as one of the most brilliant that ever existed. Alexander the Great when he invaded India intended to push his conquests to Palibothra, the capital of Magadha, whose monarch he heard could oppose him with 30,000 cavalry, 600,000 infantry, and 9,000 elephants. Their highest point of grandeur was supposed to have been attained at the time of Seleucus Nicator, one of the immediate successors of Alexander, who invaded Magadha. But ancient Behar is far more celebrated in another respect. Six centuries before the Christian era it was the cradle of Buddhism when that religion was in its infant state. It sent its missionaries to Ceylon, China, Thibet, and Tartary, and the religion they taught is still followed by 300 millions of people. Behar is a sacred spot in the eyes of the Chinese and other Buddhist nations. In 1202 A.D. Behar fell into the hands of the Mahometans without a struggle, and from that time it formed one of the three subahs or provinces under the rulers of Bengal. In the time of Akbar it comprised the seven *sarkárs* of Monghir, Champáran, Hàjípur, Sáran, Tirhut, Rohtás, and Behar. It came into the possession of the East India Company with the acquisition of the Díwání in 1765, when the province was united with Bengal. Behar province contains eight districts with an area of 44,139 square miles, and a population of 23,127,104.

Behar, a magisterial subdivision, and a town of Patna district. The Subdivision was formed in 1846. It has an area of 792 square miles, with a total population of 570,888 souls, the average population per square mile being 721.

BEHBEHAN, a town of Persia, in the province of Fars, pleasantly situated in the middle of a highly-cultivated plain, which is watered by the rivers Zab and Jerahi. Population (1890), 6,000.

BEHEM, or Behaim, Martin, a well-known navigator and cartographer, was born at Nuremberg about 1436. Having entered the service of Portugal, he was appointed in 1484 to act as geographer in the expedition of Diego Cam to the western coast of Africa, and on his return to Lisbon received the honor of knighthood in reward for his services. He was afterward employed by the king in various capacities, and visited the capital from time to time in connection with his engagements; but, after his marriage in 1486, his principal residence seems to have been at Fayal, in the Azores, where his father-in-law, Job Huerter, held the rank of governor of the Flemish colony. On a visit to his native city in 1492, he constructed a terrestrial globe, in which he incorporated the discoveries of Marco Polo and other recent travelers. The globe is still preserved in the family, and has frequently been reproduced by engraving. He died in Lisbon in 1506, or, according to his tombstone, 1507.

BEHEMOTH, the name of a large and strong four-footed beast referred to in Job xl. 15-24, and by most scholars identified with the hippopotamus.

BEHISTUN, Bihsutun, or Bisutun, the ancient Baghistan, a precipitous mountain or rock in Persia, remarkable for the extensive inscriptions of a very early date still preserved on some parts of its escarpment. It lies twenty-seven miles east of Kirmanshah, in the province of Irak Ajemi. The principal inscription is cuneiform, and relates to the victories of Darius Hystaspes, who is represented in a sculptured centre-piece as receiving the homage of a number of captives, upon one of whom he has planted his foot. The labor expended on the work must have been very great.

BEHMEN, Jacob. See Boehme.

BEHN, Aphra, an English authoress of some celebrity, was born of a good family in Canterbury in the reign of Charles I., and died in 1689.

BEHRING, or Bering, Vitus, born in Denmark in 1680, conducted several voyages of exploration in Kamchatka, and in 1741 discovered the sea, strait and island known by his name. He was wrecked on Behring Island and died December 19, 1741.

BEHRING'S ISLAND, the most westerly of the Aleutian group in the North Pacific. It is rocky and desolate, and is only remarkable as being the place where the navigator Behring was wrecked in 1741.

BEHRING STRAIT, the narrow sea between the northeast part of Asia and the northwest part of North America, connecting the North Pacific with the Arctic Ocean. At the narrowest part, East Cape in Asia approaches within thirty-six miles of Cape Prince of Wales on the American shore.

BEIRA, a province of Portugal, bounded on the north by the provinces of Traz-os-Montes and Minho, east by Spain, south by Almetejo and Portuguese Estremadura, and west by the Atlantic. Area about 8,586 square miles. Population in 1889, 1,477,432.

BEIT EL FAKIH (*i.e.*, *House of the Saint*), an unwalled town in Arabia, in the province of Yemen, seventy-seven miles northeast of Mocha.

BEJA, a city of the province of Alemetjo, in Portugal, thirty-six miles south of Evora. Population, 8,487.

BEJAR, a fortified town of Spain, in the province of Salamanca, situated on the River Cuerpo de Hombre, in a deep and fertile valley of the Sierra de Bejar, about forty-five miles south of the provincial capital. Population, 12,099.

BEKE, Charles Tilstone, a distinguished English traveler, geographer, and Biblical critic, was born in London, October 10, 1800, and died at Bromley, in Kent, July 31, 1874.

BEKES, a market-town of Hungary, formerly a royal free city, and the capital of the county of the same name, situated at the confluence of the White and Black Korös, fourteen miles north-northwest of Gyula, which is now the capital. Population, 23,938.

BEKKER, Balthazar, a celebrated Dutch divine, was born in Friesland in 1634. He was the author of several works in philosophy and theology, which from their freedom of thought and critical rationalism excited considerable enmity against him. His most celebrated production was the work entitled *Die Betooverde Wereld*, or *The World Betwitched*, in which he examined critically the phenomena generally ascribed to spiritual agency, and exposed with much force the many absurdities regarding the power of Satan that had become articles of Christian faith. The *odium theologicum* was fiercely roused by this book, and Bekker was deposed from the office of the ministry. He resided in Amsterdam till his death in 1698.

BEKKER, or Wolff, Elizabeth, a Dutch novelist, was born in 1738. She was married to Adrian Wolf, a Reformed clergyman, but is always known under her maiden name. After the death of her husband in 1777, she resided for some time in France, with her close friend, Agatha Deken. She was exposed to some of the dangers of the French Revolution, and, it is said, escaped the guillotine only by her great presence of mind. In 1795 she returned to Holland, and resided at the Hague till her death in 1804.

BEKKER, Immanuel, a distinguished philologist, was born at Berlin in 1785, and died the 7th June 1871.

BEL. See Baal.

BEL, or Belius, Matthias, an Hungarian divine and historian, was born in 1684, and was educated partly at Halle. In 1719 he was made rector of the evangelical Lyceum at Presburg, where he remained till his death in 1749.

BEL AND THE DRAGON, one of the apocryphal books of the Old Testament. See Apocrypha.

BELA, or Beyla, a town of Baluchistan, capital of the province of Lus, on the north-eastern bank of the River Poorally, 293 miles N. of Khelat. Population about 5000.

BELBEIS, or Belbeys, a town of Upper Egypt, in the province of Kelyubieh, on the eastern arm of the Nile, 28 miles N.N.E. of Cairo. The present population is not supposed to exceed 5000.

BELEM, a town of Portugal, now regarded as a suburb of Lisbon. See Lisbon.

BELFAST, the chief manufacturing and commercial town of Ireland, a municipal and parliamentary borough, the capital of Ulster, and, since 1850, the county town of Antrim, in which, with the exception of the large suburb of Ballymacarret on the other side of the river, it is mainly comprised. It is situated at the mouth of the Lagan, which flows into Belfast Lough (Carrickfergus Bay), and is built on an alluvial deposit and land reclaimed from the sea, the greater portion of which is not more than 6 feet above high-water mark. It was thus for a long period exposed to occasional inundations, and was somewhat subject to epidemics; but its situation, improved by drainage, has become more healthy, while the environs are agreeable and picturesque.

At the commencement of the 18th century Belfast had become known as a place of considerable trade, and what was then thought a handsome, thriving, and well-peopled town, with many new houses and good shops. During the civil commotions which so long afflicted the country, it suffered less than most other places; and it soon afterwards attained the rank of the "greatest town for trade in the north of Ireland."

The increased freedom of trade with which Ireland was favored, the introduction of the cotton manufacture by Robert Joy in 1777, the establishment in 1791 of ship-building on an extensive scale by William Ritchie, an energetic Scotchman, combined with the rope and canvas manufacture already existing, supplied the inhabitants with employment, and increased the demand for skilled labor.

Belfast Lough is exceedingly picturesque, whether entered by the Antrim or by the Down side of the channel. The outer harbor is one of the safest in the kingdom, great improvements having been made within the last thirty years on the more immediate entrance to the port. The course of the Lagan, which runs past the quays and down to Gramoyle, was originally most tortuous and somewhat difficult to navigate; but, about 1840, the late William Dargan was employed to make a straight cut from the lower part of the harbor and to deepen the channel, so that ships of large draught can be brought to the quays, which extend for about a mile below Queen's Bridge on both sides of the river. There are also seven extensive docks and tidal basins supplied with the necessary conveniences for the shipping.

The exports from Belfast being largely conveyed by steamer to London, Liverpool, and Glasgow, and thence trans-shipped to their destinations, do not appear in the Board of Trade returns, as only the direct business with foreign counties, which does not reach any considerable amount, is registered in those tables. Thus other ports get credit for business which really belongs to Belfast.

The weaving of linen by means of power-looms, though long carried on in Dundee, Leeds, and other great seats of manufacture, is of comparatively recent introduction into Belfast,—being hardly known there five-and-twenty years ago.

Cotton-spinning, which at one period formed a most extensive industry in Belfast, has greatly fallen off,—nearly all the mills having been converted to the spinning of flax.

The enterprize of the citizens of Belfast was well supported by the liberal system of tenure for building purposes granted by the late Lord Donegall and his predecessors. Sites for mills, factories, and other public works were obtained on very reasonable terms, and for all religious and charitable objects those lords of the soil bestowed ground free of rent.

The River Lagan is crossed by three bridges, of which the principal is the Queen's Bridge, opened in January 1843, and built on the site of the Old Long Bridge, which dated from 1686. Like most modern towns which have rapidly risen through commerce and manufactures, Belfast cannot boast of many architectural beauties. It would seem as if its people had been too deeply absorbed in the bustle of business to think of æsthetic superfluities. More recently, however, a higher style of building has been adopted; and some of the warehouses and shops show great taste in design and workmanship.

BELFAST, the capital of Waldo county, Me., is situated on Penobscot Bay, 30 miles from the Atlantic. It has a good harbor, seldom obstructed by ice, and a considerable sea-carrying trade and some shipbuilding; granite, hay and potatoes are exported, and there are manufactures of carriages, machinery, paper and other articles. Belfast has one national and one savings bank, three newspapers, six churches, a high school and primary schools, and a population of 5,300.

BELFORT, Béfort, or Bedfort, a second-class fortified town of France, was formerly in the department of Upper Rhine, and capital of an arrondissement; but since the peace of 1871, it has given name to a separate territory not as yet incorporated with any department. It is situated on the left bank of the Sauvoureuse, 38 miles S.S.W of Colmar, at the intersection of several important roads and railways, by which it maintains a considerable trade with Germany and Switzerland. In November 1870 siege was laid to the place by the German forces, but the French garrison managed to hold


BELGIUM
AND
THE NETHERLANDS.
Scale of Miles.
10 5 0 10 20 30 40
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NORTH SEA
Mouths of the Schelde Maas and Rhine
NETHERLANDS
BELGIUM
FRANCE
GERMAN EMPIRE
FRIESLAND
GRONINGEN
DRENTHE
OVERYSSEL
GELDERLAND
UTRECHT
NORTH HOLLAND
SOUTH HOLLAND
ZEELAND
NORTH BRABANT
LIMBURG
WEST FLANDERS
EAST FLANDERS
ANTWERP
BRABANT
HAINAUT
NAMUR
LUXEMBURG
GD DUCHY OF LUXEMBURG
WESTPHALIA
EAST FRIESLAND
ZUIDER ZEE
THE HAGUE
Amsterdam
Rotterdam
Utrecht
Antwerp
BRUSSELS
Ghent
Bruges
Liege
Namur
Luxemburg
Rand. McNally & Co., Engr's, Chicago.
Longitude East from Greenwich.

out till the 16th of February 1871, when they capitulated with the sanction of the Government, and marched out with the honors of war.

BELGÁM (BELGAUM), a district of British India in the Bombay Presidency. It is bounded on the N. by the state of Miraj, on the N.E. by the Raládgi collectorate, on the E. by the states of Jámkhandi and Mudhol, on the S. by the collectorates of Dhárwár and Kánará, on the S.W. by the Portuguese territory of Goa, and on the W. by the states of Sáwantwári and Kolhápur. Population, 980,000.

BELGIUM (Fr. *Bélgique*, Ger. *Belgien*), is one of the smaller of the European states, among which it ranks 16th in point of area and 8th according to population. It is bounded on the N. by Holland, E. by Dutch Limbourg, Luxembourg, and Rhenish Prussia, S. and S.W. by France, and N.W. by the North Sea. It is somewhat triangular in form, the longest side—that which adjoins France—being 384 miles in length. The length of its other boundaries are,—towards Holland 268 miles, Germany 59, Luxembourg 80, and the North Sea 41. Its greatest length from N.W. to S.E. (from Ostend to Arlon) is 174 miles, and its greatest breadth from N. to S. 105. It has an area of 2,945,593 hectares, equal to 7,278,968 English acres, or 11,373 square miles,—being about one-eighth of the area of Great Britain. This country is divided into nine provinces,—Antwerp in the N., West and East Flanders and Hainault in the W., Namur in the S., Luxembourg in the S.E., Liége and Limbourg in the E., and Brabant in the centre.

Belgium is in general a very flat country having few elevations, and these rarely exceeding 2000 feet in height. They are principally to be found in the E. and S.E., while the N. and N.W. parts of the country bear a considerable resemblance to Holland. The elevations of Belgium take their rise in France, and extend generally in a N.E. direction. A chain proceeding from the neighborhood of the sources of the Saone separates the waters of the Meuse from those of the Moselle, passes Arlon and Neufchateau, then extends in a north-eastern direction towards Bastogne, and finally enters Prussia. A branch of this chain goes off at Neufchateau, proceeds northward towards Liége, passes St. Hubert, and separates the Ourthe from the Meuse. A part of the Ardennes also extends into Belgium, and separates the basin of the Meuse from that of the Scheldt. It proceeds in a north-eastern direction, passing Fontaine l'Evêque, Gembloux, Ramillies, and Tongres, then, gradually decreasing in height, it turns northward to Asch, and afterwards N.W. to Hechtal, Lommel, and Turnhout. A series of heights on the frontier of France, near Chimay, extends in a N.W. direction towards Namur, and separates the Meuse from the Sambre.

The provinces of Liége, Luxembourg, and Namur present the greatest irregularities of surface. This part of the country is intersected by numerous ravines and streams with steep and rocky banks, by deep valleys, and by ridges of hills, which often have precipitous and rocky escarpments. The vegetation here is of a very poor and languid character. The greater part of the region is covered with dense forests, marshy and uncultivated plateaus or poor pasture land, and corn is very rarely cultivated. Descending towards the coasts the forests become less extensive; and rye, oats, and potatoes take the place of the pasture land. In the western and north-western provinces are extensive and well-watered plains, which, from their great fertility and the high state of their cultivation, are the boast of the Belgians and the admiration of strangers.

In the provinces bordering on the sea the land is in some places so low as to be required to be protected from inundation by dikes. These parts are called *polders*. Numerous places along the banks of the rivers are also protected by embankments; these are called *interior polders*. About a sixtieth part of the kingdom (50,000 hectares, or 193 square miles) is thus artificially gained from the sea and rivers.

The coast of Belgium is said to be undergoing a change similar to that of Scandinavia,—in some parts a gradual elevation, and in others a gradual depression. Nieuport is said to be on the axis of this change, from which, northward, to the mouth of the Scheldt, the sea is continually gaining upon the land, while southward to Pas de Calais it is losing.

The principal rivers are the Scheldt, Meuse, and Yzer, with their tributaries. The Scheldt is navigable during its entire course through Belgium, and has a general direction from S.W. to N.E., passing through the province of Hainault, along the eastern boundary of West Flanders, traversing East Flanders, and finally forming the boundary between the provinces of East Flanders and Antwerp. Its entire length through Belgium is 108 miles. The Meuse has a course nearly parallel to that of the Scheldt, traversing the provinces of Namur, Liége, and Limbourg. It is 115 miles in length, during the whole of which it is navigable. The small river of Yzer, which enters the sea at Nieuport, is navigable for about 26 miles. The navigable rivers connected with the Scheldt are,—the Dyle, which after receiving the Nethe at the village of Rumpst, takes the name of Ruppel, and joins the Scheldt nearly opposite to Ruppelsmonde; the Great and Little Nethe, which after their junction take the name of Nethe, and fall into the Dyle; the Demer, also an affluent of the Dyle; the Dender, which enters the Scheldt at Dendermonde; the Durme, which joins it near Thielrode; and the Lys at Ghent. The entire navigable length of these streams is 230 English miles. The navigable rivers of the Meuse are the Amblere and the Vesdre, affluents of the Ourthe; the Ourthe, which joins the Meuse at Liége; and the Sambre, which joins it at Namur. The navigable length of these is 142 miles. The small river of Yperlee, which joins the Yzer, is navigable for about 9 miles. The other streams are the Senne, the Haine, the Semoy, and the Lesse.

Besides these navigable rivers, Belgium has a number of canals for inland navigation, some of which are used also for irrigation. They are twenty-nine in number, and their entire length is 606,440 metres, or 376 English miles. The principal of these are the canals—from Bruges to Ostend, from Brussels to Charleroi, from Bocholt to Herenthal, from Brussels to Willebroeck, from Ghent to Bruges, from Liége to Maestricht, from Maestricht to Bois-le-Duc, from Pommeroeul to Antoing, from Plasschendaele to Nieuport, the Louvain canal, the Lieve, and the Moevaert. Each of these canals is upwards of twelve miles in length, and the longest that from Brussels to Charleroi, upwards of 46 miles. The entire length of the river and canal navigation of Belgium is 1006 English miles.

Belgium possesses a number of mineral springs, the principal of which are the hot springs of Chaudfontaine, situated about five miles from Liége, and the mineral spring of Tongres; but the most celebrated waters are those of Spa. The ferruginous springs of Huy were formerly in considerable repute, but are now little used.

The climate may be described as temperate, frost rarely appearing before October or later than April.

The last official census was taken in December, 1887, and showed a population of 5,974,743. The annual increase is 1.6 per cent. The gain by immigration is about balanced by the loss by emigration, and the female population is slightly in excess of the male.

The principal towns are: Brussels, with 448,000 inhabitants; Antwerp, 210,000; Ghent, 147,000; Liége, 140,000; Bruges, 48,113; Verviers, 38,875; Tournay, 31,923; Malines, 38,540; Louvain, 32,314.

Belgium is the most densely populated country of Europe, having on an average 178 inhabitants to the square kilometre, which is equivalent to 461 to the square mile. The density differs greatly in the several provinces, being as high as 285 per square kilometre in East Flanders, 281 in Brabant, and 250 in Hainault; and as low as 86 in Namur, 84 in Limbourg, and 47 in Luxembourg.

The languages spoken in Belgium are French or Walloon (a dialect of the ancient French), and Flemish or Dutch. French is the language of the upper and educated classes, and is generally understood even in the Flemish parts of the kingdom.

Since the formation of Belgium into an independent state, the Government has taken a laudable interest in all that concerns the advancement and happiness of the people; and not being trammelled by a respect for old laws or useless customs, it has adopted, as far as possible, the most improved systems of other countries. The whole system of government is based upon the broadest principles of rational freedom and liberality. All power emanates from the people, and can be exercised only according to law. The people are upon a strict equality in the eye of the law; personal liberty is guaranteed to all, as well as entire freedom in opinion and in religious worship. All the religious sects are endowed by the state, and large grants are also given annually for educational and charitable purposes. Home is inviolable, nor can any one be deprived of his property unless for the good of the state and for a suitable indemnity. Justice is open to all, as well as the means of education, and the benefits of the public charities. The press is free, and civil death is abolished. Any one may address petitions to the public authorities signed by one or more persons. Trial by jury is established for all criminal and political charges, and for offences of the press. The contents of letters are inviolable, and the post-office is responsible for all letters committed to it.

The government is a constitutional representative and hereditary monarchy. The legislative power is vested in the king, the chamber of representatives, and the senate. The judicial power is exercised by fixed tribunals, freed from all authoritative influences, judging publicly, and assigning reasons for their decisions. Affairs exclusively provincial or communal are managed by the provincial or communal councils.

The royal succession is in the direct male line in the order of primogeniture; to the exclusion of females and their descendants. The king's person is declared sacred, and his ministers are held responsible for the acts of the Government. No act of the king can have effect unless countersigned by one of his ministers, who thus becomes the responsible party. The king convokes, prorogues, and dissolves the chambers, and makes rules and orders necessary for the execution of the laws, but has no power to suspend or dispense with the execution of the laws themselves. He nominates to civil and military offices, and commands the sea and land forces. He declares war, and concludes treaties of peace, of alliance, and of commerce,—communicating the same to the chambers as far as may be consistent with the interest and safety of the state. He sanctions and promulgates the laws, and has the power of remitting or reducing the punishments pronounced by the judges, except in the case of his ministers, to whom he can extend pardon only at the request of one of the chambers. In default of male heirs the king may nominate his successor with the consent of the chambers. The regency can only be conferred upon one person, and no change in the constitution can be made under his rule.

The people are represented in the Legislature by the Chamber of Representatives and the Senate, the members of which are chosen by the people. Each chamber determines the manner of exercising its own powers, and every session nominates its president and vice-presidents, and forms its *bureau*. No petition can be presented personally; and every resolution is adopted by the absolute majority, except in some special cases, when two-thirds of the votes of the members are required to be favorable; in the case of an equality of votes the proposition is thrown out. The chambers meet annually in the month of November, and should sit for at least forty days; but the king has the power of convoking them on extraordinary occasions, and of dissolving them either simultaneously or separately. On dissolution a new election must take place within forty days, and a meeting of the chambers within two months. An adjournment cannot be made for a period exceeding one month without the consent of the chambers.

The Chamber of Representatives is composed of deputies chosen directly by the people paying a certain amount of direct taxes. The number of deputies is fixed according to the population, and cannot exceed one member for every 40,000 inhabitants; at present they amount to 138. To be eligible for membership it is necessary to be a Belgian by birth or to have received the grand naturalization, to be in the possession of the civil and political rights of the kingdom, to have attained the age of twenty-five years, and to be resident in Belgium. The members not residing in the town where the chamber sits receive, during the session, an indemnity of 200 florins ($84) each per month. The members are elected for four years, one-half going out every two years, except in case of a dissolution, when a general election takes place. This chamber has the parliamentary initiative and the preliminary vote in all cases relating to the receipts and expenses of the state, and to the contingent of the army.

The electors of the Chamber of Representatives have also the nomination of the members of the Senate. To be eligible as a senator it is necessary to be a Belgian by birth or to have received the grand naturalization, to be in the enjoyment of civil and political rights, to be domiciled in Belgium, to be forty years of age, and to pay at least 1000 florins ($420) of direct taxes. In those provinces where the number of those paying 1000 florins of taxes does not amount to one in every 6000 inhabitants, this proportion is made up by those paying the highest amount below that sum. The permanent deputations of the provincial councils annually prepare a list of those who are eligible to the Senate. In 1888 the number of these was 453. At the age of eighteen the heir-presumptive to the throne has a seat in the Senate, but he has no voice in its deliberations till he attain the age of twenty-five. The senators receive no indemnity. They are elected for eight years, one-half going out every four years, except in the case of a dissolution. The Senate is composed of half as many members as the Chamber of Representatives, the number at present being sixty-nine.

In order to be a general elector it is necessary to be a Belgian by birth or to have received the grand naturalization, to be twenty-one years of age, and to pay direct taxes to the amount of at least 20 florins ($8). In 1888 the total number of general electors was 131,735, or at the rate of 45.3 per 1000 of population.

The king appoints and dismisses his ministers at pleasure. No member of the royal family can be a minister, nor any but a Belgian, or one who has received the

grand naturalization. Ministers have a right of admission to the chambers, and may demand a hearing; but they have no voice in the deliberations unless they are members. The chambers can at any time require the presence of the ministers. No act or writing by the king can free a minister from responsibility. The Chamber of Representatives has the power of accusing the ministers, and of bringing them before the court of cassation, which alone has the right of judging them, in all cases of offences committed in the exercise of their functions. There are six ministers, viz., of foreign affairs, of the interior, of justice, of finance, of war, and of public works.

Naturalization is of two kinds, the one conferring on the foreigner all the civil and political rights belonging to a Belgian, with certain exceptions specified by law, such as the right to vote in the choice of members for the legislative chambers or of sitting there; to obtain these the *grand naturalization* is requisite. The registration-fee for the former is 500 francs; for the latter, 1000. Since 1831 only 47 have received the grand naturalization and 1527 the ordinary.

For civil purposes the provinces are divided into 26 arrondissements, 204 justice-of-peace cantons, and 2528 communes; and for military purposes, into 41 arrondissements, 303 military cantons, and 2568 communes.

In each province is a governor named directly by the king, for the purpose of superintending and securing the due execution of the laws, and a provincial council, composed of Belgian citizens at least twenty-five years of age, residing in the province, and in the enjoyment of civil and political rights. The number of members of each provincial council is made to depend upon the population, and varies in the different provinces from one for every 11,500 of the population in Brabant and Hainault, to one for every 5000 in Limbourg and Luxembourg. Each canton, however, is entitled to be represented by at least one member, and the number of members for each canton depends upon the population according to the scale fixed for the province.

These councils are of the highest importance to the country. They watch over the interests of their several provinces, prepare the budgets, direct taxation, and superintend public works. They give a healthy impulse to agriculture, trade, and commerce; direct the construction of roads, canals, and bridges; and extend the benefits of education and religion throughout the country. The communes have the power of appeal to the king if they consider themselves aggrieved by any of the acts of the provincial council, or of the permanent deputation.

Matters exclusively communal are managed by communal councils. The councillors are Belgian citizens in the full enjoyment of civil and political rights, and, except in some special cases, resident in the commune. They are elected for six years, one-half going out every three years. The number of councillors is from 7 to 31, in proportion to the population of the commune, which varies from under 1,000 to upwards of 70,000 inhabitants.

Full liberty is guaranteed to all in the exercise of the public or private rites of their worship; nor does the state interfere in any way in matters of religion, except where the public safety may be concerned or the laws infringed. Almost the entire population of Belgium is Roman Catholic, there being only about 15,000 Protestants and 3000 Jews. The ministers of each denomination are paid by the state.

The kingdom is divided into six Roman Catholic dioceses,— the archbishopric of Malines, and the bishoprics of Bruges, Ghent, Liége, Namur, and Tournay. The archbishopric has three vicars-general, and a chapter of twelve canons; and each of the bishoprics, two vicars-general, and a chapter of eight canons. In 1888 there were 156 deaneries, 233 rectories, 2788 chapels of ease, 148 public chapels, and 1745 vicariates.

The temporal affairs of the churches are managed by a vestry-board and a board of wardens.

The Protestant Evangelical Church is under a synod, composed of the clergymen of the body and a representative from each of the churches. It sits in Brussels once a year, when each member is required to be present, or to delegate his powers to another member. The Anglican Church has eight pastors and as many chapels in Belgium,—three in Brussels and one in each of the towns of Antwerp, Bruges, Ghent, Ostend, and Spa.

The Jews have a central synagogue at Brussels, three branch synagogues of the first-class at Antwerp, Ghent, and Liége, and two of the second-class at Arlon and Namur.

The Belgian Government has shown itself thoroughly alive to the great importance of a general diffusion of education among the people. Numerous public schools and literary and scientific institutions are established throughout the country, supported out of the communal, provincial, or Government funds. Different classes of inspectors are appointed to visit and report upon the state of education in their various districts. Prizes, scholarships, and other rewards are bestowed upon those that distinguish themselves most in the prosecution of their studies. Religious and moral instruction is under the direction of the sect to which the majority of the pupils belong; but those connected with other sects may be exempted from attendance on this course. Normal schools have also been established for the purpose of securing trained and efficient teachers. The schools are open to all, and gratuitious instruction is provided for those who may not otherwise have the means of acquiring it. Yet, with all these advantages, there are still many among the lower classes growing up in ignorance.

The educational institutions may be divided into four classes, viz., primary, middle, superior, and special.

A law passed in 1842 enacted that there should be at least one primary school in every commune, except in certain cases where primary education is already sufficiently provided for by private schools, or where one school may serve for several neighboring communes. The communes may also adopt one or more private schools, possessing the legal qualifications, to occupy the place of the communal school. The branches taught are reading, writing, and the elements of arithmetic; the rudiments of the language spoken in the locality,— French, Flemish, or German; moral and religious instruction; and the legal system of weights and measures, in most schools taught practically. In many of the schools gymnastics, music, the elements of drawing, the outlines of history and geography, and the rudiments of the natural sciences, are also taught. The communes are obliged to afford gratuitous instruction to all the children within their bounds whose parents are in poor circumstances or are otherwise unable to educate them. The primary schools are under the surveillance of the communal authorities and Government inspectors; and the imparting of moral and religious instruction is superintended by delegates from the religious bodies.

The expenses of public primary education fall in the first instance on the commune; and in case of insufficiency of funds, the province, and finally the state, come to its assistance. Each commune, however, must contribute a sum equal to at least two per cent. upon its direct taxation before being entitled to claim any assistance from the province or state.

The middle schools are divided into two classes, those supported by the Government, and those maintained by the communes. The former are of two kinds — (1), the royal athenæums, called also the middle superior schools; and (2), the middle inferior schools, or the middle schools properly so called, including the former superior primary, as well as the schools formerly known as industrial and commercial schools.

In the state middle schools the courses are arranged so as to occupy three years. To some is annexed a preparatory section, making a year or more.

The communal middle schools are of two grades, a first and second,—the former embracing 17 schools, the latter 16. They ought to be based upon the same principles, and teach the same branches as the royal athenæums and middle schools. In 1888 the number of scholars in the first or higher grade of schools was 1381, of whom 239 were in the preparatory classes, 730 in the humanity section, and 412 in the professional. The number of scholars in the lower grades of schools was 1828, of whom 1274 were in the lower sections and 554 in the higher. Most of these schools have libraries, museums of natural history, and chemical laboratories attached to them. There are in addition to these 75 unendowed colleges, of which 45 are Episcopal and 11 Jesuit.

The educational staff consists of a prefect of studies in the athenæum, and a rector in the middle schools, professors, regents, and masters. The prefects, professors, rectors, and regents are nominated by the king, and the masters and teachers by the minister of the interior. The diploma of a professor *agregé* of either degree is bestowed by a special jury after a searching examination. It is given without regard to the place where the candidate has studied. The prefects and rectors reside on the premises, and have the general direction and management of the institutions over which they are placed. Each has to report annually as to the state and condition of the institution under his care, and to register the conduct and progress of the scholars.

The middle, like the primary schools, are subjected to a regular system of inspection.

The superior instruction establishments are the four universities, — two belonging to the state, at Ghent and Liége, the free university at Brussels, and the Catholic university at Louvain.

Each of the state universities has faculties of philosophy and literature, science, law, and medicine. In each there are 8 professors in philosophy, 9 in the sciences, 7 in law, and 8 in medicine. One or two additional professors may be added to each of the faculties in case of necessity. The professors are nominated by the king, and cannot exercise any other profession without the consent of the Government.

Attached to each university are a number of *agregés* named by the king. Their title is honorary, and they are chosen from among those students who have most distinguished themselves at the public competitions or final examinations, from professors of middle instruction, or from members of the civil or military body of engineers. They are nominally attached to one of the faculties, but are not prohibited from exercising any of the liberal professions, and in case of any of the professors being unable to perform his duties, a substitute is chosen from among the *agregés* attached to that faculty.

The universities are under the management of a rector, a secretary, deans of faculty, the senatus academicus, and the board of assessors. The rector is nominated by the king for three years, and has the direction of all academic matters. The secretary is appointed annually by the king from a list of two candidates nominated by the senatus academicus. The deans of the faculties are chosen annually by the professors of each faculty, and have the right of convoking the professors of their faculty. The senatus and the board of assessors are convoked by the rector; the former is composed of the professors, under the presidency of the rector, and the latter of the rector, secretary, and the deans of faculty.

Each student pays annually for enrolment 15 francs, and then takes out a ticket for the branches of the course in which he intends to take his examinations. For philosophy and literature, and for law, the annual ticket costs 250 francs, and 200 francs for the other faculties. The instructions are given in the French language.

Attached to the university of Ghent is a school for civil engineers. The preparatory course extends over two years, and comprehends the mathematical, physical, and natural sciences necessary to the subsequent courses. The special course is divided into two sections, the one for engineers of roads and bridges, and the other for architectural engineers.

Similar to the above is the mining school attached to the university of Liége.

The free university of Brussels has faculties of philosophy and literature, of science, of law, and of medicine, courses in which are given by ordinary and extraordinary professors and *agregés*. Each student pays annually 15 francs for enrolment, and a fee of 200 or 250 francs for the courses in any of the faculties. The fee for single classes is generally 50 francs. An annual subsidy of 10,000 francs is allocated to the university by the provincial council of Brabant, and the permanent deputation has the right of annually presenting ten youths of the province for gratuitous instruction.

The Catholic university of Louvain is governed by a grand rector, nominated and revocable by the episcopal body. A vice rector is also nominated by the episcopal body on the advice of the grand rector. The rector nominates the secretary and other functionaries of the university. The faculties are philosophy and literature, the mathematical, physical, and natural sciences, law, medicine, and theology.

A competition takes place annually among the scholars of superior instruction, and at these competitions two gold medals are given in each of the faculties. There are also twelve travelling scholarships given annually, tenable for two years, to such students as have taken their doctor's degree with the highest distinction and wish to travel, to enable them to visit foreign countries; and about sixty bursaries of 400 francs each are given annually to poor students to enable them to prosecute their studies.

The special educational institution of Belgium are of various kinds, and are generally in a very efficient state. They include (in addition to the engineering and mining schools already mentioned) normal schools, military schools, navigation schools, &c., and academies and schools of design, painting, sculpture, music, &c.

There are two Government normal schools for primary teachers, one at Lierre and the other at Nivelles, — the former having twelve and the latter thirteen professors, with a rector each. The course extends over three years, and during the last year of attendance the pupils are exercised in teaching in the primary schools of the town. There are also seven episcopal normal schools, in which similar branches are taught, except that the principles of the Catholic religion are more particularly inculcated.

Bursaries of 200 francs each are annually given by Government to assist poor students attending the normal schools; and students of promise, who have taken diplomas at either of the Government primary normal schools,

may be admitted to the normal school of middle instruction at Nivelles.

There is a military school at Brussels for training officers for the army.

Each regiment has a regimental school for training young men in the army for subalterns, and a number of evening schools for affording the means of education to the soldiery. Attendance at one of these schools is obligatory on all subalterns and corporals whose education is not complete, according to their position.

Schools of navigation have been established at Antwerp and Ostend for furnishing properly educated masters for merchant vessels, where instruction is given gratuitously.

A Government agricultural institute was established at Gembloux in 1860 for affording theoretical and practical instructions in agriculture and kindred subjects.

The academies and schools of design, painting, sculpture, &c., are divided in three classes:—1. The royal academies of fine arts, in which painting, sculpture, architecture, and engraving are taught in the most efficient manner; 2. Academies of design established in the principal towns, and giving instructions in designing, architecture, and the principles of geometry and respective drawing; 3. Schools of design established in all the larger towns for instructing young persons and artisans in the elements of designing and architecture.

The Royal Academy of the Fine Arts at Antwerp is principally intended to afford gratuitous instructions in painting, sculpture, architecture, and engraving, and to propagate and encourage a taste for the fine art. In 1888 there were 1665 scholars. A competition in one of the branches of the fine arts is annually held in Antwerp, the laureate at which receives a pension of 3500 francs annually for four years, to enable him to perfect himself in his art in Germany, France, and Italy. The second prize is a gold medal of 300 francs.

The Royal Musical Conservatory at Brussels is under the direction of the minister of the interior, aided by a commission of seven members nominated by the king, with the burgomaster of Brussels as honorary president. The instruction is gratuitous, and includes vocal and instrumental music, composition, and the Italian language.

Belgium possesses a great number of learned societes, as the Royal Medical Academy, the Royal Academy of Science, Literature, and Art, &c.

The Royal Academy of Science, Literature, and Art also has its seat at Brussels. It is divided into three classes, for the sciences, literature, and the fine arts; the first two are each subdivided into two sections, and the last into branches, for painting, sculpture, engraving, architecture, and music. Each class is composed of 30 members, 50 foreign associates, and not more than ten native correspondents.

There is a Government inspector-general of science, literature, and art, who has the general superintendence of that department, under the minister of the interior. Under him are two administrative boards, the one for literature and science, and the other for the fine arts.

The Royal Observatory for astronomical and meteorological observations is under the management of a director and three assistants. In the observatory are instruments specially provided by Government for the use of young men desirous of making meteorological or astronomical observations,

The Royal Museum of Brussels, for the reception of objects in natural history belonging to the state, is under the direction of a council of five members appointed by the king. There is also a museum of industry, containing models and plans of machines used in arts, manufactures, and agriculture. Annexed to this museum is a school where instruction is given gratuitously in the construction of such machines. It possesses a chemical laboratory, library, &c.

Besides the libraries belonging to different societies, associations, &c., there are a number of public libraries in Belgium. The principal of these is the royal library of Brussels. It contained in 1889 about 371,500 volumes, 22,221 manuscripts, 53,556 engravings, and 19,517 medals and coins.

The archives of Belgium contain a great number of interesting and valuable documents connected with the history of the country. These are carefully preserved, classified, and catalogued.

The benevolent and charitable institutions of Belgium are numerous and open to all. The duty of supporting them falls in the first instance upon the commune, afterwards upon the province, and finally, in case of necessity, upon the state.

Every town of importance and many of the rural communities have hospitals for the aged, infirm, and indigent. Asylums for incurables are also numerous, but much less so than the former.

Foundling hospitals are established in Antwerp, Brussels, Louvain, Bruges, Ostend, &c.

To prevent the misery, and frequently the crime, arising from the want of employment among the working classes, charity workshops have been established in Ghent, Liége, and other towns. These are accessible to all workmen without employment and in poor circumstances. The able-bodied are paid according to their work, and the aged and infirm according to their necessities. The workshops of apprenticeship and improvement are intended not only to supply work to the unemployed, but principally to initiate the people in the exercise of new or improved branches of industry, and to instruct the young men in some trade or profession by which they may be able to gain an honest livlihood. They have been found of great benefit to many of the poorer classes who would otherwise have been brought up as vagrants and beggars. The apprenticeship generally lasts from four to six months. Similar to these are the manufacturing schools, intended principally for girls, where they are employed in the manufacture of lace, &c. These are supported partly by the state and partly by the province and commune, but many of them are private.

There are three depôts of mendicity or workhouses in the kingdom, at Bruges, Hoogstraeten, and Reckheim.

The judicial system of Belgium consists of courts and tribunals of various kinds, as the court of cassation, the courts of appeal and of assize, tribunals of primary instance, of commerce, &c. The court of cassation or annulment sits at Brussels, and is divided into two chambers, the one for civil and the other for criminal matters. It is composed of a president-general, a president of the chamber, and fifteen councillors. It decides upon appeals against judgments pronounced in the other courts and tribunals in contravention of legal forms. There are three courts of appeal; one at Brussels, for the provinces of Antwerp, Brabant, and Hainault; another at Ghent, for the two Flanders; and a third at Liége, for Liége, Limbourg, Luxembourg, and Namur. In the capital of each province is a court of assize, composed of a councillor, deputed from one of the courts of appeal, who presides, and two judges chosen from among the presidents and judges of the primary tribunals, where the court is held. Crimes, graver misdemeanors, political offences, and abuses of the press are adjudged by the courts of assize. In each judiciary arrondissement is a tribunal of primary instance, judging of misdemeanors belonging to the cor-

rectional police, in civil matters, and in commercial affairs where there is no commercial tribunal. The number of judges varies from three to ten in each tribunal. Tribunals of commerce are established by law in several principal towns. They judge definitively in civil matters of not more than 2000 francs, but above that sum their decisions are subject to appeal, as in the tribunals of primary instance. In several of the manufacturing towns are councils of *prud'hommes*, composed of master tradesmen and workmen. They decide in all questions and disputes arising between masters and workmen. For all criminal and political cases, as well as offences of the press, trial by jury is established. The jury is composed of twelve persons chosen by lot from a leet of thirty. Justices of the peace and judges of the tribunals are chosen directly by the king.

Councils of war are held in the chief place of each province, with the exception of Limbourg, which is joined to Liége, and of Luxembourg, which is united with Namur. They decide in crimes and misdemeanors committed in their provinces by the military of a rank not higher than captain. The military court for the whole of Belgium has its seat at Brussels. It is composed of five members, one of whom is a councillor of the appeal court of Brussels, delegated annually to preside; the rest are general or superior officers chosen by lot every month. All officers of a grade superior to that of captain are amenable to this court. It also decides on appeals from the provincial or other military courts.

Besides the ordinary police, there are commissaries of police, royal procurators, *juges d'instruction*, &c. The commissaries of police, and in the communes where these are wanting the burgomasters or delegated aldermen, are specially charged with searching out and proving all contraventions of the police laws. The royal procurators are charged with discovering and prosecuting for all offences coming within the jurisdiction of the courts of assize or the correctional tribunals of police. There is at least one *juge d'instruction*, or examining judge, in each arrondissement who is specially charged with the collection of evidence, and with bringing the culprit before the tribunal. There is a council chamber composed of at least three judges, including the *juge d'instruction*, for the preliminary examination of culprits.

The prisons are of three kinds — (1), central prisons; (2), houses of surety; and (3), houses of arrest. The houses of surety are established in the capital of each province, where there is a court of assize, and the houses of arrest are in the capital of each arrondissement, the seat of a court of primary instance, where there is not already a house of surety. In these houses are confined the prisoners whose term does not exceed six months if the prison is a common one, and three years if on the solitary system.

Since 1830 the agricultural state of the country has been much improved. A superior council of agriculture is specially charged with the promotion and superintendence of the agricultural interests of the country; and in each of the provinces a commission of practical men is nominated to encourage the introduction of improvements in the different branches of agriculture and report annually upon the state of agriculture in their provinces. Every five years a grand agricultural exhibition of horses, cattle, agricultural implements, and produce is held in Brussels, at which a number of gold and silver medals, &c., are given as prizes. Local exhibitions are also held frequently in the various districts.

The Belgians, particularly in Flanders, are averse to the introduction of improvements in their agricultural operations, and their implements are generally rude and clumsy. Their lands are, however, cultivated with great care and are very productive. Of the cereal crops rye is the most extensively cultivated, and forms an important article of food for the working classes. Wheat and oats are also extensively cultivated, the former particularly in the provinces of Hainault, Brabant, and West Flanders. Comparatively little barley is raised. Hops, chicory, tobacco, rape and other oleaginous plants, hemp, flax, madder, beet, &c., are common. Of these the most extensively cultivated is flax, principally in the two Flanders. Tobacco was much more extensively grown a few years ago than at present; it is now almost entirely confined to the two Flanders and Hainault. The chicory plant is principally raised in Hainault. The cultivation of beet for the extraction of sugar is continually increasing, and numerous establishments have been formed for its preparation. The leguminous plants, pease, beans, and tares, are used principally as fodder for cattle; the most common are beans. The beet root is even more extensively cultivated as fodder than as an industrial plant, particularly in the provinces of West Flanders, Liége, Hainault, and Brabant. Potatoes are largely grown in all the provinces; and, next to potatoes, turnips are the most extensively cultivated of the alimentary roots.

Belgium is rich in various kinds of minerals, as coal, iron, calamine, &c., which form a valuable source of employment to many thousands of its inhabitants.

Marble is abundant in many parts of Belgium; and the black marbles, as those of Dinant and Gochene, may rival the finest productions of other countries. There are also numerous quarries of freestone, granite, limestone, slate, &c.

Notwithstanding many vicissitudes, flax, the most ancient, still forms one of the most important branches of industry in the country.

Cotton also forms an important branch of industry, which is at present in a more flourishing condition than at any former period.

The manufacture of woollens forms also an important branch of industry. The wool for this purpose is principally imported from Prussia, Saxony, &c., the native produce being small in quantity and chiefly used in hosiery.

There are twenty-three chambers of commerce and manufacture established in the principal towns, the members of which are nominated by the king from a triple list of candidates presented to him by the chambers. The members of each vary in number from nine to twenty-one, one-third going out annually. They present to the Government or legislative chambers their views as to the best means of increasing the commercial and industrial prosperity of the country, report annually upon the state of their districts, and give useful information or direction to the provincial or civic authorities under their administration. There is a superior council of industry and commerce, composed of two delegates chosen annually by each of the chambers of commerce of Antwerp, Brussels, Ghent, Liége, Mons, and Charleroi, one elected by each of the other chambers of commerce, and a certain number of members chosen by the king, not exceeding a third of the others. The president and two vice-presidents are nominated by the king for each session. The council considers matters affecting commerce and industry, and such questions connected therewith as may be submitted to it by the Government.

Belgium possesses a great number of commercial and financial associations, joint-stock companies for carrying on public works or other enterprises, assurance companies, private banking companies, railway companies. &c

It has eight commercial exchanges, under the direction of Government, namely, in Antwerp, Brussels, Ghent, Bruges, Ostend, Mons, Termonde, and Louvain. In 1822 the General Society for the Encouragement of National Industry was formed at Brussels, under a royal charter for 27 years, which has since been extended to 1875 and 1905. The National Bank, instituted by charter granted in 1850 and renewed 1872, has its seat at Brussels, and has branches in all the provincial capitals and several other towns. Its capital is 50,000,000 francs, in shares of 1000 francs each. It pays a dividend of 5 per cent. upon the shares, and one-third at least of the profits exceeding 6 per cent. goes to form a sinking fund. The administration consists of a governor nominated by the king, six directors, and a council of censors. The banking operations are superintended by a Government commissary; and a report upon its state is presented to the Government every month. The state funds are deposited in this bank. The Bank of Belgium, chartered in 1835, has a capital of 50,000,000 francs. Its seat is at Brussels. The Bank of Flanders, established in Ghent, has a capital of 10,000,000 francs.

After England, there is no country in Europe where, in proportion to its extent, the roads are more numerous or better kept than in Belgium. They are of three kinds,—those maintained by the state, and those by the provinces and communes. The total length of the two latter cannot be given with accuracy; that of the first is 1187 leagues.

A bill was passed in 1834 authorizing the establishment of a system of railroads, of which Malines was to form the centre, and the line from Brussels to Malines, opened May 5, 1835, was the first railway in operation on the Continent. The Government railways are wrought on account of the Government, and are under special administration.

In the time of the Romans this portion of the Netherlands was included in Gaul, and formed part of that division of it which was known as *Gallia Belgica*. It was inhabited mostly by Celtic tribes, but there were also not a few of German race. The latter was subsequently largely increased by eruptions from the north, so that in the 5th and 6th centuries, under the rule of the Franks, they formed the principal element of the population. For several centuries the history of the Franks is the history of the Netherlands. Afterward the country was divided into a number of independent duchies, counties, and free cities. Among these may be mentioned the duchies of Brabant, Limbourg, and Luxembourg, the counties of Flanders, Hainault, and Namur, the bishopric of Liége, the lordship of Melines, &c. Of these the county of Flanders rose to be superior to all the others, and became distinguished for its industry and commercial activity. In 1385 the male line of the counts of Flanders became extinct, and their possessions passed into the hands of the dukes of Burgundy, who soon after, in various ways, came into possession of the whole of the Netherlands. In order to strengthen their power they sought to repress the spirit of liberty, and to do away with the free institutions that had sprung up in the country; but notwithstanding this the people continued to increase in wealth and prosperity, and industry and commerce flourished more and more among them. In 1447 Mary of Burgundy, only daughter and heiress of Charles the Bold, married the Archduke Maximilian, son of the Emperor Frederick IV., and thus the Netherlands came into the possession of the House of Austria. Maximilian succeeded to the imperial throne in 1493, and the following year he resigned the government of the Netherlands to his son Philip, then a youth of seventeen years of age. The latter, in 1496, married Joanna, daughter of Ferdinand and Isabella of Castile, and died in 1506, leaving to succeed him a son who afterward became Charles V. During the reign of this monarch the Protestant religion began to spread in the country, though its adherents were subjected to much persecution. His son and successor, Philip II. of Spain, by his cruel persecutions and his attempt to establish the Inquisition in the country, drove the people into open rebellion. The duke of Alva, who was sent at the head of a Spanish army to reduce them to subjection, perpetrated upon them the most horrid cruelties, devastating the whole country in every direction, and erecting scaffolds in every city. At length the northern portion of the Netherlands succeeded in establishing its independence, and became the republic of the Seven United Provinces, while the southern portion, or Belgium, continued under the rule of Spain. In 1598 Philip ceded Belgium to his daughter Isabella and her husband the Archduke Albert, under whom it formed a distinct and independent kingdom. Attempts were then made to restore the prosperity of the country and improve its internal condition; but, unfortunately, Albert died without leaving issue in 1621, and the country again fell into the hands of Spain.

For many years Belgium continued to share in the declining fortunes of Spain; and in the wars that broke out between that power and France and Holland, it was exposed to the first attack, and peace was usually purchased at the expense of some part of its territory. By the treaty of the Pyrenees (1659) the county of Artois, Thionville, and other districts were ceded to France. Subsequent French conquests, confirmed by the peace of Aix-la-Chapelle (1668), took away Lille, Charleroi, Oudenarde, Coutray, and other places. These were, indeed, partly restored to Belgium by the peace of Nimeguen (1679); bnt, on the other hand, it lost Valenciennes, Nieuport, Cambray, St. Omer, Ypres, and Charlemont, which were only in part recovered by the peace of Ryswick (1697). After the conclusion of this last treaty the Spanish Government attempted to restore prosperity to Belgium by the introduction of new customs laws, and by other means, particularly by the construction of canals to counteract the injury done to its commerce by the closing of the navigation of the Scheldt by the Dutch. But these attempts were of little avail in consequence of the breaking out of the War of the Spanish Succession, which was only brought to an end by the peace of Utrecht in 1713. By this treaty Belgium was assigned to Austria, and took the name of the Austrian Netherlands. Yet such was the enfeebled state of the country that Holland retained the right, which had been conceded to her during the late war, of garrisoning the principal fortresses on the French frontier, and her right to close the navigation of the Scheldt was also recognized. In 1722 a commercial company was formed at Ostend by Charles VI., but this was sacrificed in 1731 to the jealously of the Dutch. During the Austrian War of Succession almost the whole country fell into the hands of the French, but was restored to Austria by the peace of Aix-la-Chapelle (1748). Belgium was undisturbed by the Seven Years' War (1756–63), and during the long peace which followed enjoyed considerable prosperity under the mild rule of Maria Theresa, whose representative here, Prince Charles of Lorraine, conducted affairs with great judgment and moderation. The empress did much for the advancement of education, founding, among other institutions, the Belgian Academy of Sciences, and opposed the undue power of the clergy. Her son and successor, Joseph II., got into difficulties with Holland, and compelled that power to withdraw her garrisons from the frontier towns, but was unsuccessful in his attempts

to free the navigation of the Scheldt. It was, however, in his attempts to reform internal abuses that he failed most signally here as in other parts of his dominions. He excited the religious feelings of the people against him, by attempting to curb the power of the priests, and he offended the states by seeking to overturn the civil government. Numbers of the malcontents left the country, and organized themselves as a military force in Holland. As the discontent became more general, the insurgents returned, took several forts, defeated the Austrians at Turnhout, and overran the country. On 11th December 1789, the people of Brussels rose against the Austrian garrison, and compelled it to capitulate, and on the 27th the states of Brabant declared their independence. The other provinces followed, and, on 11th January 1790, the whole formed themselves into an independent state under the name of United Belgium, with a congress to manage its affairs. After the death of Joseph II. his successor, Leopold II., issued a proclamation on 3d March 1790, wherein he promised the restoration of the former constitution if the people would return to their allegiance. This, however, they refused to do, and they also rejected the proposal of a congress to meet at the Hague for the settlement of their differences. In the end of November, therefore, a strong Austrian army was sent into Belgium, and the country was subdued without any great opposition. The constitution as it existed at the end of the reign of Maria Theresa was restored, an amnesty was proclaimed for past offences, and the opposition of the states was put down. The short period of peace which followed was terminated by the breaking out of the war with revolutionary France. The battle of Jemappes (7th Nov. 1792) made the French masters of the country to the south of Liége; and the battle of Fleurus (26th June 1794) put an end to the Austrian rule in Belgium. The treaty of Campo Formio (1797) and the subsequent treaty of Luneville (1801) confirmed the conquerors in the possession of the country, and Belgium became an integral part of France, being governed on the same footing, receiving the *Code Napoleon*, and sharing in the fortunes of the Republic and of the Empire. (See FRANCE.) After the fall of Napoleon and the conclusion of the first peace of Paris (30th May 1814), Belgium was for some months ruled by an Austrian governor-general, after which it was united with Holland under Prince William Frederick of Nassau, who took the title of king of the Netherlands (23d March 1815). The Congress of Vienna (31st May 1815) determined the relations and fixed the boundaries of the new kingdom; and the new constitution was promulgated on the 24th of August following, the king taking the oath at Brussels, Sept. 27.

Belgium enjoyed during her union with Holland a degree of prosperity that was quite remarkable. The mineral wealth of the country was largely developed, the iron manufactures of Liége rapidly advanced in prosperity, the woollen manufactures of Verviers received a similar impulse, and many large establishments were formed at Ghent and other places where cotton goods were fabricated which rivalled those of England and far surpassed those of France. The extensive colonial and foreign trade of the Dutch furnished them with new markets for their produce; while the opening of the navigation of the Scheldt raised Antwerp to a place of the first commercial importance. The Government also did much in the way of improving the internal communications of the country, in repairing the roads and canals, and forming new ones, deepening and widening rivers, and the like. Nor was the social and intellectual improvement of the people by any means neglected. A new university was formed at Liége, normal schools for the instruction of teachers were instituted, and numerous elementary schools and schools for higher instruction were established over the country.

Matters were in this state when the news of the success of the Paris revolution of 1830 reached Belgium. Numbers of the Propagandists came to Brussels, where they paraded the streets and talked loudly in the public places of the glories of the Revolution and of the future destinies of France. The first outbreak occurred on the 25th of August, just a month after the commencement of that of Paris. A play, called *La Muette*, which abounds in passages well calculated to inflame the populace in their then excited state, was performed in the theatre, and when the curtain fell the audience rushed out into the street shouting, "Imitons les Parisiens." They were speedially joined by others, and the mob at once proceeded to deeds of violence, destroying or damaging a number of public buildings, manufactories, and private houses. The guards and posts in the centre of the city were overcome or quietly surrendered; the troops were drawn out, but they were too few in number to contend with the insurgents, and they either retreated to their barracks or were withdrawn to the upper part of the city, where they piled their arms in front of the king's palace, and renounced all attempts at suppressing the tumult. A number of the more influential and the middle-class citizens now enrolled themselves into a burgher guard for the protection of life and property, and to interpose in a manner between the contending parties. The intelligence of these events in the capital soon spread throughout the provinces; and in most of the large towns similar scenes were enacted, commencing with plunderings and outrages by the mobs, followed by the institution of burgher guards for the maintenance of peace. The burgher guard of Brussels was most anxious to terminate the dispute without recourse being had to extreme measures. They demanded the dismissal of the minister, Van Maanen, who was obnoxious to the people, and a separate administration for Belgium without an entire separation of the two countries. The Government neither agreed to make these concessions nor did it resolve upon actual force, but adopted a sort of middle course which, by allowing things to go on, ended in converting a popular riot into a complete revolution. The heir-apparent, the prince of Orange, was sent on a peaceful mission to Brussels, but furnished with such limited powers as, in the circumstances, were utterly inadequate. On his arrival a conference was held which extended over several days; and at the final meeting on 3d Sept., when a number of the members of the States-general were present, the prince had become so convinced that nothing but a separate administration of the two countries would restore tranquility, that he promised to use his influence with his father to bring about that object — the persons present on their part assuring him that they would heartily unite in maintaining the dynasty of the House of Orange. The king summoned an extraordinary States-general, which met at the Hague, 13th Sept., and was opened by a speech from the throne, which was firm and temperate, but by no means definite. The proceedings of the body were dilatory, and the conduct of the Dutch deputies exasperated the people of Belgium beyond measure. The modern party in the country gradually lost their influence, and those who were in favor of violent measures prevailed, while the warlike demonstrations made by the troops kindled a feeling of animosity and stimulated preparations for defence. Although the States were still sitting at the Hague, the king's army was gradually approaching Brussels. It consisted of 14,000 well-appointed troops under the com-

mand of Prince Frederick ; but its movements were too tardy if force was to be employed, and it was entirely out of place if conciliatory measures were to prevail. On 20th September the council resolved to take possession of Brussels, believing that the inhabitants were eager to receive the troops, and that their presence there would tend to restore peace ; and orders were sent to Prince Frederick to that effect. On the 23d the troops advanced towards the city, and, with little opposition, occupied the upper or court portion of it, which is situated on a hill, by which the rest of the town is commanded. The fighting continued for three days without any definite result, when the prince ordered a retreat. The news of this soon reached Ghent, Bruges, Ostend, and other towns which at once declared in favor of separation. A Provisional Government was formed at Brussels, which declared Belgium to be an independent state, and summoned a national congress for the regulation of its affairs. The council of the king now consented to separate administrations for the two kingdoms, but it was too late to restore peace. Antwerp was the only important town which remained in the hands of the Dutch, and the army on leaving Brussels had fallen back on this town. In the end of October an insurgent army had arrived before the gates, which were opened by the populace to receive them, and the troops, under General Chassé, retired within the citadel. A truce was concluded between the parties, but the Belgian officers were unable to restrain the fury of the populace who, with such weapons as they had, attacked the citadel. The general ordered a cannonade and bombardment of the town, which continued for two days, destroying a number of houses and large quantities of merchandise. A suspension of hostilities then took place, but the misrepresentations and exaggerations of the proceedings which spread did much to inflame the minds of the Belgians still further against the Dutch.

A convention of representatives of the five great powers met in London, in the beginning of November, at the request of the king of the Netherlands, but its attention was mainly directed to bringing about peace, and through it both sides were brought to consent to a cessation of hostilities. On the 10th November the national congress assembled at Brussels, consisting of 200 deputies chosen from the different provinces. Three important questions were decided by that assembly:— (1.) The independence of the country, — carried unanimously ; (2), a constitutional hereditary monarchy,— by a majority of 174 against 13 in favor of a republic ; and (3), the perpetual exclusion of the Orange Nassau family,— by a majority of 161 against 28 in favor of delay. On 20th December the conference of London proclaimed the dissolution of the kingdom of the Netherlands, at the same time that it claimed for itself the right of interfering even against the will of both countries to regulate the conditions of partition. On the 28th of January 1831 the congress proceeded to the election of a king, and out of a number of candidates the choice fell on the duke of Nemours, second son of Louis Philippe, but he declined the office. The congress then resolved on the election of a regent as a temporary measure, and they selected Baron Surlet de Crokier, who was installed on the 25th of February. This, however, did little to restore tranquillity to the country, and the partisans of the prince of Orange were still actively intriguing in his favor. At length, in the month of April, a proposition was privately made to Prince Leopold of Saxe-Coburg, widower of the Princess Charlotte of England, with the view of ascertaining whether, if chosen, he would accept the crown. It is remarkable that though his name was mentioned he was not among the number of candidates brought forward on the previous occasion. He answered in the affirmative, but strictly abstained from giving any authority to exertion being made in his favor. After many stormy discussions the election at length took place on the 4th of June, when 152 votes out of 196, four only being absent, determined that Prince Leopold should be proclaimed king of the Belgians, under the express condition that he "would accept the constitution and swear to maintain the national independence and territorial integrity." Leopold at once accepted, and made his public entry into Brussels on the 21st, when he was received with great cordiality.

Leopold now proceeded with vigor to strengthen his position, and to restore order and confidence. French officers were selected for the training and disciplining of the army, the civil list was arranged with economy and order, and the other branches of the public service were reformed or rearranged. He kept on the best terms with the Roman Catholic clergy and the Roman Catholic nobility; and his subsequent marriage with a daughter of the French king (9th August 1832), and a contract that the children of the marriage should be educated in the Roman Catholic faith, did much to inspire confidence in his good intentions. The king now gave his attention to the improvement of the manufactures and commerce of Belgium; and on 1st May 1834 he sanctioned the law which was to create the first railroad on the continent of Europe.

In 1835 the alien bill gave rise to considerable discussion, but it was at length carried. Its object was to give Government the power to send out of the kingdom, or to compel to reside in a particular place, any foreigner whose conduct was calculated to endanger the public peace. In 1836 an Act to regulate the municipal form of government in the towns and communes was passed. The election of the members of the municipal councils was continued in the citizens, but the appointment of the burgomaster and magistrates was vested in the king from among the members of the councils. The manufactures and commerce continued to flourish and extend, and the formation of railways was actively carried on. As Holland had not yet acceded to all the conditions of the twenty-four articles, Belgium still kept possession of the whole of Limbourg and Luxembourg except the fortress of the latter, with a small area round it, which was occupied by Prussian troops. These territories had been treated in every way as a part of Belgium, and had sent representatives to both chambers. Great indignation was therefore felt at the idea of their being separated, when Holland, on the 14th of March 1838, signified its readiness to accept the conditions of the treaty. The chambers argued that Belgium had been induced to agree to the twenty-four articles in 1832 in the hope of thereby at once terminating all harassing disputes, but that as Holland did not then accept them, the conditions were no onger binding, and the circumstances were now quite changed. They urged that Luxembourg in effect formed an integral part of their territory, and that the people were totally opposed to a union with Holland. They offered to pay for the territory in dispute, but the treaty gave them no right of purchase, and the proposal was not entertained. The two chambers unanimously voted addresses to the king, expressing a hope that the integrity of Belgium would be maintained, Similar addresses were sent from all parts of the country. and the people were roused to a great state of excitement. The king was at one with his people, and every preparation was made for war. But the firmness of the allied powers, and their determination to uphold the conditions of the treaty, at last brought the king, though with extreme reluctance, to give in to their views.

After violent discussions the Chamber of Representatives gave its adhesion on 19th March 1839, and some days later the Senate followed the example. The treaty was signed at London on the 19th of April. The annual payment by Belgium for its share of the national debt, which had been fixed at 8,400,000 florins, was reduced to 5,000,000 florins, or $2,080,000, with quittance of arrears prior to 1st January 1839. When this excitement was at its height the Bank of Brussels failed, and much misery and distress among the people was the result. This was immediately followed by the failure of the Brussels Savings-Bank, but the Government instantly came forward and guaranteed the claims thereupon, amounting to 1,500,000 florins.

The Belgian revolution owed its success to the union of the Roman Catholics and the Liberals; and the king had been very careful to maintain the alliance between these two parties. This continued to be the character of the Government up to 1840, but by degrees it had been becoming more and more conservative, and was giving rise to dissatisfaction. A ministry was formed on more liberal principles, but it clashed with the Catholic aristocracy, who had the majority in the Senate. The elections of 1847 gave a majority in favor of the Liberals; the cabinet resigned, and a Liberal administration took its place and formally announced a new policy. Hence it happened that when next year France was in revolution and her king a fugitive, Belgium remained calm and unshaken. When the news reached Brussels the king convoked a council of his ministers and offered to resign if they thought it would avert calamity or conduce to the public welfare. The ministers replied that a constitutional monarchy was best fitted for the people, and that a republic was neither according to their wishes nor adapted to their character. The democratic societies of Brussels attempted a revolutionary movement, but met with little success. At this time a new electoral law was issued lowering the franchise of 20 florins' worth of property ($8), by which the number of electors was at once doubled; and soon after another law reduced the qualification for municipal councils to 46 francs ($9). These timely concessions gave general satisfaction, and completely disarmed the extreme democratic party; so that when an expedition was organized in Paris against the throne of Leopold, with the countenance and aid of certain members of the French Government, it met with no sympathy and totally failed in its object. On the night of the 24th March the conspirators, to the number of about 800 French and 100 Belgians, arrived at Quievrain by train, but they were at once surrounded by the military and peasants and made prisoners. Alarmed at this attempt the Government strongly reinforced the frontier towns with troops, and was thus able to repulse a more formidable invasion that took place a few days later. Belgium, however, suffered severely from the shock given to commercial credit and general industry.

On the 10th December 1865 King Leopold died, after a reign of 34 years. He was greatly beloved by his people, and much respected by the other sovereigns of Europe. He was repeatedly chosen to decide in international disputes; and the grievances of hostile Governments were not unfrequently submitted to him. His well-known honesty and integrity of purpose, his reflective and well-balanced intellect, his habit of close and accurate reasoning, his grave and serious deportment, all eminently fitted him for the office of arbiter. To him Belgium owed much. In difficult circumstances and critical times he managed its affairs with great tact and judgment; by conciliatory measures he reconciled and kept at peace opposing factions; and by his well-known devotion to the best interests of the country he secured the confidence and esteem of all classes of the people. He was succeeded by his eldest son Leopold II., who was immediately proclaimed king, and took the oath to the constitution on 17th December.

On the outbreak of the war between France and Germany in 1870, Belgium saw the difficulty and danger of her position, and lost no time in providing for contingencies. A large war credit was voted, the strength of the army was raised, and large detachments were moved to the frontier. The feeling of danger to Belgium also caused great excitement in England, particularly after the contents of the secret treaty — which revealed the aggrandizing schemes of France against Belgium — became known. The British Government declared its intention to maintain the integrity of Belgium in accordance with the treaty of 1839, and it induced the two belligerent powers to sign treaties to that effect. In the event of either power violating the neutrality of Belgium, England was to co-operate with the other in such manner as might be mutually agreed upon to secure the integrity of the country. It was at first feared that Belgian territory might be violated by the necessities of one or other of the belligerents, but this was not the case. A considerable portion of the French army routed at Sedan did, indeed, take refuge in Belgian territory; but they laid down their arms according to convention, and were "interned" in the king's dominions.

In 1870 the Liberal party, which had been in power for thirteen years, was overthrown by a union of the Catholics with the Radicals or Progressionists, joined by not a few Liberals, to whom the opposition of the Government to certain reforms had given offense. A ministerial crisis followed, which was terminated by the advent to office of a Catholic cabinet, at the head of which was Baron d'Anethan. A new election took place in August 1870, which gave them a majority in both houses, — a result brought about in no small degree by the excitement consequent on the breaking out of the Franco-German war. The Baron d'Anethan steered his course prudently, and increased the power of the Ultramontanes considerably by carrying a reform bill, which widened the basis of representation as regarded the provincial and communal councils, by introducing large masses of the Catholic lower orders to the privilege of the franchise. It added nearly one-half to the number of electors for the provincial councils, and more than a fourth to those for the communal councils. The Liberals were very much dissatisfied; and towards the end of the year the mob in Brussels took up the question, and tumults broke out which the police and civic guard had to put down by force. They demanded the dismissal of the ministers, to which the king at length consented; and a new ministry was formed under M. de Theux. The communal elections of 1872 were the occasion of a sharp struggle throughout the kingdom between the church party and the Liberals, but success remained chiefly with the latter. The elections of June 1874 resulted in a considerable reduction of the Ultramontane majority within the Senate and the Chamber of Representatives, without actually converting it into a minority. In July of that year a conference of representatives of the leading powers of Europe was held in Brussels, with the view of introducing certain changes in the usages of war, but no definite result was arrived at. In May and June 1875, religious disturbances broke out in various parts, which were attended with serious consequences. At Brussels, Ghent, and other places, religious processions, which partook of the character of party demonstrations, were attacked by mobs of the populace, and many persons were injured. These disturbances were only put a stop to by energetic measures on the part of those in author-

ity, and the infliction of severe punishment on the delinquents.

The attention of foreign states was later particularly directed to Belgium, in consequence of certain remonstrances addressed to it by Germany on the subject of its international relations and its duties toward foreign powers. This arose from an obscure Belgian, named Duchesne, having written to a French archbishop, offering to assassinate Prince Bismarck for a consideration. He was taken and tried by the Belgian Government, but it was found that the law had provided no punishment for the offense which he had committed. Such a law has since been enacted.

BELGOROD, a town in the Russian government of Kursk, 412 miles south of Moscow, having considerable manufactures and a population of 20,000.

BELGRADE (in Servian, *Bielgorod*, or White Town), the capital of the Servian monarchy, situated at the confluence of the Save and the Danube, on the right bank of the latter stream, opposite the Austrian town and fortress of Semlin. It is built both on, and at the side of, a northern spur of the Avala heights, the rocky summit being crowned by its once famous citadel, which still remains very much as it was left by Prince Eugene, except that on the E. S. and W. the glacis has been changed into a promenade. The town was formerly divided into three parts, namely, the Old Town, the Russian Town (*Sava mahala* or Save-district), and the Turkish town (*Dorcol*, or Cross-road). A great change has, however, taken place in the course of the present century, and the old divisions are only partially applicable, while there has to be added the Tirazia, an important recent suburban extension along the line of the aqueduct or *Tirazi*. Since 1869 great activity has been shown in building, and the Old Town is gradually being regulated according to a definite plan. The general appearance of the place is growing more and more European; its mosques and minarets, protected from actual demolition by a Turkish treaty, are falling into ruin from neglect. Belgrade is identified with the ancient *Singidunum*, and was the station of the *Legio IV. Flavia Felix*. It has from its earliest existence been a place of military importance, and in modern times has sustained many sieges, and repeatedly passed from the hands of the Austrians to those of the Turks. It was taken by Soliman II. in 1521, and retaken by the Austrians in 1688, but again lost in 1690. In 1717 it surrendered to Prince Eugene. The imperialists retained it till 1739, when the Turks invested and reduced it. Austria again took it in 1789, but it was restored at the peace of 1791. In the year 1806 the Servian insurgents succeeded in carrying it. In 1862 it was bombarded from the citadel on account of a contest raging between the Turkish and Servian inhabitants, but five years later it was completely evacuated by the foreign forces, and the citadel received a garrison of Servian soldiers. It is now the seat of the national government and the residence of the young king. Population, 38,471.

BELIAL, a Hebrew word often used as a proper name, but really an abstract term meaning worthlessness or wickedness. Thus "sons of Belial" or "men of Belial" as given in the Authorized Version.

BELIEF, with its synonyms Assurance, Confidence, Conviction, Credence, Trust, Persuasion, Faith, is in popular language taken to mean the acceptation of something as true which is not known to be true, the mental attitude being a conviction that is not so strong as certainty, but is stronger than mere opinion. For the grounds of such conviction, ordinary language refers at once to probable as opposed to intuitive or demonstrative evidence. Such popular phrases do not, of course, amount to a definition of belief; but this is not to be expected from them, especially if, as may be laid down with some confidence, no logical definition of the process be possible. It may be described and marked off from similar or contrasted states, but a rigidly scientific definition of what appears to be a simple, ultimate fact is not attainable. The general explanation, however, is so far unsatisfactory in that it throws no light upon the most interesting question with regard to belief, its province, and does not tell us what are the objects of belief as opposed to those of knowledge. To answer this it is necessary to describe somewhat more minutely the mental process under examination.

Unfortunately for purposes of analysis, the word belief is used in a variety of relations which seem at first sight to have but little in common. We are said to believe in what lies beyond the limits of our temporal experience, in the supersensible, in God and a future life. Again, we are said to believe in the first principles or ultimate verities from which all trains of demonstration must start; as conditions of demonstration, these are themselves indemonstrable, and are therefore objects of belief. We receive by belief perceptions of single matters of fact, which from their very nature cannot be demonstrated. We believe from memory the facts of past experience; we have expectation or belief in future events. We accept truths on the evidence of testimony; and finally, we believe that our actual consciousness of things is in harmony with reality. From this unsystematic arrangement of objects of belief it will be possible to eliminate certain classes by noting in the first instance what we are not said to believe, but to know. By knowledge may be understood generally the conviction of truth which rests on grounds valid for all intelligence, and which is expressed in propositions necessary both for our thinking and for reality. At the same time we are commonly and correctly said to know states of consciousness when they are immediately present, together with their differences, similarities, connections, and relations to self. Whatever is necessarily connected with present experience, and can be logically deduced from it, is also matter not of belief but of knowledge. Again, we know all propositions of apodictic certainty, such as those of mathematics and logic. Mathematical propositions carry us beyond mere thinking; the laws which flow from the relations of space and time are not only thought but known to be true of all objects of sensible experience, for no objects whatsoever can form part of that experience save under these quantitative conditions. It is therefore an error to say that we believe abstract mathematical laws apply to objects; we know this with absolute certainty. So also our cognizance of logical principles, such as the laws of identity and contradiction, is matter of knowledge, of insight, not of belief. It would appear, therefore, that knowledge extends to facts immediately present in consciousness, and to certain relations true of all facts of sensible experience; but in neither of these classes of cognition does there seem to be given an absolute guarantee for the *existence* of any fact which is not immediately before us.

It follows from what has been said that we exclude from the province of belief primitive truths and facts of immediate experience, with such phenomena, past or future, as are connected casually or by rational links with facts immediately known. There is still a wide field left for belief. In the stage of knowledge, which we call sensible cognition belief introduces itself; for consciousness, which unhesitatingly affirms the correspondence of its content with reality, readily exhibits its falsity when submitted to analysis. The belief, though firm, is shown to be erroneous,— to be merely the rapid

summation of a number of signs, which themselves do not come clearly before consciousness, and are therefore accepted without examination. In memory of our past experience belief is involved. When I remember, I have present to consciousness ideas which represent past reality. To have ideas simply is to imagine; to have ideas which we are convinced represent past experience is to have imagination *plus* belief, *i. e.*, to remember. It should be observed that we are frequently said to trust our memory, to believe that what we remember is true. This phraseology is objectionable; we cannot properly be said to *trust* our memory, we simply use it. In the very fact of remembering is involved the reference to past reality which is the essence of belief. We believe testimony, *i. e.*, we accept as true facts not in our experience, and which possibly may never be. In this case our belief is, that under certain conditions we should have the experience which from the testimony we can picture to ourselves. Expectation, so far as merely contingent elements are concerned, is a pure case of belief.

So far as we have yet seen, all objects of belief have been or may be objects of knowledge; and the most prominent distinction between the two is the presence in the one of an actual intuition and its absence in the other. This distinction, however is not absolute; all thinking of reality is not belief. Belief is rather the thinking of reality which is determined by grounds not necessarily valid for all intelligence, but satisfactory for the individual thinker. The difference between imagination and the thought of some reality does not seem capable of further analysis; it expresses an ultimate fact. According to Mill, belief is a case of constant association; an idea is believed which is irresistibly called up in connection with present experience. Thus in memory, the ideas of the past experience are irresistibly associated with the idea of myself experiencing them, and this irresistibility constitutes belief. Expectation, again, is the irresistible suggestion by present experience of a consequent or train of consequents. And to memory and expectation all ordinary cases of belief may be reduced.

Kant's distinction of *Meinung* and *Glaube* leads us directly to the one species of belief which has not yet been considered. All objects of belief, so far as has yet appeared, might come within our temporal experience; but we are said to believe in the supersensible, which from its very definition seems to surpass experience and, consequently, knowledge. To such belief the name *faith* is properly restricted, and in its nature it differs somewhat from the belief hitherto discussed. When understood in this sense, religious belief is by no means a mere feeling, though it contains feeling as one of the stages in its development, for mere feeling is in itself blind and valueless, whereas faith is intelligent or rational. Nor is it a blank faith which would have the same value whatever were the objects believed in, for religious belief has a definite content; it is the acceptation of certain facts and truths and the active realization of them. As its content is definite (for if it were not so, the religions of Christ and of Mahomet, of Buddha and of Zoroaster, would stand on the same level, all having subjective faith or conviction), belief of necessity involves knowledge, rational construction of the facts believed. Faith is but the lower stage of completed insight, and in its own development follows the natural order of progress in knowledge, which begins with feeling and intuition, rises through concrete representation into logical connection, and finally culminates in rational cognition. So religious belief, which is primarily little more than a vague feeling of something over and beyond the present state of existence, combined with the dim sense of our own finite and dependent condition, gradually rises to a higher stage, and in its efforts to attain some cognizance of the supersensible, begins even to attach itself to natural objects. But as it can find in these no satisfaction, it is compelled to construct some representations of the supernatural which shall harmonize with our spiritual wants. In the formation of these religious ideas we are not left without help, nor are they to be looked upon as mere figments of the mind. The revelation which has been given in nature, both physical and moral, and in the special experience to which the name is more frequently applied, furnishes matter which is laid hold of and pressed into the service. Religious belief or faith always attaches itself to representations, intuitions, or facts; it gives what Newman has called Real as opposed to Notional Assent. But it is not the less necessary that faith should be raised to insight, and that we should construe in terms of thought what religious experience brings before us as direct intuition. There must be theology as well as religion. Nothing is believed which is not held to be so connected with the rational nature of man as irretrievably to injure that nature should its truth be overthrown. This is not to put knowledge in place of faith, if knowledge be understood to apply only to the logically necessary; nor is it to assert that what have been called truths of revelation could have been discovered by natural reason. Knowledge, however, cannot be confined to the abstract understanding; and nothing is more delusive than the total opposition of revelation and reason. "What is there in the nature of things," says Augustine, "that God has done unreasonably?" To affirm that reason does not of itself discover the truths of revelation, is simply to bring against it the reproach it may well bear, that it does not create experience. Reason has not to make new facts, but to accept given experience, and evolve from it the pure elements of thought which it contains, and in which its truth consists. Faith, therefore, precedes knowledge, as Anselm used to say; but its priority is that of time, not of authority.

There remains to be taken into account the interesting question of the grounds and motives for belief. It is, of course, necessary to distinguish between these two; the *cause* of a belief may not be exactly a *reason* for it. Belief, though natural, is not always rational, but frequently rests with happy unconsciousness on foundations utterly inadequate to its support. But if we disregard this distinction and include both causes and reasons under the title principles of belief; these may be divided into three classes—(1), Testimony; (2). Feeling, Desires, or Wishes; (3), Evidence of Reason. These are rarely dissevered in actual practice. Testimony, to the reception of which the name belief is frequently restricted, is familiar enough to require no extended notice. Our natural tendency is to accept all testimony as true; it is experience alone that teaches caution. Where from the nature of the case no such experience is to be had, credulity settles down into firm and ineradicable conviction. The majority of men would be astonished to find how much their belief depends upon the society into which they have been born and in which they live. Dogmas at first forced upon a people gradually become ingrained in the minds of those brought up in habitual contact with them. There is hardly a limit to the possibility of instilling beliefs through continued custom, and no resistance to analysis is so strong as that offered by mere customary opinion, which has imperceptibly introduced itself into the very life's blood of those who share it.

The feelings, though not so directly a source of convictions as testimony, exercise an extensive and complex influence on belief. It has always been a popular

saying that a man believes what he wishes — that "the wish is father to the thought;" and there can be no doubt that the superior force given to an idea by the concentration on it of desire or affection, causes it to bulk so largely in conciousness as to exclude the thought of its non-realization. The very idea of a result opposed to what we earnestly desire is unpleasant enough to make us resolutely shut it out of sight. This, however, is but a partial and limited effect. We know very well that our belief is only occasionally swayed by our wishes, and that necessity too often constrains us to believe what we willingly would not. Our volition cannot directly compel belief. But the feelings play a most important part; for it is by their means primarily that we stretch beyond the field of direct knowledge and complete our limited experience with what we feel to be necessary for the harmony of our moral and religious nature. We believe that without which our nature would be dissatisfied, and this belief takes its rise in the feelings,— the blind expression of intellectual want,— which form the first stage towards completed insight.

It is hardly necessary to do more than refer to the rational grounds for belief. Wherever our knowledge of any object or law is incomplete, belief is ready to step in and fill up the gap by some hypothesis, which is in conformity with our experience, is rationally connected with the facts to be explained, and is not yet known to be true. Great portions of our so-called scientific knowledge are nothing but rational belief,— hypotheses unverified, perhaps even unverifiable,— and the settlement of the conditions or legitimacy of such presumptions forms the principal part of inductive logic.

BELISARIUS (Sclavonic, *Beli-tzar*," White Prince") the greatest general of the Byzantine empire, was born about 505 A.D., at Germania, on the borders of Illyria. As a youth he served in the body-guard of Justinian, who appointed him commander of the Eastern army. He won a signal victory over the Persians in 530, and successfully conducted a campaign against them, until forced, by the rashness of his soldiers, to join battle and suffer defeat in the following year. Recalled to Constantinople, he married Antonina, a profligate, daring woman. During the sedition of the "green" and "blue" parties of the circus he did Justinian good service, effectually crushing the rebels who had proclaimed Hypatius emperor. In 533 the command of the expedition against the Vandal kingdom in Africa, a perilous office, which the rest of the imperial generals shunned, was conferred on Belisarius. With 15,000 mercenaries, whom he had to train into Roman discipline, he took Carthage, defeated Gelimer the Vandal king, and carried him captive, in 534, to grace the first triumph witnessed in Constantinople. In reward for these services Belisarius was invested with the consular dignity, and medals were struck in his honor. At this time the Ostrogothic kingdom, founded in Italy by Theodoric the Great, was shaken by internal dissensions, of which Justinian resolved to avail himself. Accordingly, Belsarius invaded Sicily; and, after storming Naples and defending Rome for a year against almost the entire strength of the Goths in Italy, he concluded the war by the capture of Ravenna, and with it of the Gothic king Vitiges. So conspicuous were Belisarius's heroism and military skill that the Ostrogoths offered to acknowledge him Emperor of the West. But his loyalty did not waver; he rejected the proposal and returned to Constantinople in 540. Next year he was sent to check the Persian king Nushirvan; but, thwarted by the turbulence of his troops, he achieved no decisive result. On his return to Constantinople the intrigues of Antonina, whom he had confined on account of her illicit amours, caused him to be stripped of his dignities and condemned to death, and he was only pardoned by humbling himself before his imperious consort. The Goths having meanwhile reconquered Italy, Belisarius was dispatched with utterly inadequate forces to oppose them. Nevertheless, during five campaigns his strategic skill enabled him to hold his enemies at bay, until he was removed from the command, and the conclusion of the war entrusted to his rival Narses. Belisarius remained at Constantinople in tranquil retirement until 559, when an incursion of Bulgarian savages spread a panic through the metropolis, and men's eyes were once more turned towards the neglected veteran, who placed himself at the head of a mixed multitude of peasants and soldiers, and repelled the barbarians with his wonted courage and adroitness. But this, like his former victories, stimulated Justinian's envy. The savior of his country was coldly received and left unrewarded by his suspicious sovereign. Shortly afterwards Belisarius was accused of complicity in a conspiracy against the emperor; his fortune was confiscated, and himself flung into prison. His last years are shrouded in uncertainty, as they are not dealt with in the circumstantial history of Procopius; but he seems to have been liberated and reinstalled in the enjoyment of his hard-won honors before his death in 565. The fiction of Belisarius wandering as a blind beggar through the streets of Constantinople, which has been adopted by Marmontel in his *Bélisaire*, and by various painters and poets, seems to have been invented by Tzetzes, a writer of the 12th century. Gibbon justly calls Belisarius the Africanus of New Rome. But for his successes, which were achieved with most insignificant means, the effete Byzantine empire would have been dismembered among Vandals, Persians, and Goths. He was merciful as a conqueror, stern as a disciplinarian, enterprising and wary as a general; while his courage, loyalty, and forbearance seem to have been almost unsullied. Like Corbulo, the faithful general of Nero, he was suspected and persecuted by an ungrateful master; and, like him, he restored the old discipline to the troops and the ancient lustre to the Roman arms in a corrupt and nerveless age.

BELIZE, the capital of British Honduras, and the only trading-port in the colony. It is situated on the sea-coast, at the mouth of a river of the same name. The population is about 5000.

BELKNAP, JEREMY, an American clergyman and author, was born at Boston in 1744 and died in 1798. He was educated at Harvard University, where he graduated in 1762. In 1767 he was called to a Congregational church in Dover, New Hampshire, and remained there for twenty years. He then removed to the Federal Street church in Boston, which he held till his death.

BELL (from *pelvis*, a basin or foot-pan, *Pes lavare*), an open percussion instrument varying in shape and material, but usually cup-like or globular and metallic, so constructed as to yield one dominant note.

Antiquaries have worried themselves and their readers about the antiquity of bells and to small purpose. It is doubtful whether the bells of gold (Exod. xxviii. 32, 35) were anything but jangling ornaments of some kind worn by the high priest; but Mr. Layard believes that he has found some small bronze bells in the palace of Nimroud. We may gather generally that small bells long preceded large ones, which latter, however, were used in India and China long before they were known in Europe.

The Romans used bells for various purposes. Lucian, 180 A.D., mentions an instrument mechanically constructed with water, which rang a bell as the water flowed to measure time. Bells summoned the Romans to the public baths; they were also used in processions,

and so passed naturally into the service of the Western Church. The first recorded application of them to churches is ascribed by Polydore Virgil to Paulinus (*circa* 400 A.D.) He was bishop of Nola, a city of Campania (hence *nola* and *campana*, the names of certain bells). It has been maintained that Pope Sabinianus, 604, first used church bells; but it seems clear that they were introduced into France as early as 550. In 680, Benedict, abbot of Wearmouth, imported them from Italy; and in the 7th century, Bede mentions them in England. St. Dunstan hung many in the 10th century; and in the 11th they were not uncommon in Switzerland and Germany. It is incredible that the Greek Christians, as has been asserted, were unacquainted with bells till the 9th century; but it is certain that, for political reasons after the taking of Constantinople by the Turks, in 1453, their use was forbidden, lest they should provide a popular signal for revolt.

Several old bells are extant in Scotland, Ireland, and Wales; the oldest are often quadrangular, made of thin iron plates hammered and rivetted together. Dr. Reeves of Lusk described in 1850 St. Patrick's bell preserved at Belfast, called *Clog an eadhacta Phatraic*, "the bell of St. Patrick's will." It is 6 inches high, 5 broad, 4 deep, adorned with gems and gold and silver filagree work; it is inscribed 1091 and 1105, but is probably alluded to in Ulster annals in 552.

The four-sided bell of the Irish missionary St. Gall, 646, is preserved at the monastery of St. Gall, Switzerland. In these early times bells were usually small; even in the 11th century a bell presented to the church at Orleans weighing 2600 pounds was thought large. In the 13th century larger bells were cast. The bell, Jacqueline of Paris, cast 1400, weighed 15,000 pounds; another Paris bell of 1472, 25,000 pounds; and the famous Amboise bell at Rouen, 1501, 36,364 pounds. But there we have reached the threshold of the golden age of bells, of which more anon.

We shall now give a brief account of the manufacture of the bell proper, *i.e.*, the church bell of the last five centuries. It must not be supposed that the early bell-founders understood all the principles of construction, mixture of metals, lines, and proportions which go to form our notions of a good bell.

Bell-metal is a mixture of copper and tin in the proportion of 4 to 1.

Bells, like viols, have been made of every conceivable shape within certain limits. The long narrow bell, the quadrangular, and the mitre-shaped in Europe at least indicate antiquity, and the graceful curved-inwardly-midway and full trumpet-mouthed bell indicates an age not earlier than the 16th century.

The bell is first designed on paper according to the scale of measurement. Then the crook is made, which is a kind of double wooden compass, the legs of which are respectively curved to the shape of the inner and outer sides of the bell, a space of the exact form and thickness of the bell being left betwixt them. The compass is pivotted on a stake driven into the bottom of the casting-pit. A stuffing of brickwork is built round the stake, leaving room for a fire to be lighted inside it. The outside of this stuffing is then padded with fine soft clay, well mixed and bound together with calves' hair, and the inner leg of the compass run round it, bringing it to the exact shape of the inside of the bell. Upon this *core*, well smeared with grease, is fashioned the false clay bell, the outside of which is defined by the outer leg of the compass. Inscriptions are now moulded in wax on the outside of the clay-bell; these are carefully smeared with grease, then lightly covered with the finest clay, and then with coarser clay, until a solid *mantle* is thickened over the outside of the clay bell. A fire is now lighted, and the whole baked hard; the grease and wax inscriptions steam out through holes at the top, leaving the sham clay bell baked hard and tolerably loose, between the *core* and the *cope* or *mantle*. The cope is then lifted, the clay bell broken up, the *cope* let down again, enclosing now between itself and the *core* the exact shape of the bell. The metal is then boiled, and run molten into the mould. A large bell will take several weeks to cool. When extricated it ought to be scarcely touched, and should hardly require tuning. This is called its maiden state, and it is one so sought after that many bells are left rough and out of tune in order to claim it.

A good bell, when struck, yields one note, so that any person with an ear for music can say what it is. This note is called the *consonant*, and when it is distinctly heard the bell is said to be "true." Any bell of moderate size (little bells cannot well be experimented upon) may be tested in the following manner:—Tap the bell just on the curve of the top, and it will yield a note one *octave* above the consonant. Tap the bell about one quarter's distance from the top, and it should yield a note which is the *quint* or fifth of the octave. Tap it two quarters and a half lower, and it will yield a *tierce* or third of the octave. Tap it strongly above the rim where the clapper strikes, and the quint, the tierce, and the octave will now sound simultaneously, yielding the consonant or key-note of the bell.

The history of bells is full of romantic interest. In civilized times they have been intimately associated, not only with all kinds of religious and social rights, but with almost every important historical event. Their influence upon architecture is not less remarkable, for to them indirectly we probably owe all the most famous towers in the world. Grose in his *Antiquities* observes, "Towers at first scarcely rose above the roof, being intended as lanterns for the admission of light, an addition to the height was in all likelihood suggested on the more common use of bells."

Bells early summoned soldiers to arms, as well as citizens to bath or senate, or Christians to church. They sounded the alarm in fire or tumult; and the rights of the burghers in their bells were jealously guarded. Thus the chief bell in the cathedral often belonged to the town, not to the cathedral chapter. The curfew, the Carolus, and St. Mary's bell in the Antwerp tower all belong to the town; the rest are the property of the chapter. He who commanded the bell commanded the town; for by that sound, at a moment's notice, he could rally and concentrate his adherents. Hence a conqueror commonly acknowledged the political importance of bells by melting them down; and the cannon of the conquered was in turn melted up to supply the garrison with bells to be used in the suppression of revolts. Many a bloody chapter in history has been rung in and out by bells.

On the third day of Easter 1282, at the ringing of the Sicilian vespers, 8000 French were massacred in cold blood by John of Procida, who had thus planned to free Sicily from Charles of Anjou. On the 24th of August, St. Bartholomew's day, 1571, bells ushered in the massacre of the Huguenots in France, to the number, it is said, of 100,000. Bells have rung alike over slaughtered and ransomed cities; and far and wide throughout Europe in the hour of victory or irreparable loss. At the news of Nelson's triumph and death at Trafalgar, the bells of Chester rang a merry peal alternated with one deep toll, and similar striking incidents could be indefinitely multiplied. It was, however, in the low countries of Belgium and Holland, distracted with incessant civil wars, that, for purely political reasons, bells acquired unique importance.

But their religious and civil uses may be further noticed. The Ave Mary bell tolled at 6 and 12 to remind men of prayer to the Virgin; the vesper bell for evening prayer; the compline was for the last service of the day. The sanctus, often a handbell, rang at the sacrifice of the mass; the passing bell, at death. The curfew (*couvre feu*), introduced by the Conqueror into England, rang at 8 o'clock to extinguish all lights. In many parts of the country and in university towns at 8 and 6 o'clock bells are still rung.

Bell-founding attained perfection in Holland in the 16th and 17th centuries; and the names of Hemony, Dumery, and the Van den Gheyns stand out as the princes of the art. Their bells are still heard throughout the Low Countries, and are plentiful at Amsterdam, Bruges, Ghent, Louvain, Mechlin, and Antwerp. These bells are frequently adorned with bas reliefs of exquisite beauty, such as feathers, forest leaves, fruit, flowers, portraits, or dancing groups, and inscribed with Latin, sometimes bad, but strong, quaint, and often pathetic.

Bell-ringing is conducted as follows: — Ropes hang through holes in the bell-chamber, and are usually fastened to a wheel for leverage, round which the rope passes. There is a great knack in handling the rope. The first half-pull "drops" the bell, the second "sets" it; it next swings up to the slur-bar, then it swings down and up to the other side, the clapper striking as it ascends. Eight bells make the most perfect peal, tuned in the diatonic scale.

Bells are struck in three ways,— (1) with a hammer on the outside, let off either by a tambour or revolving drum, similar in appearance to the prickly cylinder of a musical box, which drum can be fitted with tunes or chimes by musical nuts or spikes, and altered at will; (2) the bell can also be struck by hand, as in the common stand of small bells to be seen occasionally in the London streets, the player having a hammer in each hand; or (3) the clapper may strike the bell internally, either being pulled by a rope, the bell being stationary, or by the bell swinging to and fro. If the hammer or clapper be too light the tone of the bell is not properly drawn; if too heavy it will pulverize or crack the bell in time.

Great reforms are needed in the hanging of bells, a subject to which the Americans have given much attention. What Messrs. Gillett and Bland are in England with reference to carillon machinery, the Meneleys of New York are to the ordinary mechanism and hanging of bells. There is hardly a cathedral tower in England where the hanging of one or more bells, or the oscillation of the tower, is not justly complained of. When a bell is hard to ring it is usually on account of its hanging. The leverage is wrongly applied; the wood-work is crowded against the masonry, and many of the finest towers have thus become unsafe.

There are a few bells of world-wide renown, and several others more or less celebrated. The great bell at Moscow, *Tzar Kolokol*, which, according to the inscription, was cast in 1733, was in the earth 103 years, and was raised by the Emperor Nicholas in 1836. The present bell seems never to have been actually hung or rung, having cracked in the furnace. Photographs of it are now common, as it stands on a raised platform in the middle of a square. It is used as a chapel. It weighs about 440,000 lb.; height, 19 feet 3 inches; circumference, 60 feet 9 inches; thickness, 2 feet; weight of broken piece, 11 tons. The second Moscow bell, the largest in the world in actual use, weighs 128 tons. The great bell at Peking weighs 53 tons; Nanking, 22 tons; Olmutz, 17 tons; Vienna (1711), 17 tons; Nôtre Dame (1680), 17 tons; Erfurt, one of the finest bell metal, 13 tons; Great Peter, York Minster, which cost £2000 in 1845, 10 tons; St. Paul's, 5 tons; Great Tom at Oxford, 7 tons; Great Tom at Lincoln, 5 tons. Big Ben of the Westminster clock tower (cracked) weighs between 13 and 14 tons; it was cast by George Mears under the direction of Edward Beckett Denison in 1858. Its four quarters were cast by Warner in 1856. The Kaiserglocke of Cologne cathedral, lately recast (1875), weighs 25 tons.

On the varied uses past and present of small bells a volume might be written. Octaves of little bells have been introduced into organs and utilized in the orchestra. Handringers are still common throughout England— one man with a bell fitted with a clapper, in each hand, ringing but two notes of the tune in his turn. Upright stands of bells without clappers, struck with wands may often be seen in the streets. Bells for horses, dogs, cows, sheep, &c., have already been alluded to. In Italy and elsewhere they are often made of baked earth; these have a very sweet sound, and cost about 2 cents. For sledges and harness they are of metal, and worn usually in bunches. A bunch of twelve cost about two francs. On the Italian lakes and elsewhere a bell fixed to a floating cork marks the spot where lines or nets are laid for fish. Hunting-hawks were formerly supplied with small bells to facilitate recovery.

While some uses of bells have gone out, new ones have come in. A few instances will give the reader some idea of the indefinite number of services to which they have been applied. The expression to curse with book, bell, and candle, alludes to an old form of exorcism, in which the bell was used to scare the evil spirit — a function also attributed to larger bells. Bearing the bell alludes to the prize of a silver bell usually given at horse-races to the winner; hence comes what is, after all, only the bell reversed and used as a drinking vessel — the prize cup. The diving-bell no more comes within the scope of the present article than the dome of a mosque. Certain uses of small bells are fast disappearing.

BELL, Dr. Andrew, a clergyman of the Church of England well known for his philanthropic efforts in the cause of education, and more particularly for his success in extending the monitorial system of instruction in schools, was born at St. Andrews in 1753. He graduated at the university of that town, and afterwards spent some years in America. In 1807 Dr. Bell was called upon to organize a system of schools in accordance with his views. For his valuable services he was in some degree recompensed by his preferment to a prebend of Westminster, and to the mastership of Sheborn Hospital, Durham. He died in 1832 at Cheltenham, and was buried in Westminster Abbey.

BELL, Sir Charles, K. H., the youngest son of the Rev. William Bell, a clergyman of the Episcopal Church of Scotland, was born at Edinburgh, November 1774. After having studied two years at the High School and two years more at the University of Edinburgh, Charles embraced the profession of medicine and devoted himself chiefly to the study of anatomy, under the direction of his brother John, who was twelve years older, and who had already earned a reputation as an anatomist and surgeon.

On the 1st of August 1799 he became a fellow of the Royal College of Surgeons of Edinburgh. At that time the fellows of the college were in rotation surgeons to the Royal Infirmary of Edinburgh. In this position Bell soon gave evidence of great ability. He dissected, drew, described, mounted preparations of anatomical, physiological, or pathological value, improved on the modes of operating in surgery known at that time, and invented a method of making models of morbid parts,

of which specimens may still be seen in the museum of the college.

In 1807 Bell first published his idea of a new anatomy of the brain, in which he announced the discovery of the different functions of the nerves corresponding with their relations to different parts of the brain. It is now difficult to imagine the confusion which prevailed in the minds of anatomists and physiologists regarding the functions of the various nerves prior to this discovery. The nerves had been noticed by anatomists from the earliest times, and they were divided into cranial and spinal nerves, according as they originated from the brain or spinal cord. Some were supposed to carry from the brain the mandates of the will, while others communicated to the sensorium impressions made on their extremities, which resulted in consciousness. It was supposed, however, that the same nerve, even at the same time, might in some mysterious way transmit either motor or sensory impressions in opposite directions. When a nerve was cut, the parts beyond the incision were found to be destitute of sensibility, and to be beyond the influence of the will. It was consequently correctly inferred to be the cord through which volition acted on the muscles, and through which sensory impressions were transmitted to the sensorium. The idea of two sets of filaments functionally different in the same nerve was not then entertained. Boerhaave asserted that there were two kinds of spinal nerves, the one serving for motion and the other for the use of the senses. Haller states, "I know not a nerve which has sensation without also producing motion." The first Monro held a similar opinion, and he believed all those spinal nerves which passed through a ganglion to be motor nerves.

To Sir Charles Bell we owe the discovery that in the nervous trunks there are special sensory filaments, the office of which is to transmit impressions from the periphery of the body to the sensorium, and special motor filaments which convey motor impressions from the brain or other nerve centre to the muscles. He also showed that some nerves consist entirely of sensory filaments and are therefore sensory nerves, that others are composed of motor filaments and are therefore motor nerves, whilst a third variety contain both kinds of filaments and are therefore to be regarded as sensory-motor. Furthermore, he indicated that the brain and spinal cord may be divided into separate parts, each part having a special function—one part ministering to motion, the other to sensation, and that the origin of the nerves from one or other or both of those sources endows them with the peculiar property of the division whence they spring. He also demonstrated that no motor nerve ever passes through a ganglion. Lastly, he showed both from theoretical considerations and from the result of actual experiment on the living animal, that the interior roots of the spinal nerves are *motor*, while the posterior are *sensory*. These discoveries as a whole must be regarded as the greatest in physiology since that of the circulation of the blood by the illustrious Harvey. It not only was a distinct and definite advance in scientific knowledge, but from it flowed many practical results of much importance in the diagnosis and treatment of disease.

In 1807 he produced a *System of Comparative Surgery* founded on the basis of anatomy. This work indicates the author's idea of the science of surgery. He regarded it almost wholly from an anatomical and operative point of view, and there is little or no mention of the use of medicinal substances. It placed him, however, in the highest rank of English writers on surgery.

The chair of surgery in the University of Edinburgh was offered to him in 1836. When the offer was made he was regarded as one of the foremost scientific men in England, and he had a large surgical practice. In Edinburgh he did not earn great local professional success; and, it must be confessed, he was not appreciated as he deserved. But honors came thick upon him. On the Continent he was spoken of as greater than Harvey. It is narrated that one day Roux, a celebrated French physiologist, dismissed his class without a lecture, saying "That will do gentlemen, you have seen Charles Bell."

Sir Charles Bell died at Hallow Park near Worcester on Thursday, 28th April 1842, in his sixty-eighth year; and he lies under the yew tree in the peaceful churchyard of Hallow. His epitaph, written by his life-long friend Lord Jeffrey, summarizes his character as follows:—"Sacred to the memory of Sir Charles Bell, who, after unfolding, with unrivalled sagacity, patience, and success, the wonderful structure of our mortal bodies, esteemed lightly of his greatest discoveries, except only as they tended to impress himself and others with a deeper sense of the infinite wisdom and ineffable goodness of the Almighty Creator. He was born at Edinburgh 1774; died, while on a visit of friendship, at Hallow park, in this parish, 1842; and lies buried in the adjoining churchyard."

BELL, GEORGE JOSEPH, brother of the preceding, was born at Edinburgh on the 20th of March, 1770. In 1821 he was unanimously elected professor of the law of Scotland in the University of Edinburgh; and in 1831 he was appointed to one of the principal clerkships in the Supreme Court. He was in 1833 placed at the head of a commission to inquire into the expediency of making various improvements in the Scottish bankruptcy law; and in consequence of the reports of the commissioners, chiefly drawn up by himself, many beneficial alterations have been made in this department of the law. He died on the 23d September 1843.

BELL, HENRY, a mechanical engineer, well known for his successful application of steam-power to the propulsion of ships, was born at Torphichen, in Linlithgowshire in 1767. He died at Helensburgh, 14th November 1830, and a monument was erected to his memory at Dunglass, near Bowling, on the banks of the Clyde.

BELL, HENRY GLASSFORD, was born at Glasgow in 1805, and received his education at the High School of that city. He afterwards studied at Edinburgh and became intimate with Moir, Hogg, Wilson, and others of the brilliant staff of *Blackwood's Magazine*, to which he was drawn by his political sympathies. In 1828 he became editor of the *Edinburgh Literary Journal*, which proved unsuccessful. He passed to the bar in 1832. In 1831 he published *Summer and Winter Hours*, a volume of poems, of which the best known is that on Mary Queen of Scots. He further defended the cause of the unfortunate queen in a prose *Life*. He died in January 1874.

BELL, JOHN, of Antermony, a Scottish traveller in the first half of the last century, was born in 1691, and educated for the medical profession, in which he took the degree of M.D. He died in 1780. His travels, published at Glasgow, in 2 vols. 4to, 1763, were speedily translated into French, and widely circulated in Europe.

BELL, JOHN, anatomist and surgeon, was born at Edinburgh, 12th May 1763. He had the merit of being the first in Scotland who applied with success the science of anatomy to practical surgery. While still a young man he established, in the face of much opposition, an anatomical theatre in Surgeon Square, where he attracted large audiences by his admirable lectures on anatomy, physiology, and surgery, in which he was as-

sisted by his younger brother Charles. He died at Rome in 1820, while on a tour in Italy for the benefit of his health.

BELL, ROBERT, editor of the *Annotated Edition of the British Poets*, was an Irishman by birth and education, but a Londoner by a long residence of nearly forty years. He was born at Cork in 1800, and was educated at Trinity College, Dublin. With the tasks of a subordinate in a Government office at Dublin he combined literary pursuits, editing a political journal and contributing to periodicals and magazines. He died in London, at the age of sixty-seven, April 12, 1867.

BELLA, STEFANO DE LA, engraver, was born at Florence in 1610. He died in 1664. His productions were very numerous, amounting to over 1400 separate pieces.

BELLADONNA, DWALE, or DEADLY NIGHTSHADE (*Atropa Belladonna*), a tall bushy herb of the natural order *Solanaceæ*, growing to a height of 4 or 5 feet, having leaves of a dull green color, with a black shining berry fruit about the size of a cherry, and a large tapering root. The plant is a native of Central and South Europe, extending into Asia, and it is also found in waste places and hedge-rows of Britain, though it is a doubtful native. The entire plant is highly poisonous, and accidents not unfrequently occur through children and unwary persons eating the attractive-looking fruit. Its leaves and roots are largely used in medicine, on which account the plant is cultivated, chiefly in South Germany, Switzerland, and France. Both roots and leaves contain the poisonous alkaloid atropia, but in practice the roots only are employed for its extraction. Preparations of belladonna and atropia are used in medicine as anodynes in local nervous pains,—atropia being frequently hypodermically injected but rarely taken internally. They are also of great value in ophthalmic practice on account of their peculiar property of producing dilatation of the pupil, either when painted around or dropped into the eye. Belladonna is also used as an anti-spasmodic in hooping-cough and spasmodic coughs generally, and for various other medicinal purposes.

BELLAI, or BELLAY, GUILLAUME DU, lord of Langey, a French general, who signalized himself in the service of Francis I., was born at Glatigny in 1491. He died in 1543, and was buried in the church of Mans, where a noble monument was erected to his memory.

BELLAMY, JACOBUS, a Dutch poet, was born at Flushing in 1757. He was apprenticed when young to a baker, but his abilities were discovered by a clergyman named De Water, who exerted himself in the boy's behalf, and obtained sufficient assistance to send him, in 1782, to the University of Utrecht. In 1785 appeared his *Vaderlandsche Gesangen*, which at once gained him the highest reputation as a poet.

BELLAIRE, a city of Belmont county, Ohio, on the Ohio river, five miles from Wheeling, W. Va. It is the terminus of two railroads, and is an important manufacturing and shipping point. Bellaire contains two banks, ten churches, several schools, and two newspaper offices. The city is lighted by gas, and has waterworks and a street railway, and a population (1890) of 9,901. The manufactures include nails, pig-iron, window-glass, flint ware, and agricultural machinery.

BELLARMINE (Ital. BELLARMINO), ROBERT FRANCIS ROMULUS, Cardinal, Catholic theologian and polemic, was born, October 4, 1542, at Montepulciano, in Tuscany. He was destined by his father for state service, but his inclinations were too strong to be restrained, and at the age of eighteen he entered the Society of Jesus. In 1599 he was, much against his will, raised to the dignity of cardinal, and two years later was made archbishop of Capua. He resigned the archbishopric in 1605, being detained in Rome by the desire of the newly-elected Pope Paul V. About the same time he had a controversy with James I. of England, who, after the discovery of the Gunpowder Plot, had passed severe laws against Roman Catholics. For some years before his death, which occurred at Rome, 17th September 1621, he held the bishopric of his native town. Bellarmine, whose life was a model of Christian asceticism, was one of the greatest Roman Catholic theologians, particularly in the department of polemics.

BELLAY, JOACHIM DU, an eminent French poet and member of the Pleiad, was born late in 1524, at Lyré, on the left bank of the Loire, and died in 1558. His collected works did not appear until 1568. The early death of the French Ovid, as he has been called, was a serious loss to European literature, for Joachim de Bellay was at the height of his power, and still rapidly advancing.

BELLEFONTAINE, the capital of Logan county, Ohio, is situated at the intersection of two important railroads, fifty miles northwest of Columbus, the State capital. It contains one national and one other bank, three newspaper offices, eleven churches, and a full complement of public schools. Its manufactures include carriages, woolen goods, railroad cars, and furniture, and it has a population of over 5,000.

BELLEFONTE, a Pennsylvania railroad town, in Center county, forty-seven miles northeast of Altoona. It has one national and two other banks, ten churches, two newspaper offices, and a population of 5,000. Cutlery, glass, and machinery are manufactured here.

BELLE-ISLE-EN-MER, an island on the W. coast of France, belonging to the department of Morbihan. It is about 10 miles in length by 4 or 5 in breadth, and is divided into the four communes of Palais, Bangor, Porte Philippe, and Locmaria. The inhabitants are principally engaged in agriculture and the fisheries, and in the preservation of sardines, anchovies, &c. The breed of draught horses in the island is highly prized.

BELLEAU, REMY, French poet of the Renaissance, and member of the Pleiad, was born at Nogent-le-Rotrou in 1528. Popular in his own age, he died in 1577.

BELLENDEN, JOHN, a Scotch poet, and the translator of Boece's *History*, was born about the beginning of the 16th century, probably in East Lothian. Bellenden, who was a strenuous opponent of the Reformation, is said to have died at Rome in 1550.

BELLENDEN, WILLIAM, a distinguished classical scholar, who flourished during the early part of the 17th century, is said to have been a professor at the University of Paris. Nothing is known with certainty of his life, except that he held the office, probably a sinecure, of Master of Requests.

BELLEROPHON, in *Greek Legend*, a local hero of Corinth, but partly also connected with, and partly similar to, Perseus, the local hero of the neighboring Argos, the points of likeness being such as to suggest that they had originally been one and the same hero, while the difference in their exploits might result from the rivalry of the two towns. Both are connected with the sun-god Helios and with the sea-god Poseidon, the symbol of the union being the winged horse Pegasus. Bellerophon was a son of Glaucus of Corinth, who is spoken of as a son of Poseidon, and in some way himself a marine deity. To account for the name, *i.e.*, "slayer of Belleros," an otherwise unknown hero of this name was invented. But it is by no means certain that "Belleros" is a personal name; it may mean nothing more than "monster."

The first act of Bellerophon was to capture the horse Pegasus, when it alighted on the Acrocorinth to drink at the fountain of Peirene, with a bridle which he found

by his side on awaking from sleep beside the altar of Athene, where he had laid himself down on the advice of the seer Polyidus. The goddess had appeared to him in a dream, reached him a golden bridle, and told him to sacrifice a white bull to his father Poseidon. The next incident occurs in Tiryns, at the court of Prœtus, whose wife, Sthenebœa (or Anteia, as Homer calls her), failing to seduce Bellerophon, charges him with an attempt on her virtue. Prœtus now sends him to Iobates, his wife's father, the king of Lycia, with a letter or sealed tablet, in which were instructions, apparently by means of signs, to take the life of the bearer. Arriving in Lycia, he was received as a guest and entertained for nine days. On the tenth, being asked the object of his visit, he handed the letter to the king, whose first plan for complying with it was to send him to slay the Chimæra, a monster which was devastating the country. Its forepart was that of a lion, its hindpart that of a serpent; a goat's head sprang from his back, and fire was vomited from its mouth. Bellerophon, mounted on Pegasus, kept up in the air out of the way of the Chimæra, but yet near enough to kill it with his spear, or as he is at other times represented, with his sword or with a bow. His divine origin was now proved; the king gave him his daughter in marriage; and the Lycians presented him with a large and fertile estate. But, as in the case of Hercules, the gods now punish him with frenzy. His son Isander fell in battle and his daughter was slain by Artemis.

BELLES-LETTRES, a term borrowed from the French to express the more elegant or refined departments of literature. It is practically synonymous with another indefinite expression, "polite literature."

BELLEVILLE, an outlying section of Paris, but now enclosed within the fortifications. It is principally inhabited by workmen, and was one of the last strongholds of the Commune of 1871. See PARIS.

BELLEVILLE, a city of the United States of America, capital of the county of St. Clair in Illinois, situated about 14 miles S.E. of St. Louis on a rising ground, in the midst of a fertile district. It is a thriving commercial and manufacturing city, well supplied with water, and in the immediate neighborhood of coal deposits. Its industrial establishments comprise breweries, flour-mills, distilleries, foundries, and a woollen factory, and it possesses a court-house, banks, a high school and a convent for the education of young ladies. Population, 15,360.

BELLEVILLE, a town in the province of Ontario, Canada, in Hastings county, with a population in 1890 of 11,000. It is situated at the mouth of the river Moira, on the bay of Quinte, and is an important shipping point. It has several newspapers, nine churches, breweries, distilleries, and many factories, the output of which extends over a wide range of articles, and is daily growing in importance and value.

BELLEY, the capital of an arrondissement in the department of Ain, France, is situated near the Rhone, 39 miles east of Lyons.

BELLINI, the name of an honorable Venetian family. Three members of this family fill a great place in the history of the Venetian school of painting in the fifteenth century and at the beginning of the sixteenth. The first distinguished member of this noted family was—

1. JACOPO BELLINI. When Gentile da Fabriano, one of the most refined and accomplished of the religious painters of the Umbrian Apennines, came to practice at Venice, where art was backward, several young men of the city took service under him as pupils. Among these were Giovanni and Antonio of Murano, and Jacopo Bellini. The Umbrian master left Venice for Florence in 1422, and the two brothers of Murano stayed behind and presently founded a school of their own. (See VIVARINI.) But Jacopo Bellini followed his teacher to Florence in the capacity of *famulus*. It was the time when a new spirit had just broken out in Florentine art, and when the leaders of that school—Ghiberti and Donatello, Andrea del Castagno, Paolo Uccello, Masaccio—had made immense progress in many ways at once,—in the science of anatomy and perspective, in classical grace and style, in the truth and sincerity of nature,—so that from them the young Venetian found much more to learn than even from his Umbrian teacher as to the possible perfections of the art. The little evidence left us proves that he made good use of his opportunities. But his works are as rare as the events of his life, after his service in Florence with Gentile da Fabriano, are uncertain. That service presently got him into trouble. The Umbrian, as a stranger coming to paint in Florence, was jealously looked on. One day a group of young Florentines took to throwing stones at his shop, and the Venetian pupil ran out and put them to flight with his fists. Thinking this might be turned against him, he went and took service on board the galleys of the Florentine state; but, returning after a year, he found he had in his absence been tried for assault and condemned in a heavy fine. He was arrested and put in prison, but the matter was afterwards compromised upon a public act of penance to which Jacopo submitted. Whether he accompanied his master to Rome in 1426 we cannot tell, but there is evidence to show that he was practising on his own account in Venice in 1430, and probably as soon as 1427. Neither can we fix the date of his marriage; but it was probably about the time of his return to his native state, for we know that he had grandchildren before 1458. The remainder of his life was spent between Venice, Verona, and Padua. At Venice, besides other work, he painted a great series from the lives of Christ and the Virgin in the church of St. John the Evangelist. This has entirely perished. In the cathedral of Verona there was, until it was destroyed by the barbarism of the 18th century, an important Crucifixion from his hand. In the archbishop's palace of the same city another Crucifixion still remains, but greatly injured. At Padua Jacopo appears to have lived several years, and to have founded there a school which became the rival of the school of Squarcione. There his sons, Gentile and Giovanni, grew up; there his daughter Niccolosia found a husband in Andrea Mantegna, the most famous of the scholars of Squarcione. (See MANTEGNA.) In Jacopo Bellini the Venetian school had not yet found its special and characteristic manner. But he holds a position of great importance, as having been the first to fertilize Venetian soil with the science and genius of Florence. From no extant pictures of his can his manner be judged so well as from the book of his sketches, which has become the property of the British Museum. This, in spite of fading and decay, is a unique and invaluable possession, containing a vast number of original studies tinted or drawn with pen or ink, and including compositions from Scripture and the lives of the saints, from classical fable, and from natural history in surprising variety.

2. GENTILE BELLINI was the elder of the two sons of Jacopo. To the precise date of his birth we have no clue. Both he and his brother Giovanni served together under their father Jacopo as his pupils as long as he lived. After his death each of them practised his art independently in their native city; but a warm and unbroken affection is recorded to have always subsisted between the brothers. In 1479 the Sultan Mahomet

sent word to the Signoria of Venice that he desired the services at Constantinople of a good painter of their state, at the same time inviting the doge to the wedding of his son. The doge declined to go, but the Signoria chose Gentile Bellini to be sent with two assistants at the expense of the state and to paint for the Turk, first electing his younger brother Giovanni to fill his place in the works at the Ducal Palace until he should return. He was admirably received, and painted the portraits of the sultan and many of his officers, besides that picture of the reception of a Venetian embassy by the grand vizier which is now at the Louvre (No. 68). It is a well-known and doubtful story how the sultan alleged that a picture of Gentile's showed an imperfect knowledge of the appearance of the muscles of the neck after decapitation, and to convince the painter had a slave decapitated in his presence, and how this made Gentile uncomfortable and anxious to get away. He returned at the end of 1480, bringing gifts and honors; and from that time he and Giovanni were engaged together for the state on the decoration of the great hall. Gentile painted there four great subjects from the story of Barbarossa, which unhappily perished in the fire of 1577. It is recorded that in 1486 the young Titian entered his workshop as a pupil. Three of the most important of his works date from the last five or six years of the century, and were done for the school of St. John the Evangelist at Venice. He died on the 23d February 1507. It is by his science and spirit in the treatment of animated and dignified processional groups, with many figures and architecture of masterly perspective, that we chiefly know Gentile Bellini.

3. Giovanni Bellini. His birth it is no less impossible to fix with accuracy than that of his brother. His earliest work, done at Padua, shows strongly the stern influence of his brother-in-law Andrea Mantegna. The National Gallery has a Christ on the Mount, painted by Giovanni, probably about 1455, and apparently in direct competition with a picture of the same subject by Mantegna himself, similarly conceived, which belongs to the Baring Gallery. The characteristics of the style formed at Padua by Mantegna and Giovanni Bellini, and maintained by the former all his life, are a great intensity and vehemence of expression, an iron severity and unmatched firmness and strength of draughtsmanship; a tendency, in draperies, to imitate the qualities of sculpture; a love of the difficulties of perspective; a leaning towards the antique, which these masters learned to transform and reanimate with a more passionate energy and an austerer strength of their own. Of the two, Bellini is always the more reserved and simple, the more inclined to work from nature and the less from the antique, and he has the richer choice in color; but there are works in which they are indistinguishable. It is probable that the famous picture of the Circumcision now at Castle Howard, which was repeated more than once by the master himself, and many times over by his pupils and assistants, was painted before this date. The altar pieces on a great scale, which are the noblest monument of his middle period, were certainly painted after it. Of these the chief were the Virgin and Saints, in a chapel of the church of Saints Giovanni and Paolo at Venice, which perished along with Titian's Peter Martyr in the fatal fire of 1867; a great Coronation of the Virgin, in the church of St. Dominic at Pesaro; a Transfiguration, now in the museum of Naples; a Virgin and Saints, painted for the church of S. Giobbe, now in the Academy at Venice (No. 36). These, and the multitude of Madonnas and other devotional pictures painted by Giovanni Bellini during the thirty years following his change of manner and adoption of the oil medium, are among the noblest products of the religious art of the world. They stand alone in their union of splendor with solemnity; they have the manful energy of Mantegna without his harshness, and the richness of Giorgione without his luxury. Succeeding pictures show an increase of this richness, and a character more nearly tender. In 1506, when Albert Dürer visited Venice, where he was subject to some annoyances, he found the noble old man not only the most courteous of the Venetian artists in his reception of a stranger, but the best in his profession.

BELLINI, Lorenzo, physician and anatomist, was born at Florence in 1643, and died in 1703, in the sixtieth year of his age.

BELLINI, Vicenzo, one of the most celebrated operatic composers of the modern Italian school, was born at Catania in Sicily, November 3, 1802. He was descended from a family of musicians, both his father and grandfather having been composers of some reputation. After having received his preparatory musical education at home, he entered the conservatoire of Naples, where he studied singing and composition under Tritto and Zingarelli. He soon began to write pieces for various instruments, as well as a cantata and several masses and other sacred compositions. His first opera, *Adelson e Savina*, was performed in 1824 at a small theatre of Naples; his second dramatic work, *Bianca e Fernando*, saw the light two years later at the San Carlo theatre of the same city, and made his name known in Italy. His next work, *Il Parata*, was written for the celebrated Scala theatre in Milan, to words by Felice Romano, with whom Bellini formed a union of friendship to be severed only by his death. The splendid rendering of the music by Tamburini, Rubini, and other great Italian singers, contributed greatly to the success of the work, which at once established the European reputation of its composer. Almost every year of the short remainder of his life witnessed the production of a new operatic work, each of which was received with rapture by the audiences of France, Italy, Germany, and England, and some of which retain their place on the stage up to the present day. We mention the names and dates of four of Bellini's operas familiar to most lovers of modern Italian music, viz.:—*I Montechi e Capuleti* (1829), in which the part of Romeo has been a favorite with all the great contraltos for the last seventy years; *La Somnambula* (1831), *Norma*, Bellini's best and most popular creation (1832), and *I Puritani* (1834), written for the Italian opera in Paris, and to some extent under the influence of French music. In 1833 Bellini had left his country to accompany to England the great singer Pasta, who had created the part of his *Somnambula*. In 1834 he accepted an invitation to write an opera for the national Grand Opera in Paris. While he was carefully studying the French language and the cadence of French verse for the purpose, he was seized with a sudden illness and died at his villa in Puteaux near Paris, September 21, 1835. This unexpected interruption of a career so brilliant sheds, as it were, a gloom of sadness over the whole of Bellini's life, a sadness which, moreover, was foreshadowed by the character of his works. His operatic creations are throughout replete with a spirit of gentle melancholy, frequently monotonous and almost always undramatic, but at the same time irresistibly sweet, and almost disarming the stern demands of higher criticism which otherwise would be compelled to reprove the absence of both dramatic vigor and musical depth. To the feature just mentioned, combined with a rich flow of *cantilena*, Bellini's operas owe their popularity, and will owe it as long as the audiences of our large theatres are willing to tolerate outrages on rhyme and reason if sung by a beautiful voice to a pleasing tune. In so far, however, as the defects

of Bellini's style are characteristic of the school to which he belongs, they fall to be considered in a general treatment of the whole subject. See MUSIC.

BELLINZONA, or BELLENZ, one of the three towns which are the capital in turn of the Swiss canton of Tessin or Ticino. Bellinzona was in existence at least as early as 1242, when it was conquered by Otto Visconti. It was long an object of contest between the Swiss and the Milanese; it finally passed into the hands of the three cantons of Uri, Unterwalden, and Schwyz after the battle of Marignano in 1515.

BELLMAN, KARL MIKAEL, the greatest lyrical poet of Sweden, was born at Stockholm on the 4th of February 1740. His father, who held a responsible official position, was descended from a family that had already distinguished itself in the fine arts; his mother, a gifted and beautiful woman, early instructed him in the elements of poetry and music. When quite a child he suddenly developed his extraordinary gift of improvising verse, during the delirium of a severe illness, weaving wild thoughts together lyrically, and singing airs of his own composition. From this time he gave himself up to the poetic art, and received great encouragement from the various eminent men who met round his father's table, among whom was Dalin, the favorite poet of the day. As early as 1757 he published a book of verse, a translation of Schweidnitz's *Evangelical Thoughts of Death*, and for the next few years wrote a great quantity of poems, imitative for the most part of Dalin. In 1760 appeared his first characteristic work, *The Moon*, a satirical poem, which was revised and edited by Dalin. But the great work of his life occupied him from 1765 to 1780, and consists of the collections of dithyrambic odes known as *Fredman's Epistles* and *Fredman's Songs*. These were not printed until 1790. The mode of their composition was extraordinary. No poetry can possibly smell less of the lamp than Bellman's. He was accustomed, when in the presence of none but confidential friends, to announce that the god was about to visit him. He would shut his eyes, take his zither, and begin to improvise a long Bacchic ode in praise of love or wine, and sing it to a melody of his own invention. The genuineness of these extremely singular fits of inspiration could not be doubted. The poems which Bellman wrote in the usual way were tame, poor, and without character. The *Fredman's Epistles* glow with color, ring with fierce and mysterious melody, and bear the clear impress of individual genius. These torrents of rhymes are not without their method; wild as they seem, they all conform to the rules of style, and among those that have been preserved there are few that are not perfect in form. The odes of Bellman breathe a passionate love of life; he is amorous of existence, and keen after pleasure, but under all the frenzy there is a pathos, a yearning that is sadder than tears. The most dissimilar elements are united in his poem; in a bacchanal hymn the music will often fade away into a sad elegiac vein, and the rare picturesqueness of his idyllic pictures is warmed into rich color by the geniality of his humor. He is sometimes frantic, sometimes gross, but always ready, at his wildest moment, to melt into reverie. A great Swedish critic has remarked that the voluptuous joviality of Bellman is, after all, only "sorrow clad in rose-color," and this underlying pathos gives his poems their undying charm. His later works, *The Temple of Bacchus*, a journal called *What you Will*, a religious anthology entitled *Zion's Holiday*, and a translation of Gellert's *Fables*, are comparatively unimportant. He died on the 11th of February 1795. Several statues exist of Bellman. One represents him naked, crowned with ivy, and striking the guitar; the best is the splendid colossal bust by Byström, which adorns the public gardens of Stockholm, which was erected by the Swedish Academy in 1829. Bellman had a grand manner, a fine voice, and great gifts of mimicry, and was a favorite companion of King Gustavus III. The best edition of his works is one lately published at Stockholm, edited by J. G. Carlén.

BELLONA, in *Roman Mythology*, the goddess of war, corresponding to the Greek Enyo, and called now the sister or daughter of Mars, now his charioteer or his nurse. Her worship appears to have been promoted in Rome chiefly by the family of the Claudii, whose Sabine origin, together with their use of the name of "Nero," has suggested an identification of Bellona with the Sabine war goddess Nerio.

BELLOT, JOSEPH RENÉ, one of the heroes and victims of Arctic exploration, was born at Paris, March 18, 1826. At the age of fifteen he entered the Naval School, in which he studied two years, and earned a high reputation. He distinguished himself in the French expedition of 1845 against Tamatave in Madagascar; and although he was not yet twenty he received the cross of the Legion of Honor at the close of that year. He was afterwards attached to the staff of the station, was promoted to the rank of *Enseigne de Vaisseau* in November 1847, and in 1851 obtained permission to join the English expedition then preparing to go out, under the command of Captain Kennedy, in search of Sir John Franklin. On this occasion he displayed great courage, presence of mind, and self-devotion, rendered important services, and made the discovery of the strait, which bears his name, between Boothia Felix and Somerset Land. Early in 1852 he was promoted lieutenant. In the same year he accompanied, as a volunteer, the expedition sent out by the English Government under Captain Inglefield on the same quest. His intelligence, his devotion to duty, and his courage won him the esteem and admiration of all with whom he was associated. While making a perilous journey with two comrades across the ice, for the purpose of communicating with Captain Inglefield, he was overtaken by a storm, August 21, and being blown into an opening between the broken masses of ice was seen no more. A pension was granted to his family by the Emperor Napoleon III., and an obelisk was erected to his memory in front of Greenwich Hospital.

BELLOWS AND BLOWING-MACHINES are machines for producing a current of air, chiefly in order to assist the combustion of a fire.

The common bellows now in use probably represents one of the oldest contrivances for this purpose. It consists of two flat boards, of oval or triangular shape, connected round their edges by a piece of leather so as to form an air chamber. The leather is kept from collapsing, on separation of the boards, by two or more hoops, which act like the ribs in animals. The lower board has a hole in its centre covered inside by a leather flap or valve opening inwards; it has also fastened to it a metal pipe or nozzle, of smaller aperture than the valve. On raising the upper board, the air from without lifts the valve and enters the cavity; then on pressing down the top board, this air is compressed, shuts the valve, and is driven through the pipe with a velocity corresponding to the pressure.

The blast here is, of course, not continuous, but in puffs,—a certain interval being needed for refilling the bellows after each discharge. This drawback was remedied by the invention of double bellows. To understand their action, it is only necessary to conceive an additional board with valve, like the lower board of the single bellows, attached by leather under this lower board. Thus two similar cavities are obtained, separated by the lower board of what was the single

bellows. The lowest board is held down by a weight, and another weight presses the top board. When the lowest board is raised it forces the air into the upper cavity, and the valve of the middle board prevents return of this air. The lowest board being then depressed, air enters the lower cavity from without, and this in its turn is next forced into the upper cavity. The weighted top board is meanwhile continuously pressing the air of the upper cavity through the nozzle. While the blast thus obtained is continuous, it is not wholly free from irregularities.

By a simple arrangement for altering the diameter of the pipe the force of the blast may be varied.

The blowing-machines now almost exclusively used for blast furnaces are of the cylinder and piston type (which is the principle adopted, it may be remarked, in a small hand bellows used by the Chinese). At first the blowing cylinders were single-acting, that is to say, they had the power of propelling a blast only when the piston was moving in one direction. With two or more of these blowing cylinders attached to one crank-shaft, worked by a water-wheel, a tolerably steady pressure of air was obtained. But in these and other respects considerable progress has been realized.

The cylinder-engines of the present day (which are generally driven by steam) may be classed in two chief systems, according as the cylinder is placed horizontally or vertically. In the former case the steam and blast cylinders are usually in one line, the same rod carrying the pistons of both, and being guided on both sides, while a fly-wheel is employed as regulator. In the vertical systems the steam and blowing cylinders are sometimes similarly connected, but, in the larger engines, they are generally placed one at each end of a beam connecting their pistons. The vertical engines have been most popular in England and in some parts of the Continent (as Silesia), but the other type (almost exclusively used in Westphalia and on the Rhine) is now adopted in several English works.

Where it is desirable to make small blast engines do the work of large ones, compensating smallness of size with velocity, it becomes necessary that the air valves be moved otherwise than by the simple action of the air itself. The best form of such an arrangement is that devised by Mr. Slate, in which there is an annular slide valve placed outside the blast cylinder; it receives its motion from a crank connected with the fly-wheel shaft. Thus, with lap and lead of the valve properly proportioned, a high velocity can be attained, and the tremor and jar that are observable in some of the larger engines are entirely absent. Two such engines working together, with their cranks at right angles, give such a uniform blast that no regulator of any kind is needed.

The blast engines with slide valves, however, have not proved so advantageous in practice as was anticipated, owing to the large amount of friction on the valve surfaces, greater liability to derangement, and the wear and tear resulting from such rapid motion.

Another kind of blowing engine, in which water is employed, is that invented by Mr. Street; in its simpler form it consists of a barrel-shaped vessel, supported horizontally by the two ends of its axis. The cylinder is divided longitudinally by a plane extending from the middle of the internal surface above (the barrel being in its position of rest) to near the opposite side. Suppose the cylinder partly filled with water and made to turn a little way round on its axis, the air on one side will be compressed by the water, while that on the other will be rarefied. A valve opening outwards from the condensed side admits the air to a cavity from which a nozzle pipe proceeds, while a valve opening inwards on the rarefied side admits external air. With additional and corresponding valves, the process is repeated on the reverse oscillation of the cylinder. Thus by swinging the cylinder from side to side, by a crank and rod connected with the engine, alternate puffs of air are propelled into a regulative air chest of special construction. which then supplies a steady blast.

Fan-blast machines are frequently employed, especially to urge the fire of steam boilers, and in puddling and reheating, and in the cupola furnaces where antracite is burnt, or coke used for remelting pig-iron in foundries. In one common form the fan consists of four spokes of a rimless wheel, tipped with vanes and made to rotate in a cylindrical chest, in which it has often a slightly eccentric position. There are openings on both sides round the spindle for admission of air, which, sucked in by the centrifugal action of the fan as it quickly rotates, flows towards the vanes, and is driven through an exit pipe attached to another part of the cylinder.

The rotary blower, invented by Messrs. Root of Connersville, Ind., is one which has of late years found extensive use both in America and Europe. The arrangement differs in some essential features from that of the ordinary fan; it acts by regular displacement of the air at each revolution.

BELLOWS FALLS, a town of Windham county, Vt., on the Connecticut river, 100 miles south of Montpelier. It has considerable manufactures of paper, woolen goods and agricultural implements, power being derived from the river, which at this point has a fall of forty-two feet. It contains a national bank, a newspaper office, and five churches. Population, 3,000.

BELLUNO, the ancient *Belunum*, is the capital of a province of Northern Italy, and the seat of a bishop, situated at the confluence of the Piave, and the Ardo. Population, 15,509.

BELMONT, formerly called Pittsburgh Landing, a town of Missouri, on the west bank of the Mississippi river, near the mouth of the Ohio, noted as the scene of a sanguinary battle between the Confederate and Union forces, in the early part of the war of the rebellion, known as General Grant's first battle in that struggle. The Confederate forces under General Polk were defeated, but the losses of killed, wounded and captured on both sides were about even.

BELOIT is an enterprising and thriving city of Rock county, Wis., situated on the Rock river, ninety miles west-northwest of Chicago, and twelve miles south of Janesville. It is well built, with wide streets and some fine public buildings, and stands on high ground. There are two national banks, nine churches, several schools, and a newspaper office. Beloit contains several paper mills, machine shops, and manufactories of reaping and mowing machines. It is the seat of Beloit College (Congregational), which was founded in 1847, and has some 200 students. Population (1890), 6,276.

BELON, PIERRE, French naturalist, was born about 1517 at the hamlet of Soulletière, in Maine. Belon, who was highly favored both by Henry II. and by Charles IX., was assassinated one evening in April 1564, when coming through the Bois de Boulogne. Besides the narrative of his travels he wrote several scientific works of considerable value.

BELPASSO, a town of Sicily, on the slopes of Etna, in the province of Catania, and about 8 miles from the city of that name. Population, 7620.

BELPER, a market-town of Derbyshire, situated on the banks of the Derwent, which is here crossed by a stone bridge. It is 7 miles north of Derby, on the Midland Railway. Population, 9,000.

BELSHAM, THOMAS, a Unitarian clergyman, was born at Bedford in 1750. In 1805 he was appointed to

the Essex Street chapel, where he remained till his death in 1829. His most popular work was the *Evidences of Christianity;* the most important was his translation and exposition of the Epistles of St. Paul. Belsham was one of the most vigorous and able writers on the Unitarian side.

BELSHAM, WILLIAM, brother of the preceding, was born in 1752, and died in 1827. His productions were mainly historical and political writings, advocating the politics of the Whig party.

BELSHAZZAR, the name of a Babylonian prince mentioned in the book of Daniel. According to the account in the fifth chapter of Daniel, Belshazzar was king of Babylon at the time of the capture of the city by the Medes and Persians, and was slain when the city was surprised during a festival. No ancient historian mentions the name of Belshazzar among the successors of Nebuchadnezzar, and there has been considerable controversy as to the identity of the unfortunate monarch. The successors of Nebuchadnezzar, according to the copyists of Berosus, were as follows :— Evil-merodach, two years, son of Nebuchadnezzar; Neriglissar, or Nergalsharezer, four years, son-in-law of Nebuchadnezzar; Laborosoachod, nine months, son of Neriglissar; Nabonidus, seventeen years, not of the royal family; Niebuhr and some others identified Belshazzar with Evil-merodach; other scholars with Neriglissar; and a third section, including Ewald and Browne, identified him with Nabonidus. There is no necessity now to argue against these and similar views, as they are set aside by the Babylonian cuneiform inscriptions, which show that Bel-sar-uzur, or Belshazzar, was the name of the eldest son of Nabonidus, the last king of Babylon. In some of his latter inscriptions Nabu-nahid or Nabonidus mentions his eldest son Bel-sar-uzur in such terms as to lead to the impression that the young prince was associated with himself on the throne; and this explains several difficulties between the historians and the book of Daniel with respect to the capture of Babylon. After the defeat of the Babylonian forces Nabonidus fled to Borsippa, while the young prince Belshazzar was left in charge of Babylon, the capital, which was closely besieged by the Medes and Persians. The historians all say that Nabonidus, the last king of Babylon, submitted to the conquerors at Borsippa after the taking of his capital, while the book of Daniel states that Belshazzar was slain on the night of the capture of Babylon. These two statements have been supposed to contradict each other, but we now know that they refer to two totally distinct princes whose fates were quite different.

BELT, GREAT, and LITTLE BELT, two straits which connect the Baltic Sea with the Cattegat.

BELTANE, or BELTEIN, a festival originally common to all the Celtic peoples, of which traces were to be found in Ireland and the Highlands of Scotland down to the beginning of the present century. The name is compounded of *bel* or *beal*, the Celtic god of light, and *tin* or *tine*, meaning fire. The principal Beltane celebration was held annually in the beginning (generally on the first day) of May, though the name is also applied to a similar festival which occurred in the beginning of November.

BELTON, the county seat of Bell county, Tex., is situated on the Leon river, sixty miles northeast of Austin. It contains two banks, two newspaper offices, eight churches and good schools. Population, 5,000.

BELTS and BELTING. Flexible belts for the transmission of motive power in machinery are made of leather, india-rubber, cotton, woven hair, canvas, gutta percha, and most of the textile fabrics. Leather belts are prepared from the best oak or hemlock-tanned leather, the strips being joined by riveting or lacing. India-rubber belting is formed of several plies of cotton duck or canvas, overspread with rubber composition.

BELUCHISTAN. See BALUCHISTAN.

BELUGA, the WHITE WHALE, is of the dolphin family, and closely related to the narwhal. It ranges from ten to twelve feet in length, feeds on fish and is killed by the Greenlanders for its oil. It inhabits the Arctic seas but is often found as far south as the mouth of the St. Lawrence. See CETACEA and DOLPHIN.

BELVEDERE, a town of Italy, in the province of Calabria Citra, on the Mediterranean, 32 miles northwest of Cosenza.

BELVIDERE, the capital of Boone county, Ill., is situated on the Kishwaukee river, seventy-eight miles west-northwest of Chicago, and has good railroad communications. It contains two banks, eleven churches, graded schools, flouring mills, a plow factory, and manufactories of boots and shoes, and agricultural implements. Population (1890), 3,863.

BELZONI, GIOVANNI BATTISTA, one of the most enterprising and successful Egyptian explorers, was born of humble parantage at Padua in 1778. When about eighteen years of age he appears to have removed to Rome, and for a short time became a monk. In 1798 the occupation of the city by the French troops drove him from Rome. He wandered through Holland, and in 1803 went to England. In 1812 he set out on his travels, passing through Lisbon and Madrid to Egypt. He visited Thebes and removed with great skill the colossal statue, commonly called young Memnon, which he shipped to England. He also visited Elephantina and Philæ, discovered the temple Abusimbel, made excavations at Carnac, and opened up a splendid tomb in the Beban-el-Molouk. He was the first to penetrate into the second great pyramid of Ghizeh, and the first to visit the oasis west of Lake Mœris. In 1819 he returned to England and published in the following year a most interesting account of his travels and discoveries. In 1823 he again set out for Africa, intending to penetrate to Timbuctoo. He reached Benin, but was seized with dysentery at a village called Gato, and died December 3, 1823.

BEM, JOSEPH, born in Galicia in 1795, took an active part in the Polish insurrection of 1830–31, and fled to France on its failure. In 1848 he joined the Hungarians and commanded the army of Transylvania against the Austrian forces, whom he defeated in several engagements. He was finally driven into Turkey, embraced Islam and took service under the Sultan. He died at Aleppo, December 10, 1850.

BEMBO, PIETRO, Cardinal, was born at Venice on the 20th of May 1470. While still a boy he accompanied his father to Florence, and there acquired a love for that Tuscan form of speech which he afterwards cultivated in preference to the dialect of his native city. Having completed his studies, which included two years' devotion to Greek under Lascaris at Messina, he chose the ecclesiastical profession. The offer of a cardinal's hat by Pope Paul III. took him in 1539 again to Rome, where he renounced the study of classical literature and devoted himself to theology and classical history, receiving before long the reward of his conversion in the shape of bishoprics of Gubbio and Bergamo. He died on the 18th of January 1547.

BENARES, a division, district, and city of British India, under the jurisdiction of the Lieutenant-Governor of the N.W. provinces. It is bounded on the N. by Oudh, the Duáb, and Bundelkhand; on the E. by Nepál; on the S. by Bengal; and on the W. by Ríwa. It comprises the districts of Mirzápur, Gházípur, Azimgarh, Bastí, and Gorakhpur; has an area of 18,314 square miles; and a total population of 8,178,147.

BENARES, a DISTRICT of British India, in the division of the same name, under the jurisdiction of the Lieutenant-Governor of the N.W. Provinces, lies between 25° 7′ and 25° 32′ N. lat., and 82° 45′ and 83° 38′ E. long. It is bounded on the N. by the British district of Jaunpur, on the N.E. by Gházípur, on the S.E. by Sháhábád, on the S. and S.W. by Mirzápur, and on the W. by Mirzápur and Jaunpur. The surface of the country is remarkably level, with numerous deep ravines in the calcareous conglomerate. This substratum when burnt affords good lime, and forms an excellent material for roads in its natural state. The soil is a clayey or a sandy loam, and very fertile, except in the tracts called Usur, which are impregnated with soda, nitre, and other salts.

From a very remote period Benares formed the seat of a Hindu kingdom, said to have been founded by one Kási Rájá, 1200 years B.C. Subsequently it became part of the kingdom of Kanauj, which in 1193 A.D. was conquered by Muhammad of Ghor. On the downfall of the Pathán dynasty of Dehli, about 1599, it was incorporated with the Mughul empire. On the dismemberment of the Dehli empire it was seized by Safdar Jang, the Nawáb Vazír of Gudh, by whose grandson it was ceded to the East India Company by the treaty of 1775. The subsequent history of Benares contains two important events,—the rebellion of Chait Sinh, occasioned by the unjust demands of Warren Hastings for money to carry on the Marhattá war; and the mutiny of the Native regiments in 1857, on which occasion the energy and coolness of the European officials (chiefly of General Neill) carried the district successfully through the storm.

BENARES, the most populous city in the North-Western Provinces, and the headquarters of the commissioner of the division, is situated on the north bank of the Ganges, in 25° 7′ N. lat. and 83° 4′ E. long. According to the census of 1888, the population amounted to 175,188, viz., 89,763 males, and 85,425 females,—133,549, or 76.23 per cent. being Hindus; 41,374, or 23.77 per cent., Mahometans; others, 265. Gross municipal income in 1888, £16,069; expenditure, £14,331; average rate of municipal taxation, 1s. 10d. per head.

The town of Benares—the religious centre of Hinduism—is one of the most ancient cities on the globe. The Rev. Mr. Sherring, in his *Sacred City of the Hindus* (1868), states—"Twenty-five centuries ago, at the least, it was famous. When Babylon was struggling with Nineveh for supremacy, when Tyre was planting her colonies, when Athens was growing in strength, before Rome had become known, or Greece had contended with Persia, or Cyrus had added lustre to the Persian monarchy, or Nebuchadnezzar had captured Jerusalem and the inhabitants of Judea had been carried into captivity, she had already risen to greatness, if not to glory. Nay, she may have heard of the fame of Solomon, and have sent her ivory, her apes, and her peacocks to adorn his palaces; while partly with her gold he may have overlaid the temple of the Lord." Hiouen Thsang, the celebrated Chinese pilgrim, visited Benares in the 7th century A.D., and described it as containing thirty Buddhist monasteries, with about 3000 monks, and about a hundred temples of Hindu gods. Even after the lapse of so great a time the city is still in its glory, and as seen from the river it presents a scene of great picturesqueness and grandeur. The Ganges here forms a fine sweep of about 4 miles in length, the city being situated on the outside of the curve, on the northern bank of the river, which is the most elevated. It is about 3 miles in length, by 1 in breadth, rising from the river in the form of an amphitheatre, and is thickly studded with domes and minarets. The bank of the river is entirely lined with stone, and there are many very fine *ghâts* or landing-places built by pious devotees, and highly ornamented. These are generally crowded with bathers and worshippers. Shrines and temples line the bank. The internal streets are so winding and narrow that there is not room for a carriage to pass, and it is difficult to penetrate them even on horseback. Their level is considerably lower than the ground-floors of the houses, which have generally arched rows in front, with little shops behind them; and above these they are richly embellished with verandahs, galleries, projecting oriel windows, and very broad overhanging eaves supported by carved brackets. The houses are built of Chanár stone, and are lofty—none being less than two stories high, most of them three, and several five or six stories. The Hindus are fond of painting the outside of their houses a deep red color, and of covering the most conspicuous parts with pictures of flowers, men, women, bulls, elephants, and gods and goddesses in all the multiform shapes known in Hindu mythology. The number of temples is very great; they are mostly small, and are placed in the angles of the streets, under the shadow of the lofty houses. Their forms are not ungraceful, and many of them are covered over with beautiful and elaborate carvings of flowers, animals, and palm branches, rivalling in richness and minuteness the finest specimens of Gothic or of Grecian architecture.

Benares, having from time immemorial been a holy city, contains a vast number of Bráhmans, who either subsist by charitable contributions, or are supported by endowments in the numerous religious institutions of the city. Hindu religious mendicants, with every conceivable bodily deformity, literally line the principal streets on both sides. Some have their legs or arms distorted by long continuance in one position; others have kept their hands clenched until the finger nails have pierced entirely through their hands. But besides an immense resort to Benares of poor pilgrims from every part of India, as well as from Thibet and Burmah, numbers of rich Hindus, in the decline of life, retire thither to pass the remainder of their days, or temporarily to wash away their sins in the sacred water of the Ganges. These devotees lavish large sums in indiscriminate charity, and it is the hope of sharing in such pious distributions that brings together the concourse of religious mendicants from all quarters of the country.

Besides its religious interest, Benares is important as a wealthy city and a place of considerable trade; the bázárs are filled with the richest goods, and there is a constant bustle of business in all the principal streets. A large trade is carried on in the sugar, saltpetre, and indigo which are produced in the district. Silk and shawls are manufactured in the city; and Benares is especially famous for its gold embroidered cloths, called *Kinkáb* (Kincob), and for its gold filagree work.

BENAVENTE, a decayed town of Spain, in the province of Zamora, situated on a gentle eminence near the River Esla.

BENBOW, JOHN, English admiral, the son of a Shropshire gentleman, was born at Shrewsbury about 1650. He went to sea when very young, and at the age of thirty became master of a merchantman. When trading to the Mediterranean in 1686, he beat off a Sallee pirate with such bravery that James II., who took a keen interest in ships and seamen, made him captain of a man-of-war. On the accession of William III. he was employed to protect English commerce in the Channel, a duty which he vigilantly discharged. After taking part with great intrepidity in the bombardment of St. Malo (1693), and superintending the blockade of Dunkirk (1696); he sailed in 1698 for the West Indies,

where he compelled the Spaniards to restore several English vessels which they had seized. On his return he was appointed vice-admiral, and was frequently consulted by the king. In 1701 he was sent again to the West Indies, a station declined by his seniors from fear of the French strength in these waters. In August 1702 his ship, the "Breda," gave chase off Santa Martha to a French squadron under Du Casse; and although unsupported by his consorts, he kept up a running fight for five days with the most stubborn courage. While boarding the sternmost French vessel he received two severe wounds; and shortly afterwards his right leg was shattered by a chain-shot, despite which he remained on the quarter-deck till morning, when the flagrant disobedience of the captains under him, and the disabled condition of his ship, forced him reluctantly to abandon the chase. After his return to Jamaica, where his subordinates were tried by court-martial, he died of his wounds on November 4, 1702. He possessed inflexible resolution and great naval skill, and secured his high rank through his unaided merits.

BENCH, or BANC, has various legal significations.

FREE-BENCH signifies that estate in copyhold-lands which the wife, being espoused a virgin, has, after the decease of her husband, for her dower, according to the custom of the manor. With respect with the free-bench different manors have different customs.

QUEEN'S BENCH is one of the three superior courts of Common Law at Westminster, the others being the Common Pleas and the Exchequer.

The Court of Common Pleas is sometimes called the COMMON BENCH.

Sittings in BANC (in the courts of Common Law) are the sittings of the full court for the hearing of motions, special cases, &c., as opposed to the *nisi prius*, sittings for trial of facts, where usually only a single judge presides.

BENCHERS, in the Inns of Court, the senior members of the society, who are invested with the government of the body to which they belong.

BENCOOLEN, the chief town of a Dutch residency in the S.W. of Sumatra. It is situated on the coast at the mouth of a river of the same name. The locality is low and swampy, and most of the houses are raised on bamboo piles. The bay is a mere open roadstead fringed with coral reefs, and landing is difficult on account of the surf. A lighthouse has been recently erected by the Dutch authorities. At one time there was a very extensive trade carried on with Bengal, the Coromandel coast, and Java, but it has greatly declined. The principal exports are pepper and camphor.

BENDER, a town of Russia, the capital of a district in the province of Bessarabia, situated on the right bank of the Dniester, 35 miles from Kisheneff. As early as the 12th century the Genoese had a settlement on the site of Bender. The Moldavians called the place Teegeen, and the name of Bender was only bestowed by the Turks in the end of the 14th century. In 1709 Charles XII., after the defeat of Poltava, collected his forces here in a camp which they called New Stockholm, and continued there till 1711. Bender was thrice taken by the Russians,— by Panim in 1770, Potemkin in 1789, and Meyendorf in 1806,— but it was not held permanently by Russia till the Bucharest peace of 1812.

BENDER-ABBASI, a town of Persia in the province of Kirman, on the northern shore of the Persian Gulf, about 12 miles N.W. of the island of Ormuz.

BENEDICT, ST., the founder of the celebrated Benedictine order, is the most illustrious name in the early history of Western monasticism. To him more than to any other the monastic system, which was destined to exercise such an influence for centuries, owes its extension and organization. Benedict was born at Nursia in Umbria, about the year 480. He belonged to an old Italian family, and was early sent to Rome to be educated. But the disorder and vices of the capital drove him into solitude while still a youth. It was a time of public peril and social ruin. The Roman empire was crumbling to pieces, shaken by the successive inroads of barbarians, and a prey to every species of violence and corruption. Young Benedict fled from the wickedness around him. He gave up his literary studies and preferred to be wisely ignorant. This is the statement of his biographer Gregory the Great, from whom come all the details that we know of Benedict's life.

When Benedict fled from Rome he took refuge in a solitary gorge formed by the Anio, in its picturesque course, about 40 miles from the city. There, in a dark inaccessible grotto near Subiaco, he found seclusion and shelter. A neighboring monk supplied him with food let down by a rope, with a small bell attached, which gave notice of the approach of the food. After spending about three years in retirement a neighboring convent of monks insisted upon choosing him as their head. He warned them of the severity of the rule he would be bound to exercise, but they would not be dissuaded from their purpose. He had hardly commenced his office, however, when they broke out into fierce resentment against him, and attempted to poison him. The attempt proved abortive, and Benedict, calmly reproving them for their ingratitude, left them and withdrew once more into his solitude.

By this time, however, the fame of Benedict had spread, and it was impossible for him to remain inactive. Multitudes gathered around him, and no fewer than twelve select cloisters were planted in the lonely valley of the Anio and on the adjacent heights. Young patricians from Rome and elsewhere were attracted to these fraternities; and amongst them one of the name of Maurus (St. Maur), who began to share in popular esteem something of the sanctity and miraculous endowments of Benedict, and who was destined to be his successor. But with increasing fame came also jealousy of his position and duties. A renewed attempt was made by an envious priest to administer poison to the saint; and, miraculous interpositions having again come to his rescue, the same priest, by name Florentius, had recourse to the diabolical device of sending seven lewd girls within the precincts of the monastery, to seduce the monks by their gestures and sports. Benedict determined to depart from a neighborhood so full of danger, notwithstanding the long period of thirty years during which he had labored to consecrate it and spread abroad the blessings of an ascetic Christianity. He journeyed southwards, and at length settled at Monte Cassino, an isolated and picturesque hill near the source of the Liris. There at this time an ancient temple of Apollo still stood, to which the ignorant peasants brought their offerings. Benedict, in his holy enthusiasm, proceeded to demolish the temple and to erect in its place two oratories, one to St. John the Baptist and the other to St. Martin, whose ascetic fame had travelled to Italy from the south of Gaul. Around these sacred spots gradually rose the famous monastery which was destined to carry the name of its founder through the Christian world, and to give its laws, as Milman says, "to almost the whole of Western monasticism."

Benedict survived fourteen years after he had began this great work. His sanctity and his influence grew with his years, in illustration of which it is now told how the barbarian king Totila, who made himself master of Rome and Italy, sought his presence, and, prostrating himself at his feet, accepted a rebuke for his

cruelties, and departed a humbler and better man. His last days were associated with the love and devotion of his sister Scolastica, who too had forsaken the world and given herself to a religious life with an enthusiasm and genius for government hardly less than his own. He died standing, after partaking of the holy communion, and was buried by the side of his sister.

The BENEDICTINES, or followers of St. Benedict, were those who submitted to the monastic rule which he instituted. This rule will be generally described in the article on MONASTICISM. It is sufficient here to say that its two main principles were labor and obedience. It was the distinction of Benedict that he not merely organized the monks into communities, but based their community-life, in a great degree, on manual labor, in contrast to the merely meditative seclusion which had hitherto been in vogue both in the East and the West.

BENEDICT. Fourteen Popes bore the name of Benedict —

BENEDICT I. (573–8) succeeded John III., and occupied the Papal chair during the incursions of the Lombards, and during the series of plagues and famines which followed these invasions. (Paul. Diacon. *De Gest. Longob.*, ii. 10.)

BENEDICT II. (684–685) succeeded Leo II., but although chosen in 683 he was not ordained till 684, because the leave of the Emperor Constantine was not obtained until some months after the election. (Paul. Diacon. *op. cit.* vi. 53.)

BENEDICT III. (855–858) was chosen by the clergy and people of Rome, but the election was not confirmed by the Emperor Lothair, who appointed an anti-pope, Anastasius. Benedict was at last successful, and the schism helped to weaken the hold of the emperors upon the popes. The mythical Pope Joan is usually placed between Benedict and his predecessor Leo IV.

BENEDICT IV. (900–903).

BENEDICT V. (964–965) was elected by the Romans on the death of John XII. The Emperor Otho did not approve of the choice, and carried off the pope to Hamburg, where he died.

BENEDICT VI. (972–974) was chosen with great ceremony and installed pope under the protection of the Emperor Otho the Great. On the death of the emperor the turbulent citizens of Rome renewed their outrages, and the pope himself was strangled by order of Crescentius, the son of the notorious Theodora.

BENEDICT VII. (975–983) belonged to the noble family of the counts of Tusculum, and governed Rome quietly for nearly nine years, a somewhat rare thing in those days.

BENEDICT VIII. (1012–1024), also of the family of Tusculum, was opposed by an anti-pope, Gregory, who compelled him to flee from Rome. He was restored by Henry of Saxony, whom he crowned emperor in 1014. In his pontificate the Saracens began to attack the southern coasts of Europe, and effected a settlement in Sardinia. The Normans also then began to settle in Italy.

BENEDICT IX. (1033–1056), the son of Alberic, count of Tusculum, and nephew of Benedict VIII., obtained the Papal chair by simony. He was deposed in 1044, and Sylvester was chosen in his stead. The result was a long and disgraceful schism (*cf.* Mittler *De Schismate in Eccl. Rom. sub Pontiff. Bened. IX.*)

BENEDICT X. (1058–9) scarcely deserves to be reckoned a pope. He reigned nine months. It is important, however, to remember that his election is one of the latest made by Roman factions, and under his successor the mode of election by the cardinals was adopted.

BENEDICT XI. (1303–1304) succeeded the famous Boniface VIII., but was unable to carry out his Ultramontane policy. He released Philip the Fair of France from the excommunication laid upon him by Boniface, and practically ignored the bull *Unam Sanctam*. The popes who immediately succeeded him were completely under the influence of the kings of France, and removed the Papal seat from Rome to Avignon.

BENEDICT XII. (1334–1342) succeeded Pope John XXII., but did not carry out the policy of his predecessor. He practically made peace with the Emperor Louis, and as far as possible came to terms with the Franciscans, who were then at war with the Roman see. He was a reforming pope, and tried to curb the luxury of the monastic orders, but without much success. (Baluze, *Vitæ Pontif. Avenion.*, i.)

BENEDICT XIII. Two popes assumed this title—(1). *Peter de Luna*, a Spaniard, who was chosen by the French cardinals on the death of Clement VII. in 1394. On the death of Urban V. in 1389 the Italian cardinals had chosen Boniface IX.; the election of Benedict therefore perpetuated the great schism. The greater portion of the church refused to recognize him, and in 1397 the French Church, which had supported him, withdrew from allegiance to both popes, and in 1398 Benedict was imprisoned in his own palace at Avignon. The Council of Constance brought this state of matters to an end. Benedict abdicated in 1417, but was recognized by Scotland and Spain until his death in 1424. His name does not appear in the Italian list of popes. (*Cf.* Dupuy, *Hist. du Schisme*, 1378–1428). (2.) *Vincenzo Marco Orsini*, who succeeded Innocent XIII. in 1724. He at first called himself Benedict XIV., but afterwards altered the title. He was a reforming pope, and endeavored to put down the luxury of the Italian priesthood and of the cardinalate. He died in 1730.

BENEDICT XIV. (1740–1758) belonged to a noble family of Bologna. Elected to the Papal chair at a time of great difficulties, chiefly caused by the disputes between Roman Catholic nations about the election of bishops, he managed to overcome most of them. The disputes of the Holy See with Naples, Sardinia, Spain, Venice, and Austria were settled. Perhaps the most important act of his pontificate was the promulgation of his famous laws about missions in the two bulls, *Ex quo singulari* and *Omnium solicitudinum*. In these bulls he denounced the custom of accommodating Christian words and usages to express heathen ideas and practices, which had been extensively done by the Jesuits in their Indian and Chinese missions. The consequence of these bulls was that the most of the so-called converts were lost to the church.

BENEFICE, a term first applied under the Roman empire to portions of land, the usufruct of which was granted by the emperors to their soldiers or others for life, as a reward or *beneficium* for past services, and as a retainer for future services. In imitation of the practice observed under the Roman empire, the term came to be applied under the feudal system to portions of land granted by a lord to his vassal for the maintenance of the latter on condition of his rendering military service; and such grants were originally for life only, and the land reverted to the lord on the death of the vassal. In a similar manner grants of land, or of the profits of land, appear to have been made by the bishops to their clergy for life, on the ground of some extraordinary merit on the part of the grantee. The validity of such grants was first formally recognized by the Council of Orleans, 511 A.D., which forbade, however, under any circumstances, the alienation from the bishoprics of any lands so granted. The next following Council of Orleans, 533, broke in upon this principle, by declaring that a bishop could not reclaim from his clergy any grants made to them by his predecessor, excepting in

cases of misconduct. This innovation on the ancient practice was confirmed by the subsequent Council of Lyons, 566, and from this period these grants ceased to be regarded as personal, and their substance became annexed to the churches, — in other words, they were henceforth enjoyed *jure tituli*, and no longer *jure personali*. How and when the term *beneficia* came to be applied to these episcopal grants is uncertain, but they are designated by that term in a canon of the Council of Mayence, 813.

The term benefice, according to the canon law, implies always an ecclesiastical office, but it does not always imply a cure of souls. It has been defined to be the right which a clerk has to enjoy certain ecclesiastical revenues on condition of discharging certain services prescribed by the canons, or by usage, or by the conditions under which his office has been founded.

BENEFIT OF CLERGY. This expression relates to a former condition of the law of England, which shows at once the power of the clerical element and the ignorance of the people. It meant, in effect, the almost total exemption of the clerical order from punishment by the secular authority, except in the notable instance of treason. Under the statute *Pro Clero* (1350) any priest or clerk who could read, and few save those in orders in those days possessed this amount of knowledge, could "plead his clergy" when indicted for felony, and was then delivered over to the ecclesiastical authorities. Of course his trial before the latter was a farce. The system was abolished in the reign of George IV.

BENEFIT SOCIETIES, associations for mutual benefit and for assistance in time of sickness or at death, are fully described under FRIENDLY SOCIETIES.

BENEKE, FRIEDRICH EDUARD a distinguished German psychologist, was born at Berlin on the 17th February 1798. He was educated under Bernhardt at the Gymnasium Fredericianum, and studied at the universities of Halle and Berlin. He directed his attention in the first instance to theology, coming under the influence of Schleiermacher and De Wette, but afterwards to pure philosophy, studying particularly English writers, and the German modifiers of Kantianism, such as Jacobi, Fries, and Schopenhauer. In 1820 he published his *Theory of Knowledge*, his *Empirical Psychology as the Foundation of all Knowledge*, and his inaugural dissertation *De Veris Philosophiæ Initis*. In all these writings appeared very strongly his fundamental view, that philosophical speculation must be limited to the facts of inner experience, and that a true psychology, which is the basis of all knowledge, must be formed by treating these facts according to the rigid methods of physical science. His marked opposition to the philosophy of Hegel, then dominant in Berlin, came to the front still more clearly in the short tract, *New Foundation of Metaphysics*, intended to be the programme for his lectures as *privat-docent*, and in the able treatise, *Groundwork of a Physic of Ethics*, written in direct antagonism to Kant's *Metaphysics of Ethics*, and attempting to deduce ethical principles from a basis of empirical feeling. In the same year (1822) his lectures were prohibited at Berlin, according to his own belief through the influence of Hegel with the Prussian authorities, who also prevented him from obtaining a chair from the Saxon Government. He retired to Göttingen, lectured there for some years, and was then allowed to return to Berlin. In 1832 he received an appointment as *Professor Extraordinarius* in the university, which he continued to hold till his death. On 1st March 1854 he disappeared from his home; and some months later his body was found in the canal near Charlottenburg. There was some suspicion that he had committed suicide in a fit of mental depression.

BENEVENTO, a city of Italy, the capital of a province, situated on a hill near the confluence of the Calore and the Sabato, 32 miles N.E. of Naples. The town is surrounded by walls, and was formerly defended by a castle of the 12th century, which now contains Government offices and a prison. It occupies the site of the ancient *Beneventum*, and is largely built of its ruins. Except Rome, few cities can boast of so many remains of antiquity. Of these the most beautiful and perfect is the arch of Trajan, erected in 114 A.D., 53 feet in height, and consisting of a single arch of Parian marble of the Corinthian order, highly ornamented with basso and alto relievos, which represent various events in the reign of that emperor. It now forms one of the gates of the city (*Porta Aurea*). Of the amphitheatre the remains, now known as *Grottoni di Mappa*, are in a very ruinous condition, and the arena is occupied by houses of a mean description. Benevento is the see of a bishop, and has a cathedral of the 12th century in the Lombardo-Saracenic style, in front of which is an Egyptian obelisk of granite covered with hieroglyphics. Among its other buildings may be mentioned the town-hall, the diocesan seminary, the lyceum, which was formerly a Jesuit college, and several hospitals. The principal manufactures are leather, parchment, and plated goods. A considerable trade is carried on in grain.

Beneventum, or, as it was originally called, Maleventum, seems to have been of Samnite foundation. In 268 B.C. it was colonized by the Romans, who had probably been in possession of it for some time. During the second Punic war two of the most important battles were fought in the neighborhood. It continued to be a very flourishing city till the close of the empire, and from its position on the *Via Appia*, it often comes into notice. About 545 A.D. it was sacked by Totila, but before long had recovered its prosperity. Being raised to the rank of a duchy by Alboin, king of the Lombards, it continued in possession of its own dukes till 1053, when the emperor, Henry III., who had rendered himself master of the city, exchanged it with Leo IX. for the bishopric of Bamberg. From that time it continued in Papal possession till 1806, when the Emperor Napoleon I. bestowed it, with the title of prince, on Talleyrand.

BENGAL (or, as it is often more precisely designated, "Lower Bengal"), the largest and most populous of the twelve local governments of British India, comprising the lower valleys and deltas of the Ganges and Brahmaputra, lies between 19° 18′ and 28° 15′ N. lat., and between 82° and 97° E. long. Excluding Assam, which was erected into a separate administration in February 1874, Bengal now includes the four great provinces of Bengal Proper, Behar, Orissa, and Chhotá or Chutiá Nágpur; and forms a Lieutenant-Governorship with an area of 203,473 square miles, and a population of 64,444,379 souls. Including Assam, which, until the spring of 1874, was a part of Bengal, the area was 248,231 square miles, and the population 66,856,859. This great lieutenant-governorship, excluding Assam, contains one-third of the total population of British India, and yields a revenue of £17,687,072, or over one-third of the aggregate revenues of the Indian empire. It is bounded on the N. by Assam, Bhután, and Nepál; on the S. by Burmah, the Bay of Bengal, and Madras; on the W. by an imaginary line running between it and the adjoining lieutenant-governorship of the North-Western Provinces, and by the plateau of the Central Provinces; and on the E. by the unexplored mountainous region which separates it from China and Northern Burmah. The territory, thus hemmed in, except at its north-western angle, by the unchangeable land-marks of nature, consists chiefly of two broad river

valleys. By the western one, the Ganges brings down the wealth and the accumulated waters of Northern India. The eastern valley forms the route by which the Brahmaputra, after draining the Thibetan plateau far to the north of the Himálayas, and skirting round their passes not far from the Yangtse-Kiang and the great river of Cambodia, ends its boisterous journey of 1800 miles. These valleys, although for the most part luxuriant alluvial plains, are diversified by spurs and peaks thrown out from the great mountain systems which wall them in on the north-east and south-west. They teem with every product of nature, from the fierce beasts and irrepressible vegetation of the tropics, to the stunted barley which the hill-man rears, and the tiny furred animal which he hunts within sight of the unmelting snows. Tea, indigo, turmeric, lac, waving white fields of the opium-poppy, wheat and innumerable grains and pulses, pepper, ginger, betel-nut, quinine and many costly spices and drugs, oil-seeds of sorts, cotton, the silk mulberry, inexhaustible crops of jute and other fibres; timber from the feathery bamboo and coronetted palm to the iron-hearted *sál* tree — in short, every vegetable product which feeds and clothes a people, and enables it to trade with foreign nations, abounds. Nor is the country destitute of mineral wealth. The districts near the sea consist entirely of alluvial formations; and, indeed, it is stated that no substance so coarse as gravel occurs throughout the Delta, or in the heart of the provinces within 400 miles of the river mouths. But amid the hilly spurs and undulations on either side, coal, and iron and copper ores, hold out a new future to Bengal, as capital increases under the influence of a stable government, and our knowledge of the country becomes more exact. The coal-fields on the west have for over a century been worked by English enterprise; in 1868 they yielded 564,933 tons, and more in the following years. In the east, the coal measures of Assam, which province was separated from Bengal in 1874, still await the opening out of the country and improved facilities of transport. The climate varies from the snowy regions of the Himálayas to the tropical vapor-bath of the Delta and the burning winds of Behar. The ordinary range of the thermometer on the plains is from about 52° Fahr. in the coldest month to 103° in the shade in summer. Anything below 60° is considered very cold; and by care in the hot weather the temperature of well-built houses rarely exceeds 95°. The rainfall also varies greatly; from 500 to 600 inches per annum at Chará Púnji (Cherra Poonjee) on the range between Silhet and Assam, to an average of about 37 inches in Behar, and about 65 inches on the Delta.

Rivers.—But the secret of the wealth of Bengal is its rivers. These untaxed highways bring down, almost by the motive power of their own current, the crops of Northern India to the sea-board,—an annual harvest of wealth to the trading classes, for which the population of the Lower Provinces neither toil nor spin. Lower Bengal, indeed, exhibits the two typical stages in the life of a great river. In the northern districts the rivers, like the English ones, run along the valleys, receive the drainage from the country on either side, absorb broad tributaries, and rush forward with an ever increasing volume. But near the centre of the provinces the rivers enter upon a new stage of their career. Their main channels bifurcate, and each new stream so created throws off its own set of distributaries to right and left. The country which they thus enclose and intersect forms the Delta of Bengal. Originally conquered by the fluvial deposits from the sea, it now stretches out as a vast dead level, in which the rivers find their velocity checked, and their current no longer able to carry along the silt which they have brought down from Northern India. The streams, accordingly, deposit their alluvial burden in their channels and upon their banks, so that by degrees their beds rise above the level of the surrounding country. In this way the rivers in the Delta slowly build themselves up into canals, which every autumn break through or overflow their margins, and leave their silt upon the adjacent flats. Thousands of square miles in Lower Bengal annually receive a top-dressing of virgin soil, brought free of expense a quarter of a year's journey from the Himálayas,—a system of natural manuring which renders elaborate tillage a mere waste of labour, and which defies the utmost power of over-cropping to exhaust its fertility. As the rivers creep further down the Delta, they become more and more sluggish, and their bifurcations and interlacings more complicated. The last scene of all is a vast amphibious wilderness of swamp and forest, amid whose solitude their network of channels insensibly merges into the sea. Here the perennial struggle between earth and ocean goes on, and all the ancient secrets of land-making stand disclosed. The rivers, finally checked by the dead weight of the sea, deposit their remaining silt, which emerges as banks or blunted promontories, or, after a years battling with the tide, adds a few feet, or, it may be, a few inches to the foreshore.

The Ganges, which enters on the western frontier, and runs diagonally across Bengal, gives to the country its peculiar character and aspect. About 200 miles from its mouth it spreads out into numerous branches, forming a large delta, composed, where it borders on the sea, of a labyrinth of creeks and rivers, running through the dense forests of the Sundarbans, and exhibiting during the annual inundation the appearance of an immense sea. At this time the rice fields to the extent of many hundreds of square miles are submerged. The scene presents to a European eye a panorama of singular novelty and interest;—rice fields covered with water to a great depth; the ears of grain floating on the surface; the stupendous embankments, which restrain, without altogether preventing, the excesses of the inundations; and peasants in all quarters going out to their daily work with their cattle in canoes or on rafts. The navigable streams which fall into the Ganges intersect the country in every direction, and afford great facilities for internal communication. In many parts boats can approach by means of lakes, rivulets, and water-courses, to the door of almost every cottage. The lower region of the Ganges is the richest and most productive portion of Bengal, abounding in valuable produce. Another mighty river by which Bengal is intersected is the Brahmaputra, the source of whose remotest tributary is on the opposite side of the same mountains which give rise to the Ganges. These two rivers proceed in diverging courses until they are more than 1200 miles asunder; and again approaching each other, intermix their waters before they reach the ocean. The other principal rivers in Bengal are the Ghagra, Son, Gandak, Kusi, Tistá; the Húglí (Hoogly), formed by the junction of the Bhágirathí and Jalangí; and farther to the west, the Damodar and Rúpnáráyan; and in the south-west, the Mahánadí, or great river of Orissa. In a level country like Bengal, where the soil is composed of yielding and loose materials, the courses of the rivers are continually shifting, from the wearing away of their different banks, or from the water being turned off by obstacles in its course into a different channel. As this channel is gradually widened the old bed of the river is left dry. The new channel into which the river flows is, of course, so much land lost, while the old bed constitutes an accession to the adjacent estates. Thus, one man's property is diminished, while that of another is enlarged or im

proved; and a distinct branch of jurisprudence has grown up, the particular province of which is the definition and regulation of the alluvial rights alike of private property and of the state.

The People.— Within the provinces under the Lieutenant-Governor of Bengal dwell a great congeries of people, of widely diverse origin, speaking different languages, and representing far separated eras of civilization. They amounted in 1872 (including Assam, which then formed part of Bengal), to 66,856,859 souls, or over a million and a quarter more than the whole inhabitants of England and Wales, Sweden, Norway, Denmark (with Jutland), Greece, and all the Ionian Islands, or the total population, including Indians and Chinese, of the United States. The problem of government in Bengal, however, is not one of numbers. It is intensified and infinitely complicated by the fact, that while this vast population is ruled by a single head, it consists of elements so dissimilar as to render it impracticable to place them under any one system of administration. They exhibit every stage of human progress, and every type of human enlightenment and superstition,—from the sceptical educated classes, represented by the Hindu gentleman who distinguishes himself at a London Inn of Court and harangues the British public in the Brighton Pavilion, or from a metropolitan platform, to the hill chieftain, who lately sacrificed an idiot on the top of a mountain to obtain a favorable decision in a Privy Council appeal. A large section of the people belongs to the august Aryan race, from which we ourselves descend, having a classical language more kindred to English than those of the Welsh or Scottish Highlanders. We address the Deity and His earthly representatives, our father and mother, by words derived from roots common to the Christian and the Hindu. Nor does the religious instinct assume a wider variety of manifestations, or exhibit a more striking series of metamorphoses, among the European than among the Indian branches of the race. Theodore Parker and Comte are better known to the rising generation of Hindus in Bengal than any Sanskrit theologian. On the same bench of a Calcutta college sit youths trained up in the strictest theism, others indoctrinated in the mysteries of the Hindu trinity and pantheon, with representatives of every link in the chain of superstition—from the harmless offering of flowers before the family god to the cruel rites of Kálí, whose altars in the most civilized districts of Bengal, as lately as the famine of 1866, were stained with human blood. Indeed, the very word Hindu is one of absolutely indeterminate meaning. The census officers employ it as a convenient generic to include 42½ millions of the population of Bengal, comprising elements of transparently distinct ethnical origin, and separated from each other by their language, customs, and religious rites. But Hinduism, understood even in this wide sense, represents only one of many creeds and races found within Bengal. The other great historical cultus, which, during the last twelve centuries, did for the Semitic peoples what Christianity accomplished among the European Aryans, has won to itself one-third of the whole population of Bengal. The Muhammadans exceed 20½ millions of souls; and the Lieutenant-Governor of Bengal is, so far as numbers go, as great a Musalmán power as the Sultán of Turkey himself. Amid the stupendous catastrophes of the seasons, the river inundations, famines, tidal waves, and cyclones of the lower provinces of Bengal, the religious instinct works with a vitality unknown in European countries, where the forces of nature have long yielded to the control of man. Until the British Government stepped in with its police, and canals, and railroads, between the people and what they were accustomed to consider the dealings of Providence, scarcely a year passed without some terrible manifestation of the power and the wrath of God. Marhattá invasions from Central India, piratical devastations on the sea-board, banditti who marched about the interior in bodies of 50,000 men, floods which drowned the harvests of whole districts, and droughts in which a third of the population starved to death, kept alive a sense of human powerlessness in the presence of an Omnipotent fate with an intensity which the homilies of a stipendiary clergy fail to awaken. Under the Muhammadans a pestilence turned the capital into a silent wilderness, never again to be re-peopled. Under English rule, it is estimated that 10 millions perished within the Lower Provinces alone in the famine of 1769–70; and the first surveyor-general of Bengal entered on his maps a tract of many hundreds of square miles as bare of villages, and "depopulated by the Maghs."

Popular Religions.— The people of Bengal, thus constantly reminded by calamity of a mysterious Supreme Power, have always exhibited deep earnestness in their own modes of propitiating it, and a singular susceptibility to new forms of faith. Great tidal waves of religion have again and again swept over the provinces within even the brief period of the Christian era. Islám was one of many reformed creeds offered to them, and several circumstances combined to render its influence more widely spread and more permanent than that of its rivals. It was the creed of the governing power; its missionaries were men of zeal, who spoke to the popular heart; it brought the good news of the unity of God and the equality of man to a priest-ridden and caste-ridden people. Above all, the initiatory rite made relapse impossible, and rendered the convert and his posterity true believers forever. Forcible conversions are occasionally recorded, with several well-known instances of Hindus becoming apostates from their ancient faith to purchase pardon for crimes. Such cases, however, were few in number, and belonged to the higher ranks. It would also appear that a Mughul adventurer now and then circumcised off hand the villages allotted to him in fief. But it was not to such measures that Islám owed its permanent success in Bengal. It appealed to the people, and it derived the great mass of its converts from among the poor. It brought in a truer conception of God, a nobler ideal of the life of man, and offered to the teeming low castes of Bengal, who had sat for ages despised and abject on the outermost pale of the Hindu community, free entrance into a new social organization. So far as local tradition and the other fragmentary evidence which survives enable a modern inquirer to judge, the creed of Muhammad was here spread neither by violence nor by any ignoble means. It succeeded because it deserved to succeed. Nevertheless, it has conspicuously failed to alter the permanent religious conceptions of the people. The initiatory rite separated the Musalmáns from the rest of the Bengali population, and elevated the heterogeneous low-caste converts into a respectable community of their own. But the proselytes brought their old superstitions with them into their new faith. Their ancient rites and modes of religious thought reasserted themselves with an intensity that could not be suppressed, until the fierce white light of Semitic monotheism almost flickered out amid the fuliginous exhalations of Hinduism. A local writer, speaking from personal acquaintance with the Musalmán peasantry in the northern districts of Lower Bengal, states that not one in ten can recite the brief and simple *kalmá* or creed, whose constant repetation is a matter of almost unconscious habit with Muhammadans. He describes them as "a sect which observes none of the ceremonies of its faith, which is

ignorant of the simplest formulas of its creed, which worships at the shrines of a rival religion, and tenaciously adheres to practices which were denounced as the foulest abominations by its founder." Fifty years ago these sentences would have truly described the Muhammadan peasantry, not only in the northern districts, but throughout all Lower Bengal. In the cities, or amid the serene palace life of the Musalmán nobility and their religious foundations, a few Maulvís of piety and learning calmly carried on the routine of their faith. But the masses of the rural Musalmáns had relapsed into something little better than a mongrel breed of circumcised low-caste Hindus. Since then, one of those religious awakenings so characteristic of India has passed over the Muhammadans of Bengal. Itinerant preachers, generally from the north, have wandered from district to district, calling on the people to return to the true faith, and denouncing God's wrath on the indifferent and unrepented. A great body of the Bengali Musalmáns have purged themselves of the taint of Hinduism, and shaken off the yoke of ancient rural rites. The revival has had a threefold effect — religious, social, and political. It has stimulated the religious instinct among an impressionable people, and produced an earnest desire to cleanse the worship of God and his prophet from idolatry. This stern rejection of ancient superstitions has widened the gulf between the Muhammadans and the Hindus. Fifty years ago the Bengali Musalmáns were simply a recognised caste, less widely separated from the lower orders of the Hindus than the latter were from the Kulin Bráhmans. There were certain essential points of difference, of a doctrinal sort, between the Hindu and Muhammadan villager; but they had a great many rural customs and even religious rites in common. The Muhammadan husbandman theoretically recognised the one Semitic God; but in a country subject to floods, famines, the devastations of banditti, and the ravages of wild beasts, he would have deemed it a foolish policy to have neglected the Hindu festivals in honor of Krishna and Durgá. The Bengali peasantry no longer look to their gods, but to the officer in charge of the district, for protection, and when he fails them, instead of offering expiatory sacrifices to Káli, they petition Government, or write violent letters to the vernacular press. The reformed Muhammadan husbandmen now stand aloof from the village rites of the Hindus. They have ceased to be merely a separate caste in the rural organization, and have become a distinct community, keeping as much apart from their nominal co-religionists of the old unreformed faith as from the idolatrous Hindus. This social isolation from the surrounding Hindus is the second effect of the Musalmán revival in Bengal. Its third result is political, and effects England. A Muhammadan like a Christian revival strongly reasserts the duty of self-abnegation, and places a multitude of devoted instruments at the disposal of any man who can convince them that his schemes are identical with the will of God. But while a return to the primitive teachings of Christ means a return to a religion of humanity and love, a return to Muhammadan first principles means a return to a religion of intolerance and aggression. The very essence of Musalmán Puritanism is abhorrence of the Infidel. The whole conception of Islám is that of a church either actively militant or conclusively triumphant — forcibly converting the world, or ruling with a rod of iron the stiff-necked unbeliever. The actual state of India, where it is the Musalmáns who are in subjection, and the unbeliever who governs them, is manifestly not in accord with the primitive ideal; and many devout Muhammadans of the reformed faith have of late years endeavored, by plots and frontier attacks, to remove this anomaly. The majority are not actively hostile, but they stand aloof from the institutions, and refuse to coalesce with the system which the British Government has imposed on Bengal. Their rebel camp beyond the frontier has forced three great expeditions, which have broken their military power; and the calm, inexorable action of the courts has stamped out the chronic abetment of rebellion by Muhammadans within Bengal.

Besides the 42½ millions aggregated under the name of Hindus, and the 20½ millions of Musulmáns, a great residue remains. These consist, with the exception of two very small bodies of Christians and Buddhists, of semi-aboriginal and distinctly non-Aryan races. They number over 3½ millions, equalling almost exactly the population of Scotland. These people dwell, for the most part, among the lofty ranges and primeval forests which wall in Bengal on the north, east, and south-west, or upon the spurs and hilly outworks which these mountain systems have thrown forward upon the lowlands. Some of them represent the simplest types of social organization known to modern research. Their rudimentary communities are separated by religion, custom, and language from each other and from the dwellers on the plains. Many of them, till lately, looked upon war as the normal condition of human society, and on peace as an unwelcome temporary break in their existence. For ages they have regarded the lowland Hindus as their natural enemies, and in turn have been dealt with as beasts of chase by the more civilized inhabitants of the valleys. Within the present generation human sacrifice continued to be an obligatory rite among them — a rite so deeply graven upon their village institutions, and so essential to the annually recurring festivals of their religious year, as to seriously occupy the Indian legislature, and to require a special agency to suppress it. To this day instances of the detestable practice occur; and their extreme jealousy of anything like foreign rule renders it the wisest policy to leave them as much as possible under their own hamlet communities and petty chiefs. Nevertheless, they form the most hopeful material yet discovered in Bengal for the humanizing influences of Christianity, and of that higher level of morality and religious hope which Christian missions represent.

GOVERNMENT.—Nor are the diversities in race and religion among the 66¾ millions of Bengal less marked than their different capacities for self-government, and the varying degrees to which they can be subjected to administrative control. They exhibit every stage of political development, from the great municipality based upon English models, with powers of self-taxation and a public debt of its own, down to the primitive hill-hamlet, which pays no rent, acknowledges no higher tenure than the aboriginal one of priority of occupation, clings to its ancient system of nomadic husbandry, and is scarcely aware of any power superior to that of its own tribe fathers. Including Assam, which up to February 1874 formed a part of Bengal, the territories under the Lieutenant-Governor consist of five great provinces, each of which speaks a language of its own, and has a separate political and ethnical history. For administrative purposes these five provinces are divided into 58 districts, of which 36 are regulation districts, whose advanced state has rendered it expedient to place them under the complete system of the Anglo-Indian law; while 22 are non-regulation districts, in which this has not yet been found practicable. The latter contain territories of three distinct classes. The first of them consists, for the most part, of newly-acquired territory, to which the general regulations have never been extended in their entirety. The second, of tracts inhabited by primitive races specially exempted from the

operation of the regulations, to whom a less formal code of law is better adapted. The third, of semi-independent or tributary states, administered, or partly administered by British officers. The management of the whole is firmly concentrated in a single man, the Lieutenant-Governor of Bengal, who is answerable to the Government of India, and through it to Her Majesty's ministers and Parliament. His responsibility is divided by no executive council, as in Madras or Bombay. All orders issue through his secretaries in his own name; and although his policy is subject to the watchful control of the Government of India, represented by the Viceroy, yet to the Lieutenant-Governor personally belongs the reputation or disgrace of a successful or an inglorious administration. In making laws for his people he is assisted by a legislative council, composed partly of his principal officers, partly of leading members of the non-official European and Native communities. In his legislative, as in his executive functions, a power of control, amounting if needful to veto, rests with the Government of India — a power which, from the English talent for harmonious proconsular rule, is very seldom exercised. The administration is conducted by a body of covenanted civilians, supplemented by a few military officers in the less civilized districts, and aided by a staff of subordinate officials. The civilians are appointed direct from England, enter into a bond with the Secretary of State, and give securities for the discharge of their highly responsible duties. In 1871 they numbered 260 men. The military officers belong to the staff corps of the Bengal army, and are employed to the number of 52 in the backward tracts, which do not require so exact an administration, and cannot afford to pay for the cost of it. The subordinate district officials are appointed in Bengal by the Lieutenant-Governor, and consist chiefly of natives and Anglo-Indians; but several departments, such as the educational, telegraph, and public works, are now officered to a certain extent by gentlemen engaged direct from England. The revenues raised in the territories under the Lieutenant-Governor of Bengal amounted in 1871-72 to £17,687,072. Of this sum, £16,713,636 accrued from the imperial taxes laid on by the Government of India, and £973,436, from provincial, municipal, and rural taxation. The total cost of government was only £6,338,968, leaving a surplus from this single one of the Indian local governments of £11,348,104. It is scarcely too much to say, that so long as the British power retains the port of Calcutta and the rich provinces under the Lieutenant-Governor of Bengal, it would have sufficient revenue to effect the reconquest of India if any accident should happen in the Panjáb or north-west. The vast income which the Lower Provinces yield is not altogether derived from their people. China pays an annnal tribute of over 5 millions in the shape of opium duty, and the inland parts of India contribute about a third of a million to the customs of Bengal. Taking the total thus obtained from other territories at a little over 6 millions, the population under the Lieutenant-Governor of Bengal pays, in round figures, 11½ millions a year, or about 3s. 5d. a head. This includes imperial, provincial, municipal, and rural taxation of every sort.

The return which the Government gives for this high taxation may be briefly summed up as follows: — It assures to the provinces absolute protection from foreign enemies. The army employed in the territories under the Lieutenant-Governor of Bengal numbers only 11,554 officers and men, exclusive of a detachment of Madras Native infantry stationed at Cattack, in Orissa, and numbering about 600 men — making a gross total of troops in Bengal of about 12,000 men. Of this small force 4662 are massed in Calcutta and its environs, with a view to their proximity to the sea-board, rather than with an eye to the internal requirements of the country; 6892 guard the frontiers, with detachments on the line of railway, which now forms the great highway of Bengal; a detachment of about 600 effective troops of the Madras Native infantry is stationed in Orissa. Taking 12,000 as the total military force stationed in Bengal, 3000 consist of European troops and English officers, and 9000 of native officers and men. The Government is a purely civil one, the existence of any armed force being less realized than in the quietest county of England; and of the 66¾ millions of people under the Lieutenant-Governor of Bengal, probably 40 millions go through life without once seeing the gleam of a bayonet or the face of a soldier. Internal order and protection to person and property are secured by a large army of police. This force consists of two elements: a regular constabulary introduced by the English Government, numbering 33,913 men in 1881, and costing £584,059 to the state; and an indigenous police developed out of the rural watch of the Hindu commonwealth, numbering 184,645 men, and costing £435,336 a year, paid by grants of land, or by the villages and landowners. The total number of the Bengal police amounts therefore to 217,558, or one man to every 307 of the population; and, excluding uninhabited swamps and hill jungles, about one policeman to each square mile of area. This minute supervision costs just over a million sterling a year, being at the rate of £4, 2s. 1½d. per square mile, or 3½d. per head of the population.

A great system of state education has been rapidly developed since 1844. In 1871–72 the Government and aided schools numbered 4383, with 7292 teachers, and 163,280 pupils,—maintained at a total cost of £194,716, of which Government contributed rather under one-half, or £89,649. The total annual cost of education per pupil was £1, 12s. 9d., of which Government bore under one-half, or 15s.; the remainder being obtained from school fees, local subscriptions, &c. Besides these, there were 10,907 ascertained schools not receiving aid from the state, with 11,026 teachers, and 169,917 pupils. In addition to these, there is a vast number of petty hedge schools in Bengal, of which no statistics exist. The total of state and *ascertained* private schools in 1871 was 15,290, with 18,318 teachers, and 333,197 pupils.

The cheapness of labor, as compared with European countries, enables the Government to perform its other functions at an equally small cost. It has brought courts very near to the door of the peasant, and established a system of registration by which proprietary rights and transfers are cheaply and absolutely ascertained. A great department of public works has spread a network of roads over the country, connecting Bengal by railways with other parts of India, and, in districts which specially require it, is endeavoring to exercise some degree of control over the rivers and the natural water-supply, on which the safety of a tropical people depends. An organized system of emigration watches over the movements of the landless classes, from the overcrowded or unfertile districts of the west to the rich under-populated territories on the east, and to colonies beyond the seas. Charitable dispensaries and a well-equipped medical department struggle to combat the diseases and epidemics which from time immemorial have devastated the Delta, and place the operations of European surgery within the reach of the poorest peasant. The whole cost of civil administration for the 66¾ millions of Bengal amounts, as already stated, to £6,338,968, or under 1s. 11d. per head. An unfettered vernacular press makes known the views of the people

to their rulers, and municipal institutions are developing the ancient Hindu capacity for self-government from the village to the municipal stage of human society.

The word BENGAL is derived from Sanskrit geography, and applies strictly to the country stretching southwards from Bhágalpur to the sea. The ancient Banga formed one of the five outlying kingdoms of Aryan India, and was practically conterminous with the Delta of Bengal. It derived its name, according to the etymology of the Pandits, from a price of Mahábhárata, to whose portion it fell on the primitive partition of the country among the Lunar race of Dehli. But a city called Bángálá, near Chittagong, which, although now washed away, is supposed to have existed in the Muhammadan period, appears to have given the name to the European world. The word Bángálá was first used by the Musalmáns ; and under their rule, like the Banga of old Sanskrit times, it applied specifically to the Gangetic delta, although the latter conquests to the east of the Brahmaputra were eventually included within it. In their distribution of the country for fiscal purposes, it formed the central province of a governorship, with Behar on the N.W., and Orissa on the S.W., jointly ruled by one deputy of the Dehli emperor. Under the English the name has at different periods borne very different significations. Francis Fernandez applies it to the country from the extreme east of Chittagong to Point Palmyras in Orissa, with a coast line which Purchas estimates at 600 miles, running inland for the same distance, and watered by the Ganges. This territory would include the Muhammadan province of Bengal, with parts of Behar and Orissa. The loose idea thus derived from old voyagers became stereotyped in the archives of the East India Company. All its north-eastern factories, from Balasor, on the Orissa coast, to Patná, in the heart of Behar, belonged to the "Bengal Establishment," and as our conquests crept higher up the rivers, the term came to be applied to the whole of Northern India. The Presidency of Bengal, in contradistinction to those of Madras and Bombay, eventually included all the British territories north of the Central Provinces, from the mouths of the Ganges and Brahmaputra to the Himálays and the Panjáb. The term Bengal continues to be officially employed in this sense by the military department of the Government of India. But during the last forty years the tendency to a more exact order of civil administration has gradually brought about a corresponding precision in the use of Indian geographical names. The North-Western Provinces date their separate existence from 1831. Since that year they stand forward under a name of their own as the North-Western Provinces, in contradistinction to the Lower Provinces of Bengal. Later annexations have added new territorial entities, and the northern Presidency is now mapped out into four separate governments — the North-Western Provinces, Oudh, Panjáb, and Lower Bengal. Three of the provinces of the present Lieutenant-Governorship of Bengal — namely, Bengal proper, Behar, and Orissa — consist of great river valleys ; the fourth, Chhotá or Chutiá Nágpur, is a mountainous region which separates them from the Central India plateau. Orissa embraces the rich deltas of the Mahánadì and the neighboring rivers, bounded by the Bay of Bengal on the S.E., and walled in on the N.W. by tributary hill states. Proceeding westward, the province of Bengal proper stretches along the coast from Orissa to British Burmah, and inland from the sea-board to the Himálayas. Its southern portion is formed by the united deltas of the Ganges and Brahmaputra; its northern consists of the valleys of these great rivers and their tributaries. Behar lies on the north-west of Bengal proper, and comprises the higher valley of the Ganges, from the spot where it issues from the territories of the Lieutenant-Governor of the North-Western Provinces. Between Behar and Orissa, but stretching further westward and deep into the hill country, lies the province of Chhotá or Chutiá Nágpur.

PRINCIPAL CROPS.— The chief products of the province have been already enumerated. The great staple crop is rice, of which there are three harvests in the year,— the *boro*, or spring rice ; *áus*, or autumn rice ; and *áman*, or winter rice. Of these the last or winter rice is by far the most extensively cultivated, and forms the great harvest of the year. The *áman* crop is grown on low land. *Aman* rice is much more extensively cultivated than *áus*, and in favorable years is the most valuable crop, but being sown in low lands is liable to be destroyed by excessive rainfall. Harvest takes place in December or January. *Aus* rice is generally sown on high ground.

MINERAL PRODUCTS.— The coal mines of Ráníganj, within Bardwán district, however, demand somewhat more special notice. In this field there were, in 1872, altogether 44 mines worked, of which 19 turn out more than 10,000 tons of coal per annum apiece. In the larger and better mines, coal is raised by steam power from pits and galleries; and in the smaller mines or workings, by hand labor from open quarries. In the Ráníganj coal-field alone, 61 steam engines, with an aggregate of 867 horse-power, are at work. Only one seam or set of seams of less thickness than 8½ feet is worked, and the average thickness of the seams at the Ráníganj mines is about 15 or 16 feet. The pits are mostly shallow, very few are more than 150 feet deep.

TRADE.—No complete statistics of the internal trade of Bengal exist. The Ganges, the Brahmaputra, and on a much smaller scale, the Mahánadí in Orissa, with the Eastern Bengal Railway and the great East Indian Line, form the main arteries of commerce. From these main channels a network of minor streams, and a fairly adequate although not yet complete system of raised roads, radiate to the remotest districts. The chief articles of internal traffic are the vegetable and mineral productions enumerated above. The larger transactions of commerce are conducted in the great cities, such as Calcutta and Patna, and in a number of purely market centres, such as Nawábganj and Sirájganj, which have recently grown up under British rule.

HISTORY.—The history of so large a province as Bengal forms an integral part of the general history of India. (See INDIA). The northern part, Behar, formed a powerful kingdom in Sanskrit times, and its chief town, Patná, is identified as the *Palibothra* of the Greeks. The Delta or southern part of Bengal lay beyond the ancient Sanskrit polity, and was governed by a number of local kings belonging to a pre-Aryan stock. The Chinese travellers, Fa Hiang in the 5th century, and Hiouen Thsang in the 7th century, found the Buddhist religion prevailing throughout Bengal, but already in a fierce struggle with Hinduism — a struggle which ended about the 9th or 10th century in the general establishment of the latter faith. Until the end of the 12th century Hindu princes governed in a number of petty principalities, till, in 1199, Muhammad Bakhtiyar Khilji was appointed to lead the first Musalmàn invasion into Bengal. The Muhammadan conquest of Behar dates from 1200 A.D., and the new power speedily spread southwards into the Delta. From about this date until 1340 Bengal was ruled by governors appointed by the Muhammadan emperors in the north. From 1340 to 1539 its governors asserted a precarious independence, and arrogated the position of sovereigns on their own account. From 1540 to 1576 Bengal passed under the rule of the Pathán or

Afghán dynasty, which commonly bears the name of Sher Sháh. On the overthrow of this house by the powerful arms of Akbar, Bengal was incorporated into the Mughul empire, and administered by governors appointed by the Dehli emperor, until the treaties of 1765, which placed Bengal, Behar, and Orissa under the administration of the East Indian Company. Until 1854 Bengal remained under the Governor-General of India as governor, his place being supplied, during his absence in other parts of India, by a deputy-governor from among the members of his council. By the statute 16 and 17 Vict. cap. 95, these two great offices were separated, and Bengal erected into a Lieutenant-Governorship. The first lieutenant-governor was appointed in 1854, and the constitution of the Government of Bengal still continues on this basis, except that the lieutenant-governor is now appointed subject to the approval of Her Majesty.

English connection with Bengal.—The East India Company formed its earliest settlements in Bengal in the first half of the 17th century. These settlements were of a purely commercial character. In 1620 one of the Company's factors dates from Patná; in 1624–36 the Company established itself, by the favor of the emperor, on the ruins of the ancient Portugese settlement of Píppli, in the north of Orissa; in 1640–42 the patriotism of an English surgeon, Mr. Gabriel Boughton, obtained the establishment at Balasor, also in Orissa, and at Húglí, some miles above Calcutta. The vexations and extortions to which the Company's early agents were subjected more than once almost induced them to abandon the trade, and in 1677–78 they threatened to withdraw from Bengal altogether. In 1685, the Bengal factors, driven to extremity by the oppression of the Mughul governors, threw down the gauntlet; and after various successes and hair-breadth escapes, purchased from the grandson of Aurangzeb in 1696, the villages which have since grown up into Calcutta, the metropolis of India. During the next fifty years the English had a long and hazardous struggle alike with the Mughul governors of the province and the Marhattá armies which invaded it. In 1756 this struggle culminated in the great outrage known as the Black Hole of Calcutta, followed by Clive's battle of Plassey and capture of Calcutta, which avenged it. That battle, and the subsequent years of confused fighting, established the military supremacy in Bengal, and procured the treaties of 1765, by which the provinces of Bengal, Behar, and Orissa passed under English administration. To Warren Hastings (1772–85) belongs the glory of consolidating this power, and converting a military occupation into a stable civil government. To another member of the civil service, John Shore, afterwards Lord Teignmouth (1786–93), is due the formation of a regular system of Anglo-Indian legislation. Acting through Lord Cornwallis, then Governor-General, he ascertained and defined the rights of the landholders in the soil. These landholders under the native system had, for the most part, started as collectors of the revenues, and gradually acquired certain prescriptive rights as quasi-proprietors of the estates entrusted to them by the Government. In 1793 Lord Cornwallis declared their rights perpetual, and made over the land of Bengal to the previous quasi-proprietors or *zamíndárs*, on condition of the payment of a fixed land tax. This great piece of legislation is known as the Permanent Settlement of the Land Revenue. But the Cornwallis code, while defining the rights of the proprietors, failed to give adequate recognition to the rights of the under-tenants and the cultivators. His Regulations formally *reserved* the latter class of rights, but did not legally define them, or enable the husbandmen to enforce them in the courts. After half a century of rural disquiet, the rights of the cultivators were at length carefully formulated by Act X. of 1859. This measure, now known as the land law of Bengal, effected for the rights of the under-holders and cultivators what the Cornwallis code in 1793 had effected for those of the superior landholders. The status of each class of person interested in the soil, from the Government as suzerain, through the *zamíndárs* or superior landholders, the intermediate tenure-holders, and the under-tenants, down to the actual cultivator, is now clearly defined. The Act dates from the first year after the transfer of India from the Company to the Crown; for, meanwhile, the mutiny had burst out in 1857. The transactions of that revolt chiefly took place in Northern India, and will be found under the article on the North-Western Provinces; the uprising, although fierce and for a time perilous to British supremacy, was quickly put down. In Bengal it began at BARRACKPUR (*q.v.*), was communicated to Decca in Eastern Bengal, and for a time raged in Behar, producing the memorable defence of the billiard-room at Arrah by a handful of civilians and Sikhs,—one of the most splendid pieces of gallantry in the history of the British arms. Since 1858, when the country passed to the Crown, the history of Bengal has been one of steady and peaceful progress. The two great lines of railway, the East Indian and the Eastern Bengal, have been completed; and a third, the Northern Bengal Railway, is now in progress. Trade has enormously expanded; new centres of commerce have sprung up in spots which not long ago were silent jungles; new staples of trade, such as tea and jute, have rapidly attained importance; and the coal-fields and iron ores are beginning to open up prospects of a new and splendid era in the internal development of the country.

BENGAZI, a seaport town on the northern coast of Africa, and capital of the province of Barca, is situated on a narrow strip of land between the Gulf of Sidra and a salt lake.

BENGEL, JOHN ALBERT, a celebrated Biblical scholar and critic, was born at Winnenden, in Würtemberg, on the 24th June 1687. His father, who was one of the ministers of that town, having died when Bengel was only six years old, his education was taken in hand by a friend of his father named Spindler, who having afterwards become master in the gymnasium at Stuttgart, carried the boy thither with him, and superintended his education until he entered the University of Tübingen in the year 1703. While at the university, the works to which, among others, he gave special attention as private studies were those of Aristotle and Spinoze, and so thoroughly did he make himself acquainted with the metaphysics of the latter, that he was selected by one of the professors to prepare materials for a treatise *De Spinosismo* which the professor afterwards published. He himself used to express his "great thankfulness for the benefit which he had derived from the study of metaphysics and mathematics, in respect to the clearness of thought which they imparted, which was of the utmost value to him in the analysis and exposition of the language of Scripture." After taking his degree, Bengel devoted himself to the study of theology to which the grave and religious tone of his mind, deepened and strengthened by his early training and discipline, naturally inclined him. Like other young men of thoughtful character, before and since, he had to struggle with doubts and difficulties of a religious nature, and he alludes, with much feeling, to the "many arrows which pierced his poor heart, and made his youth hard to bear." It is interesting to know that at this early date his attention was directed to the various readings of the Greek New Testament, and that one cause of his men-

tal perplexities was the difficulty of ascertaining the true reading among the great number of those which were presented to his notice. In 1707 Bengel entered the church, and was appointed to the parochial charge of Metzingen-unter-Urach. Here he remained only one year, and during that time devoted himself to the study of the writings of Spencer, Arndt, A. H. Franke, and Chemnitz. The profound impression which the works of these men made upon his mind was never effaced, and may be traced in that vein of devotional, not to say pietistic, feeling which runs through all his religious compositions. In 1708 Bengel was recalled to Tübingen to undertake the office of *Repetent* or theological tutor. Here he remained until 1713, when he was appointed the head of a seminary recently established at Denkendorf and intended as a preparatory school of theology. Before entering on his duties there, he made a literary journey through the greater part of Germany, to acquaint himself with the various systems of education which were in use, in order to qualify himself for the better discharge of his official duties. In prosecuting the journey he visited with laudable impartiality the seminaries of the Jesuits as well as those of the Lutheran and Reformed Churches. Among other places he visited Heidelberg and Halle, and had his attention directed at the former city to the canons of Scripture criticism published by Gerhard von Mästricht, and at the latter to Vitringa's *Aracrisis ad Apocalypsin*. The influence exerted by these upon his theological studies will be apparent when we come to notice his works upon the criticism and interpretation of Scripture. For twenty-eight years — from 1713–1741 — he discharged his important duties as head of the school of Denkendorf with distinguished ability and success, devoting all his energies to the religious and intellectual improvement of his students. It is impossible to read the extracts from his diary and correspondence, which have been preserved, without being struck with the spirit of fervent piety, combined with sagacity and good sense, which characterized his management of the institution. These twenty-eight years were the period of Bengel's greatest intellectual activity, many of the works on which his reputation rests being included within them. In 1741 he was appointed prelate of the cloister of Herbrechtingen, an office which he held for eight years. In 1749 he was raised to the dignity of consistorial counsellor and prelate of Alpirsbach, with a residence in Stuttgart. Bengel henceforth devoted himself to the discharge of his duties as a member of the consistory. A question of considerable difficulty was at that time occupying the attention of the church courts, viz., the manner in which those who separated themselves from the church were to be dealt with, and the amount of toleration which should be accorded to meetings held in private houses for the purpose of religious edification. The civil power (the duke of Würtemberg was a Roman Catholic) was disposed to have recourse to measures of repression, while the membe s of the consistory, recognizing the good effects of such meetings, were inclined to concede a considerable degree of liberty. Bengel exerted himself on the side of the latter. The admirer of Spener, the founder of the *collegia pietatis*, could not but show himself favorably disposed to meetings held for religious purposes, and while maintaining the rights and privileges of the church, he was an advocate of all reasonable freedom being accorded to those who felt themselves bound on grounds of conscience to withdraw from her communion. The good effects of this policy may be seen at this day in the attitude taken up by those who in Würtemberg have separated from the church. Bengel's public position necessarily brought him into contact with many individuals of celebrity, by whom he was consulted on all important theological and ecclesiastical questions. In one year he received no fewer than 1,200 letters of interrogation. He died in 1752, aged sixty-five years and four months.

BENGUELA, a country on the western coast of Africa, situated to the south of Angola, and extending from the River Coanza to the Cunene, which is otherwise known as Nourse, Rio das Trombas, Rio dos Elephantes. The population of the whole territory of Benguela is estimated at about 140,000.

BENICARLÓ, a city of Spain, in the province of Castellon, on the coast of the Mediterranean. Population. 7.000.

BENICIA, a town of Solano county, Cal., forty miles northeast of San Francisco, at the head of navigation on the Strait of Carquinez. It contains a United States arsenal, the depot and machine shops of the Pacific Mail Steamship Company, several tanneries and factories. There is also a convent and several seminaries, three churches, and good schools. Pop. 3,500.

BENIN, a country, city, and river of Western Africa, to the west of the main channel of the Niger. The name was formally applied to the whole stretch of coast from the Volta, in Rio del Rey or Riumbi, including what is now known as the Slave Coast, the whole delta of the Niger, and a small portion of the country to the eastward; and some trace of this earlier application remains in the name of *Bight of Benin*, still given to that part of the sea which washes the Slave Coast. The Kingdom of Benin seems at one time to have been one of the most powerful of Western Africa, and was known to Europeans in the 17th century as the Great Benin. Budagry and Lagos, now British possessions, are both Beninese colonies. Benin has now been long in a state of decline, and the territory is broken up into independent states of no individual importance. Such coherence, indeed, as still exists is rather ethnographical than territorial; but it may be regarded as bounded on the E. by the Niger, N. by the Yoruba country, and W. by Egba. The soil is highly fertile, and produces palms, rice, beans, maize, kokos, plantains, cotton, sugar, and Guinea pepper, in great abundance. The pawpaw and African plum grow wild, and excellent tobacco can be raised. Many parts of the country are covered with almost impenetrable forests and swamps, but towards the north there is fine pasture land, in which the natives rear both cattle and horses of considerable value. Of trees the cotton wood, the tamarind, and the mangrove are the most frequent. The population is pretty dense, and it is said that in the most flourishing state of the kingdom the king could collect 100,000 men. His rule is absolute, and he is revered by his subjects as a species of divinity. It is a crime to believe that the king either eats or sleeps; and all offences against him are punished with the utmost severity. The religion and mythology agree with the great system of Yoruba and Oro; the chief god is worshipped with human sacrifices to an appalling extent. The people, at the same time, do not indulge in wanton cruelty; they usually stupify the victims before putting them to death. The houses, at least of the better classes, are built on a plan similar to that of the Romans, with a regular *atrium* and *impluvium*. The Beninese weave their cotton into a fine kind of muslin, which is worn in huge bulging petticoats by people of wealth, while the lower orders are content with a simple *Beluko* or kilt. The capital of the kingdom, or city of Benin, is situated about 73½ miles inland from the mouth of the Rio Formoso or Benin River. It covers a large extent of ground, but is so broken up into separate portions by intervening spaces of jungle, that no proper estimate can be formed

of its population. The Obwe, or King's quarter, alone is supposed to have upwards of 15,000 inhabitants; but at the time of Burton's visit in 1862 many of the houses were empty and falling to ruin.

The River Benin, called by the natives Uwo Ko Jakri, or Outlet of Jakri, is about two miles broad at its mouth; but it is crossed by a very extensive bar of mud and sand, on which there is only 12 feet of water at spring tides. Ships of 60 tons can ascend as far as Gwato.

BENJAMIN, the youngest son of the patriarch Jacob, by Rachel. His mother, dying in childbed, gave him the name Benoni, "Son of my pain," which was changed by his father to Benjamin, meaning probably "Son of the right hand," that is, "Son of prosperity." Of his personal history little is recorded. He was the favorite of his father and brothers, and seems to have been of an amiable though somewhat weak character. In this respect he strikingly contrasts with the tribe, whose history was foretold in the dying prophecy of Jacob, "Benjamin shall ravin as a wolf." The tribe of Benjamin, though the least numerous of Israel, became nevertheless a considerable race. In the desert it counted 35,400 warriors, and at the entrance of Israel into Canaan even as many as 45,600. The portion allotted to this tribe was encompassed by the districts of Ephraim, Dan, and Judah.

BENJAMIN, of Tudela, in Navarre, a celebrated Jewish rabbi of the 12th century, whose *Itinerary* is a literary curiosity.

BENNET, Henry, Earl of Arlington, a distinguished statesman in the reign of Charles II., was born of an ancient family in Middlesex, in the year 1618, and died in 1685. His *Letters to Sir William Temple* were published after his death.

BENNETT, James Gordon, American journalist, originator and editor of the *New York Herald*, was by birth a Scotchman. He was born at Newmills in Banffshire, about 1800. Destined for the priesthood in the Roman Catholic Church, he was educated in a seminary at Aberdeen. But it became evident that he was naturally unfit for the priestly calling; and his aversion ripened into a determination to escape from it. The reading of Franklin's *Autobiography* led him to resolve on emigration to America, and in the spring of 1819 he sailed for the New World. Landing at Halifax, he earned a poor living there for a short time by giving lessons in French, Spanish, and bookkeeping; he passed next to Boston, where starvation almost threatened him till he got employment in a printing-office; and in 1822 he went to New York. An engagement as translator of Spanish for a newspaper took him for a few months to Charleston, South Carolina. On his return to New York he projected a school, gave lectures on political economy, and did subordinate work for the journals. In 1825 he made his first attempt to establish a journal of his own; and the next ten years were occupied in a variety of similar attempts, which proved futile. During that period, however, he became Washington correspondent of the *Inquirer;* and his letters, written in imitation of the letters of Horace Walpole, attracted attention. Notwithstanding all his hard work and his resolutely abstemious life, he was still a poor man. It was not till 1835 that he struck the vein which was to reward and enrich him. On May 6 of that year appeared the first number of a small one-cent paper, bearing the title of *New York Herald*, and issuing from a cellar, in which the proprietor and editor played also the part of salesman. "He started with a disclaimer of all principle, as it is called, all party, all politics;" and to this he certainly adhered. By his immense industry and practical sagacity, his unscrupulousness, variety of news, spicy correspondence, supply of personal gossip and scandal, the paper became a great commercial success. Bennett continued to edit the *Herald* till his death. The successful mission of Stanley to Central Africa in search of Dr. Livingstone, of whom nothing had long been heard, was undertaken by his desire and at his expense; and he thus showed in the last year of his life the inextinguishable spirit of enterprise which had animated him throughout his whole career. He died at New York, June 2, 1872.

BENNETT, John Hughes, for twenty-six years professor of the institutes of medicine at Edinburgh University, was born in London on the 31st August 1812, and died on the 25th September, 1875.

BENNETT, Sir William Sterndale, was considered, for more than the last 20 years of his life, the head of the musical profession in England by the unanimous verdict of both English and foreign musicians. At his death he received the highest honor England can confer upon her sons — a grave in Westminster Abbey. He was born in 1816 at Sheffield, where his father was organist. Having lost his father at an early age, he was brought up at Cambridge by his grandfather, from whom he received his first musical education. In 1826 he entered the Royal Academy of Music, and remained a pupil of that institution for the next ten years, studying pianoforte and composition under Cipriani Potter, Dr. Crotch, W. H. Holmes, and C. Lucas. It was during this time that he wrote several of his most appreciated works, not uninfluenced it seems by the contemporary movement of musical art in Germany, which country he frequently visited during the years 1836-42. At one of the Rhenish musical festivals in Düsseldorf he made the personal acquaintance of Mendelssohn, and soon afterwards renewed it at Leipsic, where the talented young Englishman was welcomed by the leading musicians of the rising generation. He played at one of the celebrated Gewandhaus concerts his third pianoforte concerto, which was received by the public in a manner flattering both to the pianist and the composer. We still possess an enthusiastic account of the event from the pen of Robert Schumann, whose genial expansive nature was always open to new impressions. He never tired of Bennett's praise, whom he pronounced to be "the most musical of all Englishmen," and whom, in a private letter, he goes so far as to call "an angel of a musician." But even Schumann could not wholly conceal from himself the influence which Mendelssohn's compositions exercised on Bennett's mode of utterance, an influence which precluded the possibility of an original development to a degree almost unequaled in the history of music, excepting perhaps the case of the Danish composer Niels W. Gade, who like Bennett was attracted to Leipsic by the fame of Mendelssohn, and who like him offered his own artistic individuality at the shrine of the German composer's genius. His great success on the Continent established Bennett's position in England. He settled in London, devoting himself chiefly to practical teaching. For a short time he acted as conductor of the Philharmonic Society, in which capacity, however, he earned little success. He was made musical professor at Cambridge in 1856, and in 1868 principal of the Royal Academy of Music. In 1871 he received the honor of knighthood. He died in 1875.

BENNINGTON is situated in the township and county of the same name in Vermont, fifty-six miles southwest of Rutland. It has considerable manufactures of chairs, woodenware and machinery, contains iron foundries and knitting-mills, a national bank, two newspaper offices, four churches and several schools. Population (1890), 4,000. There is an observatory at Mount Anthony. Bennington township contains also two villages—North Bennington and Bennington Centre.

BENSERADE, ISAAC DE, a French poet, was born in 1612 at Lions-la-Forêt in Normandy. He made himself known at court by his verses and his wit, and had the good fortune to please the cardinals Richelieu and Mazarin. Some years before his death in 1691 Benserade retired to Chantilly, and devoted himself to a translation of the Psalms, which he nearly completed.

BENSON, GEORGE, a learned dissenting minister, was born at Great Salkeld, in Cumberland, in 1699. His mental capacity was so precocious, that at 11 years of age he was able to read the Greek Testament. He afterwards studied at an academy at Whitehaven, whence he removed to the University of Glasgow. In 1721 he was chosen pastor of a congregation of dissenters at Abingdon, in Berkshire, where he continued till 1729, when he became the choice of a congregation in Southwark; and in 1740 he was appointed by the congregation of Crutched Friars colleague to the learned Dr. Lardner. He died in 1763.

BENT-GRASS, *Agrostis*, a genus containing some sixty species of coarse grasses common in temperate and cold climates. Some of the bents are valuable as forage and pasture plants.

BENTHAM, GEORGE, born in England in 1800, was a nephew of Jeremy Bentham (see below). Perhaps to a greater extent that any other botanist he added to our knowledge of plants, and his *Genera Plantarium* embodies almost everything known of botany. He was president of the Linnean Society 1863-74, and a member of many learned societies. He died September 10, 1884.

BENTHAM, JEREMY, was born on February 15, 1748, in Red Lion Street, London, England, in which neighborhood his grandfather and father successively carried on business as attorneys. He was educated at Westminster School and Queen's College. The first fruits of Bentham's studies, the *Fragment on Government*, appeared in 1776. This masterly attack upon Blackstone's praises of the English constitution was variously attributed to Lord Mansfield, Lord Camden, and Lord Ashburton. One important result of its publication was that, in 1781, Lord Shelburne called upon its author in his chambers at Lincoln's Inn. Henceforth Bentham was a frequent guest at Bowood, where he saw the best society, and where he met Miss Caroline Fox, to whom he afterwards made a proposal of marriage. In 1785 Bentham started, by way of Italy and Constantinople, on a visit to his brother, Sir Samuel Bentham, who became a general in the Russian service; and it was in Russia that he wrote his *Defense of Usury*. Disappointed in the hope which he had entertained, through a misapprehension of something said by Lord Lansdowne, of taking a personal part in the legislation of his country, he settled down to the yet higher task of discovering and teaching the principles upon which all sound legislation must proceed. His fame spread widely and rapidly. He was made a French citizen in 1792; and his advice was respectfully received in most of the states of Europe and America, with many of the leading men of which he maintained an active correspondence. His ambition was to be allowed to prepare a code of law for his own or some foreign country. During nearly a quarter of a century he was engaged in negotiations with Government for the erection of a "Panopticon," which would render transportation unnecessary. The scheme was eventually abandoned, and Bentham received £23,000 by way of compensation. In 1823 he established the *Westminster Review* Some idea of the extent of Bentham's literary labors may be derived from the fact that his *Works*, as edited with biographical notices by Dr. Bowring in 1843, fill eleven volumes octavo, of closely printed double columns. Bentham died on the 6th of June 1832, in his 85th year, at the house in Queen's Square Place, which he had occupied for fifty years. In accordance with his directions, his body, after being dissected in the presence of his friends, was embalmed, and is still preserved, seated in his wonted dress, in University College, London.

Bentham's life was a happy one of its kind. His constitution, weakly in childhood, strengthened with advancing years so as to allow him to get through an incredible amount of sedentary labor, while he retained to the last the fresh and cheerful temperament of a boy. An ample inherited fortune permitted him to pursue his studies undistracted by the necessity for making a livelihood, and to maximize the results of his time and labor by the employment of amanuenses and secretaries. He was able to gather around him a group of congenial friends and pupils, such as the Mills, the Austins, and Bowring, with whom he could discuss the problems upon which he was engaged, and by whom several of his books were practically rewritten, from the mass of rough though orderly memoranda which the master had himself prepared. Thus, for instance, was the *Rationale of Judicial Evidence* written out by J. S. Mill, and the *Book of Fallacies* by Bingham. The services which Dumont rendered in recasting, as well as translating, the works of Bentham were still more important.

The popular notion that Bentham was a morose visionary is far removed from fact. It is true that he looked upon general society as a waste of time, and that he disliked poetry as "misrepresentation"; but he intensely enjoyed conversation, gave good dinners, and delighted in music, in country sights, and in making others happy. These features of Bentham's character are illustrated in the graphic account given by the American minister, Mr. Rush, of an evening spent at his house in the summer of the year 1818.

Whether or no he can be said to have founded a school, his doctrines have become so far part of the common thought of the time, that there is hardly an educated man who does not accept as too clear for argument truths which were invisible till Bentham pointed them out. His sensitively honorable nature, which in early life had caused him to shrink from asserting his belief in Thirty-nine articles of faith which he had not examined, was shocked by the enormous abuses which confronted him on commencing the study of the law. He rebelled at hearing the system under which they flourished described as the perfection of human reason. But he was no merely destructive critic. He was determined to find a solid foundation for both morality and law, and to raise it upon an edifice, no stone of which should be laid except in accordance with the deductions of the severest logic. This foundation is "the greatest happiness of the greatest number," a formula adopted from Beccaria. The pursuit of such happiness is taught by the "utilitarian" philosophy, a phrase used by Bentham himself in 1802, and therefore not invented by Mr. J. S. Mill, as he supposed, in 1823. In order to ascertain what modes of action are most conducive to the end in view, and what motives are best fitted to produce them, Bentham was led to construct marvellously exhaustive, though somewhat mechanical, tables of motives. With all their elaboration, these tables are, however, defective, as they omit some of the highest and most influential springs of action. But most of Bentham's conclusions may be accepted without any formal profession of the utilitarian theory of morals. They are, indeed, merely the application of a rigorous common sense to the facts of society. That the proximate ends at which Bentham aimed are desirable hardly any one would deny, though the feasibility of the means by which he proposes to attain them may often be questioned; and much of

the new nomenclature in which he thought fit to clothe his doctrines may be rejected as unnecessary. To be judged fairly, Bentham must be judged as a teacher of the principles of legislation. With the principles of private morals he really deals only so far as is necessary to enable the reader to appreciate the impulses which have to be controlled by law.

As a teacher of legislation he inquires of all institutions whether their utility justifies their existence. If not, he is prepared to suggest a new form of institution by which the needful service may be rendered. While thus engaged no topic is too large for his mental grasp, none too small for his notice; and, what is still rarer, every topic is seen in its due relation to the rest. English institutions had never before been thus comprehensively and dispassionately surveyed.

BENTINCK, Lord William George Frederick Cavendish, better known as Lord George Bentinck, the second son of the fourth duke of Portland, by Henrietta, sister to the Viscountess, was born February 27, 1802. He was educated at Eton, and at Christ Church, Oxford; after which he entered the army, and served for several years in the Guards. On retiring from the army, he acted for some time as private secretary to his uncle Mr. Canning, then prime minister; in which capacity he gave proofs of high ability for the conduct of public business. In 1828 he succeeded his uncle Lord William Bentinck as member for Lynn-Regis, and continued to represent that constituency during the remaining twenty years of his life. Till within three years of his death Lord George Bentinck was little known out of the sporting world. His early attempts at public speaking afforded no indication of the abilities which the subsequent course of political events served to develop so conspicuously. His failures in the House of Commons seem to have discouraged him from the attempt to acquire reputation as a politician. On his first entrance into parliament he belonged to what may be called the moderate Whig party, and voted in favor of Catholic emancipation, as also for the Reform Bill, though he opposed some of its principal details. Soon after, however, he joined the ranks of the Opposition, with whom he sided up to the important era of 1846. When, in that year, Sir Robert Peel openly declared in favor of free trade, the advocates of the corn-laws, then without a leader, after several ineffectual attempts at organization, discovered that Lord George Bentinck was the only man around whom the several sections of the Opposition could be brought to rally. His sudden elevation to so prominent a position took the public mind by surprise; but he soon gave convincing evidence of powers so formidable, that the position of the Protectionist party at once assumed an imposing aspect. Towards Sir Robert Peel, in particular, his hostility was marked and uncompromising. Believing, as he himself expressed it, that that statesman and his political colleagues had "hounded to the death his illustrious relative" Mr. Canning, he combined with his opposition as a political leader a degree of personal animosity that gave additional force to the poignancy of his invective. Apart from the question of the corn-laws, his politics were strictly independent. In opposition to the rest of his party, he supported the bill for removing the Jewish disabilities, and was favorable to the scheme for the payment of the Roman Catholic clergy in Ireland by the landowners. As he had held no high office under Government, his qualifications as a statesman never found scope beyond the negative achievements of a leader of Opposition; but it may be safely affirmed that nothing but his untimely death could have debarred him from acquiring a distinguished position among the statesmen of Britain. This event, caused by the rupture of a vessel in the heart, took place suddenly on the 21st September 1848, while he was proceeding on foot to visit a friend in the country.

BENTIVOGLIO, Giovanni, was born at Bologna about 1438, seven years before the murder of his father Annibale, then the chief magistrate of the republic. In 1462 Giovanni contrived to make himself master of the state, which he continued to rule with a stern sway for nearly half a century; but his encouragement of the fine arts, and his decoration of the city by sumptuous edifices, gilded his usurpation. He was finally expelled by Pope Julian II., in 1506, and died in the state of Milan at the age of seventy.

BENTIVOGLIO, Guido, Cardinal, an eminent statesman and historian, was born at Ferrara in 1579. After studying at Padua, he went to reside at Rome, and was received with great favor by Pope Clement VIII., who made him a prelate. He was sent as nuncio into Flanders, and afterwards to France; and when he returned to Rome he was intrusted by Louis XIII. with the management of the French affairs at that court. In 1621 he was made a cardinal, and in 1641 received the bishopric of Terracina. He was the intimate friend of Pope Urban VIII., and on the death of Urban public opinion marked out Bentivoglio for his successor. He died suddenly, however, before the election took place. His principal works are, *Della Guerra di Fiandria*, 1632–39; *Relazioni di G. Bentivoglio in tempo delle sue Nunziature di Fiandria e di Francia*, 1631; *Memorie* 1648; *Lettere*, 1631.

BENTLEY, Richard (born, 1662; died, 1742), was born at Oulton, a township in the parish of Rothwell, in the West Riding of Yorkshire.

In 1690 Bentley took deacon's orders in the Established Church. In 1692 he was nominated first Boyle lecturer, a nomination which was repeated in 1694. He was offered the appointment a third time in 1695, but declined it, being by that time involved in too many other undertakings. In these first series of lectures he endeavors to present the Newtonian physics in a popular form, and to frame them into a proof of the existence of an intelligent Creator. The second series, preached in 1694, has not been published, and is believed to be lost. Scarcely was Bentley in priest's orders before he was preferred to a prebendal stall in Worcester cathedral. And, in 1693, the keepership of the royal library becoming vacant by the death of Henri de Justel, great efforts were made by his friends to obtain the place for Bentley. But, though there was a High Church candidate (Edmund Gibson) backed by the archbishops, the court interest prevailed, and the place was given to Mr. Thynne. Mr. Thynne, however, wanted only the salary and not the office, and was prevailed on to cede the place to Bentley for an annuity of £130 for life, the whole emoluments being but £200 and apartments in St. James's Palace. To these preferments were added, in 1695, a royal chaplaincy, and the living of Hartlebury. He was also about the same time elected a fellow of the Royal Society. And the recognition of Continental scholars came in the shape of a dedication, by Grævius (John George), prefixed to a dissertation of Albert Rubens, *De vita Th., Mallii*, published at Utrecht in 1694.

While these distinctions were being accumulated on Bentley, his energy was making itself felt in many and various directions. His first care was the royal library, the queen's library as it was commonly called. He made great efforts to retrieve this collection from the dilapidated condition into which it had been allowed to fall. He employed the mediation of the earl of Marlborough to beg the grant of some additional rooms in the palace for the books. The rooms were

granted, but Marlborough characteristically kept them for himself. Bentley enforced the law against the publishers, and thus added to the library nearly 1000 volumes which had been neglected to be delivered. He was commissioned by the University of Cambridge to obtain Greek and Latin founts for their classical books, and he had accordingly cast, in Holland, those beautiful types which appear in the Cambridge books of that date. He assisted Evelyn in his *Numismata*.

In the year 1700, Bentley, then in his 38th year, received that main preferment which, says De Quincey, "was at once his reward and his scourge for the rest of his life." The six commissioners of ecclesiastical patronage unanimously recommended Bentley to the Crown for the headship of Trinity College.

Trinity College, the most splendid foundation in the University of Cambridge, and in the scientific and literary reputation of its fellows the most eminent society in either university, had, in 1700, greatly fallen from its high estate. It was not that it was more degraded than the other colleges, but its former lustre made the abuse of endowments in its case more conspicuous. Bentley inaugurated many beneficial reforms in college usages and discipline, executed extensive improvements in the buildings, and generally used his eminent station for the promotion of the interests of learning, both in the college and in the university. But this noble energy was attended by a domineering temper, an overweening contempt for the feelings, and even for the rights, of others, and an unscrupulous use of means when a good end could be obtained. Bentley, at the summit of classical learning, disdained to associate with men whom he regarded as illiterate priests. He treated them with contumely, while he was diverting their income to public purposes. The continued drain upon their purses—on one occasion the whole dividend of the year was absorbed by the rebuilding of the chapel—was the grievance which at last roused the fellows to make a resolute stand. After ten years of stubborn, but ineffectual resistance within the college, they had recourse, in 1710, to the last remedy—an appeal to the visitor. Their petition is an ill-drawn invective, full of general complaints, and not alleging any special delinquency. Bentley's reply (*The Present State of Trinity College, &c.*, 8vo; Lond. 1710) is in his most crushing style. The fellows amended their position, and put in a fresh charge, in which they articled fifty-four separate breaches of the statutes as having been committed by the master. Bentley, called upon to answer, demurred to the bishop of Ely's jurisdiction, alleging that the Crown was visitor. He backed his application by a dedication of his Horace to the lord treasurer (Harley). The Crown lawyers decided the point against him; the case was heard, and a sentence of ejection from the mastership ordered to be drawn up, but before it was executed the bishop of Ely died, and the process lapsed.

This process, though it had lasted nearly five years, was only a prologue to the great feud, the whole duration of which was twenty-nine years. Space will not allow of its vicissitudes being here followed. It must suffice to say that Bentley was sentenced by the bishop of Ely (Greene) to be ejected from the mastership, and by Convocation to be stripped of his degrees, and that he foiled both the visitor and the university.

Bentley survived the extinction of this thirty years' war, two years. Surrounded by his grandchildren, he experienced the joint pressure of age and infirmity as lightly as is consistent with the lot of humanity. He continued to amuse himself with reading; and though nearly confined to his arm-chair, was able to enjoy the society of his friends, and several rising scholars, Maitland, John Taylor, his nephews Richard and Thomas Bentley, with whom he discussed classical subjects. He was accustomed to say that he should live to be 80, adding that a life of that duration was long enough to read everything worth reading.

Dr. Bentley married, in 1701, Joanna, daughter of Sir John Bernard of Brompton. Their union lasted forty years. Mrs. Bentley died in 1740, leaving a son, Richard, and two daughters, one of whom married, in 1728, Mr. Denison Cumberland, grandson of Richard Cumberland, bishop of Peterborough, and father of Richard Cumberland, the dramatic author. Bentley is most imperfectly represented by any one of his books. They have all the same occasional stamp. If we try to form our idea of the man, not from this or that extempore effusion, but from all that he did or was, we shall find that Bentley was the first, perhaps the only Englishman, who can be ranked with the great heroes of classical learning. Before him we have only Selden to name, or, in a more restricted field, Gataker and Pearson. But Selden, with stupendous learning, wanted that which Bentley shared with Scaliger or Wolf, the freshness of original genius and confident mastery over the whole region of his knowledge. "Bentley is not," says Mähly, "one among the great classical scholars, but he inaugurates a new era of the art of criticism. He opened a new path. With him criticism attained its majority. When scholars had hitherto offered suggestions and conjectures, Bentley, with unlimited control over the whole material of learning, gave decisions." The modern German school of philology, usually so unjust to foreigners, yet does ungrudging homage to the genius of this one Englishman. Bentley, says Bunsen, "was the founder of historical philology."

BENZOIC ACID, an organic acid present in large quantity in gum benzoin, and found also in dragon's blood (the resin of *Calamus Draco*) and some allied substances. It is, besides, prepared by numerous reactions from organic substances, being now largely made from naphthalin, one of the products of the distillation of coal tar. Benzoic acid is extracted from gum benzoin by the process of sublimation. The resin, coarsely powdered, is submitted to a heat of 300° Fahr. in a close vessel, by which the acid is expelled and may be condensed in receivers. By the sublimation process the acid carries away with it a small portion of essential oil, which gives its peculiar sweet odor to sublimed benzoic acid.

BENZOIN, GUM, sometimes called GUM BENJAMIN, a fragrant gum-resin obtained from *Styrax Benzoin*, a tree of considerable size, a native of Sumatra and Java, and introduced into Siam, Borneo, &c. The gum-resin is obtained by making incisions in the bark of trees after they have attained six years of age, when the benzoin exudes, and after hardening in the air is carefully scraped off with a knife. A tree produces on an average about 3lb. annually for 10 or 12 years. The produce of the first three years is known as "head" benzoin, and is esteemed the finest and most valuable; that produced in later years goes by the name of "belly" benzoin; and after the trees are cut down a small quantity of a dark-colored and very inferior quality is obtained, which is called "foot" benzoin. In medicine benzoin is seldom administered except as an adjunct to pectoral medicines. A compound tincture of benzoin is applied to flabby ulcers, and to excised wounds after the edges have been brought together. In these connections benzoin has a popular reputation under the name of Friars' or Monks' Balsam, which is a compound tincture of benzoin, and it forms an ingredient in court or black sticking-plaster. Benzoin diminishes the tendency towards rancidity in fats, a circumstance turned to account in the *Adeps benzoatus* of pharmacy.

BÉRANGER, PIERRE JEAN DE, the national song-writer of France, was born at Paris on the 19th August 1780. The aristocratic particle before the name was a piece of groundless vanity on the part of his father, which the poet found useful as a distinction. He was descended, in truth, from a country innkeeper on the one side, and, on the other, from a tailor in the Rue Montorgueil. Of education, in the narrower sense, he had but little. From the roof of his first school he beheld the capture of the Bastille, and this stirring memory was all that he acquired. Later on he passed some time in a school at Péronne, founded by one Bellenglise on the principles of Rousseau, where the boys were formed into clubs and regiments, and taught to play solemnly at politics and war. Béranger was president of the club, made speeches before such members of Convention as passed through Péronne, and drew up addresses to Tallien or Robespierre at Paris. In the meanwhile he learned neither Greek nor Latin — not even French, it would appear; for it was after he left school, from the printer Laisney, that he acquired the elements of grammar. His true education was of another sort. In his childhood, shy, sickly, and skilful with his hands, as he sat home alone to carve cherry stones, he was already forming for himself those habits of retirement and patient elaboration which influenced the whole tenor of his life and the character of all that he wrote. At Péronne he learned of his good aunt to be a stout republican; and from the doorstep of her inn, on quiet evenings, he would listen to the thunder of the guns before Valenciennes, and fortify himself in his passionate love of France and distaste for all things foreign. Although he could never read Horace save in a translation, he had been educated in *Telemaque*, Racine, and the dramas of Voltaire, and taught, from a child, in the tradition of all that is highest and most correct in French.

After serving his aunt for some time in the capacity of waiter, and passing some time also in the printing office of one Laisney, he was taken to Paris by his father. Here he saw much low speculation and many low royalist intrigues. In 1802, in consequence of a distressing quarrel, he left his father and began life for himself in the garret of his ever memorable song. For two years he did literary hackwork, when he could get it, and wrote pastorals, epics, and all manner of ambitious failures. At the end of that period (1804) he wrote to Lucien Bonaparte, enclosing some of these attempts. He was then in bad health, and in the last stage of misery. His watch was pledged. His wardrobe consisted of one pair of boots, one greatcoat, one pair of trousers with a hole in the knee, and "three bad shirts which a friendly hand wearied itself in endeavoring to mend." The friendly hand was that of Judith Frère, with whom he had been already more or less acquainted since 1796, and who continued to be his faithful companion until her death, three months before his own, in 1857. She must not be confounded with the Lisette of the songs; the pieces addressed to her (*La Bonne Vieille*, *Maudit Printemps*, &c.) are in a very different vein. Lucien Bonaparte interested himself in the young poet, transferred to him his own pension of 1000 francs from the Institute, and set him to work on a *Death of Nero*. Five years later, through the same patronage, although indirectly, Béranger became a clerk in the university at a salary of another thousand.

Meanwhile he had written many songs for convivial occasions, and "to console himself under all misfortunes;" some, according to M. Boiteau, had been already published by his father; but he set no great store on them himself; and it was only in 1812, while watching by the sick-bed of a friend, that it occurred to him to write down the best he could remember. Next year he was elected to the *Caveau Moderne*, and his reputation as a song-writer began to spread. Manuscript copies of *Les Gueux*, *Le Sénateur*, above all of *Le Roi d'Yvetot*, a satire against Napoleon, whom he was to magnify so much in the sequel, passed from hand to hand with acclamation. It was thus that all his best works went abroad; one man sang them to another over all the land of France. He was the only poet of modern times who could altogether have dispensed with printing.

His first collection escaped censure. "We must pardon many things to the author of the *Roi d'Yvetot*," said Louis XVIII. The second (1821) was more daring. The apathy of the Liberal camp, he says, had convinced him of the need for some bugle call of awakening. This publication lost him his situation in the university, and subjected him to a trial, a fine of 500 francs, and an imprisonment of three months. Imprisonment was a small affair for Béranger. At Sainte Pélagie he occupied a room (it had just been quitted by Paul Louis Courier), warm, well-furnished, and preferable in every way to his own poor lodging, where the water froze on winter nights. He adds, on the occasion of his second imprisonment, that he found a certain charm in this quiet, cloisteral existence, with its regular hours and long evenings alone over the fire. This second imprisonment of nine months, together with a fine and expenses amounting to 1100 francs, followed on the appearance of his fourth collection. The Government proposed through Laffitte that, if he would submit to the judgment without appearing or making defences, he should only be condemned in the smallest penalty. But his public spirit made him refuse the proposal; and he would not even ask permission to pass his term of imprisonment in a *Maison de Santé*, although his health was more than usually feeble at the time. "When you have taken your stand in a contest with Government, it seems to me," he wrote, "ridiculous to complain of the blows it inflicts on you, and impolitic to furnish it with any occasion of generosity." His first thought in La Force was to alleviate the condition of the other prisoners.

In the revolution of July he took no inconsiderable part. Copies of his song, *Le Vieux Drapeau*, were served out to the insurgent crowd. He had been for long the intimate friend and adviser of the leading men; and during the decisive week his counsels went a good way towards shaping the ultimate result. "As for the republic, that dream of my whole life," he wrote in 1831, "I did not wish it should be given to us a second time unripe." Louis Philippe, hearing how much the song-writer had done towards his elevation, expressed a wish to see and speak with him; but Béranger refused to present himself at court, and used his favor only to ask a place for a friend, and a pension for Rouget de l'Isle, author of the famous *Marseillaise*, who was now old and poor, and whom he had been already succoring for five years.

In 1848, in spite of every possible expression of his reluctance, he was elected to the assembly, and that by so large a number of votes (4471) that he felt himself obliged to accept the office. Not long afterwards, and with great difficulty, he obtained leave to resign. This was the last public event of Béranger's life. He continued to polish his songs in retirement, visited by nearly all the famous men of France. He numbered among his friends Chateaubriand, Thiers, Laffitte, Michelet, Lamennais, Mignet. Nothing could exceed the amiability of his private character; so poor a man has rarely been so rich in good actions; he was always ready to receive help from his friends when he was in need, and always forward to help others. His corre-

spondence is full of wisdom and kindness, with a smack of Montaigne, and now and then a vein of pleasantry that will remind the English reader of Charles Lamb. He occupied some of his leisure in preparing his own memoirs, and a certain treatise on *Social and Political Morality*, intended for the people, a work he had much at heart, but judged at last to be beyond his strength. He died on the 16th July 1857. It was feared that his funeral would be the signal for some political disturbance; but the Government took immediate measures, and all went quietly. The streets of Paris were lined with soldiers and full of townsfolk, silent and uncovered. From time to time cries arose: "*Honneur, Honneur à Béranger!*"

BERAR, a province of British India, forming a Commissionership. Area, about 17,500 square miles; population, 2¼ millions. The province consists of the districts assigned to the British Government by the Nizám of Haidarábád, under the treaties of 1853 and 1861. These districts are Amáotí, Elichpur, Wún, Akolá, Buldáná, and Básim. Berar province is bounded on the N. and E. by the Central provinces, on the S. by the Nizám's dominions, and on the W. by the Nizám's territory, the Bombay district of Khandesh, and by the Central Provinces. The Ajantá range intersects the whole province from W. to E., and divides it into two distinct sections — the Payanghát or lowland country, bounded on the N. by the Gáwilgarh range of the Sátpurá hills, which form the northern boundary between Berar and the Central Provinces, and on the S. by the Ajantá range, and the Bálághát or upland country of the Ajantá hills, occupying the whole southern part of the province. The Payanghát is a wide valley running up eastward between the Ajantá range and the Gáwilgarh hills, from 40 to 50 miles in breadth. This tract contains all the best land in Berar, it is full of deep, rich, black alluvial soil, called *regár*, of almost inexhaustible fertility, and it undulates just enough to maintain a natural system of drainage. Here and there are barren tracts where the hills jut out far into the plain, covered with stones and scrub jungle, or where a few isolated flat-topped hills occur. There is nothing picturesque about this broad strip of alluvial country, it is destitute of trees except near the villages close under the hills; and apart from the Púrná, which intersects it from east to west, it has hardly a perennial stream. In the early autumn it is one sheet of cultivation, but after the beginning of the hot season, when the crops have been gathered, its monotonous plain is relieved by neither verdure, shade, nor water. The aspect of the country above the passes which lead to the Bálághát is quite different. The trees are finer and the groves more frequent than in the valley below; water is more plentiful and nearer to the surface. The highlands fall southwards towards the Nizám's country by a gradual series of ridges or steppes. The principal rivers of the province are the Taptí, which forms a portion of its northwestern boundary; the Púrná, which intersects the valley of the Payanghát; the Wardhá, forming the whole western boundary line; and the Páin-gangá, marking the southern boundary for nearly its whole distance. The only natural lake is the Salt Lake of Sunár. There are no large tanks or artificial reservoirs.

The early history of Berar belongs to that of the Deccan. The province suffered repeated invasions of Mahometans from the north, and on the collapse of the Báhmani dynasty in 1526, Berar formed one of the five kingdoms under independent Mahometan princes, into which the Deccan split up. In the beginning of the seventeenth century the province was invaded by Prince Murad Mirza, son of the Emperor Akbar, and annexed to the Dehli empire. It did not long enjoy the blessings of tranquillity, for on the rise of the Marhattá power about 1650, the province became a favorite field of plunder. In 1671 the Marhattá general, Prataáp Ráo, extended his ravages as far east as Karinjá, and exacted from the village officers a pledge to pay *chauth*. In 1704 things had reached their worst; the Marhattás swarmed through Berar "like ants or locusts," and laid bare whole districts. They were expelled in 1704 by Zulfikár Khan, one of Aurangzeb's best generals, but they returned incessantly, levying black-mail in the shape of *chauth* and *sardeshmukhí*, with the alternative of fire and sword. Upon the death of Aurangzeb the Marhattás consolidated their predominance in Berar, and in 1717 their demand for *chauth*, or a fourth, and *sardeshmukhí*, or a tenth of the revenue of the province, was conceded by the governor. But in 1720–24 the viceroy of the Deccan, under the title of Nizam-ul-mulk, gained his independence by a series of victories over the imperial generals, and from that time till its cession to England in 1853, Berar was always nominally subject to the Haidarábád dynasty. The Marhattá rulers posted their officers all over the province, they occupied it with their troops, they collected more than half the revenue, and they fought among themselves for possession of the right to collect; but with the exception of a few *parganás* ceded to the Peshwá, the Nizám maintained his title as *de jure* sovereign of the country, and it was always admitted by the Marhattás. In the Marhattá war of 1803, the British under General Wellesley, afterwards the duke of Wellington, assisted by the Nizam, crushed the Marhattá power in this part of the country, by utterly defeating them at Argáon on the 28th November 1803, and a few days afterwards at Gáwilgarh. On the 19th December 1803 the Marhattá chief signed a treaty, in which he resigned all claim to territory and revenue west of the Wardhá, but retained Narnálá and Gáwilgarh in his possession. By this treaty the whole of Berar was made over in pepetual sovereignty to the Nizám. From that time till 1848 the history of the province consists of a long list of internal dissentions and civil wars. These troubles reduced the state to the verge of bankruptcy. The pay of the Nizám's irregular force, maintained under the treaty of 1800, fell into arrears, and had to be advanced by the British Government. There were also other unsatisfied claims of the Government on the Nizám, and in 1853 his whole debt amounted to £450,000. Accordingly, in that year a new treaty was concluded with the Nizám, under which the existing Haidarábád contingent force is maintained by the British Government, in lieu of the troops which the Nizám had been previously bound to furnish on demand in time of war; while for the payment of this contingent and other claims on the Nizám, districts then yielding a gross revenue of £500,000 per annum, including the present province of Berar, were assigned to that Government.

BÉRARD, FRÉDÉRIC, a French physician and writer on psychology, was born at Montpellier in 1789, and died in 1828, at the early age of 39.

BERBER, or EL-MECHEREF, a town of considerable size on the east bank of the Nile, some distance below the confluence of the Atbara, in about 18° N. lat. and 34° E. long. It is of importance as one of the main stations on the direct route from Khartoum to Cairo, and as the starting place of caravans for Suakin, on the eastern coast.

BERBERA, one of the most important seaports on the coast of the Somali country, in East Africa, 160 miles E.S.E. of Zeyla, and nearly opposite Aden. It seems at one time to have been a town of some size, as there are still remains of an aqueduct extending inland for several miles; but its permanent inhabitants have lo-

a long period been very few. From November to April, however, it becomes the general resort of from ten to twenty thousand persons from all the neighboring countries.

BERBICE, the eastern division of British Guiana. See GUIANA.

BERCHEM, or BERGHEM, NICHOLAS, an eminent painter, born at Haarlem in 1624. He received instruction from his father, and from the painters Van Goyen, Wils, and Weeninx. His pictures, of which he produced an immense number, were in great demand, as were also his etchings and drawings. His landscapes are highly esteemed; and many of them have been finely engraved by John Visscher, an eminent artist in his own line. The distinguishing characteristics of Berchem's works are—breadth and just distribution of lights, grandeur of masses of shadow, truth and simplicity of the figures, just gradation of distances, brilliancy and transparency of coloring, correctness of design, and elegance of composition. He died in 1683.

BERCHTESGADEN, or BERCHTOLSGADEN, a small town, beautifully situated on the south-eastern confines of Bavaria, and long celebrated for its extensive mines of rock-salt, which were worked as early as 1174.

BERDIANSK, a seaport town of Russia, in the government of Taurida, situated on the north-west shore of the Sea of Azoff, near the entrance of the River Berdianka into the Berdiansk Gulf.

BERDICHEFF, a town of Russian-Poland, in the government of Kieff, 24 miles from Jitomir, on the Gnilopyat, and not far from the borders of Volhynia, to which it historically belongs.

BERENGARIUS, a celebrated mediæval theologian, was born at Tours, 998 A.D. He was educated in the famous school of Fulbert of Chartres, and early acquired a great reputation for learning, ability, and piety. Appointed in 1031 superintendent of the cathedral school of his native city, he taught with such success as to attract pupils from all parts of France, and powerfully contributed to diffuse an interest in the study of logic and metaphysics, and to introduce that dialectic development of theology which is designated the scholastic. About 1040 Berengar was made archdeacon of Angers. It was shortly after this that rumors began to spread of his holding heretical views regarding the sacrament of the supper. He had submitted the doctrine of transubstantiation (already generally received both by priests and people, although it had been first unequivocally taught and reduced to a regular theory by Paschasius Radbert only in 831) to an independent examination, and had come to the conclusion that it was contrary to reason, unwarranted by Scripture, and inconsistent with the teachings of men like Ambrose, Jerome, and Augustine. He did not conceal this conviction from his scholars and friends, and through them the report spread widely that he denied the common doctrine respecting the Eucharist. His early friend and school companion, Adelmann, archdeacon of Liege, wrote to him letters of expostulation on the subject of this report in 1046 and 1048; and a bishop, Hugo of Langres, wrote (about 1049) a refutation of the views which he had himself heard Berengar express in conversation. Berengar's belief was not shaken by their arguments and exhortations, and hearing that Lanfranc, the most celebrated theologian of that age, strongly approved the doctrine of Paschasius and condemned that of Ratramnus, he wrote to him a letter expressing his surprise, and urging him to reconsider the question. The letter arriving at Bec when Lanfranc was absent at Rome, was sent after him, but was opened before it reached him, and brought under the notice of Pope Leo IX. Because of it Berengar was condemned as a heretic, without being heard, at a synod at Rome and another at Vercelli, both held in 1050. His enemies in France cast him into prison; but the bishop of Angers and other powerful friends, of whom he had a considerable number, had sufficient influence to procure his release. At the Council of Tours (1054) he found a protector in the Papal legate, the famous Hildebrand, who, satisfied himself with the fact that Berengar did not deny the real presence of Christ in the sacramental elements, succeeded in persuading the assembly to be content with a general confession from him that the bread and wine, after consecration, were the body and blood of the Lord, without requiring him to define how. Trusting in Hildebrand's support, and in the justice of his own cause, he presented himself at the Synod of Rome in 1059, but found himself surrounded by fierce and superstitious zealots, who forced him by the fear of death to signify his acceptance of the doctrine "that the bread and wine, after consecration, are not merely a sacrament, but the true body and the true blood of Christ, and that this body is touched and broken by the hands of the priests, and ground by the teeth of the faithful, not merely in a sacramental but in a real manner." He had no sooner done so so than he bitterly repented his weakness; and acting, as he himself says, on the principle "to take an oath which never ought to have been taken is to estrange one's self from God, but to retract what one has wrongfully sworn to, is to return back to God," when he got safe again into France he attacked the transubstantiation theory more vehemently than ever. He continued for about sixteen years to disseminate his views by writing and teaching, without being directly interfered with by either his civil or eclesiastical superiors, greatly to the scandal of the multitude and of the zealots, in whose eyes Berengar was "ille apostolus Satanæ," and the academy of Tours, the "Babylon nostri temporis." An attempt was made at the Council of Poitiers in 1075 to allay the agitation caused by the controversy, but it failed, and Berengar narrowly escaped death in a tumult raised by fanatics. Hildebrand, now Gregory VII., next summoned him to Rome, and, in a synod held there in 1078, tried once more to obtain a declaration of his orthodoxy by means of a confession of faith drawn up in general terms; but even this strong-minded and strong-willed Pontiff, although sincerely anxious to befriend the persecuted theologian, and fully alive to the monstrous character of the dogma of trasubstantiation as propounded by Pope Nicholas II. and Cardinal Humbert at the synod held in 1059, was at length forced to yield to the demands of the multitude and its leaders; and in another synod at Rome (1079), finding that he was only endangering his own position and reputation, he turned unexpectedly upon Berengar and commanded him to confess that he had erred in not teaching a change *as to substantial reality* of the sacramental bread and wine into the body and blood of Christ. "Then," says Berengar, "confounded by the sudden madness of the Pope, and because God in punishment for my sins did not give me a steadfast heart, I threw myself on the ground, and confessed with impious voice that I had erred, fearing the Pope would instantly pronounce against me the sentence of condemnation, and, as a necessary consequence, that the populace would hurry me to the worst of deaths." He was kindly dismissed by the Pope not long after, with a letter recommending him to the protection of the bishops of Tours and Angers, and another pronouncing anathema on all who should do him any injury or call him a heretic. He returned home overwhelmed with shame and bowed down with sorrow for having a second time been guilty of a great impiety. He immediately recalled his forced confession, and besought all Christian men "to pray for him,

so that his tears might secure the pity of the Almighty." He now saw, however, that the spirit of the age was against him, and hopelessly given over to the belief of what he had combated as a delusion. He withdrew, therefore, into solitude, and passed the rest of his life in retirement and prayer on the island of St. Côme near Tours. He died there in 1088.

BERENICE, an ancient city on the western shore of the Red Sea, near the head of the *Sinus Immundus* or Foul Bay.

BERENICE, the name of several Egyptian and Jewish princesses. The two most generally known are—

1. BERENICE, the daughter of Magus, king of Cyrene, and the wife of Ptolemy Euergetes, of Egypt. During her husband's absence on an expedition to Syria, she dedicated her hair to Venus for his safe return, and placed it in the temple of the goddess of Zephyrium. The hair having by some unknown means disappeared, Conon, the mathematician, explained the phenomenon in courtly phrase, saying that it had been carried to the heavens and placed among the stars. The name *Coma Berenices* applied to a constellation, commemorates this incident. Only a few lines remain of the poem in which Callimachus celebrated the transformation, but there is a fine translation of it by Catullus.

2. BERENICE, daughter of Agrippa I., king of Judæa, and born probably about 28 A. D. She was first married to her uncle, Herod, after whose death she lived for some years with her brother Agrippa, not without scandal. Her second husband was Polemo, king of Cilicia, but she soon deserted him, and returned again to Agrippa, with whom she was living when Paul appeared before him at Cæsarea. During the devastation of Judæa by the Romans, she fascinated Titus, whom she accompanied to Rome.

BEREZINA, or BERESINA, a river of Russia, in the government of Minsk, forming a tributary to the Dnieper. It rises in the marshes of Boresoff, and has a course of more than 330 miles. The river is memorable on account of the disastrous passage of the French army during the retreat from Moscow in November, 1812. The French built two bridges over the river and a number crossed in safety, but the rear guard of 7,000 men were compelled to surrender. The Russian batteries played on the bridges, which were finally destroyed, and when the wounded French and camp-followers tried to cross on the ice the Russians fired round shot and broke the ice. More than 12,000 dead were taken from the river and 16,000 prisoners captured.

BEREZOFF, a town of Asiatic Russia, capital of a circle in Tobolsk, 700 miles N. of that city, situated on three hills on the left bank of the Sosna, 13 miles above its mouth, and on the Bogul, a tributary of the Sosna. In 1742 General Osterman was sent to Berezoff with his wife and died there in 1747. In 1782 the town was raised to the rank of chief town of a district of the Tobolsk government. In 1808 it was burned down.

BERG (*Ducatus Montensis*), a former duchy of Germany, on the right bank of the Rhine, bounded on the N. by the duchy of Cleves, E. by the countship of Mark and duchy of Westphalia, and on the S. and W. by the bishopric of Cologne. The district was raised in 1108 to the rank of a countship, but did not become a duchy till the 14th century, after it had passed into the possession of the Jülich family. On the extinction of this house in 1609, Austria laid claim to the duchy as an imperial fief; but, in keeping with the wishes of the inhabitants, it was administered conjointly by the electors of Saxony and Brandenburg and the Elector Palatine till 1624, when by the Düsseldorf treaty the last of the three obtained the sole authority. In 1806 it was bestowed by Napoleon, along with the duchy of Cleves and other possessions, on Murat, who bore the title of grand duke of Berg; and after Murat's elevation to the throne of Naples, it was transferred to Louis, the son of the king of Holland. By the Congress of Vienna in 1815 it was made over to Prussia, and now forms a flourishing part of her territory.

BERGAMA, a town of Asia Minor, with 2500 inhabitants. See PERGAMUS.

BERGAMO, a northern province of Italy, bounded on the N. by Sondrio, E. by Tyrol and Brescia, S. by Cremona, and W. by Milan and Como. To the N. and W. of Lake Iseo there are numerous mineral wells, the most important of which are those of Trescoro. Marble is abundant in the mountains, and there are valuable iron mines. At an early period the wealth of the capital appears to have been increased by the working of the copper mines in the district. Population, 391,580.

BERGAMO, the capital of the above province, is situated between the Brembo and Serio, two tributaries of the Adda, 39 miles N.E. of Milan, on the railway that runs from Venice to the Lake of Como. It consists of a new and an old town, the latter known as the *Città*, or city, being built on a hill, while the former, or *Borgo S. Leonardo*, occupies the level ground below. It dates from the 10th century, and is of great importance, especially for the silk trade. Bergamo, or *Bergomum*, was a municipal town during the Roman empire, and, after being destroyed by Attila, became one of the most flourishing cities of the Lombard kings, who made it the capital of a duchy. In the 15th century it was appropriated and fortified by the Venetians. In 1509 it was occupied by Louis XII. of France, who retained it for seven years, and then restored it to Venice. In 1796 the French again made themselves masters of the city, and constituted it the capital of their departmen' of Serio. Bergamo was the birthplace of Tiraboschi Rubini, and Donizetti. Population (1890) 26,200.

BERGAMOT, Oil of, an essential oil obtained from the rind of the fruit of a species of *Citrus*, regarded by Risso as *C. bergamia*, but not generally believed to constitute a distinct species. The bergamot is a small tree with leaves and flowers like the bitter orange, and a round fruit nearly 3 inches in diameter, with a thin lemon-yellow smooth rind. The oil is now obtained by placing several fruits in a saucer-shaped apparatus, the surface of which is cut into radiating sharp-edged grooves. Against the sharp edges of this dish the fruits are rapidly revolved by means of a heavy cover placed above it, which is moved by a cog wheel. The oil vessels are ruptured by pressure against the knife edges, and the oil which exudes falls through small perforations in the bottom into a vessel placed underneath. It is allowed to rest till a greasy substance — bergamot camphor — deposits, after which it is bottled for use. Bergamot Oil is a limpid greenish-yellow fluid of a specific gravity of 0.869, of a powerful but pleasant citrine odor and an aromatic bitterish taste. The chief use of bergamot oil is in perfumery and as a flavoring material in cookery.

BERGEN, a city and seaport on the west coast of Norway, capital of the province of South Bergen. It is situated on a rocky promontory at the head of a deep bay called the Vaag, has a fine harbor with two good entrances, and is surrounded by hills, some of which attain the height of 2,000 feet. Bergen has a considerable export trade, which consists of stockfish, lobsters, fish-roes, herrings, whale oil, horns, skins, rock moss, and timber and is chiefly carried on with the northern countries of Europe. Bergen was founded in the eleventh century by Olaf the Peaceful. Pop. 49,542.

BERGEN-OP-ZOOM, a town of Holland, in the province of North Brabant, situated on both sides of the

River Zoom, near its confluence with the East Scheldt. It is about 15 miles N. of Antwerp, and 22 W.S.W. of Breda.

BERGERAC, the chief town of an arrondissement in the department of Dordogne, in France, situated in a fertile plain, 30 miles S.S.W. of Périgueux.

BERGEN POINT, a railroad and telegraph town in Hudson county, N. J., now known as BAYONNE CITY (*q.v.*)

BERGMANN, TORBERN OLOF, Swedish chemist and naturalist, was born at Catherinberg, West Gothland, in 1735. At the age of seventeen he entered the University of Upsala, and distinguished himself by extraordinary assiduity in study, directing his attention more particularly to the natural sciences. During a residence at home rendered necessary by his weak health, he employed himself in collecting specimens of insects and plants, which he forwarded to Linnæus, who was much pleased with them. In 1756 he gained great reputation by his memoir on the *Coccus aquaticus*, which, contrary to the opinion of Linnæus, he proved to be nothing but the ovum of a certain species of leech. Some years later he was made professor of physics at Upsala, and published numerous scientific memoirs. In 1767 the chair of chemistry and mineralogy having become vacant through the resignation of Wallerius, Bergmann resolved to become a candidate. He had not hitherto devoted special attention to chemistry, but in a very short period by incredible application he produced as evidence of his fitness for the post a paper on the composition of alum, which is still regarded as a masterpiece. He was appointed to the chair, which he held till his death in 1784. In 1776 he had declined an offer from the king of Prussia inviting him to settle in Berlin. Bergmann was an unusually acute and sagacious analytical chemist, and made extensive and constant use of the laboratory. He described very carefully the properties of carbonic acid gas, and gave a valuable analysis of mineral waters.

BERKELEY, a town of Alameda county, California, beautifully situated on the Bay of San Francisco, eight miles northeast of San Francisco. Berkeley is the seat of the University of California, and also contains the State institution for the deaf, dumb and blind.

BERKELEY, a market-town in the county of Gloucester, near the River Severn, on the Midland Railway of England. Population, 5,000.

BERKELEY, GEORGE, bishop of Cloyne, one of the most subtle and original English metaphysicians, was born on the 12th March 1685, at Dysert castle, on the banks of the Nore, about two miles below Thomastown, Ireland. Not much is known of his family, who seem to have been connected with the noble English house of the same name. From his own account, and from the few notices of contemporaries, we can gather that his was a mind of peculiar subtlety, keen to probe to the very foundation any fact presented to it, and resolutely determined to rest satisfied with no doctrine which had only the evidence of authority or custom, and was not capable of being realized in consciousness. Of the greatest importance for the development of his rare powers in a definite direction was the general condition of thought at the time of his residence at Dublin. The older text-books of physics and philosophy were no doubt in use (Dublin in this respect has always been conservative), but alongside of them the influences of the new modes of thinking were streaming in. The opposed physical systems of Descartes and Newton had begun to be known; the new and powerful calculus was being handled; the revolution in metaphysical speculation inaugurated by Descartes had reached Dublin; and, above all, the first great English work on pure philosophy, the *Essay* of Locke, had been translated into Latin, and its doctrines were being eagerly and minutely discussed by the young Trinity College students. Add to this the undoubted influence exercised by the presence in Dublin of such men as the university provost, Peter Browne, afterwards bishop of Cork, and King, archbishop of Dublin from 1703, and it will be readily seen that Berkeley, to use Professor Fraser's words, "entered an atmosphere which was beginning to be charged with the elements of reaction against traditional scholasticism in physics and metaphysics."

Although more competent than any man of his time to appreciate these new movements of thought, Berkeley did not neglect the routine work of the university. He had a distinguished career, was made scholar in 1702, took his B.A. degree in 1704, and obtained a fellowship in 1707.

He soon began to appear as an author. In 1707 he published two short tracts on mathematics, and in 1709 the *New Theory of Vision*, in which he applied his new principle, though without stating it explicitly. The new theory is a critical examination of the true meaning of the externality which is apparently given in visual consciousness, and which, to the unphilosophical mind, is the strongest evidence of the independent existence of outer objects. Such visual consciousness is shown to be ultimately a system of arbitrary signs, symbolizing for us certain actual or possible tactual experience — in fact, a language which we learn through custom. The difference between the contents of the visual and tactual consciousness is absolute; they have no element in common. The visible and visual signs are definitely connected with tactual experiences, and the association between them, which has grown up in our minds through custom or habit, rests upon, or is guaranteed by, the constant conjunction of the two by the will of the Universal Mind. But this synthesis, whether on the objective side as the universal thought or course of nature, or on the subjective side as mental association, is not brought forwards prominently by Berkeley. It was at the same time perfectly evident that a quite similar analysis might have been applied to tactual consciousness, which does not give externality in its deepest signifiance any more than visual; but it was with deliberate purpose that Berkeley at first drew out only one side of his argument. In 1710 the new doctrine received its full statement in the *Principles of Human Knowledge*, where externality in its ultimate sense as independence of all mind is considered; where matter, as an abstract, unperceived substance or cause, is shown to be an impossible and unreal conception; where true substance is affirmed to be conscious spirit, true causality the free activity of such a spirit, while physical substantiality and causality in their new meaning are held to be merely arbitrary but constant relations among phenomena connected subjectively by suggestion or association, conjoined objectively in the Universal Mind. In ultimate analysis, then, nature is conscious experience, and forms the sign or symbol of a divine, universal intelligence and will.

In the preceding year Berkeley had been ordained as deacon, and in 1711 he delivered his *Discourse on Passive Obedience*, in which he deduces moral rules from the intention of God to promote the general happiness, thus working out a theological utilitarianism, which may with advantage be compared with the later expositions of Austin and Mill. From the year 1707 he had been engaged as college tutor; in 1712 he paid a short visit to England, and in April of the following year he was presented by Swift at court. His splendid abilities and fine, courteous manners, combined with the purity

and uprightness of his character, made him a universal favorite. While in London he published his *Dialogues* (1713), a more popular exposition of his new theory; for exquisite facility of style these are perhaps the finest philosophical writings in the English language. In November of the same year he became chaplain to Lord Peterborough, whom he accompanied on the Continent, returning in August 1714. He travelled again in 1715 as tutor to the son of Dr. Ashe, and was absent from England for five years. On his way home he wrote and sent to the French Academy the essay *De Motu*, in which is given a full account of his new conception of causality, the fundamental and all-comprehensive thought in his philosophy. In 1721, during the disturbed state of social relations consequent on the bursting of the great South Sea bubble, he published an *Essay towards preventing the Ruin of Great Britain*, which shows the intense interest he took in all practical affairs. In the same year he returned to Ireland as chaplain to the duke of Grafton, and was made divinity lecturer and university preacher. In 1722 he was appointed to the deanery of Dromore, a post which seems to have entailed no duties, as we find him holding the offices of Hebrew lecturer and senior proctor at the university. The following year brought him an unexpected addition of fortune, Miss Vanhomrigh, Swift's Vanessa, having left him half her property. It would appear that he had only met her once at dinner. In 1724 he was nominated to the rich deanery of Derry, but had hardly been appointed before he was using every effort to resign it in order to devote himself to his enthusiastically conceived scheme of founding a college in the Bermudas, and extending its benefits to the Americans. With infinite exertion he succeeded in obtaining from Government a promise of £20,000, and, after four years spent in preparation, sailed in September 1728, accompanied by some friends and by his wife, daughter of Judge Forster, whom he had married in the preceding month. Their destination was Rhode Island, where they resolved to wait for the promised grant from Government. Three years of quiet retirement and study were spent in the island. Berkeley bought a farm, made many friends, and endeared himself to the inhabitants. But it gradually became apparent that Government would never hand over the promised grant, if indeed they had ever seriously contemplated doing so. Berkeley was therefore compelled reluctantly to give up his cherished plan. Soon after his return he published the fruits of his quiet studies in *Alciphron, or the Minute Philosopher* (1733), a finely written work in the form of dialogue, critically examining the various forms of free-thinking in the age, and bringing forward in antithesis to them his own theory, which shows all nature to be the language of God. The work was extremely popular. In 1734 he was raised to the bishopric of Cloyne, and at once went into residence. The same year, in his *Analyst*, he attacked the higher mathematics as leading to freethinking; this involved him in a hot controversy. The *Querist*, a practical work in the form of questions on what would now be called social or economical philosophy, appeared in three parts, 1735, 1736, 1737. In 1744 was published the *Siris*, partly occasioned by the controversy with regard to tar-water, but rising far above the petty circumstances from which it took its rise, and in its chain of reflections revealing the matured thoughts and wide reading of its author, while opening up hidden depths in the Berkeleian metaphysics. In 1751 his eldest son died, and in 1752 he removed with his family to Oxford for the sake of his son George who was studying there. On the evening of the 14th January 1753, he expired suddenly and painlessly in the midst of his family. And thus quietly closed one of the purest and most beautiful lives on record. His remains were deposited in Christ Church, Oxford.

BERKHAMPSTEAD, GREAT, a market-town of England, in the county of Herts, twenty-six miles northwest of London, on the Junction canal and the North-Western railway. Population (1890), 5,000.

BERKSHIRE, one of the southeastern counties of England, bounded on the northeast by Buckinghamshire, from which it is separated by the Thames; north by Oxfordshire and a small portion of Gloucester; west by Wilts; south by Hants; and southeast by Surrey. It is of a very irregular figure, extending from east to west fully sixty miles; while from north to south, in its widest part, it is about thirty-five miles, and in its narrowest part, at Reading, not more than seven. Area, 450,132 acres. Population (1890), 238,361.

Berkshire is not a manufacturing county, although the woollen manufacture was introduced here as long ago as the time of the Tudors. There are some paper-mills, particularly in the neighborhood of Newbury, and an extensive biscuit manufactory at Reading. The chief trade consists in agricultural produce.

Antiquities, both Roman and Saxon, are numerous in various parts of this county. Watling Street enters Berkshire from Bedfordshire at the village of Streatley, and leaves it at Newbury. Another Roman road passes from Reading to Newbury, where it divides into two branches, one passing to Marlborough in Wiltshire, and the other to Cirencester in Gloucestershire. A branch of Ickfield Street passes from Wallingford to Wantage. Near Wantage is a Roman camp, of a quadrangular form; and there are other remains of encampments at East Hampstead near Wokingham, at Pusey, on White-Horse Hill, and at Sinodun Hill, near Wallingford. At Lawrence Waltham there is a Roman fort, and near Denchworth a fortress said to have been built by Canute the Dane, called Cherbury Castle. Barrows are very numerous in the downs in the N. W. of the county, particularly between Lambourn and Wantage. Dragon Hill is supposed to have been the burying-place of a British prince called Uther Pendragon, and near to it is Uffington Castle, supposed to be of Danish construction. On White-Horse Hill, in the same vicinity, is the rude figure of what is called a horse, although it bears a greater resemblance to a greyhound. It has been formed by cutting away the turf and leaving the chalk bare.

Berkshire comprehended the principality inhabited by the *Atrebates*, a tribe of people who originally migrated from Gaul. Under the Romans it formed part of *Britannia Prima*, and during the Saxon heptarchy was included in the kingdom of the West Saxons. When Alfred divided the country into shires, hundreds and parishes, it obtained the name of *Berocscire*, which was subsequently changed to that which it now bears.

BERLIN is the chief city of the province of Brandenburg, the capital of the kingdom of Prussia, and since 1871 the metropolis of the German empire.

The city is built on what was originally in part a sandy and in part a marshy district on both sides of the River Spree, not far from its junction with the Havel, one of the principal tributaries of the Elbe. By its canals it has also direct water communication with the Oder. The Spree rises in the mountain region of Upper Lusatia, is navigable for the last 97 English miles of its course, enters Berlin on the S.E. as a broad sluggish stream, retaining an average width of 420 feet, and a depth of 6 or 7 feet, until it approaches the centre of the city, where it has a sudden fall of 4 feet, and leaves the city on the N.W., after receiving the waters of the

Panke, again as a dull and sluggish stream, with an average width of only 160 feet, but with its depth increased to from 12 to 14 feet. Within the boundaries of the city it feeds canals, and divides into branches, which, however, reunite. The river, with its canals and branches, is crossed by about 50 bridges, of which very few have have any claim to architectural beauty. Among these latter may be mentioned the Schlossbrücke, built after designs by Schinkel in the years 1822–24, with its eight colossal figures of white marble, representing the ideal stages of a warrior's career. The statues are for the most part of high artistic merit. They stand on granite pedestals, and are the work of Drake, Wolff, and other eminent sculptors. The Kurfürstenbrücke is another bridge which merits notice, on account of the equestrian bronze statue of the Great Elector, by which it is adorned.

Singular obscurity rests on the origin of the city. The hypotheses which carried it back to the early years of the Christian era have been wholly abandoned. Even the Margrave Albert the Bear (d. 1170) is no longer unquestionably regarded as its founder, and the tendency of opinion now is to date its origin from the time of his great-grandsons, Otho and John. When first alluded to, what is now Berlin was spoken of as two towns, Cöln and Berlin. The first authentic document concerning the former is from the year 1237, concerning the latter from the year 1244, and it is with these dates that the trustworthy history of the city begins. Fidicin, in his *Diplomatische Beiträge zur Geschichte der Stadt Berlin*, vol. iii., divides the history of the town, from its origin to the times of the Reformation, into three periods. The first of these, down to the year 1307, is the period during which the two towns had a separate administration; the second, from 1307 to 1442, dates from the initiation of the joint administration of the two towns to its consummation. The third period extends from 1442 to 1539, when the two towns embraced the reformed faith.

In the year 1565 the town had already a population of 12,000. About ninety years later, after the close of the Thirty Years' War, it had sunk to 6000. At the death of the Great Elector in 1688, it had risen to 20,000. The Elector Frederick III., afterwards King Frederick I., sought to make it worthy of a royal "residence," to which rank it had been raised in 1701. From that time onwards Berlin grew steadily in extent, splendor, and population. Frederick the Great found it, at his accession in 1740, with 90,000 inhabitants. At the accession of Frederick William IV. in 1840 it had 331,894, and in December, 1889, fifty years later, the population had quadrupled, the exact numbers in that year being 1,315,412. The two original townships of Cöln and Berlin have grown into the sixteen townships into which the city is now divided, covering about 25 English square miles of land, and Berlin now takes its place as the fourth, perhaps the third, greatest city in Europe, surpassed only by London, Paris, and possibly Vienna. Its importance is now such that a bill, recently submitted by the Government to the consideration of the Legislature, proposed to raise it to the rank of a province of the kingdom.

Progress and prosperity have, however, been chequered by reverses and humiliation. The 17th century saw the Imperialists and Swedes, under Wallenstein and under Gustavus Adolphus, as enemies, within its walls; the 18th century, the Austrians and Russians, during the Seven Years' War; the 19th century, Napoleon I. and the French; and the year 1848 witnessed the bloody scenes of the March Revolution. But the development of constitutional government, and the triumphs of 1866 and 1870, have wiped out the memory of these dark spots in the history of the Prussian capital.

The town has grown in splendor as it has increased in numbers.

Up to a very recent date Berlin was a walled city. Those of its nineteen gates which still remain have only an historical or architectural interest. The principal of these is the Brandenburg Gate, an imitation of the Propylæa at Athens. It is 201 feet broad and nearly 65 feet high. It is supported by twelve Doric columns, each 44 feet in height, and surmounted by a car of victory, which, taken by Napoleon to Paris in 1807, was brought back by the Prussians in 1814. It has recently been enlarged by two lateral colonnades, each supported by 16 columns.

The streets, about 520 in number, are, with the exception of the districts in the most ancient part of the city, long, straight, and wide, lined with high houses, for the old typical Berlin house, with its ground floor and first floor, is rapidly disappearing. The Unter den Linden is 3287 feet long by 160 broad. The new boulevard, the Königgrätzerstrasse, is longer still, though not so wide. The Friedrichstrasse and the Oranienstrasse exceed 2 English miles in length. The city has about 60 squares. It has 25 theatres and 14 large halls for regular entertainments. It has an aquarium, zoological garden, and a floral institution, with park, flower, and palm houses. It has several hospitals, of which the largest is the Charité, with accommodation for 1500 patients. The Bethany, Elizabeth, and Lazarus hospitals are attached to establishments of Protestant deaconesses. The St. Hedwig's hospital is under the care of Roman Catholic sisters. The Augusta hospital, under the immediate patronage and control of the empress, is in the hands of lady nurses, who nurse the sick without assuming the garb and character of a religious sisterhood. The people's parks are the Humboldt's Hain, the Friedrich's Hain, the Hasenheide, and, above all, the Thiergarten, a wood covering 820 Prussian acres of ground, and reaching up to the Brandenburg Gate.

As has been seen, the population has quadrupled itself within the last 50 years, naturally not so much by the excess of births over deaths, as by an unbroken current of immigration. In past times Berlin received a strong infusion of foreign blood, the influence of which is perceptible to the present day in its intellectual and social life. Such names as Savigny, Lancizolle, De la Croix, De le Coq, Du Bois-Reymond, tell of the French refugees who found a home here in the cold north when expelled from their own land. Daniel, in his *Geography*, vol. iv. p. 155, says that there was a time when every tenth man in the city was a Frenchman. Flemish and Bohemian elements, to say nothing of the banished Salzburgers, were introduced in a similar manner. Add to these the 50,000 Jews now resident in the city, and the picture of the commingled races which make up its population is pretty complete.

The rate of mortality is high. In 1873, a favorable year, it was 28 to every 1000 of the population. Taking the deaths as a whole, 58 per cent. were of children under 10 years of age. The rate of mortality is on the increase. Professor Virchow, in a report to the municipal authorities, stated that, dividing the last 15 years into periods of 5 years each, the general mortality in each of the three periods was as 5, 7, 9. The mortality of children under 1 year in the same three periods was as 5, 7, 11; that is, it had more than doubled. In the year 1872, out of 27,800 deaths, 11,136 were of children under 1 year.

The city is well supplied with water by works constructed by an English company, which have now become the property of the city. English and German companies supply the city with gas. A system of un-

derground drainage is at present in process of construction. Internal communication is kept up by means of tramways, omnibuses, and cabs. In 1888 there were 250 tram-carriages, 185 omnibuses, and 4434 cabs licensed, served by 10,060 horses.

Berlin is governed by the president of police, by the municipal authorities, and in military matters by the governor and commandant of the city. The police president stands under the minister of the interior, and has the control of all that stands related to the maintenance of public order. The municipal body consists of a burgomaster-in-chief, a burgomaster, a body of town councillors (Stadträthe), and a body of town deputies (Stadtverordnete). For municipal purposes the city is divided into 16 townships and 210 districts For police purposes the *work* is divided into six departments, and an extra department for the fire brigade and street cleaning, and the *town* into six larger and fifty smaller districts. At the head of each larger district is a police captain, at the head of each smaller district a police lieutenant.

With the exception of a few of the higher schools, which are under the direct supervision of the provincial authorities, the Berlin schools are either under the direct supervision of the municipal body or of its committee for school purposes. The schools, public and private, are divided into higher, middle and elementary. In 1889 there were 24 higher public schools. Of these, 10 were gymnasia or schools for the highest branches of a learned education. The second class of high schools, the so-called Realschulen, give instruction in Latin, but otherwise devote almost exclusive attention to the departments of mathematics, science, history, modern languages, and the requirements of the higher stages of general or commercial life.

The scholastic life of Berlin culminates in its university, which is, of course, not a municipal, but a national institution. It is, with exception of Bonn, the youngest of the Prussian universities, but the first of them all in influence and reputation. It was founded in 1810. Prussia had lost her celebrated university of Halle, when that city was included by Napoleon in his newly created "kingdom of Westphalia." It was as a weapon of war, as well as a nursery of learning, that Frederick William III., and the great men whose names are identified with its origin, called it into existence, for it was felt that knowledge and religion are the true strength and defence of nations. William v. Humboldt was at that time at the head of the educational department of the kingdom, and men like Fichte and Schleiermacher worked the popular mind. It was opened on the 15th of October 1810. Its first rector was Schmalz; its first deans of faculty, Schleiermacher, Biener, Hufeland, and Fichte. Within the first ten years of its existence it counted among its professors such names as De Wette, Neander, Marheineke, Savigny, Eichhorn, Böckh, Bekker, Hegel, Raumer, Wolff, Niebuhr, and Buttmann. Later followed such names as Hengstenberg and Nitzsch; Homeyer, Bethman-Hollweg, Puchta, Stahl, and Heffter; Schelling, Trendelenburg, Bopp, the brothers Grimm; Zumpt, Carl Ritter; and at the present time it can boast of such names as Twesten and Dorner; Gneist and Hinschius; Langenbeck, Bardeleben, Virchow, and Du Bois-Reymond; von Ranke, Mommsen, Curtius, Lepsius, Hoffman the chemist, and Kiepert the geographer.

Berlin possesses eight public museums, in addition to the Royal Museum and the National Gallery. The royal museums are the old and new museums.

The new museum is connected with the old museum by a covered corridor. In its interior arrangements and decoration it is undoubtedly the most splendid structure in the city. Like the old museum, it has three floors. The lowest of these contains the Ethnographical and Egyptian museums and the museum of northern antiquities. In the first floor, plaster casts of ancient, mediæval, and modern sculpture are found in thirteen halls and in three departments. On the walls of the grand marble staircase, which rise to the full height of the building, Kaulbach's renowned cyclus of stereochromic pictures is painted, representing the six great epochs of human progress, from the confusion of tongues at the tower of Babel and the dispersion of the nations to the Reformation of the 16th century. The uppermost story contains the collection of engravings and the gallery of curiosities.

The national gallery is an elegant building, after designs by Stüler, situated between the new museum and the Spree, and is intended to receive the collection of modern paintings now exhibited provisionally in the apartments of the academy.

The public monuments are the equestrian statues of the Great Elector on the Lange Brücke, erected in 1703; Rauch's celebrated statute of Frederick the Great, "probably the grandest monument in Europe," opposite the emperor's palace, Unter den Linden; and the statue of Frederick William III. in the Lustgarten. In the Thiergarten is Drake's marble monument of Frederick William III.; and in the neighboring Charlottenburg, Rauch's figures of the same king and the Queen Louise in the mausoleum in the Park. A second group of monuments on the Wilhelm's Platz commemorates the generals of the Seven Years' War; and a third, in the neighborhood of the Opera, the generals who fought against Napoleon I. On the Kreuzberg, the highest spot in the neighborhood of Berlin, a Gothic monument in bronze was erected by Frederick William III. to commemorate the victories of 1813–15; and in the Königsplatz the emperor, Wilhelm I., erected a column of victory in honor of the triumphs of 1864, 1866, and 1870. This monument rises to the height of 187 feet, the gilded figure of Victory on the top being 40 feet high. Literature, science, and art are represented in different parts of the city by statues and busts of Rauch, Schinkel, Thaer, Beuth, Schadow, Winckelmann, Schiller, Hegel, Jahn; while the monuments in the cemeteries and churches bear the names of distinguished men in all departments of political, military, and scientific life.

Next to Leipsic, Berlin is the largest publishing centre in Germany.

Berlin is not only a centre of intelligence, but is also an important centre of manufacture and trade. Its trade and manufactures appear to be at present in a transition state — old branches are dying out, and new branches are springing into existence. Direct railway communication between the corn lands of north-eastern Germany, Poland, and Russia on the one hand, and the states of Central and Western Germany on the other, have deprived Berlin of much of its importance as a centre of trade in corn and flour.

BERLIN, a city of Waterloo county, Ontario, Canada, on the Grand river, sixty-two miles from Toronto It has banking, railroad and telegraph facilities, several breweries, factories and mills, two newspaper offices and a considerable trade. Population (1890), 7,500.

BERLIN, a city of Green Lake county, Wis., is situated on the Fox river, which affords facilities for steam navigation. It is twenty-four miles southwest of Oshkosh and ninety-six miles northwest of Milwaukee, with which towns it has direct railroad communication. Berlin contains a national bank, woolen and flour mills, tanneries, coffin and casket factories, eight churches, a high school and other schools. Population, 4,000.

BERLIOZ, HECTOR, by far the most original com-

poser of modern France, was born in 1803 at Côte-Saint-André, a small town near Grenoble, in the department of Isère. His father was a physician of repute, and by his desire our composer for some time devoted himself to the study of the same profession. At the same time he had music lessons, and, in secret, perused numerous theoretical works on counterpoint and harmony, with little profit it seems, till the hearing and subsequent careful analysis of one of Haydn's quartets opened a new vista to his unguided aspirations. A similar work written by Berlioz in imitation of Haydn's masterpiece was favorably received by his friends. From Paris, where he had been sent to complete his medical studies, he at last made known to his father the unalterable decision of devoting himself entirely to art, the answer to which confession was the withdrawal of all further pecuniary assistance. In order to support life Berlioz had to accept the humble engagement of a singer in the chorus of the Gymnase theatre. Soon, however, he became reconciled to his father, and entered the Conservatoire, where he studied composition under Reicha and Lesueur. His first important composition was an opera called *Les Francs-Juges*, of which, however, only the overture remains extant. In 1825 he left the Conservatoire, disgusted, it is said, at the dry pedantry of the professors, and began a course of autodidactic education, founded chiefly on the works of Beethoven, Gluck, Weber, and other German masters. About this period Berlioz saw for the first time on the stage the talented Irish actress Miss Smithson, who was then charming Paris by her impersonations of Ophelia, Juliet, and other Shakespearean characters. The young enthusiastic composer became deeply enamoured of her at first sight, and tried, for a long time in vain, to gain the responsive love or even the attention of his idol. To an incident of this wild and persevering courtship Berlioz's first symphonic work, *Episode de la Vie d'un Artist*, owes its origin. It describes the dreams of an artist who, under the influence of opium, imagines that he has killed his mistress, and in his vision witnesses his own execution. It is replete with the spirit of contemporary French romanticism and of self-destructive Byronic despair. A written programme is added to each of the five movements to expound the imaginative material on which the music is founded. By the advice of his friends Berlioz once more entered the Conservatoire, where after several unsuccessful attempts, his cantata *Sardanapalus* (1830) gained him the first prize for foreign travel, in spite of the strong personal antagonism of one of the umpires. During a stay in Italy Berlioz composed an overture to *King Lear*, and *Le Retour à la Vie*,— a sort of symphony, with intervening poetical declamation between the single movements, called by the composer a melologue, and written in continuation of the *Episode de la Vie d'un Artist*, along with which work it was performed at the Paris Conservatoire in 1832. Paganini on that occasion spoke to Berlioz the memorable words: "Vous commencez par où les autres ont fini." Miss Smithson, who also was present on the occasion, soon afterwards consented to become the wife of her ardent lover. The artistic success achieved on that occasion did not prove to be of a lasting kind. Berlioz's music was too far remote from the current of popular taste to be much admired beyond a small circle of esoteric worshippers It is true that his name became known as that of a gifted though eccentric composer; he also received in the course of time his due share of the dictinctions generally awarded to artistic merit, such as the ribbon of the Legion of Honor and the membership of the Institute. But these distinctions he owed, perhaps, less to a genuine admiration of his compositions than to his influential position as the musical critic of the *Journal des Débats* (a position which he never used or abused to push his own works), and to his successes abroad. In 1842 Berlioz went for the first time to Germany, where he was hailed with welcome by the leading musicians of the younger generation, Robert Schumann foremost amongst them. The latter paved the way for the French composer's success, by a comprehensive analysis of the *Episode* in his musical journal, the *Neue Zeitschrift für Musik*. Berlioz gave successful concerts at Leipsic and other German cities, and repeated his visit on various later occasions — in 1852, by invitation of Liszt, to conduct his opera *Benvenuto Cellini* (hissed off the stage in Paris), at Weimar; and in 1855 to produce his oratorio-trilogy, *L'Enfance du Christ*, in the same city. This latter work had been previously performed at Paris, where Berlioz mystified the critics by pretending to have found one part of it, the "Flight into Egpyt," amongst the manuscript scores of a composer of the 17th century, Pierre Ducré by name. Berlioz also made journeys to Vienna (1866) and St. Petersburg (1867), where his works were received with great enthusiasm. He died in Paris, March 9, 1869.

BERMUDAS, SOMERS'S ISLANDS, or SUMMER ISLANDS, a group in the Atlantic Ocean, the seat of a British colony, about 600 miles E. by S. from Cape Hatteras on the American coast. They lie to the south of a coral reef or atoll, which extends about 24 miles in length from N.E. to S.W., by 12 in breadth. The largest of the series is Great Bermuda, or Long Island, enclosing on the east Harrington or Little Sound, and on the west the Great Sound, which is thickly studded with islets, and protected on the north by the islands of Somerset, Boaz, and Inland. The remaining members of the group, St. George's, Paget's, Smith's, St. David's, Cooper's, Nonsuch, &c., lie to the east, and form a semicircle round Castle Harbor. The islands are wholly composed of a white granular limestone of various degrees of hardness, from the crystaline "base rock," as it is called, to friable grit. It seems that they are in a state of subsidence and not of elevation. The caves which usually appear in limestone formations are well represented, many of them running far into the land and displaying a rich variety of stalagmites and stalactites. Among the less ordinary geological phenomena may be mentioned the "sand glacier" at Elbow Bay. The surface soil is a curious kind of red earth, which is also found in ochre-like strata throughout the limestone. It is generally mixed with vegetable matter and coral sand. There is a total want of streams and wells of fresh water, and the inhabitants are dependent on the rain, which they collect and preserve in tanks. The climate of the Bermudas has a reputation for unhealthiness which is hardly borne out, for the ordinary death-rate is only 22 per 1000. Yellow fever and typhus, however, have on some occasions raged with extreme violence, and the former has appeared four times within the space of thirty years. Vegetation is very rapid, and the soil is clad in a mantle of almost perpetual green. The principal kind of tree is the so-called "Bermudas cedar," really a species of juniper, which furnishes timber for small vessels. The shores are fringed with the mangrove; the prickly pear grows luxuriantly in the most barren districts; and wherever the ground is left to itself the sage-brush springs up profusely. The citron, sour orange, lemon, and lime grow wild; but the apple and peach do not come to perfection. The loquat, an introduction from China, thrives admirably. The gooseberry, currant, and raspberry, all run to wood. The oleander bush, with all its beauty, is almost a nuisance. The soil is very fertile in the growth of esculent plants and roots; and a considerable trade has grown up within recent years between Ber-

mudas and New York, principally in arrowroot, of excellent quality, onions, Irish potatoes, and tomatoes. Regular steam communication between the island and that city is maintained, the government subsidizing the vessels. Medicinal plants, as the castor-oil plant, aloe, and jalap, come to great perfection without culture; and coffee, indigo, cotton, and tobacco are also of spontaneous growth. Tobacco curing ceased about 1707. Few oxen or sheep are reared in the colony, a supply being obtained from North America; but goats are kept by a large number of the inhabitants. The ass is the usual beast of burden. The indigenous Mammalia are very few, and the only Reptilia are a small lizard and the green turtle. Birds, however, especially aquatic species, are very numerous,—one of the commonest being the cardinal-grosbeak; and the chigre or jigger, are common. Fish are plentiful round the coasts, and the whale-fishery was once an important industry. Gold-fish, introduced from Demerara, swarm in the ditches. The population is about 12,000.

There are two towns in the Bermudas, St. George's, founded in 1794, and Hamilton, founded in 1790, and incorporated in 1793.

BERN, or BERNE, a canton of Switzerland. It extends from the French and Alsace frontier south-east through the heart of the Confederacy to Valais, by which it is bounded on the S., while it has the cantons of Basel, Soleure, Aargau, Lucerne, Unterwalden, and Uri on the E., and Vaud, Freiburg, Neufchâtel on the W. Bern is the second largest canton of Switzerland, its surface being estimated at 2562 square miles. The canton is naturally divided into three regions, in which the climate varies with the elevation. The southern part, called the Oberland, is for its scenery the most attractive part of all Switzerland, Many of the grandest mountains of the Alpine system — such as the Grimsel, the Finsteraarhorn, the Schreckhorn, the Wetterhorn, the Eiger, and the Jungfrau — lie along the frontier chain, and numerous offshoots and valleys of great beauty stretch northward toward the central part of the canton. This latter district consists for the most part of an undulating plain, interspersed with lesser chains and hills, — the soil being fertile and well cultivated. The north is occupied with the ranges of the Jura system. The principal river in the canton is the Aar, which drains by far the larger proportion of its surface, either directly or by means of numerous tributaries. Of these, the most important are the Saane, from the S.; the Thiele, which forms the outlet of the lakes of Bienne and Neufchâtel; and the Emme, which gives its name to the beautiful Emmenthal. The northern corner of the canton is divided between the basins of the Rhone and the Rhine. On the upper course of the Aar are the two lakes of Brienz and Thun. The mineral wealth of the country is neither extensive nor varied; but iron mines are worked, and gold is found in the River Emme. Quarries of sandstone, marble, and granite are abundant. The pastures in the Oberland and the Emmenthal are excellent, and cattle and horses of the best description are largely reared. The latter district also produces cheese of excellent quality, which is exported to Germany and Italy. Fruit is extensively cultivated in the central region and in the neighborhood of the lakes of Brienz and Thun; the vine is principally grown to the north of Lake Bienne. In the forests, which are of considerable importance, the prevailing trees are the fir, the pine, and the beach. The industrial productions of canton are the cotton, woollen and flaxen stuffs, leather, watches, and wooden wares of all kinds. Bern is divided into thirty bailiwicks or prefectures, each with a local administrator. The capital is Berne, and the other chief towns are Bienne or Biel, Thun, Burgdorf or Berthoud, Porrentruy or Pruntrut, Délémont or Delsberg. The highest legislative authority is the Great Council, the members of which are chosen in proportion to the number of the people; and the executive power is in the hands of a lesser council of nine members, chosen by the Great Council for a space of four years. The educational institutions in the canton comprise a university and two gymnasiums in the capital, and gymnasiums and colleges at Biel, Thun, Burgdorf, Neuenstadt, Porrentruy, and Délémont. There is a deaf and dumb institution at Frienisberg, and a cantonal lunatic asylum named Waldau. Population, 550,000.

BERN, the capital of the above canton, and, since 1848, the permanent seat of the Government and Diet of the Swiss Confederation. It is situated at an elevation of 1710 feet above the sea, on a sandstone peninsula, formed by the windings of the Aar, which is crossed on the south side of the city by an extensive weir, and further down passes under four bridges connecting the peninsula with the right bank. It is one of the most characteristically Swiss towns; some of the streets are broad and regular, the houses being well built with hewn stone; in others a peculiar effect is produced by the presence of lines of arcades down the sides. Prominent among the public buildings is the Federal Council Hall, or *Bundes-Rathhaus*, a fine structure in the Florentine style, which was completed in 1857. The upper story is occupied by a picture gallery of some value. The town-hall dates from 1406, and was restored in 1861. Among the ecclesiastical buildings the first place is held by the cathedral, a richly-decorated Gothic edifice, begun in 1421 and completed in 1573, from the neighborhood of which a splendid view of the Alps is obtained. Educational institutions are very numerous, comprising a university, founded in 1834, which is attended by 400 students, a gymnasium, and a veterinary school. Attached to the university are a botanical garden and an observatory; and there are, besides, a valuable museum, a public library of 45,000 volumes, especially rich in works relating to Swiss history, and several literary and scientific societies. Among the charitable establishments are two large hospitals, a foundling hospital, two orphan asylums, and a lunatic asylum. Another asylum was erected in 1854, about 2¼ miles from the city. The penitentiary is capable of containing 400 prisoners. Among the other buildings of interest are the granary, which, till 1830, used to be stored with corn in case of famine; the clock tower, with its automatic pantomime; the arsenal, with its mediæval treasures; the mint; and the Murtner Gate. The most frequent ornament throughout the city is the figure of the bear, in allusion to the mythical origin of the name of Bern; and the authorities still maintain a bear's den at municipal expense. Although, properly speaking, not a commercial city, Bern carries on some trade in woollen cloth, printed calico, muslin, silk stuffs, straw hats, stockings, and other articles of home manufacture. The climate is severely cold in winter, owing to the elevation of the situation. Population (1890), 40,000.

Bern was founded, or at least fortified, by Berthold V. of Zähringen, about the end of the 12th or beginning of the 13th century, and gradually became a refuge for those who were oppressed by feudal exactions in the neighboring countries. In 1218 it was declared a free imperial city by the Emperor Frederick II. At first its constitution was purely democratic; but in 1293 a legislative body of 200 citizens was appointed, which formed the germ of one of the most remarkable oligarchies in modern European history. The extension of territory, gradually effected by the valor of the Bernese, rendered necessary a more elaborate and rigid organiza-

tion than that which had sufficed while the limits of the city were almost the limits of the state; and the power of the nobility at home was strengthened by every new success against the enemies of the city. The blow that decided the fate of Bern was struck at Laupen on June 21, 1339, when Rudolph von Erlach beat the allied army of the neighboring states. It continued to flourish, and in 1352 joined the Swiss Confederation. A fire destroyed the city in 1405, but it was rebuilt on the same plan. In the 17th century the gradually increasing aristocratic tendency reached its climax. The adoption of new burghers was forbidden, and the burghers proper were carefully distinguished from those who were merely permanent inhabitants of the city; the burghers were divided into those capable of holding office in the state and those destitute of that privilege; and the privileged class itself, which, by 1785, numbered only 69 families, was subdivided into a higher and a lower grade. This élite grew more and more exclusive and domineering, and at last became unendurable to their humbler fellow-citizens. In 1748 the discontent made itself evident in a formidable conspiracy, of which the unfortunate Henzi was one of the leaders. The conspiracy was crushed, but the opposition broke out through other channels. At last the French Revolution came to submerge the aristocracy in a general Helvetian republic; and when the flood had passed the ancient landmarks could not be replaced, though a restoration was attempted with at first an appearance of success. The Liberal party has long been the strongest in the canton, which has at last returned almost to democracy; for, in 1870, the *referendum* was introduced, by which it is agreed that all laws, after being discussed by the Great Council, shall first receive the sanction of the people before they come into force.

BERNADOTTE, Jean Baptiste-Jules, afterwards King Charles XIV. of Sweden and Norway, was the son of a lawyer at Pau in Béarn, and was born January 26, 1764. He was destined by his parents for the law, but chose the profession of arms, and enlisted in 1780 as a private in the royal marines. When the Revolution swept away the arbitrary distinction of classes, and opened up to all alike the path of preferment, the abilities of Bernadotte were speedily acknowledged. In 1792 he was made a colonel, in the following year a general of brigade, and soon after a general of divison. In the campaign of the Rhine and of Italy his military talents found ample scope for display; and his diplomatic abilities had also been tested as ambassador at the court of Vienna. During Bonaparte's absence in Egypt Bernadotte was appointed minister of war. He reorganized the whole army, and prepared the way for the conquest of Holland. Notwithstanding the rivalry that all along existed between him and Napleon, Bernadotte was made a marshal on the establishment of the empire. He was also nominated to the government of Hanover, and took part in the campaign of 1805 at the head of a force of 20,000 men. He distinguished himself at the battle of Austerlitz, and in 1806 he was created prince of Ponte-Corvo. In 1810 the death of Prince Augustenburg of Sweden having left the throne of that kingdom without an heir, the Swedish States in Council nominated Bernadotte as successor to Charles XIII. of Sweden, a distinction for which he was scarcely less indebted to his nobility of character than to his military talents. During the great campaigns of 1813 and 1814 Bernadotte joined the coalition against Napoleon, and it was his Swedish contingent that mainly decided the battle of Leipsic. It is stated, on good authority, that he had formed the ambitious design of succeeding the emperor on the French throne. As crown prince of Sweden he devoted his whole energies to the welfare of his adopted country. Owing to the infirmities of the king he was intrusted with the entire conduct of the government. On the death of Charles XIII., in February 1818, Bernadotte ascended the throne. For the events of his administration, so conducive to the prosperity of that country, the reader is referred to the article Sweden. He died at Stockholm, March 8, 1844, leaving an only son, Oscar, who succeeded him.

BERNARD, St., one of the most illustrious Christian teachers and representatives of monasticism in the Middle Ages, was born at Fontaines, near Dijon, in Burgundy, in 1091. The son of a knight and vassal of the duke of Burgundy who perished in the first crusade, Bernard may have felt for a time the temptations of a military career, but the influence of a pious mother and his own inclinations towards a life of meditation and study led him to the cloister. While still a youth he is said to have been "marvellously cogitative," and the ascendency of his mind and character were soon shown. He joined the small monastery of Citeaux in 1113 when twenty-two years of age, and such were the effects of his own devotion and eloquent enthusiasm in commending a religious life, that he drew after him not only his two younger brothers, but also his two elder ones, Guido and Gerard, both of whom had naturally taken to soldiering, and the elder of whom was married and had children. The effect of his preaching is said to have been that "mothers hid their sons, wives their husbands, companions their friends," lest they should be drawn away by his persuasive earnestness.

The monastery of Citeaux had attracted St. Bernard not only on account of its neighborhood (it was only a few miles distant from Dijon), but by its reputation for austerity. The monks were few and very poor. They were under an Englishman of the name of Stephen Harding, originally from Dorsetshire, whose aim was to restore the Benedictine rule to its original simplicity and give a new impulse to the monastic movement. In Bernard, Harding found a congenial spirit. No amount of self-mortification could exceed his ambition. He strove to overcome his bodily senses altogether and to live entirely absorbed in religious meditation. Sleep he counted a loss, and compared it to death. Food was only taken to keep him from fainting. The most menial offices were his delight, and even then his humility looked around for some lowlier employment. Fortunately he loved nature, and found a constant solace in her rocks and woods.

So ardent a nature soon found a sphere of ambition for itself. The monks of Citeaux, from being a poor and unknown company, began to attract attention after the accession of St. Bernard and his friends. The fame of their self-denial was noised abroad, and out of their lowliness and abnegation came, as usual, distinction and success. The small monastery was unable to contain the inmates that gathered within it, and it began to send forth colonies in various directions. St. Bernard had been two years an inmate, and the penetrating eye of the abbot had discovered beneath all his spiritual devotion a genius of rare power, and especially fitted to aid his measures of monastic reform. He was chosen accordingly to head a band of devotees who issued from Citeaux in 1115 in search of a new home. This band, with Bernard at their head, journeyed northwards till they reached a spot in the diocese of Langres — a thick-wooded valley, wild and gloomy, but with a clear stream running through it. Here they settled and laid the foundations of the famous abbey of Clairvaux, with which St. Bernard's name remains associated in history.

Gradually the influence of Bernard's character began to extend beyond his monastery. His friendship with

William of Champeaux and others gave currency to his opinions, and from his simple retreat came by voice or pen an authority before which many bowed, not only within his own order but within the church at large. This influence was notably shown after the death of Pope Honorius II. in 1130. Two rival popes assumed the purple, each being able to appeal to his election by a section of the cardinals. Christendom was divided betwixt the claims of Anacletus II. and Innocent II. The former was backed by a strong Italian party, and drove his adversary from Rome and even from Italy. Innocent took refuge in France. The king, Louis the Fat, espoused his cause, and having summoned a council of archbishops and bishops, he laid his commands on the holy abbot of Clairvaux to be present also and give the benefit of his advice. With reluctance Bernard obeyed the call, and from the depths of seclusion was at once plunged into the heart of the great contest which was afflicting the Christian world. The king and prelates put the question before him in such a way as to invite his decision and make him arbiter. After careful deliberation he gave his judgment in favor of Innocent, and not only so, but from that time forward threw himself with characteristic fervor and force into the cause for which he had declared. Not only France, but England, Spain, and Germany were won to the side of Innocent, who, banished from Rome, in the words of St. Bernard, was "accepted by the world." He travelled from place to place with the powerful abbot by his side, who also received him in his humble cell at Clairvaux. Apparently, however, the meanness of the accommodation and the scantiness of the fare (one small fowl was all that could be got for the Pope's repast), left no wish on the part of Innocent or his retinue to continue their stay at Clairvaux. He found a more dainty reception elsewhere, but nowhere so powerful a friend. Through the persuasions of Bernard the emperor took up arms for Innocent; and Anacletus was driven to shut himself up in the impregnable castle of St. Angelo, where his death opened the prospect of a united Christendom. A second anti-pope was elected, but after a few months retired from the field, owing also, it is said, to St. Bernard's influence. A great triumph was gained not without a struggle, and the abbot of Clairvaux remained master of the ecclesiastical situation. No name stood higher in the Christian world.

The chief events which fill up his subsequent life attest the greatness of his influence. These were his contest with the famous Abelard, and his preaching of the second crusade.

Peter Abelard was twelve years older than Bernard, and had risen to eminence before Bernard had entered the gates of Citeaux. His first intellectual encounter had been with Bernard's aged friend William of Champeaux, whom he had driven from his scholastic throne at Paris by the superiority of his dialectics. His subsequent career, his ill-fated passion for Heloise, his misfortunes, his intellectual restlessness and audacity, his supposed heresies, had all shed additional renown on his name; and when a council was summoned at Sens in 1140, at which the French king and his nobles and all the prelates of the realm were to be present, Abelard dared his enemies to impugn his opinions. St. Bernard had been amongst those most alarmed by Abelard's teaching, and had sought to stir up alike Pope, princes, and bishops to take measures against him. He did not readily, however, take up the gauntlet thrown down by the great hero of the schools. He professed himself a "stripling too unversed in logic to meet the giant practiced in every kind of debate." But "all were come prepared for a spectacle," and he was forced into the field. To the amazement of all, when the combatants met and all seemed ready for the intellectual fray, Abelard refused to proceed with his defence. After several passages considered to be heretical had been read from his books he made no reply, but at once appealed to Rome and left the assembly. Probably he saw enough in the character of the meeting to assure him that it formed a very different audience from those which he had been accustomed to sway by his subtilety and eloquence, and had recourse to this expedient to gain time and foil his adversaries. Bernard followed up his assault by a letter of indictment to the Pope against the heretic. The Pope responded by a sentence of condemnation, and Abelard was silenced. Soon after he found refuge at Cluny with the kindly abbot, Peter the Venerable, who brought about something of a reconciliation betwixt him and Bernard. The latter, however, never heartily forgave the heretic. He was too zealous a churchman not to see the danger there is in such a spirit as Abelard's, and the serious consequences to which it might lead.

In all things Bernard was enthusiastically devoted to the church, and it was this enthusiasm which led him at last into the chief error of his career. Bad news reached France of the progress of the Turkish arms in the East. The capture of Edessa in 1144 sent a thrill of alarm and indignation throughout Christian Europe, and the French king was urged to send forth a new army to reclaim the Holy Land from the triumphant infidels. The Pope was consulted, and encouraged the good work, delegating to St. Bernard the office of preaching the new crusade. Weary with growing years and cares the abbot of Clairvaux seemed at first reluctant, but afterwards threw himself with all his accustomed power into the new movement, and by his marvelous eloquence kindled the crusading madness once more throughout France and Germany. Not only the French king, Louis VII., but the German emperor, Conrad III., placed himself at the head of a vast army and set out for the East by way of Constinople. Detained there too long by the duplicity of the Greeks, divided in council, the Christian armies encountered frightful hardships, and were at length either dispersed or destroyed. Utter ruin and misery followed in the wake of the wildest enthusiasm. Bernard became an object of abuse as the great preacher of a movement which had terminated so disastrously, and wrote in humility an apologetic letter to the Pope, in which the divine judgments are made as usual accountable for human folly. This and other anxieties bore heavily upon even so sanguine a spirit. Disaster abroad and heresy at home left him no peace, while his body was worn to a shadow by his fasting and labors. It was, as he said, "the season of calamities." Still to the last, with failing strength, sleepless, unable to take solid food, with limbs swollen and feeble, his spirit was unconquerable. "Whenever a great necessity called him forth," as his friend and biographer Godfrey says, "his mind conquered all his bodily infirmities, he was endowed with strength, and to the astonishment of all who saw him, he could surpass even robust men in his endurance of fatigue." He continued absorbed in public affairs, and dispensed his care and advice in all directions often about the most trivial as well as the most important affairs. Finally the death of his associates and friends left him without any desire to live. He longed rather "to depart and be with Christ." To his sorrowing monks, whose earnest prayers were supposed to have assisted his partial recovery when near his end, he said, "Why do you thus detain a miserable man? Spare me. Spare me, and let me depart." He expired August 20, 1153, shortly after his disciple Pope Eugenius III.

BERNARD, James, professor of philosophy and mathematics, and minister of the Walloon church at Leyden, was born at Nions, in Dauphiné, September 1, 1658. Having studied at Geneva, he returned to France in 1679, and was chosen minister of Venterol, in Dauphiné, whence he afterwards removed to the church of Vinsobres. As he continued to preach the Reformed doctrines in opposition to the royal ordinance, he was obliged to leave the country and retired to Holland, where he was well received, and appointed one of the pensionary ministers of Gonda. He died on April 27, 1718.

BERNARD, Simon, French general of engineers and aide-de-camp to Napoleon I., was born at Dôle April 28, 1779. He was educated at the Ecole Polytechnique and entered the engineer corps, in which he was rapidly advanced in rank. After the fall of the empire General Bernard came to the United States, where he executed a number of extensive military works. Among these was Fortress Monroe, and of civil engineering works were the Delaware breakwater and the Chesapeake and Ohio canal. In 1830 General Bernard returned to France, and under Louis Philippe prepared the plans for the fortifications of Paris. He served twice as minister of war and died November 5, 1839.

BERNARDIN, St., of Siena, a celebrated preacher, was born at Massa Carrara in 1380. His family, the Albizeschi, was noble, and his father was chief magistrate of Massa. He lost both parents before his eighth year, and was educated by his aunt, a pious woman. After completing his course of study he passed some years as a voluntary assistant in the hospital of Scala, and in 1404 entered the order of St. Francis. His eloquence as a preacher made him celebrated throughout Italy, nor was his fame diminished by his visit to the Holy Land, from which he returned with fresh zeal. Three cities, Siena, Ferrara, and Urbino, successively sought the honor of having him as their bishop, but without avail. In 1438 he was made vicar-general of his order in Italy. He died on the 20th May 1444, at Aquila in Abruzzo. His canonization took place in 1450 by the order of Nicholas V. A collection of his works was published in 1571 by Rudolfi, bishop of Sinigaglia.

BERNAY, the chief town of an arrondissement in the department of Eure, in France, on the left bank of the Charentonne, 26 miles W.N.W. of Evreux. It is beautifully situated in the midst of green wooded hills, and still justifies Madame de Stael's description —"Bernay is a basket of flowers." Population, 7,200.

BERNBURG, a city of Anhalt in Germany, and formerly the capital of the now incorporated duchy of Anhalt-Bernburg. Population (1890), 21,600.

BERNE. See Bern.

BERNERS, Juliana, prioress of Sopewell nunnery, near St. Albans, was the daughter of Sir James Berners, who was beheaded in the reign of Richard II. She was celebrated for her beauty, her spirit, and her passion for field sports.

BERNI, Francesco, Italian poet, was born about 1490 at Lamporecchio, in Bibbiena, a district lying along the Upper Arno. His family was of good descent, but excessively poor. At an early age he was sent to Florence, where he remained till his 19th year. He then set out for Rome, trusting to obtain some assistance from his uncle, the Cardinal Bibbiena. The cardinal, however, did nothing for him, and he was obliged to accept a situation as clerk or secretary to Ghiberti, datary to Clement VII. The duties of his office, for which Berni was in every way unfit, were exceedingly irksome to the poet, who, however, made himself celebrated at Rome as the most witty and inventive of a certain club of literary men, who devoted themselves to light and sparkling effusions. So strong was the admiration for Berni's verses, that mocking or burlesque poems have since been called *poesie bernesca*.

BERNINI, Giovanni Lorenzo, an Italian artist, born at Naples in 1598, was more celebrated as an architect and a sculptor than as a painter. His busts were in so much request that Charles I. of England, being unable to have a personal interview with Bernini, sent him three portraits by Vandyck, from which the artist was enabled to complete his model. His architectural designs, including his great colonnade of St. Peter's, brought him perhaps his greatest celebrity. Louis XIV., when he contemplated the restoration of the Louvre, sent for Bernini, but did not adopt his designs. The artist's progress through France was a triumphal procession, and he was most liberally rewarded by the great monarch. He died at Rome in 1680, leaving a fortune of over $500,000.

BERNOULLI, or Bernouilli, a name illustrious in the annals of science, belonging to a family of respectability, originally of Antwerp. Driven from their country during the oppressive government of Spain for their attachment to the Reformed Religion, the family sought first an asylum at Frankfort (1583), and afterwards at Basel, where they ultimately obtained the highest distinctions. In the course of a century eight of its members successfully cultivated various branches of mathematics, and contributed powerfully to the advance of science. The most celebrated of the family were James, John, and Daniel; but, for the sake of perspicuity they may be considered as nearly as possible in the order of family succession.

I. James Bernoulli was born at Basel on the 27th December 1654. He was educated at the public school of Basel, and also received private instructions from the learned Hoffmann, then professor of Greek. At the conclusion of his philosophical studies at the university, some geometrical figures, which fell in his way, excited in him a passion for mathematical pursuits, and in spite of the opposition of his father, who wished him to be a clergyman, he applied himself in secret to his favorite science. In 1676 he visited Geneva on his way to France, and subsequently travelled to England and Holland.

On his final return to Basel in 1682, he devoted himself to physical and mathematical investigations, and opened a public seminary for experimental physics. In the same year he published his essay on comets, *Conamen Novi Systematis Cometarum*, which was occasioned by the appearance of the comet of 1680. This essay, and his next publication, entitled *De Gravitate Ætheris*, were deeply tinged with the philosophy of Descartes, but they contain truths not unworthy of the philosophy of the *Principia*.

As an additional claim to remembrance, he was the first to solve Leibnitz's problem of the isochronous curve, and to determine the catenary, or curve formed by a chain suspended by its two extremities, which he also showed to be the same as the curvature of a sail filled with wind. This led him on to another curve, which, being formed by an elastic plate or rod fixed at one end and bent by a weight applied to the other, he called the elastic curve, and which he showed to be the same as the curvature of an impervious sail filled with a liquid.

In 1696 he proposed the famous problem of isoperimetrical figures, and offered a reward for its solution. This problem engaged the attention of British as well as Continental mathematicians; and its proposal gave rise to a painful quarrel between the brothers.

In 1687 the mathematical chair of the University of

Basel was conferred upon James; and in the discharge of its duties he was so successful as to attract students from other countries. Some of his pupils became afterwards professors in the universities of Germany. He was once made rector of his university, and had other distinctions bestowed on him. He and his brother John were the first two foreign associates of the Academy of Sciences at Paris; and, at the request of Leibnitz, they were both received as members of the Academy of Berlin. Intense application brought on infirmities and a slow fever, of which he died on the 16th of August, 1705, with the resignation of a Christian and the firmness of a philosopher. Like another Archimedes, he requested that, as a monument of his labors and an emblem of his hope of a resurrection, the logarithmic spiral should be engraven on his tombstone.

James Bernoulli wrote elegant verses in Latin, German, and French; but although these were held in high estimation in his own time, it is on his mathematical works that his fame now rests.

II. JOHN BERNOULLI, brother of the preceding, was born at Basel on the 7th August 1667. In his studies he was aided by his elder brother James. His independent discoveries in mathematics are numerous and important. Among these were the exponential calculus, and the curve called by him the *linea brachistochrona*, or line of swiftest descent, which he was the first to determine, pointing out at the same time the beautiful relation which this curve bears to the path described by a ray or particle of light passing through strata of variable density, such as our atmosphere. On his return to his native city he studied medicine, and in 1694 took the degree of M. D. At this period he married into one of the oldest families in Basel; and although he had declined a professorship in Germany, he now accepted an invitation to the chair of mathematics at Groningen (*Commercium Philosophicum*, epist. xi. and xii.) There, in addition to the learned lectures by which he endeavored to revive mathematical science in the university, he gave a public course of experimental physics. During a residence of ten years in Groningen, his controversies were almost as numerous as his discoveries. His dissertation on an electrical appearance of the barometer first observed by Picard, and discussed by John Bernoulli under the name of mercurial phosphorus, or mercury shining in vacuo, procured him the notice of royalty, and engaged him in controversy. Through Leibnitz he received from the king of Prussia a gold medal for his supposed discoveries; but Hartsoeker and some of the French academicians disputed the fact. The family quarrel about the problem of isoperimetrical figures above mentioned began about this time. In his dispute with his brother, in his controversies with the English and Scotch mathematicians, and in his harsh and jealous bearing to his son Daniel, he showed a temper mean, unfair, and violent.

He was a member of almost every learned society in Europe, and one of the first mathematicians of a mathematical age. He was as keen in his resentments as he was ardent in his friendships; fondly attached to his family, he yet disliked a deserving son; he gave full praise to Leibnitz and Euler, yet was blind to the excellence of Newton. Such was the vigor of his constitution that he continued to pursue his usual mathematical studies till the age of eighty. He was then attacked by a complaint at first apparently trifling; but his strength daily and rapidly declined till the 1st of January 1748, when he died peacefully in his sleep.

III. NICHOLAS BERNOULLI, the eldest of the three sons of John Bernoulli, was born in 1695. His early indications of genius were carefully cherished. At the age of eight he could speak German, Dutch, French, and Latin. When his father returned to Basel he went to the university of that city, where, at the age of sixteen, he took the degree of doctor in philosophy, and four years later the highest degree in law. Meanwhile the study of mathematics was not neglected, as appears not only from his giving instructions in geometry to his younger brother Daniel, but from his writings on the differential, integral, and exponential calculus, and from his father considering him, at the age of twenty-one, worthy of receiving the torch of science from his own hands. With his father's permission he visited Italy and France, and during his travels formed friendship with Varignon and with Riccati, one of the first mathematicians of Italy. The invitation of a Venetian nobleman induced him again to visit Italy, where he resided two years, till his return to be a candidate for the chair of jurisprudence at Basel. He was unsuccessful, but was soon afterwards appointed to a similar office in the University of Bern. Here he resided three years, his happiness only marred by regret on account of his separation from his brother Daniel, with whom he was united in sentiment and pursuits. Both were appointed at the same time professors of mathematics in the Academy of St. Petersburg; but this office Nicholas enjoyed for little more than eight months. At the end of July 1726 he was cut off in the prime of life by a lingering fever.

IV. DANIEL BERNOULLI, the second son of John Bernoulli, was born 9th February 1700, at Groningen. He studied medicine and became a physician, but his attention was early directed also to geometrical studies. The severity of his father's manner was ill calculated to encourage the first efforts of one so sensitive; but fortunately, at the age of eleven, he became the pupil of his brother Nicholas. He afterwards studied in Italy under Michelotti and Morgagni. After his return, though twenty-four years of age, he was invited to become president of an acadamy then projected at Genoa; but declining this honor, he was, in the following year, appointed professor of mathematics at St Petersburg. In consequence of the state of his health, however, he returned to Basel in 1733, where he was appointed professor of anatomy and botany, and afterwards of experimental and speculative philosophy. In the labors of this office he spent the remaining years of his life. He had previously published some medical and botanical dissertations, besides his *Exercitationes quædam Mathematicæ*, containing a solution of the differential equation proposed by Riccati and known by his name. In 1738 appeared his *Hydrodynamica*, in which the equilibrium, the pressure, the reaction, and varied velocities of fluids are considered both theoretically and practically. One of these problems, illustrated by experiment, deals with an ingenious mode of propelling vessels by the reaction of water ejected from the stern. Some of his experiments on this subject were performed before Maupertuis and Clairaut, whom the fame of the Bernoullis had attracted to Basel. With a success equalled only by Euler, Daniel Bernoulli gained or shared no less than ten prizes of the Acadamy of Sciences of Paris. His labors in the decline of life were chiefly directed to the doctrine of probabilities in reference to practical purposes, and in particular to economical subjects, as, for example, to inoculation, and to the duration of married life in the two sexes, as well as to the relative proportion of male and female births. He retained his usual vigor of understanding till near the age of eighty, when his nephew James relieved him of his public duties. He was afflicted with asthma, and his retirement was relieved only by the society of a few chosen friends. In the spring of 1782, after some days' illness, he died, like his father, in the repose of sleep.

He was wont to mention the following as the two incidents in his life which had afforded him the greatest pleasure,—that a stranger, whom he had met as a travelling companion in his youth, made to his declaration "I am Daniel Bernoulli" the incredulous and mocking reply, "And I am Isaac Newton;" and that, while entertaining König and other guests, he solved without rising from the table a problem which that mathematician had submitted as difficult and lengthy.

Like his father, he was a member of almost every learned society of Europe, and he succeeded him as foreign associate of the Academy of Paris.

V. JOHN BERNOULLI, the youngest of the three sons of John Bernoulli, was born at Basel on the 18th May 1710. He studied law and mathematics, and, after travelling in France, was for five years professor of eloquence in the university of his native city. On the death of his father he succeeded him as professor of mathematics. He was thrice a successful competitor for the prizes of the Academy of Sciences of Paris. His prize subjects were, the capstan, the propagation of light, and the magnet. He enjoyed the friendship of Maupertuis, who died under his roof while on his way to Berlin. He himself died in 1790. His two sons, John and James, are the last noted mathematicians of the family.

VI. NICHOLAS BERNOULLI, cousin of the three preceding, and son of Nicholas Bernoulli, one of the senators of Basel, was born in that city on the 10th October 1687. He visited England, where he was kindly received by Newton and Halley (*Com. Phil.* ep. 199), held for a time the mathematical chair at Padua, which Galileo had once filled, and was successively professor of logic and of law at Basel, where he died on the 29th of November 1759. He was editor of the *Ars Conjectandi* of his uncle James. His own works are contained in the *Acta Eruditorum*, the *Giornale de' Letterati d'Italia*, and the *Commercium Philosophicum*.

VII. JOHN BERNOULLI, grandson of the first John Bernoulli, and son of the second of that name, was born at Basel on the 4th December 1744. He studied at Basel and at Neufchâtel, and when thirteen years of age took the degree of doctor in philosophy. At nineteen he was appointed astronomer royal of Berlin. Some years after, he visited Germany, France and England, and subsequently Italy, Russia, and Poland. On his return to Berlin he was appointed director of the mathematical department of the academy. Here he died on the 10th July 1807. His writings consist of travels and astronomical, geographical, and mathematical works. In 1774 he published a French translation of Euler's *Elements of Algebra*. He contributed several papers to the Academy of Berlin.

VIII. JAMES BERNOULLI, younger brother of the preceding, and the second of this name, was born at Basel on the 17th October 1759. Having finished his literary studies, he was, according to custom, sent to Neufchâtel to learn French. On his return he studied law and took a degree. This study, however, did not check his hereditary taste for geometry. The early lessons which he had received from his father were continued by his uncle Daniel, and such was his progress in the exact sciences that at the age of twenty-one he was called to undertake the duties of the chair of experimental physics, which his uncle's advanced years rendered him unable to discharge. He afterwards accepted the situation of secretary to Count de Brenner, which afforded him an opportunity of seeing Germany and Italy. In Italy he formed a friendship with Lorgna, professor of mathematics at Verona, and one of the founders of the Italian society for the encouragement of the sciences. He was also made corresponding member of the Royal Society of Turin; and, while residing at Venice, he was, through the friendly representation of Fuss, admitted into the Academy of St. Petersburg. In 1788 he was named one of its mathematical professors. In the following year he married a daughter of Albert Euler, son of the illustrious Euler. This marriage was soon tragically dissolved by the death of the husband, who was drowned while bathing in the Neva in July 1789.

BEROSUS was a Chaldean priest who lived in the time of Alexander the Great and his immediate successors. He translated the history of his native country, Babylonia, into the Greek language, and dedicated the work to one of the Greek kings of Syria named Antiochus. His work is principally known through the fragments of Polyhistor and Apollodorus, two writers in the 1st century before the Christian era, who are quoted by Eusebius and Lyncellus.

The work of Berosus professed to commence with the creation of the universe, and the history was carried down to his own time. A few quotations at second or third hand, and the bare outlines of his system of chronology, are all that has been transmitted to us through the copyists of Berosus; but the close connection throughout between his story and the Bible, and the knowledge that he drew his information from the records of Babylonia, have always invested these fragments with great importance,—an importance which has been increased of late, since the discovery of several cuneiform inscriptions confirming different parts of his history.

BERRI, CHARLES FERDINAND, DUC DE, younger son of Charles X. of France, was born at Versailles on the 24th Jan. 1778. With his father, then Comte d'Artois, he had to leave France, and for several years served in the army of Condé. He afterwards joined the Russian army, and in 1801 took up his residence in England, where he remained for thirteen years. During that time he married an English lady, by whom he had two children. The marriage was cancelled for political reasons in 1814, when the duke set out for France. His frank, open manners gained him some favor with his fickle countrymen, which was increased by his marriage in 1816 with the Princess Caroline Ferdinande Louise of Naples. On the 13th of February 1820 he was mortally wounded, when leaving the opera-house with his wife, by a man named Louvel. Seven months after his death the duchess gave birth to a son, who received the title of duke of Bordeaux. She was compelled to follow Charles X. in his retirement from France after July 1830, but it was with the resolution of returning speedily and making an attempt to secure the throne for her son. In April 1832 she landed near Marseilles, but receiving no support, was compelled to make her way towards the ever-loyal districts of La Vendée and Bretagne. Her followers, however, were defeated, and after much suffering, she was betrayed to the Government and imprisoned in the castle of Blaye. Here she gave birth to a son, the fruit of a secret marriage contracted with an Italian nobleman, son of the Marchese Lucchesi Palli. The announcement of this marriage at once deprived the duchess of the sympathies of her supporters. She was no longer an object of fear to the French Government, who released her in June 1833. She set sail for Sicily, and from that time till her death in April 1870 lived a retired life with her husband and his relatives.

BERRYER, PIERRE ANTOINE, a French advocate and parliamentary orator, was born at Paris, January 4, 1790, in the midst of the agitating events of the first year of the great Revolution. In the great conflict of the period between Napoleon I. and the Bourbons, Berryer, like his father, was an ardent Legitimist; and

in the spring of 1815, at the opening of the campaign of the Hundred Days, he followed Louis XVIII. to Ghent as a volunteer. After the second restoration he distinguished himself as a courageous advocate of moderation in the treatment of the military adherents of the emperor. He was engaged, in conjunction with his father and Dupin, in the unsuccessful defence of Marshal Ney before the Chamber of Peers; and he undertook alone the defence of General Cambronne and General Debelle, procuring the acquittal of the former and the pardon of the latter. He stood forward with a noble resolution to maintain the freedom of the press, and severely censured the rigorous measures of the police department. In 1830, not long before the fall of Charles X., Berryer was elected a member of the Chamber of Deputies. He appeared there as the champion of the king, and encouraged him in his tyrannical course. After the Revolution of July, when the Legitimists withdrew in a body, Berryer alone retained his seat as deputy; and though avowedly the friend of the deposed king, he took an independent course, not making himself an unscrupulous partisan, but guided in his advocacy or his opposition by reason and prudence. In 1834 he defended two deputies in a Government prosecution for libel, and the same year opposed the passing of a new rigorous law against political and other associations. Among the more noteworthy events of his subsequent career were his defense of Louis Napoleon after the ridiculous affair of Boulogne, in 1840, and a visit to England in December, 1843, for the purpose of formally acknowledging the pretender, the duke of Bordeaux, then living in London, as Henry V., and lawful king of France. In November, 1868, he was removed by his own desire from Paris to his country seat at Augerville, and there he died on the 29th of the same month.

BERTHA, the name of several legendary heroines. St. Bertha, a Frankish princess, who married Æthelbert, King of Kent, in 560, was the means of his conversion and of the spread of Christianity among the Anglo-Saxons. "Bertha with the big foot" is said to have been the wife of Pepin the Little, and mother of Charlemagne.

BERTHIER, Alexander, Prince of Neuchatel and Wagram, and a Marshal of France, was born at Versailles, February 20, 1753. He fought under Lafayette in the United States and after the French revolution led the armies of France in Italy and proclaimed the republic of Rome (1798). He served as chief of staff to Napoleon for many years, but submitted to Louis XVIII. in 1814. When Napoleon returned from Elba Berthier played fast and loose with him and Louis and on July 1, 1815, he committed suicide by jumping from a window at Bamberg, Bavaria.

BERTHOLLET, Claude Louis, one of the most distinguished chemists of the French school, was born at Talloire, near Annecy, in Savoy, in 1748. He studied first at Chambery, and subsequently at Turin, where he took his degree as a physician. In 1772 he settled at Paris, and soon became the medical attendant of Philip, duke of Orleans. By the publication of a volume of chemical essays, he gained such reputation that he was admitted in 1781 into the Académie des Sciences. He was appointed government superintendent of the establishment for the improvement of dyeing; and in 1791 he published his essay *Sur la Teinture*, a work that first systematized and chemically explained the principles of the art. It was he who in 1785 first proposed to apply it to bleaching. He discovered the remarkable salt now called chlorate of potash; and we owe to him also an excellent essay on the chemical constitution of soaps. In 1798 Berthollet accompanied General Bonaparte to Egypt. On the overthrow of the Directory he was made a senator and a grand officer of the Legion of Honor. Under the empire he was created a count, and he sat as a peer on the restoration of the Bourbons. His last work was his curious essay on *Chemical Statics* (1803), in which he controverted the views of Bergmann. Berthollet was a man of great modesty and unostentatious manners. For some years he lived retired at Arcueil, especially after the misconduct and suicide of his only son. He died at Paris of a painful malady bravely borne, November 6, 1822.

BERTHOUD, Ferdinand, a celebrated Swiss chronometer-maker, was born in Neufchâtel. The date of his birth is variously given as 1725, 1727, and 1729. He settled in Paris in 1745, and applied himself to the making of chronometers, an art which was then in its infancy. He soon attained distinction for the excellence of his workmanship and the accuracy of his chronometers. Fleurieu and Borda, by order of the French Government, made a voyage from La Rochelle to the West Indies and Newfoundland for the purpose of testing them, and they found that they gave the longitude with an error of only a quarter of a degree, after a cruise of six weeks. Berthoud was a member of the French Institute, a fellow of the Royal Society of London, and a member of the Legion of Honor. He was regular in his habits, and retained the use of his faculties to the last. He died of hydrothorax, at his country house, in the valley of Montmorency, in 1807, at the age of eighty years.

BERTINORO (identified, on conjecture, with the ancient *Forum Druentinorum*), a city of Italy, in the province of Emilia and district of Forli, the seat of the bishop of the united dioceses of Forlimpopoli and Bertinoro.

BERTRAND, Henri Gratien, Count, born in 1773, served under Napoleon, distinguished himself at Austerlitz and Aspern, and became count and general. He went with Napoleon to Elba and shared his banishment at St. Helena. Under the Bourbon monarchy he was sentenced to death, but Louis XVIII. allowed him to return to France after Napoleon's death and restored him to his dignities. He accompanied the expedition which brought the remains of Napoleon to France in 1840 and he died January 31, 1844.

BERWICK, James Fitzjames, Duke of, marshal and peer of France, was a natural son of James, duke of York, afterward James II. of England, by Arabella Churchill, sister of the great duke of Marlborough. He was born at Moulins, August 21, 1670. He served his first campaigns in Hungary, and was present at the siege of Buda and the battle of Mohacz. In 1687 he returned to England, was made Knight of the Garter, and created duke of Berwick. After the Revolution he served under James II. in the campaign in Ireland, was in one engagement severely wounded, and was present at the battle of the Boyne. For a short time he was left in Ireland as commander-in-chief, but his youth and inexperience unfitted him for the post, and he was a mere puppet in stronger hands. In 1692 he was called to France, and took service in the French army. He fought under Marshal Luxembourg in Flanders, took part in the battles of Steinkerk and Landen (Neerwinden), and was taken prisoner at the latter. He was, however, immediately exchanged for the duke of Ormond, and afterward he served under Villeroi. In 1696 the duke of Berwick took a prominent part in a plot for a Jacobite insurrection, but the scheme came to nothing. In 1702 he served under the duke of Burgundy, and in the following year became naturalized as a Frenchman. In 1704 he first took command of the French army in Spain. About this time he was created marshal of France. He was then sent again to

Spain to retrieve the affairs of that kingdom, and to prop up the tottering throne. In April 1707 he won the great victory of Almanza, an Englishman at the head of a French army, over the earl of Galway (comte de Ruvigny), a Frenchman at the head of an English army. The victory established Philip V. on the throne of Spain, although neither he nor his rival, the archduke, was present at the battle. Berwick was made a peer of France and grandee of Spain. In 1708 he became commander-in-chief of the armies of France and Spain, in Flanders, on the Rhine, and on the Moselle. Through the four following years he gained fresh laurels by his masterly defence of Dauphiné, and in 1713 he returned to Spain and took Barcelona. Three years later he was appointed military governor of the province of Guienne. He advised and conducted in 1734 the siege of Philipsburg on the Rhine, and while the siege was going on was killed by a cannon-shot, June 12 of that year.

BERWICK-UPON-TWEED, a seaport town and municipal and parliamentary borough, at the mouth of the Tweed, 300 miles N. by W. from London, and 47 E. S. E. from Edinburgh. Population (1890) 15,000.

Berwick is one of the few remaining walled towns in the United Kingdom. The present ramparts were built in the reign of Elizabeth. To the north and east they are formed of earth faced with stone; bastions with cavaliers are placed at intervals, and a ditch, now dry, extends to the river. Fronting the river are four-gun and six-gun batteries defending the entrance to the harbor, and a twenty-two-gun battery commanding the south side. These ramparts which are perforated by five gateways, are generally in good repair, but since 1822 have been destitute of guns save for volunteer practice.

BERWICKSHIRE, a maritime county of Scotland, forming its S.E. extremity, bounded N.E. by the German Ocean, N. by Haddington, W. by Midlothian, S.W. by Roxburgh, S. by the Tweed, which separates it from the Northumberland, and S.E. by the liberties of the town of Berwick. Its greatest length from E. to W. is 31¼ miles; its greatest breadth 19½; area about 464 square miles, or 297,161 acres.

The early history of Berwickshire is to a great extent bound up with that of the ancient frontier town; from its position it also suffered much during the border wars. The most noteworthy antiquities are Coldingham Priory in the E. and Dryburgh Abbey in the S.W. They were burnt in the same year, 1545, during the barbarous inroad of the English army under the earl of Hereford. About four miles N. from Coldingham are the ruins of Fast Castle ("The Wolf's Craig" of the *Bride of Lammermoor*), situated on a peninsular cliff, 120 feet by 60, and 70 feet above the sea. A little further north is the Pease or Peaths Bridge, built by Telford, in 1786, over the deep glen which forms the celebrated pass — of old one of the strongest natural defences of Scotland. Near it is Cockburnspath Tower, once a strong fortress, now in ruins. In the west of Berwickshire, besides Dryburgh, there are, at Earlstoun, the remains of the ancient tower "The Rhymer's Castle," the traditional residence of Thomas Learmont, commonly called Thomas of Ercildoune or Thomas the Rhymer. About a mile from Earlstoun is Cowdenknowes, on a hill above which grew the "bonnie broom" of the old song. None of it now remains, it having been gradually encroached upon by the plough, and the last of it killed by the severe frost of 1861–62. Hume Castle, the ancient seat of the Home family, also towards the west, has a commanding view, and is itself visible from nearly every part of the country. Traces of Roman occupation and of ancient British settlements exists in various parts of the Merse. Edin's or Etin's Hall, on Cockburn Law, about four miles north of Dunse, still goes under the name of the Pech's or Pict's House. There are many large mansions throughout the county, the principal being Thirlestane Castle (earl of Lauderdale), Mertoun House (Lord Polwarth), Mellerstain and Lennel House (earl of Haddington), Nesbit (Lord Sinclair), Dunse Castle (Hay), Wedderburn and Paxton (Milne Home), Lees (Sir John Marjoribanks), Ladykirk (Baroness Marjoribanks), Ayton Castle (Mitchell Innes), Hirsel (earl of Home). Population (1890) 38,020.

BERYL, a mineral species which includes, in addition to what are ordinarily known as beryls, the aquamarine or precious beryl and the emerald. The similarity between the beryl and the emerald was pointed out by Pliny, and the only points of distinction are the green color of the emerald and the somewhat superior hardness of the beryl. The color of the emerald is generally believed to be due to the presence of a minute portion of oxide of chromium, although M. Lewy asserts, from analysis of Muzo emeralds, that it is really owing to the presence of organic matter.

Leaving out of account the emerald, the colors of the beryl range from blue through soft sea green to a pale honey yellow, and in some cases the stones are entirely colorless. The aquamarine is so named on account of its bluish green color. The chrysoberylus, chrysoprasus, and chrysolithus of ancient jewellery appear to some extent at least to have been names applied to different shades of beryl. The beryl was highly prized for use in jewellery by the Romans, by whom it was cut into six-sided prisms and mounted as ear-drops. Some of the finest examples of ancient Greek and Roman gem engraving are found executed in beryl. "The grandest intaglio extant of the Roman period is upon an aquamarine of the extraordinary magnitude of 2½ by 2⅛ inches: the bust of Julia Titi signed by the artist Euodos. For nearly a thousand years it formed the knosp of a golden reliquiary presented by Charlemagne to the abbey of St. Denys, in which it was set with the convex back uppermost, being regarded as an invaluable emerald."

BERZELIUS, Jöns Jakob, one of the most illustrious of modern chemists, was born on the 20th of August 1779, at a farm near Wäfversunda, in Östergötland, Sweden. At the age of nine he was left an orphan in the charge of his stepfather, A. Elmark of Ekeby, a learned and amiable man, gifted, too, it would seem, with some prophetic insight, for one day he said to the child, "Jakob, I think you will tread in the footsteps of Linnæus, or be another Cartouche!" From that day a desire for distinction as a man of science awoke in the child's breast. In 1793 Berzelius entered the gymnasium school at Linköping, where he made rapid progress. During his holidays, spent in the country, he met a man who instructed him in the elements of entomology, and thus gave a fresh impetus to his scientific proclivities. The latter soon developed into a passion, and under Hornstedt at Linköping, progressed rapidly till he left the college in 1796, and proceeded to the University of Upsala. In 1798 he began to study chemistry under Professor Afzelius; and although in those days the lectures were without practical experiments and extremely uninteresting, he became more and more absorbed in the study. In 1800 he was called to Stockholm as assistant to the royal physician, Dr. Hedin, and his success as a practical chemist began. The Italian, Volta, had in 1800 invented the galvanic battery which bears his name; and Berzelius was one of the first persons in Europe to observe the greatness of this discovery. In 1802 he published a treatise on this subject. In 1803 he became professor of physics, and by his lectures rapidly founded a new, a rational school

of physiology, and threw new light on many difficult points connected with the chemical and physical characteristics of animal life. In the same year he published his *Essay on the Division of Salts through Galvanism*, in which he propounds the electro-chemical theory, the honor of first laying down which is divided between Berzelius and Davy. In conjunction with Hisinger, Berzelius then published in numbers *Treatises on Physics, Chemistry, and Mineralogy*, a work of the greatest value for science. Honor after honor was heaped upon him; in 1810 he was called to be a member of the Medical College of Sweden; in 1808 he was elected president of the Academy of Sciences. Two years later he brought out his famous treatise *On the Fixed Proportions and Weights of Atoms*. He then took up mineralogy with special ardor, and published his *Treatise on the Blowpipe*; he set up for himself a regularly graduated chemical system of minerals, and the value of this was felt to be so great that the Royal Society of London voted him its gold medal for it. After incessant labor he retired, in 1832, from his professorship at Stockholm, having never been connected as teacher with any of the universities. In 1842, while he was engaged in a chemical experiment, an explosion took place and he was much injured, but recovered and continued to work on till the close of his days. He died August 7, 1848. After Linnæus, his is considered to be the greatest name in science of which Sweden can boast.

BES, the name of an Egyptian god, apparently the same as that of the city Bessa. He is stated to have been worshipped and to have had an oracle at Abydos according to Ammianus Marcellinus, and according to others at Antinoe or Antinoopolis. The name *Bes* is found in Egyptian monuments attached to a god clad in a lion's skin, the head and skull of the animal covering his head and concealing his features; his legs are bowed like Ptah, and his whole appearance is grotesque, resembling in other respects the Greek Hercules.

BESANÇON, a city of France, capital of the department of Doubs, 45 miles E. of Dijon, on the River Doubs, which flows round it on three sides. It is well protected by strong fortifications and a citadel on an almost impregnable rock. Population (1890) 47,219.

Besançon is a place of great antiquity. Under the name of *Vesentio*, it was, in the time of Cæsar, the chief town in Sequani. Under the Roman emperors it was rich and prosperous, and Aurelian especially had a great liking for the place. Many of the streets still bear the old Roman names. It was frequently destroyed and rebuilt during the Middle Ages, and the present city stands twenty feet above the original level.

BESKOW, BERNHARD VON, Baron, the Swedish dramatist, was born at Stockholm, April 19, 1796. Beskow's first book, *Poetical Efforts*, published in 1818, made a favorable impression with the public, and he wrote the prize poem for the Swedish Academy some years later. His dramas, however, are his chief claim to remembrance; the best are *Torkel Knutsson*, *Erik XIV.*, *Birger and his Race*, and *Gustavus Adolphus in Germany*. *Torkel Knutsson* is considered the finest drama that Swedish literature possesses. Œhlenschläger translated his drama into Danish, and various persons rendered them into German. He died on the 17th of October 1868.

BESSARABIA, a government in the S.W. of European Russia, on the borders of Austria and the Danubian principalities, with an area, since the cessions of the Paris peace in 1856, of 14,577 English square miles. Till the last Eastern war Bessarabia occupied the whole space between the Dniester and the Pruth from the Austrian frontier to the Black Sea.

Bessarabia, in keeping with its position near the Danube, played an important historic part in ancient times, especially in the beginning of our era, when it served as a key to the eastern approaches of the Byzantine empire. And thus, from immemorial times, nations were ceaselessly alternating with nations within its borders. The original inhabitants were the Cymri, succeeded by the Scythians. Herodotus, who had been in the Greek colonies of the Black Sea, relates that near the mouth of the Dniester (Tyras) there lived the Tyritians, possessing on the estuary of that river the town of Tyras (Oxeia or, according to Pliny, Ophiusa). In the 2d century after Christ Bessarabia was occupied by the Geti and offshoots from the Bastroni, and in 106 A.D., the Geti were conquered by Trajan. After this subjugation of the land by the Romans, the present Bessarabia went along with Walachia, Moldavia, and Transylvania, to compose Dacia. In the 3d century appeared the Goths, recently converted to Christianity In the 5th century Bessarabia was overrun by the Huns; after the Huns, in the end of the 5th century, arrived the Avars and the Bulgarians; and last of all came the Slavonians (Lutichi and Tevertzi), who built themselves the town of Bielgorod. In the 7th century appeared the race of the Bessi from whom the country acquired its present name. In the 9th century arrived the Ugrians; in the 10th the Pechenegs; in the 11th the Kumans, the Uses, and the Polovtzians; and in the 13th the Mongolians, under the leadership of Batia. In this last century, also, the Genoese founded their colonies on the shores of the Dniester. In 1367 Bessarabia formed a part of Moldavia. In 1503 the southern portion of the country, or Budjak, fell under the power of the Turks; and in 1560 there settled in that district 30,000 Nogaitzians, who had devastated northern Bessarabia, then inhabited by Roumanians. These Nogaitzians acquired the name of the Bielgorod horde. Russian armies occupied Bessarabia during all the Turkish wars in the 18th century, and again in 1806–12, when it was united to Russia by the Bukharest treaty. By the Paris convention of 1856, Russia ceded the districts of Ismael and the greater part of the Cagul to Turkey, and these now form a part of Roumania. Population 1,500,000.

BESSARION, JOANNES, titular patriarch of Constantinople, and one of the illustrious Greek scholars who contributed to the great revival of letters in the fifteenth century, was born at Trebizond in 1389, or, according to others, in 1385. Bessarion was one of the most learned scholars of his time. Besides his translations of Aristotle's *Metaphysics* and of Xenophon's *Memorabilia*, his most important work is a treatise directed against George of Trebizond, a violent Aristotelian, and entitled *In Calumniatorem Platonis*. Bessarion, though a Platonist, is not so thorough-going in his admiration as Pletho, and rather strives after a reconciliation of the two philosophies. His work, by opening up the relations of Platonism to the main questions of religion, contributed greatly to the extention of speculative thought in the department of theology. He died November 19, 1472.

BESSEGES, a town of France, in the department of Gard, twenty miles north of Alais by railway, of importance for its coal and iron mines and blast-furnaces. Population 9,169.

BESSEL, FRIEDRICH WILHELM, a distinguished Prussian astronomer, was born at Minden on the 22d July, 1784. At an early age he was placed in the counting-house of a merchant at Bremen. His strong desire to obtain a situation as supercargo on a foreign voyage led him to the study first of navigation and then of mathematics. He devoted himself with the utmost ardor to mathematical and astronomical calculations, and in

1804 undertook the reduction of the observations made on the comet of 1607. His results were communicated to Olbers, who warmly praised the young astronomer, and in 1806 recommended him for the post of assistant to Schröter in the observatory at Lilienthal. In 1810, after his reputation had been much extended by various memoirs, treating particularly of cometary orbits, he was appointed director of the new observatory then being founded by the king of Prussia at Königsberg. He was at the same time made professor of astronomy and mathematics in the university of that town. Bessel, from his keen practical intelligence, thorough acquaintance with all instrumental appliances, and complete mastery of the methods of calculation, was admirably fitted for the post of observer. The establishment at Königsberg was one of the best of its kind, and its observations, published continuously from 1813, are of great value. Bessel died in 1846.

BESSEMER, a young and thriving city of Alabama, which, since 1887, has grown from nothing to a population of 4,000. It is in the heart of the iron-producing country, and eight railroads center here. The assessed valuation in 1890 was $1,500,000. The city has a police force, a street-car line of five miles, gas and electric light, water-works, sewers, six churches, and three schools.

BESSEMER, a mining town of Gogebic county, in the upper peninsula of Michigan, of which county it is the capital. Although only founded in 1886, it is a flourishing city of nearly 4,000 people, with stores, banks, two railroads, a handsome new court-house, and ample church and school accommodation.

BESSEMER, Sir Henry, born in Hertfordshire, England, in 1813, patented in 1856 his discovery of a process for making steel direct from pig-iron, which has revolutionized the process of iron and steel manufacture. Sir Henry has received more than a million pounds sterling in royalties, while the price of steel has been reduced from $250 a ton to $50.

BESSIERES, Jean Baptiste, Duke of Istria and Marshal of France, was born in the department of Lot, August 6, 1768, and was killed at the battle of Lützen, May 1, 1813. He entered the army as a private in 1792, received a commission two years later and distinguished himself in Syria and Egypt and at Austerlitz, Jena and Friedland.

BETEL NUT. The name betel is applied to two different plants, which in the East are very closely associated in the purposes to which they are applied. The betel nut is the fruit of the Areca or betel palm, *Areca Catechu*, and the betel leaf is the produce of the betel vine or pan, *Chavica Betel*, a plant allied to that which yields black pepper. The areca palm is a graceful tree, which appears to be indigenous over a wide area in the East, including Southern India, Ceylon, Siam, the Malay Archipelago, and the Philippine Islands, in the whole of which it is extensively cultivated. The fruit of the palm is about the size of a small hen's egg, and within its fibrous rind is the seed or so-called nut, the albumen of which is very hard and has a prettily mottled grey and brown appearance. The chief purpose for which betel nuts are cultivated and collected is for use as a masticatory, — their use in this form being so wide-spread among Oriental nations that it is estimated that one-tenth of the whole human family indulge in betel chewing. For this use the fruits are gathered before they are quite ripe.

BETHANY (*i. e.*, probably the "House of Dates"), a village, now called El' Azariyeh, or Lazarieh, nearly two miles E. S. E. from Jerusalem, on the eastern slope of the Mount of Olives, at a height of 2208 feet above the sea. The whole importance of the place is derived from its connection with the New Testament history, it being never mentioned in the Old Testament or Apocrypha. It was the residence of Lazarus and his sisters, a favorite retreat of the Saviour, and the scene not only of his greatest miracle but also of his ascension.

BETHEL (*i.e.*, in Hebrew, the "House of God"), originally called Luz, an ancient city of Palestine, on the borders of the tribe of Benjamin, eleven English miles north of Jerusalem.

BETHESDA was a pool or public bath in Jerusalem, where miraculous cures were believed to be performed; now usually identified with the Birket Israel, near St. Stephen's Gate.

BETHLEHEM (*i.e.*, in Hebrew, the "House of Bread"), a small town in Palestine, situated on a limestone ridge, about six miles from Jerusalem, on the main road to Hebron. Almost complete obscurity was gathering round it when it became one of the world's most memorable spots — the birthplace of the Saviour. Desecrated during the reign of Hadrian by a grove of Adonis, the traditional scene of the nativity (a grotto on the eastern part of the ridge) was enclosed by the Empress Helena with a noble basilica, which still stands, surrounded by three convents successively erected here by the Greek, Latin, and Armenian Churches.

BETHLEHEM, a flourishing manufacturing town of Northampton county, Penn., on the left bank of the Lehigh river, five miles east of Allentown and fifty-five miles north of Philadelphia. It was founded in 1741 by the Moravian Brethren and still has seminaries of that communion in operation. Bethlehem has two national banks, several breweries, tanneries, zinc works, iron furnaces and rolling mills. South Bethlehem, which is connected with this town by a bridge, is the seat of the Lehigh (Protestant Episcopal) University, founded in 1866. The town is also a summer resort, and is well supplied with churches and schools. Population 6,750.

BETHLEN-GABOR was born in Hungary in 1580 and in 1613 became ruler of Transylvania. He made war against Austria, and in 1621 was crowned King of Hungary. Ferdinand II., of Austria, induced him to surrender his claims, but broke the treaty and Gabor raised an army and reasserted his rights; he died in 1629.

BETHUNE, the chief town of an arondissement in the French department of Pas de Calais, situated on a rock above the River Brette, 16 miles N.N.W. of Arras.

BETLIS, Bitlis, or Bedlis, a town of Turkish Armenia, in the Sandjak of Mûsh, situated near the south-west corner of Lake Van, in a highly cultivated valley, which is watered by the Bitlis-chai, a sub-tributary of the Tigris.

BETTERTON, Thomas, actor, was born in London about 1635, and, after serving as a bookseller's apprentice, turned actor some three years before the Restoration, and in 1661 joined Davenant's theatrical company. A public benefit was got up for him on the 6th April 1709, and he acted several times again before his death on 28th April 1710. He was buried in Westminster Abbey. Mrs. Betterton, whom he had married in 1662, took high rank among contemporary actresses.

BETTINELLI, Saverio, Italian litterateur, was born at Mantua 18th July, 1718, and died in 1808.

BETTING may be defined as the staking or pledging between two parties of some object of material value on the issue or contingent issue of some event or contest. The pursuit (it can hardly be termed a pastime, science, or art) of betting has been in vogue from the earliest days of civilization, commencing in the East with royal and noble gamblers, and gradually extending itself westward and throughout all classes. In all countries where the English tongue is spoken betting is

now largely indulged in; and in the United States it has spread to such an extent amongst all grades of society during the last twenty years that the interference of the legislature has been found necessary. The evils it has been productive of are two well known to call for comment here, and the principles require to be treated solely from mathematical and legislative points of view.

The first principle of all betting is that "you cannot win where you cannot lose." Accordingly no bets are "play or pay" except those on certain events enumerated below, or unless such a stipulation is laid down at the time the bet is made. Betting may be divided into "bookmaking" and "backing." The former consists in laying the odds, and, theoretically speaking, secures a small though certain profit, were all debts paid and the number of starters for the event large. During the first half of the 19th century bookmaking was a far more lucrative business than now, because betting was confined to the wealthier classes and bad debts were fewer. Also, betting commenced many months before a great race, and so the bookmaker had more opportunities of laying against all the entries, whereas most betting on play or pay events is now done just before the start.

"Backing" is a very plain matter, but in the long-run invariably a losing method of betting. It simply consists in taking the odds laid by a bookmaker against one or more starters for any event. If it be a play or pay event, and the possible starter be scratched, the backer loses his money at once. Although a backer may become possessed of such special information as may enable him to win large sums occasionally, his losses will in the long-run exceed them. In fact, the bookmaker virtually keeps a bank against him.

"Hedging" consists in laying off at shorter odds part of the sums various starters may have been backed for.

In the United Kingdom betting has been the source of considerable legislation during the past thirty years. Curiously enough, by the 9th of Queen Anne, if any one gained over £10 by betting, the loser was entitled to sue for repayment of the stake if he had paid it, and if he did not do so within three months any one might sue for treble the amount with costs. After it had become a dead letter some informers raked up this Act in 1844, and the result was the insertion of a clause in the Gaming Act, 8 and 9 Vict. c. 109, annulling the old statute. During the next seven years betting on horse races increased to an enormous extent. "List shops," where the proprietors kept a bank against all comers, and backers could stake their money in advance on a horse, sprung up in the metropolis and large towns, leading to many acts of flagrant dishonesty.

In 1866 a system of betting, termed *Paris mutuels*, was started in France. It consisted of agencies where any one may back a probable starter for any sum or sums he pleases. The whole of the money thus staked on all starters is added together, a commission deducted by the agent for his trouble, and the balance divided in "equal shares," or *Paris mutuels*, amongst those who have backed the victor. In this instance the agent's gain is, of course, certain. It has been found, however, that unlicensed opportunities of staking money in advance have produced the same evils in France as in England. During the past three years the French Government have taken the matter up strongly, and betting-houses and agencies are now as effectually doomed on the French as on the English side of the Channel.

In the United States betting is also illegal. Under the Gambling Act, whenever any money has been staked for a bet, either side can sue the stakeholder and recover his portion of the money, either before or after the bet has been decided. Owing, however, to the strong public sentiment which naturally condemns such a course, proceedings against stakeholders are excessively rare. Any voter betting on the result of an election forfeits his franchise, yet the heaviest betting in the States is on elections, and the bettors go unchallenged to the poll.

BETUL, a hilly district of British India, in the Central Provinces, comprising the westernmost section of the great Sátpurá plateau, is bounded on the N. by the Hoshangábád district and the Makrái territory, on the E. by the district of Chhindwárá, on the S. by the commissionership of West Berars, and on the W. by the district of Hoshangábád. The area is about 4118 square miles, and the population 260,000.

Little is known of the early history of the district except that it must have been the centre of the first of the four ancient Gond kingdoms of Kherlá, Deogarh, Mandla, and Chándá. According to Farishtá, these kingdoms engrossed in 1398 all the hills of Gondwáná and adjacent countries, and were of great wealth and power. About the year 1418 Sultán Husain Sháh of Málwa invaded Kherlá, and reduced it to a dependency. Nine years later the Rájá rebelled, but although with the help of the Báhmíni kings of the Deccan he managed for a time to assert his independence, he was finally subdued and deprived of his territories. In 1467 Kherla was seized by the Báhmíni kings, but was afterwards restored to Málwa. A century later the kingdom of Málwa became incorporated into the dominions of the emperor of Delhi. In 1703 a Musálman convert of the Gond tribe held the country, and in 1743 Raghují Bhonslá, the Marhattá ruler of Berar, annexed it to his dominions. The Marhattás in the year 1818 ceded this district to the East India Company as payment for a contingent, and by the treaty of 1826 it was formally incorporated with the British possessions. Detachments of British troops were stationed at Multái, Betul, and Sháhpur to cut off the retreat of Apá Sáhib, the Marhattá general, and a military force was quartered at Betul until June 1862. The ruined city of Kherlá formed the seat of government under the Gonds and preceding rulers, and hence the district was, until the time of its annexation to the British dominions, known as the "Kherlá Sarkár." The town of Multái contains an artificial tank, from the centre of which the Taptí is said to take its rise; hence the reputed sanctity of the spot, and the accumulation of temples in its honor.

The climate of Betul is fairly salubrious. Its height above the plains and in the neighborhood of extensive forests moderate the heat, and render the temperature pleasant throughout the greater part of the year. During the cold season the thermometer at night falls below the freezing point; little or no hot wind is felt before the end of April, and even then it ceases after sunset. The nights in the hot season are comparatively cool and pleasant. During the monsoon the climate is very damp, and at times even cold and raw, thick clouds and mists enveloping the sky for many days together. The average annual rainfall is 40 inches. In the denser jungles malaria prevails for months after the cessation of the rains, but the Gonds do not appear to suffer much from its effects. Travellers and strangers who venture into these jungles run the risk of fever of a severe type at almost all seasons of the year.

BETWA, a river of India, which rises in the native state of Bhopál in Málwa, and after a course of 360 miles, for the most part in a north-easterly direction, falls into the Jamná at Hamírpur.

BEUDANT, François Sulplice, a French mineralogist and geologist, was born at Paris in 1787, and died in 1862.

BEULÉ, CHARLES ERNEST, a French archæologist and man of letters, was born at Saumur 29th June 1826, and died 4th April 1874.

BEUTHEN, the chief town of a circle in the government of Oppeln in Prussian Silesia, on the railway between Oppeln and Cracow, about 50 miles from the former. Population (1890), 29,200.

BEUTHEN, or NIEDER BEUTHEN, a town in the government of Liegnitz, in Silesia, on the Oder, and the capital of the mediatized principality of Carolath-Beuthen. Population (1890), 4,000.

BEVERLEY, a market and borough town in the East Riding of Yorkshire, about a mile from the river Hull, with which it communicates by means of a canal, called the Beverley Beck. Population, 13,340.

BEVERLEY, a seaport of Massachusetts situated on a branch of Ann Harbor,and connected with Salem by a bridge built in 1778. It is sixteen miles northeast of Boston, on the Eastern railway, and is connected with Gloucester by a branch line. The principal industry is the manufacture of shoes; and a number of people are employed in the coasting trade and fisheries. Population in 1890, 10,795.

BEVERLEY, JOHN OF, a celebrated prelate, who flourished during the 7th and 8th centuries, was born at Harpham in Northumbria. He received his education at Canterbury, and after his return to the north was the instructor of the Venerable Bede. In 685 he was made bishop of Hogalstad or Hexham, and two years later was promoted to the archbishopric of York. He resigned his see in 717, and retired to a college which he had founded some years before at Beverley, where he died in 721.

BEWDLEY, a market and borough town in the parish of Ribbesford, in the county of Worcester, 129 miles from London, on the Severn Valley Railway.

Bewdley, or, as it was formerly called, *Beaulieu*, was a place of some importance in the 13th century, and had the right of sanctuary for those who shed blood.

BEWICK, THOMAS, who may be considered as the reviver of wood-engraving in England, was born at Cherryburn, near Newcastle-on-Tyne, in August 1753. At the age of fourteen he was apprenticed to Mr. Beilby, an engraver in Newcastle. In his office Bewick engraved on wood for Dr. Hutton a series of diagrams illustrating a treatise on mensuration. He seems thereafter to have devoted himself entirely to engraving on wood, and in 1775 he received a premium from the Society for the Encouragement of Arts and Manufactures for a woodcut of the "Huntsman and the Old Hound." In 1784 appeared his *Select Fables*, the engravings in which, though far surpassed by his later productions, were incomparably superior to anything that had yet been done in that line. The *Quadrupeds* appeared in 1790, and his great achievement, that with which his name is inseparably associated, the *British Birds*, was published from 1797–1804. Bewick, from his intimate knowledge of the habits of animals acquired during his constant excursions into the country, was thoroughly qualified to do justice to his great task. Of his other productions the engravings for Goldsmith's *Traveller* and *Deserted Village*, for Parnell's *Hermit*, for Somerville's *Chase*, and for the collection of *Fables of Æsop and others*, may be specially mentioned. Berwick was for many years in partnership with his former master, and in later life had numerous pupils, several of whom gained distinction as engravers. He died on the 8th November 1828.

BEYLE, MARIE-HENRI, better known as De Stendhal, the most celebrated of his many *noms de plume*, was born at Grenoble on the 23d of January, 1783. At the age of twelve he was sent to the École Centrale, newly established at Grenoble, and continued in attendance for four years, during which time he distinguished himself in all his studies. In 1799 he was preparing to become a candidate for the École Polytechnique when his plans were disturbed by an offer from M. Daru, a distant relative, of some appointment connected with the ministry for war. In the following year he accompanied M. Daru to Milan, on the chance of some suitable post offering itself. He was present at the battle of Marengo; and carried away, apparently, by the military enthusiasm consequent on Napoleon's brilliant victories, he suddenly enlisted as quartermaster in a dragoon regiment. In a month's time he was made sub-lieutenant, and for about a year and a half acted as aide-de-camp to General Michaud. But the routine of garrison life, to which he was soon afterwards condemned, made him heartily tired of a military career. On the conclusion of the peace of Amiens (1802) he threw up his commission and went to reside with his family at Grenoble. From them he obtained means to take up his abode in Paris, where for some time he continued to devote himself to study and literary work. In 1805 he suddenly accepted a situation as clerk in a mercantile house at Marseilles, and remained there nearly a year,—in fact, till the actress, for whose sake he had taken this curious step, married a wealthy Russian. In the following year he again accompanied M. Daru into Germany, and was appointed to superintend the possessions of the emperor in Brunswick. Whatever German he learned there was afterwards completely forgotten. In his official capacity as connected with the commissariat he took part in the ill-fated Russian campaign of 1812, and remained loyal to the fallen emperor. He declined to lay himself out for employment under the new régime, and retired to Milan, where he resided till 1821. His early works, chiefly on painting and music, date from this period of his life. In 1821 he was compelled to return to France, an unfounded suspicion that he was a French spy having somehow arisen at Milan. During the following nine years he resided at Paris, and gradually began to acquire his high reputation as an accomplished litterateur and man of the world. He was an admirable talker and full of anecdote, which in his opinion ought to form the staple of conversation. His fine analytic powers were displayed to full advantage in the curious work, *De l'Amour*, which he published in 1822, but the book did not find an appreciative audience. The *Vie de Rossini*, which followed, was more successful; and the pamphlet *Racine et Shakespeare* did good service for the cause of Romanticism in its struggle with the rigid classical canons of older French literature. In 1829 appeared his *Promenades dans Rome*, full of information, criticism, and original observation, but somewhat chaotic in form. He was appointed consul at Trieste in 1830, and three years later he quitted that place with the greatest joy for a similar post at Civita Vecchia. There he remained till 1841, with frequent absences, one extending from 1836 to 1839, during which he paid a short visit to London. In 1841 his health gave way, and he returned to Paris, where he died on the 22d March, 1842.

BEYROUT, BEIROUT, or BAIRUT, the most important seaport town of Syria, on the coast of the Mediterranean, in the pashalic of Acre, 57 miles W.N.W. of Damascus. Population (1890), 80,000.

Beyrout is a place of great antiquity, and may perhaps be identified with the Berothah of the Phœnicians. For a time at least it was under the supremacy of Sidon. Destroyed by Trypho, the Syrian usurper, about 140 B.C., it was restored by the elder Agrippa about 41 A.D., raised to the rank of a Roman colony, and adorned with an amphitheatre and various splendid buildings. In

the 3d century it became a seat of jurisprudence, which long maintained its reputation, and was attended by several eminent men. During the reign of Justinian, in fact, Beyrout was the only place in the empire, except Rome and Constantinople, where law was permitted to be taught, and of the three the Syrian school, under the management of Theophilus and Dorotheus, appears to have stood highest in general estimation. But the injury inflicted on the city by an earthquake in 551 led to the removal of the school to Sidon, and not long after the building in which it had been held was totally consumed by fire. In the time of the crusades Beyrout again rose into prominence, and was captured by Baldwin I. in 1111, after a two months' siege. Early in the 17th century it became a chief seat of the Druses, who retained their possession till 1763, when it was betrayed into the hands of the Turks. In 1772 it was bombarded and plundered by a Russian fleet, and in 1840 it was nearly destroyed by the attack of the English under Admiral Stopford.

BEZA, THEODORE, or more correctly DE BÈZE, was born at Vezelai in Burgundy on the 24th July 1519. His family was of good descent, and his parents were noted for their piety and generosity. While an infant he was adopted by his uncle, Nicholas de Beza, a counsellor of the parliament of Paris, who took his nephew to live with him, and superintended his education with the greatest care. At the age of ten he was put under the tuition of Melchior Wolmar, a German, who resided at Orleans. Beza studied under him for seven years at Orleans and Bourges, and from him received the impulse which guided his after life. Wolmar, who was an excellent scholar, belonged to the Reformed Church, and his pupil not only learned from him the principles of the Reformed faith, but acquired the habit of diligent and critical study of Scripture. After the return of Wolmar to Germany in 1535, Beza with great reluctance departed for Orleans in order to begin the study of law. After four years he obtained the degree of licentiate in law, and leaving Orleans, took up his abode in Paris. He was young, ardent, and poetical, of high rank, surrounded with friends, and amply supplied with funds,—for, though he was not in orders, he enjoyed the proceeds of two benefices. It was small wonder that under these circumstances he should have yielded to the temptations of Paris, and have eagerly seized the pleasures that presented themselves. But the extent of his dissipation has been enormously exaggerated; more particularly has his connection with the woman whom he afterwards married been the occasion of calumny and misrepresentation. A severe illness at last recalled to his mind the teachings of his old master Wolmar, and brought clearly before him the contrast his conduct presented to them. Immediately on his recovery in October 1548, he retired to Geneva, publicly fulfilled his promise to marry the woman with whom he had formerly lived, and joined the Reformed Church. In the following year he was made professor of Greek at the academy of Lausanne, where he remained for ten years, communicating frequently with Calvin at Geneva. During this time he completed Clement Marot's French translation of the Psalms, and began the extended labors on the New Testament, which resulted in his famous translation and commentary. His veneration for Calvin, already great, was strengthened by closer intercourse; he vigorously defended the execution of Servetus; and in 1558 he gladly removed to Geneva. He was appointed professor of Greek in the academy, and assisted Calvin in his theological lectures. Soon by his vigorous teaching, his numerous writings, and his success in foreign embassies, he came to be looked upon as the most prominent man in the church of Geneva next to Calvin; and after the death of the latter in 1564, he was nominated his successor as teacher of theology, and generally recognized as the leader of the Calvinist party. He died in 1605.

BÉZIERS, a city of France, in the department of Hérault, the capital of an arrondissment of the same name. Population (1890), 42,160.

BÉZIQUE, a game at cards (probably from Sp. *besico*, little kiss, in allusion to the meeting of the queen and knave, an important feature in the game).

BHÁGALPUR, a division or commissionership of British India, under the Lieutenant-Governor of Bengal, comprising the districts of Bhágalpur, Monghir, Santál, Parganás, and Purniah. It is bounded on the N. by the independent state of Nepál and the British district of Dárjiling; on the E. by the districts of Jalpáiguri, Dinájpur, Máldah, Hurshidábád, and Bírbhúm; on the S. by the districts of Bírbhúm, Mánbhúm and Hazáríbagh; and on the W. by the districts of Gayá, Patná, and Tirhut. Population, 2,000,000.

BHÁGALPUR, the principal town of the district and division of the same name, situated on the right bank of the Ganges, here seven miles wide. Pop., 68,238.

BHAMÓ, or BANMO (in Chinese TSIN-GAI), a city of Upper Burmah, on the left bank of the Irawady, a short distance below its confluence with the Tapeng, and about 300 miles up the river from Mandalay the capital. It was formerly a very flourishing city, and the chief town of a Shan principality; and though greatly decayed, it is still the seat of a Burmese governor and the centre of a considerable trade. Pop., 3,000.

BHANDÁRÁ, a district of British India, under the jurisdiction of the Chief Commissioner of the Central Provinces. It is bounded on the N. by the districts of Seoní and Bálághát, on the E. by the district of Ráipur, on the S. by the district of Chándá, and on the W. by the district of Nágpur. Tigers, panthers, deer, wild hogs, and other animals abound in the forests, and during the rainy season many deaths occur from snake-bites. Population (1890), 683,799.

BHANDÁRÁ, the principal town and headquarters of the district of the same name, is situated on the Wainganá, about 38 miles east of Nágpur. The town is kept neat and clean, is well drained, and is considered healthy. Population, 13,000.

BHANG, an East Indian name for the hemp plant, *Cannabis sativa*, but applied specially to the leaves dried and prepared for use as a narcotic drug. The hemp plant, as cultivated in the Bengal Presidency and the North-West Provinces, yields a peculiar resinous exudation, which is altogether wanting in the hemp grown on account of its fibre in European countries. For this resinous exudation, in which its virtues as a drug reside, hemp is cultivated in Kashmir, Bokhàra, Yarkand, and Central Asia generally, besides North India, and in certain parts of East Africa, where, according to Captain Burton, it is grown "before every cottage door." In India the products of the plant for use as a narcotic and intoxicant are recognized under the three names and forms of Bhang, Gunja or Ganja, and Churrus or Charas. Bhang consists of the larger leaves and capsules of the plant on which an effloresence of resinous matter has occurred. Bhang is used in India for smoking, with or without tobacco; it is prepared in the form of a cake or manjan, and it is made into an intoxicating beverage by infusing in cold water and straining. Gunja is the flowering or fruit-bearing tops of the female plants. It is gathered in stalks of several inches in length, the tops of which form a matted mass, from the agglutination of flowers, seeds, and leaflets by the abundant resin-

ous exudation which coats them. Churrus is the resinous substance separated from the plant. According to Dr. O'Shaughnessy it is obtained by men dressed in leather aprons brushing forcibly through the growing stalks, and the resin which thereby adheres to the leather is scraped off with knives. It is stated that in Nepaul the leather covering is dispensed with, and the resin gathered on the naked bodies of coolies, who brush through the standing stalks. Dr. Royle says "the glandular secretion is collected from the plants on the hills by the natives pressing the upper part of the young plants between the palms of their hands, and scraping off the secretion which adheres." The preparation known as hashish among the Arabs is similar to the gunja of India, and is used in the same manner. The use of preparations of hemp among the Mussulman and Hindu population of India is very general; and the habit also obtains among the population of Central Asia, the Arabs, and Egyptians, extending even to the negroes of the valley of the Zambesi and the Hottentots of South Africa. The habit appears to date from very remote times, for Herodotus says of the Scythians, that they creep inside huts and throw hemp seeds on hot stones. The seeds "soon send forth a virulent intoxicating smoke, which fills the close tent, and the people inside, being overpowered with the intoxicating effects, howl with excitement and delight." The observations of Dr. O'Shaughnessy on the effects of the drug on the native population of India led him to conclude that it alleviates pain, and causes a remarkable increase of appetite, unequivocal aphrodisia, and great mental cheerfulness. Its violent effects are delirium of a peculiar kind, and the production of a cataleptic condition. Sir Robert Christison says, that "for energy, certainty, and convenience, Indian hemp is the next anodyne, hypnotic, and antispasmodic to opium and its derivatives, and often equal to it." Preparations are used in British pharmacy in the form of tincture and extract prepared from gunja, and it is understood to form an ingredient in the patent medicine chlorodyne.

BHARÁICH, a district of British India, under the jurisdiction of the Chief Commissioner of Oudh, is bounded on the N. by the independent state of Nepál, on the E. and N.E. by the district of Gondá, on the S.W. by the district of Bára Bánki, and on the W. by the districts of Sitápur and Kheri. Pop., 800,000.

BHARTPUR, or BHURTPORE, a native state of Rájputáná in Upper India, under the political superintendence of the British Government, is bounded on the N. by the British district of Gurgáon, on the N.E. by Mathurá, on the E. by Agra, on the S. and S.W. by the Rájput states of Karaulí and Jaipur, and on the W. by the state of Alwar. Length from north to south, about 77 miles; greatest breadth, 50 miles; area, 1974 square miles. Population (1890), 750,000.

Bhartpur rose into importance under Súraj Mall, who bore a conspicuous part in the destruction of the Dehli empire. Having built the forts of Díg and Kumbher in 1730, he received in 1756 the title of Rájá, and subsequently joined the great Marhattá army with 30,000 troops. But the misconduct of the Marhattá leader induced him to abandon the confederacy, just in time to escape the murderous defeat at Pániput. Súraj Mall raised the Ját power to its highest point; and Colonel Dow, in 1770, estimated the Rájá's revenue (perhaps extravagantly) at $10,000,000, and his military force at 60,000 or 70,000 men. In 1803 the East India Company concluded a treaty, offensive and defensive, with Bhartpur. In 1804, however, the Rájá assisted the Marhattás against the British. The English under Lord Lake captured the fort of Díg and besieged Bhartpur, but was compelled to raise the siege after four attempts at storming. A treaty, concluded on 17th of April, 1805, guaranteed the Rájá's territory; but he became bound to pay $1,000,000 as idemnity to the East India Company. A dispute as to the right of the succession again led to a war in 1825, and Lord Combermere captured Bhartpur with a besieging force of 20,000 men, after a desperate resistance, on the 18th January 1826. The fortifications were dismantled, the hostile chief being deported to Benares, and an infant son of the former Rájá installed under a treaty favorable to the Company. In 1853 the Bhartpur ruler died, leaving a minor heir. The state came under British management, and the administration has been improved, the revenue increased, a system of irrigation developed, new tanks and wells constructed, and an excellent system of roads and public buildings organized.

BHATGÁON, a town of Northern India, in the Nepál valley, situated in 27° 37′ N. lat. and 85° 22′ E. long. It is a celebrated place of Hindu superstition, the favorite residence of the Bráhmans of Nepál, and contains more families of that order than either Kátmandu or Patu. Population (estimated), 30,000.

BHATNIÁR, or BHATTIS, a people of the northern part of Hindustán, inhabiting the tract of country now included within the British district of Hissar, formerly called Bhatiáná, the eastern frontier of which is situated 125 miles north-west of Dehli. The Bhattis present many peculiarities in manners and customs, distinguishing them from the other people of Hindustán. They consist of two distinct races — the one being composed of Mahometans of Rájput descent, who constitute the influential class, and who report among themselves that their ancestors emigrated some centuries ago from the district of Jasalmir, and after various vicissitudes settled in the Bhatniár country; the other comprising the common people, known as Játs, who have adopted the religion of their superiors, and are consequently treated with great moderation. Most of these people are descended from dwellers on the western bank of the Satlej, who were invited by a Rájá of the Bhattis to cross the river and settle in his country. Though tillers of the soil, the Bhattis are more generally characterized as shepherds; and though they are mostly restricted to the territory whence their name is derived, various tribes of them are to be found in the Panjáb, and they are also scattered over the high grounds to the east of the Indus.

Notwithstanding they are Mahometans, their customs are in some respects at variance with those observed by the majority of the followers of the prophet, particularly in the females appearing, without reserve, unveiled in public, and in their associating openly with the men.

While under the influence of native rule the Bhattis appear to have formed a collection of hordes of freebooters. They have been described as of a cruel, savage, and ferocious disposition, entertaining an abhorrence of the usages of civilized life — thieves from their earliest infancy, and during their predatory incursions into the neighboring districts, not scrupling, though unresisted, to add murder to robbery.

The former capital of the Bhattis was Bhatniár, which lies in a situation almost inaccessible to an enemy, for no water is to be procured within 12 miles but what supplies the inhabitants. It was taken, however, in 1398 by Timur, more recently by the military adventurer George Thomas, and finally in 1805 by the Rájá of Bikánir, who still retains authority over it. The principal town is Sírsá, between which and Bháwalpur a route for commercial purposes has been opened.

The history of the Bhattis has attracted the notice of

few European authors. They seem to have carried on frequent wars with neighboring states, and were the most formidable enemies opposed to the Rájá of Bikánir. The latter, however, invaded their territories in the beginning of the present century, and obtained some temporary advantages. But George Thomas, the military adventurer already noticed, an Irishman by birth, who, endowed with singular talents and intrepidity, had founded for himself an independent state in the north-west of India, was then at war with the province of Bikánir. Having reached its frontiers, the Bhattis solicited his alliance, and, to induce him to espouse their cause the more readily, offered him 40,000 rupees.

BHÁWALPUR, a feudatory state in North-Western India, under the political jurisdiction of the Lieutenant-Governor of the Panjáb. It is bounded on the N. by Sind and Panjáb, on the E. and S.E. by the British district of Hissar and the Rájput states of Bikánir and Jasalmrí, and on the S.W. by Sind. . Pop., 500.000.

BHIL, a tribe and a British political agency in Central India. The agency was formed in 1825, when the Bhil corps was organized, with a view to utilizing the warlike instincts of the Bhil tribes. This brave body of men have done good service, and gradually put down the predatory habits of their countrymen. The Bhil tribes chiefly inhabit the rocky ranges of the Vindhya and Sátpurá mountains, and the banks of the Narbadá and the Taptí. In common with other hill tribes, the Bhils are supposed to have been aborigines of India, and to have been driven to their present fastness at the time of the Hindu invasion. They are of dark complexion and diminutive stature, but active, and capable of enduring great fatigue. Various efforts have been made by the British Government to reclaim this people from their predatory habits, and in 1869-70 the official report stated that "the Bhils of Mánpur are becoming reconciled to the life of cultivators, though not yet willing to take out leases."

BHOPÁL, a British political agency in Central India, comprising 31 native administrations.

BHOPÁL, a native state in Malwa in Central India, under the political superintendence of the British Government. It is bounded on the N. by the state of Gwalior and the British district of Bairsiá, on the N.E. and S.E. by the Ságar and Nerbadá territory, on the S.W. by the possessions of Holkár and Sindhiá, and on the N.W. by Sindhiá's districts and Omatwárá. Length of the state from E. to W., 157 miles; breadth from N. to S., 76 miles; estimated area, 6764 square miles.

BHUTÁN, an independent kingdom in the Eastern Himálayas, is bounded on the N. by Thibet; on the E. by a track inhabited by various uncivilized independent mountain tribes; on the S. by the British province of Assam, and the district of Jalpáigurí; and on the W. by the independent native state of Sikim.

Previous to the British annexation of the Dwárs from Bhután, the area of the kingdom was reckoned at 20,000 sq. miles. The population of the country now remaining to Bhután was estimated in 1864 at 20,000 souls. Later information, however, points to a larger figure. The people are industrious, and devote themselves to agriculture, but from the geological structure of the country, and from the insecurity of property, regular husbandry is limited to comparatively few spots. The people are oppressed and poor. "Nothing that a Bhutiá possesses is his own," wrote the British envoy in 1864; "he is at all times liable to lose it if it attracts the cupidity of any one more powerful than himself. The lower classes, whether villagers or public servants, are little better than the slaves of higher officials. In regard to them no rights of property are observed, and they have at once to surrender anything that is demanded of them. There never was, I fancy, a country in which the doctrine of 'might is right' formed more completely the whole and sole law and custom of the land than it does in Bhután. The people nominally profess the Buddhist religion, but in reality their religious exercises are confined to the propitiation of evil spirits, and the mechanical recital of a few sacred sentences. Around the cottages in the mountains the land is cleared for cultivation, and produces thriving crops of barley, wheat, buckwheat, millet, mustard, chillies, &c. Turnips of excellent quality are extensively grown; they are free from fibre and remarkably sweet. The wheat and barley have a full round grain, and the climate is well adapted to the production of both European and Asiatic vegetables. Potatoes have been introduced. Elephants are so numerous as to be dangerous to travellers; but tigers are not common, except near the River Tistá. Leopards abound in the Hah valley; deer everywhere, some of them of a very large species. The musk deer is found in the snows, and the barking deer on every hill side. Wild hogs are met with even at great elevations. Large squirrels are common. Bears and rhinoceros are also found. Pheasants, jungle fowls, pigeons, and other small game abound. The Bhutiás are no sportsmen. They have a superstitious objection to firing a gun, thinking that it offends the deities of the woods and valleys, and brings down rain. A species of horse, which seems indigenous to Bhutàn, and is used as a domestic animal, is called *tángan*, from Tángastán, the general appellation of that assemblage of mountains which constitutes the territory of Bhután. It is peculiar to this tract, not being found in any of the neighboring countries of Assam, Nepál, Thibet, or Bengal, and unites in an eminent degree the two qualities of strength and beauty. The *tángan* horse usually stands about thirteen hands high, is short bodied, clean-limbed, deep in the chest, and extremely active, his color usually inclining to piebald. Swords, iron spears, and arrow-heads, and a few copper caldrons fabricated from the metal obtained in the country, complete the list of manufactures. The foreign trade of Bhután has greatly declined. The total military force was estimated by the British envoy in 1864 at 6000.

History.— Bhután formerly belonged to a tribe called by the Bhutiás Tephu, generally believed to have been the people of Kuch Behar. About two hundred years ago some Thibetan soldiers subjugated the Tephus, took possession of the country, and settled down in it. At the head of the Bhután goverment there are nominally two supreme authorities, the Dharm Rájá, the spiritual head, and the Deb Rájá, the temporal ruler. To aid these Rájás in administering the country, there is a council of permanent ministers, called the Lenehen. Practically, however, there is no government at all. Subordinate officers and rapacious governors of forts wield all the power of the state, and tyranny, oppression, and anarchy reign over the whole country. The Dharm Rájá succeeds as an incarnation of the deity. On the death of a Dharm Rájá a year or two elapses, and the new incarnation then reappears in the shape of a child who generally happens to be born in the family of a principal officer. The child establishes identity by recognizing the cooking utensils, &c., of the late Dharm Rájá; he is then trained in a monastery, and on attaining his majority is recognized as Rájá, though he exercises no more real authority in his majority than he did in his infancy. The Deb Rájá is in theory elected by the council. In practice he is merely the nominee of whichever of the two governors of East and West Bhután happens for the time to be the more powerful.

BIAFRA, a tract of country on the coast of Western Africa, on a bay or bight of the same name.

BIANCHINI, Francis, a learned Italian astronomer and antiquary, was born at Verona in 1662, of a noble and ancient family. He died in 1729.

BIARRITZ, a watering-place in the south of France, in the department of Bassess-Pyrénées, on the sea-coast about five miles south-west of Bayonne. From a mere fishing village, with a few hundred inhabitants, in the beginning of the century, it rose rapidly into a place of importance under the patronage of the late emperor Napoleon III. and the empress, with whom it was a favorite resort. Excellent bathing-ground is afforded by the Vieux Port and the various sheltered bays into which the cliffs of this part of the coast are carved by the swell of the Atlantic; and the irregular eminences and promontories supply attractive sites for the erection of villas. The climate is delightful and bracing; and the bareness of the neighborhood has been considerably relieved by fir plantations.

BIAS, a native of Priene, one of the seven sages of Greece, was the son of Teutamus, and flourished about the middle of the 6th century B.C. He was one of the most eloquent speakers of his time, and is celebrated as having never used his talents for the purpose of mere gain, but as having devoted them to the service of the injured and oppressed. Many stories are told illustrative of the nobility of his character in this and other respects. According to one of these, when his native town was taken by an enemy, and the inhabitants were carrying off whatever seemed to each most valuable, one of them, observing Bias without any burden, advised him to follow his example. "I am doing so," said he, "for I carry all my valuables with me." His fellow-citizens honored him with a splendid funeral, and dedicated to him a sanctuary which they called Teutamium. He is said to have written an heroic poem on the affairs of the Ionians, in order to show them how they might be most prosperous. A great number of the short, pithy, ethical sayings or apophthegms characteristic of the Greek sages are ascribed to Bias. Bias is the author of the famous and often imitated reproof to the impious sailors, who in the midst of a tempest were calling on the gods—"Be quiet," said he, "lest the gods discover that you are here."

BIBERACH, a town of Würtemburg, in the circle of the Danube, a capital of a bailiwick 23 miles S.S.W. of Ulm. It is situated on the River Riss, a small tributary of the Danube, partly on level ground and partly on hills, and still has a somewhat mediæval appearance from the remains of its ancient walls and towers. Biberach is the birthplace of the sculptor Natter and the painter Neher; and Wieland, who was born at the neighboring village of Oberholzheim, spent a series of years in the town. Population, 8,934.

BIBIRINE, or Bebeerine, an alkaloid obtained from the bark and fruit of the greenheart tree, *Nectandra Rodiæi*, called bibiru or spirit in Guiana, where the tree grows. The alkaloid was discovered about the year 1835 by Hugh Rodie, a surgeon resident in Demerara, who found it possessed great efficacy as a febrifuge, and it was recommended by him as a substitute for quinine.

BIBLE. The word Bible, which in English, as in Mediæval Latin, is treated as a singular noun, is in its original Greek form a plural,—*τὰ βιβλία*, *the (sacred) books*,—correctly expressing the fact that the sacred writings of Christendom are made up of a number of independent records, which set before us the gradual development of the religion of revelation. The origin of each of these records forms a distinct critical problem; and for the discussion of these questions of detail the reader is referred to the articles on separate Biblical books. The present article seeks to give a general account of the historical and literary conditions under which the unique literature of the Old and New Testaments sprang up, and of the way in which the Biblical books were brought together in a canonical collection and handed down from age to age. The Biblical development is divided into two great periods by the manifestation and historical work of Christ. In its pre-Christian stage the religion of revelation is represented as a *covenant* between the spiritual God and His chosen people the Hebrews. In accordance with this and in allusion to Jer. xxxi, 31, Jesus speaks of the new dispensation founded in His death as a new *covenant* (2 Cor. xi. 25). Hence as early as the 2nd century of our era the two great divisions of the Bible were known as the books of the Old and of the New Covenant respectively. Among Latin-speaking Christians the Greek word for covenant was often incorrectly rendered *testament*, and thus Western Christendom still uses the names of the Old and New Testaments.

Old Testament.—*Struggle and Progress of Spiritual Religion. Priests, Prophets, &c.*—The pre-Christian age of the Biblical religion falls into a period of religious productivity and a subsequent period of stagnation and mainly conservative traditions. The period of productivity is also a period of contest, during which the spiritual principles of the religion of revelation were involved in continual struggle with polytheistic nature-worship on the one hand, and, on the other hand, with an unspiritual conception of Jehovah as a God whose interest in Israel and care for His sanctuary were independent of moral conditions. In this long struggle, which began with the foundation of the theocracy in the work of Moses, and did not issue in conclusive victory until the time of Ezra, the spiritual faith was compelled to show constant powers of new development,—working out into ever clearer form the latent contrasts between true and false religion, proving itself fitter than any other belief to supply all the religious needs of the people, and, above all, finding its evidence in the long providential history in which, from the great deliverance of the Exodus down to the Captivity and the Restoration, the reality of Jehovah's kingship over Israel, of His redeeming love, and of His moral government, were vindicated by the most indisputable proofs. As it was only the deliverance from Egypt and the theocratic covenant of Sinai that bound the Hebrew tribes into national unity, the worship of Jehovah was always acknowledged as the national religion of Israel. But from Joshua to Samuel national feeling was far weaker than tribal jealousy; and in the political disintegration of the people the religion of Jehovah seemed ready to be lost in local superstitions. During this period the chief centre of monotheism was the sanctuary and priesthood of the ark; and it was from the priestly circle that Samuel arose to reunite the nation by recalling it to the religion of Jehovah, and thus to prepare the way for the splendid age of David and Solomon. But though Samuel was by education a priest, it was not as a priest, but as a prophet that he accomplished this work. In all ages a priesthood is conservative, not creative; and it was only as a growing and creative power that the still undeveloped spiritual religion could live. While it was the business of the priest faithfully to preserve religious traditions already acknowledged as true and venerable, the characteristic of the prophet is a faculty of spiritual intuition, not gained by human reason, but coming to him as a word from God himself, wherein he apprehends religious truth in a new light, as bearing in a way not manifest to other men on the practical necessities, the burning questions of the present. Unlike the priesthood, the prophets never formed a regular guild. It was an axiom that the gift of prophecy was bestowed

by the inward and immediate call of Jehovah. But from the time of Samuel we find a regular succession of prophets working out the spiritual problems of the national faith with ever increasing clearness, and gathering round them, sometimes in regularly formed communities, a circle of disciples and sympathizers which, though never, perhaps, numerically considerable, embraced the names of David and other leaders of Hebrew history, and impressed the stamp of prophetic influence on every part of the national life. From this time the priests hold only the second place in the history of the Old Testament religion; sometimes they even appear as the opponents of the prophetic party, whose progressive ideas are distasteful to their natural conservatism and aristocratic instincts. But on the whole, the more enlightened ministers of the central sanctuary continued to share with the prophets the task of upholding a lofty religious tradition, and not unfrequently both characters were united in one person. It was, in fact, only through the priests that the ideas of the prophets could receive public sanction in the ordinances of religion, as it was only through rulers like David, or Hezekiah, or Jehu, that they could influence the political conduct of affairs.

A just insight into the work of the prophetic party in Israel was long rendered difficult by traditional prejudices. On the one hand the predictive element in prophecy received undue prominence, and withdrew attention from the influence of the prophets on the religious life of their own time; while, on the other hand, it was assumed, in accordance with Jewish notions, that all the ordinances, and almost, if not quite, all the doctrines of the Jewish church in the post-canonical period, existed from the earliest days of the theocracy. The prophets, therefore, were conceived partly as inspired preachers of old truths, partly as predicting future events, but not as leaders of a great development, in which the religious ordinances as well as the religious beliefs of the Old Covenant advanced from a relatively crude and imperfect to a relatively mature and adequate form.

The proof that this latter view, and not the traditional conception, is alone true to history depends on a variety of arguments which cannot here be reproduced. That the religious ideas of the Old Testament were in a state of growth during the whole prophetic period became manifest as soon as the laws of grammatico-historical exegesis were fairly applied to the Hebrew Scriptures. That the sacred ordinances were subject to variation was less readily admitted, because the admission involved a change of view as to the authorship of the Pentateuch; but here also the facts are decisive. But the worship of Jehovah on the high places or local sanctuaries was constantly exposed to superstitious corruption and heathen admixture, and so it is frequently attacked by the prophets of the 8th century. It was undoubtedly under their influence that Hezekiah abolished the high places. The abolition was not permanent; but in the reign of Josiah, the next reforming king, we find that the principle of a single sanctuary can claim the support not only of prophetic teaching, but of a written law-book found in the temple, and acknowledged by the high priest. The legislation of this book corresponds not with the old law in Exodus, but with the book of Deuteronomy. But perhaps the clearest proof that, during the period of prophetic inspiration, there was no doctrine of finality with regard to the ritual law any more than with regard to religious ideas and doctrines, lies in the last chapters of Ezekiel, which sketch at the very era of the Captivity an outline of sacred ordinances for the future restoration. From these and similar facts it follows indisputably, that the true and spiritual religion which the prophets and like-minded priests maintained at once against heathenism and against unspiritual worship of Jehovah as a mere national deity without moral attributes, was not a finished but a growing system, not finally embodied in authoritative documents, but propagated mainly by direct personal efforts. At the same time these personal efforts were accompanied and supported by the gradual rise of a sacred literature. Though the priestly ordinances were mainly published by oral decisions of the priests, which are, in fact, what is usually meant by the word *law* (Torah) in writings earlier than the Captivity, there can be no reasonable doubt that the priests possessed written legal collections of greater or less extent from the time of Moses downwards. Again, the example of Ezekiel, and the obvious fact that the law-book found at the time of Josiah contained provisions which were not up to that time an acknowledged part of the law of the land, makes it probable that legal provisions, which the prophets and their priestly allies felt to be necessary for the maintenance of the truth, were often embodied in legislative programmes, by which previous legal tradition was gradually modified. Then the prophets, especially when they failed to produce immediate reformation, began from the 8th century, if not still earlier, to commit their oracles to writings; and these written prophecies — circulating widely in a nation which had attained a high degree of literary culture, and frequently cited by later seers — disseminated prophetic teaching in a permanent form. Long before this time music and song had been practised in the prophetic circle of Samuel, and were introduced under David into the service of the sanctuary. Another important vehicle of religious instruction was the written history of the nation, which could not fail to be generally set forth in the theocratic spirit in which all loftier Hebrew patriotism had its root. And, indeed, the literary diffusion of spiritual ideas was not confined to the direct efforts of priests and prophets. In spite of the crass and unspiritual character of the mass of the people, the noblest traditions of national life were entwined with religious convictions, and the way in which a prophet, like Amos, could arise untrained from among the herdsmen of the wilderness of Judah, shows how deep and pure a current of spiritual faith flowed among the more thoughtful of the laity. Prophecy itself may from one point of view be regarded simply as the brightest efflorescence of the lay element in the religion of Israel, the same element which in subjective form underlies many of the Psalms, and in a shape less highly developed tinged the whole proverbial and popular literature had not yet sunk to represent the lowest impulses of national life.

Close of the Old Testament Development. Formation of the Canon.—The struggle between spiritual and unspiritual religion was brought to a crisis when the prophetic predictions of judgment on national sin were fulfilled in the fall of the kingdom of Judah. The merely political worship of Jehovah as the tutelary god of the state was now reduced to absurdity. Faith in the covenant God was impossible except on the principles of spiritual belief. Nor did the restoration by Cyrus affect this result. No political future lay before the returning exiles, and continued confidence in the destiny of the race was not separable from the religious ideas and Messianic hopes of the prophets. To obey the law of Jehovah and patiently to await the coming Deliverer was the only distinctive vocation of the community that gathered in the New Jerusalem; and after a period of misfortune and failure, in which the whole nation seemed ready to collapse in despair, this vocation was clearly recognized and embodied in permanent institutions in the reformation of Ezra and Nehemiah (445 B. C.) But with this victory the spiritual religion

passed into a stationary state. The spirit of prophecy, long decadent, expired with Malachi, the younger contemporary of Nehemiah; and the whole concern of the nation from this time downwards was simply to preserve the sacred inheritance of the past. The Exile had so utterly broken all continuity of national life, that that inheritance could only be sought in the surviving monuments of sacred literature. To these, more than to the expiring voice of prophecy in their midst, the founders of the new theocracy turned for guidance. The books that had upheld the exile's faith, when all outward ordinances of religion were lacking, were also the fittest teachers of the restored community. Previous reformers had been statesmen or prophets. Ezra is a scribe who comes to Jerusalem armed, not with a fresh message from the Lord, but with "the book of the law of Moses." This law book was the Pentateuch, and the public recognition of it as the rule of the theocracy was the declaration that the religious ordinances of Israel had ceased to admit of development, and the first steps towards the substitution of a *canon* or authoritative collection of Scriptures for the living guidance of the prophetic voice. A second step in the same direction is ascribed to Nehemiah by a tradition intrinsically probable, though of no great external authority. He, it is said, collected a library which, besides documents of temporary importance, embraced "the books about the kings and prophets, and the writings of David." Certainly a complete body of the remains of the prophets, with an authentic account of the history of the period of their activity, must soon have been felt to be scarcely second in importance to the law; and so Nehemiah may very well be supposed to have begun the collection which now forms the second part of the Hebrew Bible, embracing, under the general title of *The Prophets*, the historical books of Joshua, Judges, Samuel, Kings (*Earlier Prophets*), and the four prophetic books of Isaiah, Jeremiah, Ezekiel, and the twelve minor prophets (*Later Prophets*). The mention of the writings of David implies that Nehemiah also began the third and last part of the Hebrew Canon, which comprises, under the title of *Ketubim* (Scriptures, Hagiographa), the Psalms, Proverbs, Job, the five Megillot or *rolls* (Canticles, Ruth, Lamentations, Ecclesiastes, Esther), and, finally, Daniel, Ezra, Nehemiah, and Chronicles. It is certain, however, that this part of the collection was not completed till long after Nehemiah's time; for to say nothing of the disputed dates of Ecclesiastes and Daniel, the book of Chronicles contains genealogies which go down at least to the close of the Persian period. The miscellaneous character of the Ketubim seems, in fact, to show that after the Law and the Prophets were closed, the third part of the canon was open to receive additions, recommended either by their religious and historical value, or by bearing an ancient and venerable name. And this was the more natural because the Hagiographa had not the same place in the synagogue service as was accorded to the Law and the Prophets.

The time and manner in which the collection was absolutely closed are obscure. The threefold division of the sacred writings is referred to in the prologue to the Wisdom of Sirach (Ecclesiasticus) about 130 B.C., but Jewish tradition indicates that the full canonicity of several books, especially of Ecclesiastes, was not free from doubt till the time of the famous R. Akiba, who perished in the great national struggle of the Jews with the Emperor Hadrian (Mishna, *Jadaim*, 3; *Edaiot*, 5). The oldest list of canonical books, given by Josephus (*c. Apion.*, i. 8), is of somewhat earlier date. Josephus seems to have had quite our present canon; but he took Ruth along with Judges, and viewed Lamentations as part of the book of Jeremiah, thus counting twenty-two books instead of the twenty-four of the Talmudic enumeration and of the present Hebrew Bible. There is other evidence that only twenty-two books were reckoned by the Jews of the first Christian century; and it appears that this number was accommodated to that of the letters of the Hebrew alphabet. Even in the time of Jerome, Ruth and Lamentations were not uniformly reckoned apart. The expansion of the Talmudic twenty-four to the thirty-nine Old Testament books of the English version is effected by reckoning the minor prophets one by one, by separating Ezra from Nehemiah, and by subdividing the long books of Samuel, Kings, and Chronicles. In this reckoning, and in the very different order of the books, we follow in the main the Alexandrian Greek and Vulgate Latin versions. But the Alexandrian differed from the Hebrew canon in more important points. The line of distinction between inspired and human writings was not so sharply drawn; and the Greek Bible not only admitted additions to several of the Hagiographa, but contained other apocryphal books, of some of which Greek was the original tongue, while others were translations of Hebrew or Aramaic writings. See APOCRYPHA.

In turning now to a literary and critical survey of the Old Testament books, we shall find it convenient to depart from the division of the Hebrew canon, in favor of a classification suggested by the order of the books followed in the English version and in most other translations. The Old Testament literature is made up of historical, poetico-didactic, and prophetic writings, and under these three heads we will arrange what remains to be said on the subject.

Historical Books.—These form two parallel series of sacred history. The books from Genesis to Kings give a continuous story (with some episodical additions) from the creation to the fall of the kingdom of Judah. The book of Chronicles covers the same ground on a narrower plan, contracting the early history into genealogical lists, and occupying itself almost entirely with the kingdom of Judah, and especially with matters connected with the temple and its worship. The narrative of the chronicler is continued in the books or rather book of Ezra and Nehemiah, which incorporates original memoirs of these two reformers, but otherwise is so exactly the style of the Chronicles that critics are practically agreed in ascribing the whole to a single author, probably a Levite, who, as we have already seen, cannot have written before the close of the Persian empire. The questions that are raised as to the work of the chronicler belong less to the general history of Biblical literature than to special introduction. We pass on, therefore, to the larger and more important series. The Pentateuch and the so-called earlier prophets form together a single continuous narrative. It is plain, however, that the whole work is not the uniform production of one pen, but that in some way a variety of records of different ages and styles have been combined to form a single narrative. Accordingly, Jewish tradition bears that Moses wrote the Pentateuch, Joshua the book named after him, Samuel the book of Judges, and so forth. As all Hebrew history is anonymous,—a sure proof that people had not yet learned to lay weight on questions of authorship,—it is not probable that this tradition rests on any surer ground than conjecture; and, of course, a scribe who saw in the sacred books the whole outcome of Israel's history would naturally leap to the conclusion that the father of the Law was the author of the Pentateuch, and that the other leaders of Israel's history could not but be the writers of a great part of the Scriptures. A more careful view of the books themselves shows that the actual state of the

case is not so simple. In the first place, the limits of the individual books are certainly not the limits of authorship. The Pentateuch as a law-book is complete without Joshua, but as a history it is so planned that the latter book is its necessary complement. (*Cf.*, for example, Exod. xvi. 35, Josh. v. 12; Gen. l. 24, 25; Exod. xiii. 19; Josh. xxiv. 32.) In truth, an author who wrote after the occupation of Canaan could never have designed a history which should relate all God's promises to Israel and say nothing of their fulfilment. But in its present shape the Pentateuch is certainly subsequent to the occupation, for it uses geographical names which arose after that time (Hebron, Dan), refers to the conqnest as already accomplished (Deut. ii. 12, *cf.* Num. xv. 32; Gen. xii. 6), and even presupposes the existence of a kingship in Israel (Gen. xxxvi. 31). And with this it agrees, that though there are marked differences of style and language within the book of Joshua, each style finds its counterpart in some section of the Pentateuch. In the subsequent books we find quite similar phenomena. The last chapters of Judges cannot be separated from the book of Samuel, and the earlier chapters of Kings are obviously one with the foregoing narrative; while all three books contain certain passages strikingly akin to parts of the Pentateuch and Joshua (*cf.*, for example, the book of Deuteronomy with Josh. xxiii., 1 Sam. xii., 1 Kings viii.). Such phenomena not only prove the futility of any attempt to base a theory of authorship on the present division into books, but suggest that the history as we have it is not one narrative carried on from age to age by successive additions, but a fusion of several narratives which partly covered the same ground and were combined into unity by an editor. This view is supported by the fact, that even as it now stands the history sometimes gives more than one account of the same event, and that the Pentateuch often gives several laws on the same subject. Of the latter we have already had one example, but for our present argument the main point is not diversity of enactment, which may often be only apparent, but the existence within the Pentateuch of distinct groups of laws partly taking up the same topics. Thus the legislation of Exod. xx.–xxiii. is partly repeated in ch. xxxiv., and on the passover and feast of unleavened bread we have at least six laws, which if not really discordant, are at least so divergent in form and conception that they cannot be all from the same pen. (Exod. xii. 1–28, xiii. 3–10, xxiii. 15, xxxiv. 18; Lev. xxiii. 5–14, Deut. xvi.) Of historical duplicates the most celebrated are the twofold history of the creation and the flood, to which we must recur presently. The same kind of thing is found in the later books; for example, in the account of the way in which Saul became king, where it is scarcely possible to avoid the conclusion that 1 Sam. xi. 1–11 should attach directly to ch. x. 16 (*cf.* x. 7). But the extent to which the historical books are made up of parallel narratives which, though they cover the same period, do not necessarily record the same events, was first clearly seen after Astruc (1753 A.D.) observed that the respective uses of Jehovah (LORD) and Elohim (God) as the name of the Deity afford a criterion by which two documents can be dissected out of the book of Genesis. That the way in which the two names are used can only be due to difference of authorship is now generally admitted, for the alternation corresponds with such important duplicates as the two accounts of creation, and is regularly accompanied through a great part of the book by unmistakable peculiarities of language and thought, so that it is still possible to reconstruct at least the Elohim document with a completeness which makes its original independence and homogeneity matter of direct observation. The character of this narrative is annalistic, and where other material fails blanks are supplied by genealogical lists. Great weight is laid on orderly development, and the name Jehovah is avoided in the history of the patriarchs in order to give proper contrast to the Mosaic period (*cf.* Gen. xvii. 1; Exod. vi. 3); and, accordingly, we find that the unmistakable secondary marks of this author run through the whole Pentateuch and Joshua, though the exclusive use of Elohim ceases at Exod. vi. Of course the disappearance of this criterion makes it less easy to carry on an exact reconstruction of the latter parts of the document; but on many points there can be no uncertainty, and it is clearly made out that the author has strong priestly tendencies, and devotes a very large proportion of his space to liturgical matters. The separation of this document may justly be called the point of departure of positive criticism of the sources of the Old Testament; and present controversy turns mainly on its relation to other parts of the Pentateuch. Of these the most important are — 1. The Jehovistic narrative, which also begins with the creation, and treats the early history more in the spirit of prophetic theology and idealism, containing, for example, the narrative of the fall, and the parts of the history of Abraham which are most important for Old Testament theology. That this narrative is not a mere supplement to the other, but an independent whole, appears more plainly in the story of the flood, where two distinct accounts have certainly been interwoven by a third hand. 2. Many of the finest stories in Genesis, especially great part of the history of Joseph, agree with the Elohim document in the name of God, but are widely divergent in other respects. Since the researches of Hupfeld, a third author, belonging to northern Israel, and specially interested in the ancestors of the northern tribes, is generally postulated for these sections. His literary individuality is in truth sharply marked, though the limits of his contributions to the Pentateuch are obscure.

It will be remembered that we have already seen that three currents of influence run through the Old Testament development,— the traditional lore of the priests, the teaching of the prophets, and the religious life of the more enlightened of the people. Now, in the three main sections of the early history just enumerated we find the counterpart of each of these. The priestly narrative of the Elohist, the prophetic delineation of the Jehovist, the more picturesque and popular story of the third author, embody three tendencies, which are not merely personal but national, and which constantly reappear in other parts of Hebrew literature. Up to the book of Joshua all three run side by side. But the priestly interest found little scope in the subsequent history; and from the time of the Judges we can generally distinguish only sections marked by prophetic pragmatism and others which, though distinctly religious and theocratic, are, so to speak, written from a layman's stand-point. The latter comprise a large part of Judges, and by far the greatest part of Samuel, as well as the beginning of Kings. To the modern mind this part of the narrative, which is rich in color and detail, is by far the most interesting, and it is with sincere regret that we pass at 1 Kings xi. to a division of the history for which the chief sources — cited as the Chronicles of the Kings of Israel and Judah respectively — treat almost exclusively of the outer political life of the nation. In striking contrast to the uniformity of this narrative are the interspersed histories of Elijah and other northern prophets. These histories are very remarkable in style and even in language; and, containing some of the noblest passages of the Old Testament, form one of many proofs of the unusual literary genius of the kingdom of Ephraim.

But how are these various narratives related to each other? This question is not easy to answer. In general the third or lay element of the history seems to stand nearest to the events recorded, and even, perhaps, to form the direct basis of the prophetical matter; while, occasionally, old lists of names and places, poetico-historical pieces, and the like, form a still deeper stratum in the story. (Poetical pieces in the *Book of the Wars of Jehovah*. Num. xxi. 14; *Book of Jashar* [the upright], Josh. x. 13; 2 Sam. i. Lists like 2 Sam. xxiii.) Whether the same hands or only the same tendencies as appear in the non-Levitical parts of Genesis run on as far as the book of Kings, is a question which, though answered in the affirmative by Schrader and others, cannot be viewed as decided. Even the date of these elements of the Pentateuch is obscure; but in the 8th century Hosea refers quite clearly to passages of both. Thus far there is tolerable agreement among critics; but the Levitical or Elohistic history is the subject of violent controversy, which, however, turns mainly on the analysis of the legal parts of the Pentateuch. These contain other elements besides those already enumerated, of which we need only mention the brief code which follows the Decalogue in Exod. xx.–xxiii., and the great repetition of the law in a prophetic spirit which occupies the major part of Deuteronomy. Both these codes may be called popular in tone. They are precepts not for the priests, but for the whole people; and the former is the fundamental sketch of the whole theoretic constitution, which the latter develops and to some extent alters. Now the book of Deuteronomy presents a quite distinct type of style which, as has been already mentioned, recurs from time to time in passages of the latter books, and that in such a connection as to suggest to many critics since Graf the idea, that the Deuteronomic hand is the hand of the last editor of the whole history from Genesis to Kings, or, at least, of the non-Levitical parts thereof. This conclusion is not stringent, for a good deal may be said in favor of the view that the Deuteronomic style, which is very capable of imitation, was adopted by writers of different periods. But even so it is difficult to suppose that the legislative part of Deuteronomy is as old as Moses. If the law of the kingdom in Deut. xvii. was known in the time of the Judges, it is impossible to comprehend Judg. viii. 23, and above all 1 Sam. viii. 7. That the law of high places given in this part of the Pentateuch was not acknowledged till the time of Josiah, and was not dreamed of by Samuel and Elijah, we have already seen. The Deuteronomic law is familiar to Jeremiah, the younger contemporary of Josiah, but is referred to by no prophet of earlier date. And the whole theological stand-point of the book agrees exactly with the period of prophetic literature, and gives the highest and most spiritual view of the law, to which our Lord himself directly attaches his teaching, and which cannot be placed at the beginning of the theocratic development without making the whole history unintelligible. Beyond doubt the book is, as already hinted, a prophetic legislative programme; and if the author put his work in the mouth of Moses instead of giving it, with Ezekiel, a directly prophetic form, he did so not in pious fraud, but simply because his object was not to give a new law, but to expound and develop Mosaic principles in relation to new needs. And as ancient writers are not accustomed to distinguish historical data from historical deductions, he naturally presents his views in dramatic form in the mouth of Moses. If then the Deuteronomic legislation, is not earlier than the prophetic period of the 8th and 7th centuries, and, accordingly, is subsequent to the elements of the Pentateuchal history which we have seen to be known to Hosea, it is plain that the chronology of the composition of the Pentateuch may be said to centre in the question whether the Levitico-Elohistic document, which embraces most of the laws in Leviticus with large parts of Exodus and Numbers, is earlier or later than Deuteronomy. The answer to this question turns almost wholly on archæological inquiries, for there is, perhaps, no *quite* conclusive reference to the Elohistic record in the prophets before the Exile, or Deuteronomy itself. And here arises the great dispute which divides critics, and makes our whole construction of the origin of the historical books uncertain. The Levitical laws give a graduated hierarchy of priests and Levites; Deuteronomy regards all Levites as at least possible priests. Round this difference, and points allied to it, the whole discussion turns. We know, mainly from Ezek. xliv., that before the Exile the strict hierarchical law was not in force, apparently never had been in force. But can we suppose that the very idea of such a hierarchy is the latest point of liturgical development? If so, the Levitical element is the latest thing in the Pentateuch, or, in truth, in the historical series to which the Pentateuch belongs; or, on the opposite view, the hierarch theory existed as a legal programme long before the Exile, though it was fully carried out only after Ezra. As all the more elaborate symbolic observances of the ritual laws are bound up with the hierarchial ordinances, the solution of this problem has issues of the greatest importance for the theology as well as for the literary history of the Old Testament.

And now a single word on the way in which these various elements, mirroring so many sides of the national life, and dating from so various ages, came to be fused into a single history, and yet retained so much of their own identity. The Semitic genius does not at all lie in the direction of organic structure. In architecture, in poetry, in history the Hebrew adds part to part instead of developing a single notion. The temple was an aggregation of small cells, the longest Psalm is an acrostic, and so the longest biblical history is a stratification and not an organism. This process was facilitated by the habit of anonymous writing, and the accompanying lack of all notion of anything like copyright. If a man copied a book it was his to add and modify as he pleased, and he was not in the least bound to distinguish the old from the new. If he had two books before him to which he attached equal worth, he took large extracts from both, and harmonized them by such additions or modifications as he felt to be necessary. But in default of a keen sense for organic unity very little harmony was sought in points of internal structure, though great skill was often shown, as in the book of Genesis, in throwing the whole material into a balanced scheme of external arrangement. On such principles minor narratives were fused together one after the other, and at length in exile a final redactor completed the great work, on the first part of which Ezra based his reformation, while the latter part was thrown into the second canon. The curious combination of the functions of copyist and author which is here presupposed did not wholly disappear till a pretty late date; and where, as in the books of Samuel, we have two recensions of the text, one in the Hebrew and one in the Septuagint translation, the discrepancies are of such a kind that criticism of the text and analysis of its sources are separated by a scarcely perceptible line.

Poetical Books.— The origin of some leading peculiarities of Hebrew poetry has been recently referred by Assyriologists to Accadian models; but however this may be, the key to the whole development of the poetical literature of Israel is found in the same psycho-

logical characteristics of the race which are impressed on the vocabulary and grammatical structure of the language. The Hebrew tongue is sensuous, mobile, passionate, almost incapable of expressing an abstract idea, or depicting a complex whole with repose and symmetry of parts, but fit to set forth with great subtility individual phases of nature or feeling. It is the speech of a nation whose naturally quick perceptions minister to an emotional temperament and an imperious will, which subordinates knowledge to action and desire, and habitually contemplates the universe through the medium of personal feeling or practical purpose. To speak with the philosophers, the Hebrew character is one of predominant subjectivity, eager to reduce everything to a personal standing, swift to seize on all that touches the feelings or bears directly on practical wants, capable of intense effort and stubborn persistence where the motive to action is personal affection or desire, but indisposed to theoretical views, unfit for contemplation of things as they are in themselves apart from relation to the thinker. In the poetry of such a nation the leading current must necessarily be lyrical, for the lyric is the natural vehicle of intense and immediate personal feeling. The earliest Hebrew poems are brief, pregnant expressions of a single idea, full of the fire of passion, full, too, of keen insight into nature, in her power to awake or sustain human emotion; but recording this insight not with the pictorial fulness of western art, but in swift, half-formed outlines, in metaphor piled on metaphor, without regard to any other principle of proportion or verisimilitude than the emotional harmony of each broken figure with the dominant feeling. Such a poetry could not but find its highest scope in the service of spiritual religion. The songs in Exod. xv. and Judg. v. prove the early origin of a theoretical poetry; but the proper period of Hebrew psalmody begins with David, and its history is practically the history of Psalter. Here, as in the case of the historical books, we have to begin by questioning the tradition contained in the titles, which ascribe seventy-three Psalms to David, and besides him name as authors Asaph, the sons of Korah, Solomon, Moses, Heman, Ethan. Again the tendency is to refer as much as possible to familiar names. There is no reason to believe that any title is as old as the Psalm to which it is prefixed, and some titles are certainly wrong; for example, the author of the elegy on Saul and Jonathan could not possibly have written Ps. lxxxvi.; which is a mere cento of reminiscences from other poems. On the other hand the titles are not purely arbitrary. They seem to supply useful hints as to the earlier collections from which our present Psalter was made up. The Korahite and Asaphite Psalms may probably have been derived from collections in the hands of these families of singers; and the so-called "Psalms of David" were very likely from collections which really contained poems by David and other early singers. The assertion that no Psalm is certainly David's is hyper-sceptical, and few remains of ancient literature have an authorship so well attested as the 18th or even as the 7th Psalm. These, along with the indubitably Davidic poems in the book of Samuel, give a sufficiently clear image of a very unique genius, and make the ascription of several other poems to David extremely probable. So, too, a very strong argument claims Psalm ii. for Solomon, and in later times we have sure landmarks in the psalms of Habakkuk (Hab. iii.) and Hezekiah (Isa. xxxviii.) But the greater part of the lyrics of the Old Testament remain anonymous, and we can only group the Psalms in broad masses, distinguished by diversity of historical situation and by varying degrees of freshness and personality. As a rule the older Psalms are the most personal, and are not written for the congregation, but flow from a present necessity of individual (though not individualistic) spiritual life. This current of productive psalmody runs apparently from David down to the Exile, losing in the course of centuries something of its original freshness and fire, but gaining a more chastened pathos and a wider range of spiritual sympathy. Psalm li., obviously composed during the desolation of the temple, marks, perhaps, the last phase of this development. The epoch of the return was still not without poetic freshness, as some of the so-called Songs of Degrees (Pilgrim-songs ?) prove. But on the whole the Psalms of the second temple are only reflections of old ideas, cast mainly in directly liturgical form, or at least embodying the experience of the nation rather than of the individual. The date of the latest Psalms is much disputed. Most lines of evidence suggest that the collection was complete before the latest books of the canon were written, but many expositors find in individual Psalms (44, 74, 79, 83, &c.) clear traces of the Maccabee age.

Through the whole period of Hebrew lyric, represented not only by the Psalter, but by the Lamentations, traditionally ascribed to Jeremiah, and by various scattered pieces in Prophets (*e.g.*, Isa. xii.) and in historical books (*e.g.*, Num. xxi. 17; 1 Sam. ii.), there is little change in form and poetic structure. From first to last the rhythm consists not in a rise and fall of accent or quantity of syllables, but in a pulsation of sense, rising and falling through the parallel, antithetic, or otherwise balanced members of each verse. (So-called *Hebrew Parallelism;* better, *Sense-rhythm.*) Beyond this one law of rhythm, which is itself less an artificial rule than a natural expression of the principle, that all poetic utterance must proceed in harmonious undulation, and not in the spasm of unmodulated passion, the Hebrew poet was subject to no code of art, though strophical arrangements, sometimes marked by a refrain, are not uncommon; while poems of acrostic structure (alphabetic Psalms) are found not exclusively in the most recent literature (Ps. ix., x. form a single undoubtedly old acrostic). The latter are on the whole longer than the earlier poems. But this is due not to increased constructive power, but to the diffuser style, a less vigorous unity of feeling and thought, and a tendency to ring many variations on one key. A wider range of artistic power appears in the Song of Solomon, a lyrical drama, in which, according to most critics, the pure love of the Shulamite for her betrothed is exhibited as victorious over the seductions of Solomon and his harem. As the motive of the piece is political as well as ethical, it is most naturally assigned to the early period of the northern kingdom.

The remaining poetical books of the Old Testament belong to a different category. Unfit for abstract speculation, valuing no wisdom that is not practical, and treasuring up such wisdom in sententious rhythmical form,—enforced by symbol and metaphor, and warm with the breath of human interest,—the Hebrew is a poet even in his philosophy. Side by side with the ode the earliest Hebrew literature shows us the Mashal, or *similitude*, sometimes in the form of biting epigram (Num. xxi. 27, *ff.*) or sarcastic parable (Judg. ix. 8; 2 Kings xiv. 8), sometimes as the natural vehicle of general moral teaching. The greatest name in the early proverbial wisdom of Israel is that of Solomon (1 Kings iv. 32), and beyond doubt many of his aphorisms are to be found in the book of Proverbs. Yet this book is not all Solomonic. The last two chapters are ascribed to other names, and part of the collection was not put in shape till the time of Hezekiah (xxv. 1), who can have no infallible criterion of author-

ship by Solomon, and must not be credited with critical intentions. In truth, the several sections of the book are varied enough in color to make it plain that we have before us the essence of the wisdom of centuries, while the introductory address in chapters i.–ix. shows how a later age learned to develop the gnomic style, so as to fit it for longer compositions. The fundamental type of Hebrew philosophy remains, however, unchanged, even in the book of Ecclesiastes, which bears every mark of a very late date, long after the Exile. On the other hand, a fresh and creative development, alike in point of form and of thought, is found in the book of Job, which; in grandly dramatic construction, and with wonderful discrimination of character in the several speakers, sums up the whole range of Hebrew speculation on the burning question of Old Testament religion, the relation of affliction to the justice and goodness of God and to the personal merit and demerit of the sufferer. Like the other noblest parts of the Old Testament, the book of Job has a comparatively early date. It was known to Jeremiah, and may be plausibly referred to the 7th century B.C.

In the book of Job we find poetical invention of incidents, attached for didactic purposes to a name apparently derived from old tradition. There is no valid *a priori* reason for denying that the Old Testament may contain other examples of the same art. The book of Jonah is generally viewed as a case in point. Esther, too, has been viewed as a fiction by many who are not over sceptical critics; but on this view a book which finds no recognition in the New Testament, and whose canonicity was long suspected by the Christian as well as by the Jewish Church, must sink to the rank of an apocryphal production.

In the poetical as in the historical books anonymous writing is the rule; and along with this we observe great freedom on the part of readers and copyists, who not only made verbal changes (*cf.* Ps. xiv. with Ps. liii.), but composed new poems out of fragments of others (Ps. cviii. with lvii. and lx.) In a large part of the Psalter a later hand has systematically substituted Elohim for Jehovah, and an imperfect acrostic, like Ps. ix., x., cannot have proceeded in its present form from the first author. Still more remarkable is the book of Job, in which the speeches of Elihu quite break the connection, and are almost universally assigned to a later hand.

Prophetical Books.—We have already seen that the earliest prophecies of certain date are of the 8th century, though there is a probability that Joel flourished in the 9th century, in the reign of Joash of Judah, and that the opening verses of Amos are cited from his book. On the other hand, the old school of prophecy, whose members from Samuel to Elisha were men of action rather than of letters, was not likely to leave behind it any written oracles. The prophets generally spoke under the immediate influence of the Spirit or "hand of Jehovah." What they wrote was secondary, and was, no doubt, greatly abridged. The most instructive account of the literary activity of a prophet is given in Jer. xxxvi. Jeremiah did not begin to write till he had been more than twenty years a prophet. Some prophetic books, like that of Amos, seem to have been composed at one time and with unity of plan. Other prophets, like Isaiah, published several books summing up portions of their ministry. In one or two cases, especially in that of Ezekiel, the prophet writes oracles which were apparently never spoken. Before the exile there was circulation of individual prophetic books, and earlier prophets quote from their predecessors. But the task of collecting and editing the remains of the prophet was hardly undertaken till the commencement of the second canon; and by this time, no doubt, many writings had been lost, others were more or less fragmentary, and the tradition of authorship was not always complete. It was, indeed, more important to have an oracle authenticated by the name of its author than to know the writer of a history or a Psalm, and many prophets seem to have prefixed their names to their works. But other prophecies are quite anonymous, and prophets who quote earlier oracles never give the author's name. (A famous case occurs, Isa. xv., xvi., where in xvi. 13, for *since that time* read *long ago.*) Now all the remains of prophecy, whether provided with titles or not, were ultimately arranged in four books, the fourth of which names, in separate titles, twelve authors; while the first three books are named after Isaiah, Jeremiah, Ezekiel, and actually mention no other names in the titles of the several prophecies of which they are made up. But is it safe to assume that every anonymous prophecy in these books must be by the author of the next preceding prophecy which has a title? Certainly any such assumption can only be provisional, and may be overthrown by internal evidence. But internal evidence of date, it is said, cannot apply to prophetic books in which the author looks in a supernatural way into the future. The value of this argument must be tested by looking more closely at the actual contents of the prophetic books. The prophecies contain — 1*st*, reproof of present sin; 2*d*, exhortation to present duty; 3*d*, encouragement to the godly and threatening to the wicked, based on the certainty of God's righteous purpose. In this last connection prophecy is predictive. It lays hold of the ideal elements of the theocratic conception, and depicts the way in which, by God's grace, they shall be actually realized in a Messianic age, and in a nation purified by judgment and mercy. But in all this the prophet starts from present sin, present needs, present historical situations. There is no reason to think that a prophet ever received a revelation which was not spoken directly and pointedly to his own time. If we find, then, that after the prophecy of Zechariah i. viii., which is complete in itself, there begins at ch. ix. a *new* oracle, quite distinct in subject and style, which speaks of an alliance between Judah and Israel as a thing subsisting in the prophet's own time, which knows no oppressor later than Assyria and Egypt, and rebukes forms of idolatry that do not appear after the Exile;— if, in short, the whole prophecy becomes luminous when it is placed a little after the time of Hosea, and remains absolutely dark if it is ascribed to Zechariah, we are surely entitled to let it speak for itself. When the principle is admitted other applications follow, mainly in the book of Isaiah, where the anonymous chapters, xl. lxvi., cannot be understood in a natural and living way except by looking at them from the historical stand-point of the Exile. Then arises a further question, whether all *titles* are certainly authentic and conclusive; and here, too, it is difficult to answer by an absolute affirmative. For example, in Isa. xxx. 6, the title, "The burden of the beasts of the south," interrupts the connection in a most violent way. This is not a solitary instance, but on the whole the titles are far more trustworthy in the prophecies than in the Psalms, and partly on this account, but mainly from the direct historical bearing of prophetic teaching, we can frame a completer history of written prophecy than of any other part of Old Testament literature. We have, on the other hand, a series of prophets — Amos, Hosea, and the anonymous author of Zech. ix.–xi.— who preached in the northern kingdom, but are not descendants of the school of Elisha, which had so decayed under court favor from the dynasty of Jehu, that Amos had to be sent from the wilderness to Judah to take up

again the forgotten word of the Lord. In Judah proper we have the great Assyrian prophets, Isaiah with his younger contemporary Micah, the powerful supporters of the reformation of Hezekiah, laboring one in the capital, the other in the country district of the Philistine border. To the Assyrian period belongs also Nahum, who wrote, perhaps, in captivity, and foretold the fall of Nineveh. Then comes Zephaniah about the time of the Scythian ravages, followed by the prophets of the Chaldean period; first Habakkuk and then Jeremiah and Ezekiel, men of a heavier spirit and less glowing poetic fire than Isaiah, no longer upholding the courage of Judah in the struggle with the empire of the East, but predicting the utter dissolution of existing things, and finding hope only in a new covenant — a new theocracy. In the period of Exile more than one anonymous prophet raised his voice; for not only the "Great Unnamed" of Isa. xl.–lxvi., but the authors of other Babylonian prophecies, are probably to be assigned to this time. In the new hope of deliverance the poetic genius, as well as the spiritual insight of prophecy, awakes to fresh life, and sets forth the mission of the new Israel to carry the knowledge of the Lord to all nations. But the spirit of the new Jerusalem had little in common with these aspirations, and in Haggai, Zechariah, and Malachi, prophecy retains not much of its old power except an uncompromising moral earnestness. The noble poetry of the old prophets, which even in the time of Ezekiel had begun to give way to plain prose, finds no counterpart in these latest oracles; and imaginative power is shown, where it still exists, in the artificial structure of symbolic visions. No important new ideas are set forth, and even the tone of moral exhortation sometimes reminds us more of the rabbinical maxims of the fathers in the Mishna, than of the prophetic teaching of the 8th century. And as if the spirit of prophecy foresaw its own dissolution, Malachi looks not to the continued succession of prophets; but to the return of Elijah as the necessary preparation for the day of the Lord. In this sketch of the prophetic writings we find no place for the book of Daniel, which, whether composed in the early years of the Persian empire, or, as modern critics hold, at the time of the Maccabee wars, presents so many points of diversity from ordinary prophecy as to require entirely separate treatment. It is in point of form the precursor of the apocalyptic books of post-canonical Judaism, though in its intrinsic qualities far superior to these, and akin to the prophets proper.

Further History of the Old Testament Canon in the Jewish Church. — Under this head we confine ourselves to points which lead up to the reception of the Old Testament by Christendom. These are mainly two: —(1), the history of the Hebrew text, which we now possess only in the recension established by Jewish scribes at a time later than the Christian era; (2), the history of those versions which arose among the Jews, but have influenced Christendom.

The Text of the Old Testament. — Semitic alphabets have no full provision for distinguishing vowels, and the oldest writing, before orthography became fixed, was negligent in the use even of such vowel-letters as exist. For a long time, then, not only during the use of the old Phœnician character, but even after the more modern square or Babylonian letters were adopted, the written text of the Bible was *consonantal only*, leaving a certain scope for variety of pronunciation and sense. But even the consonantal text was not absolutely fixed. The loose state of the laws of spelling and the great similiarity of several letters made errors of copying frequent. The text of Micah, for example, is often unintelligible, and many hopeless errors are older than the oldest versions. But up to the time of the Alexandrian version, MSS. were in circulation which differed not merely by greater or less accuracy of transcription, but by presenting such differences of recension as could not arise by accident. The Greek text of Jeremiah is vastly different from that of the Hebrew Bible, and it is not certain that the latter is always best. In the books of Samuel the Greek enables us to correct many blunders of the Hebrew text, but shows at the same time that copyists used great freedom with details of the the text. For the Pentateuch we have, in the copies of the Samaritans, a third recension, often but not always closely allied to the Greek. The three recensions show important variations in the chronology of Genesis; and it is remarkable that the *Book of Jubilees*, a Jewish treatise which cannot be much older than the Christian era, perhaps not much older than the destruction of the Jewish state sometimes agrees with the Samaritan or with the Alexandrian recension. Up to this time, then, there was no absolutely received text. But soon after the Christian era all this was changed, and by a process which we cannot follow in detail, a single recension became supreme. The change was, no doubt, connected with the rise of an overdrawn and fantastic system of interpretation, which found lessons in the smallest peculiarity of the text; but Lagrade has made it probable that no critical process was used to fix the standard recension, and that all existing MSS. are derived from a single archetype, which was followed even in its marks of deletion and other accidental peculiarities. (Lagarde, *Anmerkn. zur griech. Uebersetzung der Prov.*, 1863, p. 1; *cf.* Nöldeke in Hilgenfeld's *Zeitschr.*, 1873, p. 445.) Then the received text became the object of farther care, and the Massorets, or "possessors of tradition" with regard to the text, handed down a body of careful directions as to the true orthography and pronunciation. The latter was fixed by the gradual invention of subsidiary marks for the vowels, &c., an invention developed in slightly divergent forms in the Babylonian and Palestinian schools of Jewish scholarship. The vowel points were not known to Jerome, but the system was complete before the 9th century, presumably several hundred years before that time. All printed Bibles follow the Western punctuation, but old Karite MSS. with the Babylonian vowels exist, and are now in course of publication. It is from the Massoretic text, with Massoretic punctuation, that the English version and most Protestant translations are derived. Older Christian versions, so far as they are based on the Hebrew at all (Jerome's Latin, Syriac), at least follow pretty closely the received consonantal text.

Jewish Versions. — Versions of the Old Testament became necessary partly because the Jews of the Western Dispersion adopted the Greek language, partly because even in Palestine the Old Hebrew was gradually supplanted by Aramaic. The chief seat of the Hellenistic Jews was in Egypt, and here arose the Alexandrian version, commonly known as the Septuagint or Version, of the LXX., from a fable that it was composed, with miraculous circumstances, by seventy-two Palestinian scholars summoned to Egypt by Ptolemy Philadelphus. In reality there can be no doubt that the version was gradually completed by several authors and at different times. The whole is probably older than the middle of the 2d century B.C. We have already seen that the text that lay before the translators was in many parts not that of the present Hebrew. The execution is by no means uniform; and, though there are many good renderings, the defects are so numerous that the Greek-speaking Jews, as well as the large section of the Christian church which long depended directly or indirectly

on this version, were in many places quite shut out from a right understanding of the Old Testament. Nevertheless, the authority of the version was very great, its inspiration was often asserted, and its interpretations exercised a great influence on Jewish and Christian thought, though among the Jews it was to a certain extent displaced by the version of the proselyte Aquila (2d century of our era), which followed with slavish exactness the letter of the Hebrew text.

Among the Jews who spoke Aramaic, translations into the vernacular accompanied, instead of supplanting the use of the original text, which was read and then orally paraphrased in the synagogues by interpreters or Methurgemanim, who used great freedom of embellishment and application. This practice naturally led to the formation of written Targums, or Aramaic translations, which have not, however, reached us in at all their earliest form. It used, indeed, to be supposed that the simple and literal Targum of Onkelos on the Pentateuch was earlier than the time of Christ. But recent inquirers have been led to see in it, and in the linguistically cognate Targum on the Prophets (Targum of Jonathan), products of the Babylonian schools, in which the freedom of the early paraphrastic method was carefully avoided. Upon this view the date of these Targums is some centuries after the Christian era. On the other hand, an older style of paraphrase is preserved in the Palestinian Targums, which nevertheless contain in their present form elements later than the Babylonian versions. The Targum of Pseudo-Jonathan on the Pentateuch is apparently the latest form of the free Palestinian version, full of legendary adornments and other additions to the text. Other fragments of Palestinian translation, known as the Jerusalem Targum, and referring the individual passages of the Pentateuch and Prophets, probably represent an earlier stage in the growth of the Aramaic versions. There are also Targums on the Hagiographa, which, however, have less importance, and do not seem to have had so changeful a history. The Targums as a whole do not offer much to the textual critic. They are important, partly from the insight they give into an early and in part pre-Christian exegesis, partly from their influence on later Jewish expositors, and through them on Christian versions and expositions. In some cases the literal or Babylonian Targums have a text differing from the Massoretic. But it is not unlikely that if we had a satisfactory text of the Targums (towards which almost nothing has hitherto been done), these variations would find their explanation in the Eastern text and the Assyrian punctuation.

New Testament.—*Relation of the Earliest Christianity to the Literary and Intellectual Activity of the Age.*—In the literature of Palestine at the time of Christ we distinguish a learned and popular element. The learned class or scribes were busy on their twofold structure of Halacha, or legal tradition and inference, supplementing and "hedging in" the Pentateuchal law, and Haggada, or fantastic exegesis, legendary, ethical, or theosophic, under which the religious directness of the Old Testament almost wholly disappeared. The popular religious literature of the day seems again to have been mainly apocalyptic. (See Apocalyptic Literature.) The people never wearied of these mysterious revelations couched in strange symbolic and enigmatic forms, and placed in the mouths of ancient patriarchs and worthies, which held forth golden visions of deliverance and vengeance in a shape which, because crasser and earthlier, was also more palpable than the spiritual hopes of the old prophets. Beyond the limits of Palestine thought took a wider range. In adopting the Greek language the Hellenistic Jews had also become open to the influences of foreign speculation, and the schools of Alexandria, whose greatest teacher, Philo, was contemporary with the foundation of Christianity, had in great measure exchanged the faith of the Old Testament for a complicated system of metaphysico-theological speculations upon the Absolute Being, the Divine Wisdom, the Logos, and the like, which by the aid of allegorical interpretation were made to appear as the true teaching of Hebrew antiquity. To these currents of thought the relation of the earliest Christianity, entirely absorbed in the one great fact of the manifestation of God in Christ crucified, risen, and soon to return in glory, was for the most part hostile, when it was not merely superficial. With the spirit of the scribes Jesus had openly joined issue. In the legal tradition of the elders He saw the commandment of God annulled (Matt. xv.) It was His part not to destroy but to fill up into spiritual completeness the teaching of the old dispensation (Matt. v.); and herein He attached himself directly to the prophetic conception of the law in Deuteronomy (Matt. xxii. 37, *ff.*) And not only in His ethical teaching but in His personal sense of fellowship with the Father, and in the inner consciousness of His Messianic mission, Jesus stood directly on the Old Testament, reading in the Psalms and Prophets, which so vainly exercised the unsympathetic exegesis of the scribes, the direct and unmistakable image of His own experience and work as the founder of the spiritual kingdom of God (*cf.* especially, Luke xxiv. 25, *ff.*) Thus Jesus found His first desciples among men who were strangers to the theological culture of the day (Acts iv. 13), cherishing no literature but the Old Testament witness to Christ, and claiming no wisdom save the knowledge of Him. At first, indeed, the church at Jerusalem was content to express its new life in simple exercises of faith and hope, without any attempt to define its relation to the past dispensation, and without breaking with the legal ordinances of the temple. But the spread of Christianity to the Gentiles compelled the principles of the new religion to measure themselves openly with the Judaism of the Pharisees. In the heathen mission of Paul the ceremonial law was ignored, and men became Christians without first becoming proselytes. The stricter Pharisaically-trained believers were horror-stricken. The old apostles, though they could not refuse the right hand of fellowship to workers so manifestly blessed of God as Paul and Barnabas, were indisposed to throw themselves into the new current, and displayed considerable vacillation in their personal conduct. Paul and his associates had to fight their own battles against the constant efforts of Judaizing emissaries, and the rabbinical training acquired at the feet of Gamaliel enabled the apostle of the heathen to meet the Judaizers on their own ground, and to work out the contrast of Christianity and Pharisaism with a thoroughness only possible to one who knew Pharisaism from long experience, and had learned the gospel not from the tradition or teaching of men, but by revelation of Jesus Christ (Gal. i. 12).

The relation of the first Christians to the current apocalyptic was of a different kind. The Messianic hopes already current among the first hearers of the gospel were unquestionably of apocalyptic color. And though the contents of Christian hope were new, and expressed themselves in a revival of prophetic gifts (1 Cor. xii. 10; Acts xi. 27, &c.), it was not a matter of course that apocalyptic forms should be at once dropped, especially as Old Testament prophecy itself had inclined in its later stages towards an increasing concreteness in delineating the Messianic kingdom, and so had at least formed the basis for many apocalyptic conceptions. The apocalyptic books continued to be read, as appears from the in-

fluence of the book of Enoch on the epistle of Jude; and after the new spirit of prophecy had died away a Christian apocalyptic followed the Jewish models. But the way in which a genuine Christian prophecy, full of "the testimony of Jesus" (Rev. xix. 10), retained not a little of the apocalyptic manner (mainly, it is true, in dependence on the book of Daniel), appears clearly in the Revelation of John, which, whether we accept the prevalent tradition of its apostolic authorship, or, with some ancients and many moderns, ascribe it to a different John, is at least an undisputed monument of the prophecy of the apostolic age (according to modern critics, *earlier* than the fall of Jerusalem).

The influence on Christianity of Hellenistic philosophy, and, in general, of that floating spirit of speculation which circulated at the time in the meeting-places of Eastern and Western thought, was for the most part later than the New Testament period. Yet the Alexandrian education of a man like Apollos could not fail to give some color to his preaching, and in the epistle to the Hebrews, whose author, a man closely akin to Paul, is not a direct disciple of Jesus (Heb. ii. 3), the theological reflection natural to the second generation, which no longer stood so immediately under the overpowering influence of the manifestation of Christ, is plainly affected in some points by Alexandrian views. In the case of other books the assertion of foreign speculative influences is generally bound up with the denial of the authenticity of the book in question. That the gospel of John presents a view of the person of Christ dependent on Philonic speculation is not exegetically obvious, but is simply one side of the assertion that this gospel is an unhistorical product of abstract reflection. In the same way other attacks on the genuineness of New Testament writings are backed up by the supposed detection of Orphic elements in the epistle of James, and so forth.

Motives and Origin of the first Christian Literature.—We have seen that the earliest currents of Christian life and thought stood in a very secondary relation to the intellectual activity of the period. The only books from which the Apostolic Church drew largely and freely were those of the Old Testament, and the Christian task of proclaiming the gospel was not in the first instance a literary task at all. The first writings of Christianity, therefore, were of an occasional kind. The care of so many churches compelled Paul to supplement his personal efforts by epistles, in which the discussion of incidental questions and the energetic defence of his gospel against the Judaizers is interwoven with broad applications of the fundamental principles of the gospel to the whole theory and practice of Christian life. In these epistles, and generally in the teaching of Paul and his associates, Christian thought first shaped for itself a suitable literary vehicle. It was in Greek that the mission to the Gentiles was carried on, for that language was everywhere understood. Already in the mouths of Hellenistic Jews and in the translation of the Old Testament the *κοινή*, or current Greek of the Macedonian period, had been tinctured with Semetic elements, and adapted to express the ideas of the old dispensation. Now a new modification was necessary, and soon in the circle of the Pauline churches specifically Christian ideas became inseparably bound up with words which to the heathen had a very different sense. Whether the epistolary way of teaching was used upon occasion by the older apostles before the labors of Paul is not clear; for most scholars have declined to accept the ingenious view which sees in the epistle of James the earliest writing of the New Testament. The other epistles are certainly later, and the way in which several of them are addressed, not to a special community in reference to a special need, but to a wide circle of readers, seems to presuppose a formed custom of teaching by letter which extended from Paul not only to so like-minded a writer as the author of Hebrews (Apollos or Barnabas?) but to the old apostles and their associates.

Besides epistles we have in the New Testament a solitary book of Christian prophecy and a fourfold account of the gospel history, with a continuation of the third gospel in the Acts of the Apostles. The origin and mutual relations of the gospels form at the present moment the field of numerous controversies which can only be dealt with in separate articles. We must here confine ourselves to one or two points of general bearing.

Jewish disciples were accustomed to retain the oral teaching of their masters with extraordinary tenacity and verbal exactness of memory (Mishna, *Aboth* iii. 8; *Edaioth*, i. 3), and so the words of Jesus might for some time be handed down by merely oral tradition. But did the gospel continue to be taught orally alone up to the time when the extant gospels were written? or must we assume the existence of earlier evangelical writings forming a link between oral tradition and the narratives we now possess? The earliest external evidence on this point is given in the prologue to Luke's gospel, which speaks of many previous essays towards a regularly digested evangelical history on the basis of the tradition (whether exclusively oral or partly written is not expressed) of eye-witnesses who had followed the whole course of Christ's ministry. It seems to be implied that if the eye-witnesses wrote at all, they, at least so far as was known to Luke, did not compose a regular narrative but simply threw together a mass of reminiscences. This understanding of the words of the evangelist agrees very well with the uniform tradition of the old church as to the second gospel, viz., that it was composed by Mark from material furnished by Peter. This tradition goes back to Papias of Hierapolis, about 150 A.D., but it is a fair question whether the second gospel as we have it is not an enlarged edition of Mark's original work. On the other hand ecclesiastical tradition recognizes the apostle Matthew as the author of the first gospel, but does so in a way that really bears out the statements of Luke. For the tradition that Matthew wrote the first gospel is always combined with the statement that he wrote in Hebrew (Aramaic). But from the time of Erasmus the best Greek scholars have been convinced that the gospel is not a translation. Either, then, the whole tradition of a directly apostolic Aramaic gospel is a mistake, caused by the existence among the Judaizing Christians in Palestine of an apocryphal "Gospel according to the Hebrews," which was by them ascribed to Matthew, but was, in fact, a corrupt edition of our Greek gospel; or, on the other hand, what Matthew really wrote in Aramaic was different from the book that now bears his name, and only formed an important part of the material from which it draws. The latter solution is naturally suggested by the oldest form of the tradition; for what Papias says of Matthew is that he wrote *τὰ λόγια, the oracles*,—an expression which, though much disputed, seems to be most fairly understood not of a complete gospel but of a collection of the words of Christ. And if so, all the earliest external evidence points to the conclusion that the synoptical gospels are non-apostolic digests of spoken and written apostolic tradition, and that the arrangement of the earlier material in orderly form took place only gradually and by many essays. With this the internal evidence agrees. The three first gospels are often in such remarkable accord even in minute and accidental points of expression, that it is certain either

that they copied one another or that all have some sources in common. The first explanation is inadequate, both from the nature of the discrepancies that accompany the agreement of the three narratives, and from the impossibility of assigning absolute priority to any one gospel. For example, even if we suppose that the gospel of Mark was used by the other two authors, or conversely that Mark was made up mainly from Matthew and Luke, it is still necessary to postulate one or more earlier sources to explain residuary phenomena. And the longer the problem is studied the more general is the conviction of critics, that these sources cannot possibly have been merely oral.

It appears from what we have already seen, that a considerable portion of the New Testament is made up of writings not directly apostolical, and a main problem of criticism is to determine the relation of these writings, especially of the gospels, to apostolic teaching and tradition. But behind all such questions as the relative priority of Matthew or of Mark, the weight to be assigned to the testimony of Papias, and so forth, lies a series of questions much more radical in character by which the whole theological world is at present agitated. Can we say of all the New Testament books that they are either directly apostolic, or at least stand in immediate dependence on genuine apostolic teaching which they honestly represent? or must we hold, with an influential school of modern critics, that a large proportion of the books are direct forgeries, written in the interest of theological tendencies, to which they sacrifice without hesitation the genuine history and teaching of Christ and his apostles? There are, of course, positions intermediate to these two views, and the doctrine of tendencies is not held by many critics even of the Tübingen school in its extreme form. Yet, as a matter of fact, every book in the New Testament, with the exception of the four great epistles of St. Paul, is at present more or less the subject of controversy, and interpolations are asserted even in these. The details of such a controversy can only be handled in separate articles, but a few general remarks may be useful here.

The arguments directed by modern critics against the genuineness or credibility of New Testament books do not for the most part rely much on external evidence. Except in one or two cases (particularly that of 2d Peter) the external evidence in favor of the books is as strong as one can fairly expect, even where not altogether decisive. We shall see when we come to speak of the canon that, towards the close of the 2d century, the four gospels, the Acts, thirteen epistles of Paul, the first epistles of Peter and John, and the book of Revelation, were received in the most widely separated churches with remarkable unanimity. Before this time the chain of evidence is less complete. All our knowledge of the period that lies between the apostles and the great teachers of the Old Catholic Church towards the close of the 2d century is fragmentary. We possess but scanty remains of the literature, and the same criticism which seeks to bring down many New Testament books into this period questions the genuineness of many of the writings which claim to date from the first half of the 2d century, and so are appealed to by conservative writers. But on the whole, what evidence does exist is of a kind to push back all the more important writings to an early date. The gospel of John, for example, is one of the books which negative critics are most determined in rejecting. Yet the fairest writers of the school (Hilgenfeld, Keim) admit that it was known to Justin Martyr in the middle of the 2d century, though they think that besides our four gospels he had a fifth of apocryphal character. But references of an earlier date can hardly be denied; and the gospel may be traced almost to the beginning of the century by the aid of fragments of the Gnostic Basilides and of the epistles of Ignatius. The Tübingen school, indeed, maintain that the fragments preserved by Hippolytus are not from Basilides, but from a later writer of his school, and utterly reject the Ignatian epistles. But it cannot be said that they have proved their case beyond dispute. They have at most shown that, if the gospel *must on other grounds* be taken as spurious, the external evidence may be pushed aside as not absolutely insuperable. On the other hand they try to bring positive proof that certain books were unknown in circles where, if genuine, they must have circulated. But such a negative is in its very nature difficult to prove. Probably the strongest argument of the kind is that brought to show that Papias did not know the gospel of John. But we know Papias only through Eusebius; and though the latter is careful to mention all references to disputed books, it does not appear that it was part of his design to cite testimony to a book so universally allowed as John's gospel. And Papias does give testimony to the first epistle of John, which is hardly separable from the gospel. On the whole, then, we repeat that, on the most cardinal points, the external evidence for the New Testament books is as strong as can fairly be looked for, though not of course, strong enough to convince a man who is sure *a priori* that this or that book is unhistorical and must be of late date.

The strength of the negative critics lies in internal evidence. And in this connection they have certainly directed attention to real difficulties, many of which still await their explanation. Some of these difficulties are not properly connected with the Tübingen position. The genuineness of 2d Peter, which, indeed, is very weakly attested by external evidence, was suspicious even to Erasmus and Calvin, and no one will assert that the Pauline authorship of 1st Timothy is as palpable as that of the epistle to the Romans. So, again, it is undeniable that the epistle to the Colossians and the so-called epistle to the Ephesians differ considerably in language and thought from other Pauline epistles, and that their relation to one another demands explanation. But in the Tübingen school all minor difficulties, each of which might be solved in detail without any very radical procedure, are brought together as phases of a single extremely radical theory of the growth of the New Testament. The theory has two bases, one philosophical or dogmatical, the other historical; and it cannot be pretended that the latter basis is adequate if the former is struck away. Philosophically the Tübingen school starts from the position so clearly laid down by Strauss, that a miraculous interruption of the laws of nature stamps the narrative in which it occurs as unhistorical, or, at least, as more cautious writers put the case, hampers the narrative with such extreme improbability that the positive evidence in favor of its truth would require to be much stronger than it is in the case of the New Testament history. The application of this proposition makes a great part of the narrative of the Gospels and Acts appear as unhistorical, and therefore late; and the origin of this late literature is sought by regarding the New Testament as the monument of a long struggle, in the course of which an original sharp antagonism between the gospel of Paul and the Judaizing gospel of the old apostles was gradually softened down and harmonized. The analysis of the New Testament is the resurrection of early parties in the church, each pursuing its own tendency by the aid of literary fiction. In the genuine epistles of Paul on the one hand, and in the Revelation and in some parts of Matthew on the other, the original hostility of ethnic and Jewish Christianity is sharply defined; while after a

series of intermediate stages the Johannine writings present the final transition in the 2d century from the contests of primitive Christianity to the uniformity of the Old Catholic Church. This general position has been developed in a variety of forms, more or less drastic, and is supported by a vast mass of speculation and research; but the turning points of the controversy may, perhaps, be narrowed to four questions — (1.) Whether in view of Paul's undoubted conviction that miraculous powers were exercised by himself and other Christians (1 Cor. xii. 9, *f.*; 2 Cor. xii. 12) the miracle criterion of a secondary narrative can be maintained? (2.) Whether the book of Acts is radically inconsistent with Paul's own account of his relations to the church at Jerusalem, and whether the antithesis of Peter and Paul is proved from the epistles of the latter, or postulated in accordance with the Hegelian law of advance by antagonism? (3.) Whether the gospel of John is necessarily a late fiction, or does not rather supply in its ideal delineation of Jesus a necessary supplement to the synoptical gospels which can only be understood as resting on true apostolic reminiscence? (4.) Whether the external evidence for the several books and the known facts of church history leave time for the successive evolution of all the stages of early Christianity which the theory postulates?

The Christian Canon of the Old and New Testaments.— We have already seen that the Apostolic Church continued to use as sacred the Hebrew Scriptures, whose authority derived fresh confirmation from the fulfilment of the prophecies in Christ. The idea that the Old Testament revelation must now fall back into a secondary position as compared with inspired apostolic teaching was not for a moment entertained. Still less could the notion of a body of New Testament Scriptures, of a collection of Christian writings, to be read like the Old Testament in public worship and appealed to as authoritative in matters of faith, take shape so long as the church was conscious that she had in her midst a living voice of inspiration. The first apostolic writings were, as we have seen, occasional, and it was not even matter of course that every epistle of an apostle should be carefully preserved, much less that it should be prized above his oral teaching. Paul certainly wrote more than two epistles to the Corinthians, and even Papias is still of opinion, when he collects reminiscences of apostolic sayings from the mouths of the elders, that what he reads in books cannot do him so much good as what he receives "from a living and abiding voice." Nay, the very writers who are the first to put Old and New Testament books on a precisely similar footing (*e.g.*, Tertullian) attach equal importance to the tradition of churches which had been directly taught by apostles, and so were presumed to possess the "rule of faith" in a form free from the difficulties of exposition that encumber the written word. In the first instance, then, the authoritative books of the Christian church were those of the Old Testament; and in the time of the apostles and their immediate successors it was the Hebrew canon that was received. But as most churches had no knowledge of the Old Testament except through the Greek translation and the Alexandrian canon, the Apocrypha soon began to be quoted as Scripture. The feeling of uncertainty as to the proper number of Old Testament books which prevailed in the 2d century is illustrated by an epistle of Melito of Sardis, who journeyed to Palestine in quest of light, and brought back the present Hebrew canon, with the omission of the book of Esther. In the 3d century Origen knew the Hebrew canon, but accepted the Alexandrian additions, apparently because he considered that a special providence had watched over both forms of the collection. Subsequent teachers in the Eastern Church gradually went back to the Hebrew canon (Esther being still excluded from full canonicity by Athanasius and Gregory of Nazianzus distinguishing Alexandian additions as *ἀναγιγνωσκόμενα* —books used for ecclesiastical lessons. In the Western Church the same distinction was made by scholars like Jerome, who introduced for merely ecclesiastical books the somewhat incorrect name of Apocrypha; but a laxer view was very prevalent and gained ground during the Middle Ages, till at length, in opposition to the Protestants, the Council of Trent accepted every book in the Vulgate translation as canonical.

We turn now to the New Testament collection. The idea of canonicity — the right of a book to be cited as Scripture — was closely connected with regular use in public worship, and so the first step towards a New Testament canon was doubtless the establishment of a custom of reading in the churches individual epistles or gospels. The first beginnings of this custom must have been very early. The reference to Luke in 1 Tim. v. 18 is disputed, and 2 Pet. iii. 16 is usually taken as one of the many arguments against the genuineness of that epistle; but a citation from Matthew is certainly referrred to as Scripture in the epistle of Barnabas. But such recognition of an individual gospel is a long way removed from the recognition of an apostolic canon. The apostolic writings continued to be very partially diffused, and readers used such books as they had access to, often failing to distinguish between books of genuine value and worthless forgeries. For most readers were very uncritical, and there was an enormous floating mass of spurious and apocalyptic literature, including recensions of the gospel altered by heretical parties to suit their own views. It was perhaps in contest with the heretics of the 2d century that the necessity of forming a strict list of really authoritative writings came to be clearly felt; and it is remarkable that heretics, generally hostile to the Old Testament, seem to have been among the first to form collections of Christian writings for themselves. Thus Marcion, in the middle of the 2d century, selected for himself on dogmatical grounds ten Pauline epistles, and a gospel which seems to have been based on Luke. Up to this time perhaps no formal canon of sacred writings had been put forth by the Catholic Church. But in the second half of the century the notion of an authoritative New Testament collection appears in full development, and there is an amount of agreement as to the contents of the canon, which implies that, in spite of the loose way in which apocryphal books circulated side by side with genuine works, the church had no great difficulty in drawing a sharp line between the two classes when this was felt to be necessary. At the time of the great teachers of the 2d century (Irenæus, Tertullian, Clement) we had a twofold collection, *the Gospel* and *the Apostles*. The Gospel comprises the four evangelists; and this number was already so absolutely fixed as to admit of no further doubt.

Quite beyond dispute were also the main books of the *Apostolicon*, the Acts, thirteen epistles of Paul, 1st Peter, 1st John, and the Apocalypse. The Muratorian fragment which contains a list twenty or thirty years older than the 3d century omits 1st Peter, but adds Jude, 2d and 3d John (?), and (as a disputed book) the Apocalypse of Peter. The Shepherd of Hermas might also be read, but it is pointed out that it is of quite recent date and not of prophetic or apostolic authority. From this time forward, then, the controversy is narrowed to a few books, occupying a middle position between the large mass of our present New Testament, which was already beyond dispute, and the spurious literature which was quite excluded from ecclesiastical use.

Absolute uniformity was not at once attainable, for various churches had quite independent usages; and, as we have seen from the Muratorian canon, a book might receive a certain ecclesiastical recognition, without being, therefore, viewed as strictly canonical. This dubious margin to a canon was of very uncertain limits, and Clement of Alexandria still uses many apocryphal books which found no acknowledgment in other parts of the church. Gradually the list of books which have even a disputed claim to authority is cut down. In the time of Eusebius the Shepherd of Hermas was still read in some churches, and several other books — the Epistle of Barnabas, the Acts of Paul, the Revelation of Peter, the Teachings of the Apostles — appear as controverted writings. But all these are plainly on the verge of rejection, while, on the other hand, 2d and 3d John, James, and 2d Peter are gradually gaining ground. This process continued to go on without interruption till at length the whole class of disputed books (*antilegomena*) melted away, and only our present canon was left on the one hand, and books of no authority or repute upon the other. Thus the Council of Laodicea was able wholly to forbid the ecclesiastical use of uncanonical books (360 A. D.) and the only uncertain point remaining in the tradition of the Eastern Church was the position of the Apocalypse, which had gradually fallen into suspicion, and was not fully reinstated till the 5th century. The Western Church, on the other hand, was long dubious as to the epistle to the Hebrews, which was received without hesitation in the East, as the Apocalypse continued to be in the West. The age of Augustine and Jerome saw the close of the Western canon.

BIBLE SOCIETIES, associations for extending the circulation of the Holy Scriptures. For a long period this object has been pursued to a considerable extent by several religious institutions, such as the Society for the Propagation of the Gospel in Wales, formed by the Rev. Thomas Gouge, one of the two thousand ministers ejected by the Act of Uniformity in 1662; the Society for Promoting Christian Knowledge, founded in 1698; the Society for sending Missionaries to India, established in the year 1705 by Frederick IV., King of Denmark, and which numbered among its agents the celebrated missionary, Christian Frederick Schwartz; the Society for Promoting Christian Knowledge in the Highlands and Islands of Scotland, formed in Edinburgh in 1709; the Moravian Missionary Society, founded in 1732; the Book Society for Promoting Religious Knowledge among the Poor, which was formed in London in 1750, and numbered among its earliest friends Dr. Doddridge and the Rev. James Hervey; and the Religious Tract Society, founded in 1779. But the first British association which had in view the single purpose of disseminating the Scriptures was the NAVAL AND MILITARY BIBLE SOCIETY, established in the year 1780, which has done immense service to the army and navy of Great Britain. The sphere of its operations, however, was comparatively limited, and in 1804 the BRITISH AND FOREIGN BIBLE SOCIETY, the greatest agency ever devised for the diffusion of the Word of God, was founded. The proposal to institute this association originated with the Rev. Mr. Charles of Bala, whose philanthropic labors in Wales were greatly impeded by the scarcity of the Scriptures in the principality, and it was largely fostered at the outset by members of the committee of the Religious Tract Society. The exclusive object of the British and Foreign Bible Society is to promote the circulation of the Scriptures, both at home and abroad, and its constitution admits the co-operation of all persons disposed to concur in its support. The committee of management consists of 36 laymen, 6 of them being foreigners resident in or near the metropolis, and of the remaining 30, one-half are members of the Church of England, and the other half members of other Christian denominations.

The proceedings of this society gave rise to several controversies, one of which related to the fundamental law of the society to circulate the Bible alone without notes or comments. On this ground it was vehemently attacked by Bishop Marsh and other divines of the Church of England, who insisted that the prayer-book ought to be given along with the Bible. Another controversy in which the late Dr. Andrew Thomson of Edinburgh took a prominent part, related to the circulation on the continent, chiefly by affiliated societies, of the Apocrypha along with the canonical books of Scripture. In 1826 it was resolved by the committee that the fundamental law of the society be fully and distinctly recognized as excluding the circulation of the Apocrypha. This step, however, failed to satisfy all the supporters of the society in Scotland, who proceeded to form themselves into independent associations. A third serious controversy, by which the society has been agitated, was occasioned by the alleged inaccuracy of some of the translations issued under its authority; and a fourth referred to the admissibility of non-Trinitarians to the privilege of co-operation. The refusal of the society in 1831 to alter its constitution so as formally to exclude such persons, led to the formation of the Trinitarian Bible Society. This has, however, been exceedingly limited in its operations, and the original society stands unrivalled.

The EDINBURGH BIBLE SOCIETY originated in the controversy respecting the circulation of the Apocrypha, and was composed of Protestants professing their belief in the doctrine of the Holy Trinity, and disposed to co-operate in promoting the dissemination of the Scriptures.

The SCOTTISH BIBLE SOCIETY was instituted upwards of forty years ago. At the time of its establishment, the other Bible societies in Scotland employed their funds chiefly in circulating the Scriptures in foreign countries. This association was intended exclusively for the distribution of the Bible at home, and its funds were at first derived from collections made in the parish churches within the Synod of Lothian and Tweeddale.

The Scotch Bible societies were amalgamated in 1861, and took the name of NATIONAL BIBLE SOCIETY OF SCOTLAND. During the year 1874 the society issued 340,908 Bibles, Testaments and "Portions," its receipts, including the proceeds of sales, amounting to £26,840.

The first Bible society in America is believed to have been established by a few Baptists in New York in 1804; its object was to purchase and lend Bibles for a month at a time. The PHILADELPHIA BIBLE SOCIETY, which was instituted December 12, 1808, was for some years the only association in the country for the gratuitous distributiou of the sacred Scriptures. The AMERICAN BIBLE SOCIETY was formed at New York, May 8, 1817. It has numerous auxiliaries throughout the several states of the Union. In 1875 its income amounted to $577,569. Its issues during that year were 926,900 Bibles and Testaments, and since its formation 31,893,332.

Among other societies may be mentioned the BIBLE TRANSLATION SOCIETY, whose versions embody the views of the Baptists, and the PORTEUSIAN BIBLE SOCIETY (named from Bishop Porteus), for the circulation of Bibles marked so as to show the practical bearing of each chapter.

It is believed that there are altogether about 70 Bible societies in the world.

The monopoly of the right to print the Bible in Eng-

land is still possessed by the Universities of Oxford and Cambridge, and her Majesty's printer for England. But after a controversy which was carried on for some time with great warmth (1840–41), the prices of the common Bibles and Testaments were greatly reduced, and they have gradually attained their present remarkable cheapness.

In Scotland, on the expiry of the monopoly in 1839, Parliament refused to renew the patent, and appointed a Bible Board for Scotland, with power to grant licences to print the Authorized Version of the Scriptures. This step produced a great reduction in the price of the sacred volume, and its circulation was considerably increased.

BIBLIOGRAPHY. The term Bibliography has passed through different meanings. When the name *bibliographie* was adopted by the French, it was used, as late as the middle of the last century, to signify skill in deciphering and judging of ancient manuscripts. Its special application to printed books may be said to date from the *Bibliographie Instructive* of De Bure in 1763; not that he appears to have coined the new meaning of the term, but his work first popularized the study which the growth of libraries and the commerce in literature had created.

Bibliography, thus understood, may be defined as the science of books, having regard to their description and proper classification. Viewing books simply as vehicles of learning, it would undoubtedly be correct to extend our inquiry to the period when the only books, so called, were manuscripts. And such is, in fact, the view adopted by bibliographers like Peignot, Namur, and Hartwell Horne. But a survey so extensive is open to practical objections. In the first place, bibliography as a science was unknown until long after printing had laid its first foundations, and indeed made it a necessity, with requirements increasing with the multiplied productions of the press. The materials for comparative study were wanting in an age when books were regarded as isolated treasures, to be bought at prices corresponding with their scarcity. In the second place, the critical study and comparison of ancient manuscripts, their distribution into families deduced from one or more archetypes, and the investigation of ancient systems of writing, embrace a subject so wide in its scope and special in its character, that convenience of treatment, confirmed as it is by the facts of history, would alone suggest the propriety of distinguishing between manuscripts and printed bibliography. This distinction it is here proposed to observe, the subject of MSS. being reserved for the article PALÆOGRAPHY, the name which in its maturity it received.

Amid much variety of treatment in detail, two main divisions underlie the general study of bibliography, viz., *material* and *literary*, according as books are regarded with reference to their form or their substance. The former belongs chiefly to the bookseller and book-collector; the latter to the literary man and the scholar. Material bibliography treats of what Savigny terms the "äussere Bücherwesen," or the external characteristics of books, their forms, prices and rarity, the names of the printers, the date and place of publication, and the history of particular copies or editions. It involves a knowledge of typography, not, indeed, as a mechanical process, but in its results, and, in fact, of all the constituent part of books, as a means of identifying particular productions. Its full development is due to the gradual formation of a technical science of books. Considerations of buying and selling, which were first reduced to a system in Holland, and afterwards advanced to their present complete form in France and England, gave an impetus to this branch of bibliography. The growth of private libraries, especially during the last century in France, promoted a passion among rich amateurs for rare and curious books; and literary antiquarians began to study those extrinsic circumstances, apart from the merit of their contents, which went to determine their marketable value, and to reveal the elements of rarity.

Literary, or, as it is sometimes called, intellectual bibliography treats of books by their contents, and of their connection in a literary point of view. It has been subdivided into *pure* and *applied*, according as its functions became more complex with the spread of printed books and the increasing requirements of learning. Catalogues expanded into dictionaries, whose object was to acquaint literary men with the most important works in every branch of learning. Books were accordingly classified by their contents, and the compiler had to distinguish between degrees of relative utility, so that students might know what books to select. This duty, which devolved in most cases on men of learning, has led French writers in particular to exaggerate the province of bibliography. Its real value, in a literary aspect, depends on the recognition of its purpose as ancillary to the study of literature; not in short, as an end, but as a means to the attainment of knowledge, by the investigation of its sources.

France must be regarded as the real mother of bibliography. The labors of French bibliographers, especially after Naudé, converted a study, more or less desultory, into a science and a systematic pursuit. In Germany, poor in public and almost destitute of private libraries, bibliography has been studied almost exclusively in its literary aspect. The science in America has been cultivated only recently; but the names of Cogswell, Ticknor, and Jewett are already well known to bibliographers.

The history of the materials used for early manuscripts — a subject fruitful in reseach — lies outside the limits we have proposed for bibliography as the study of printed literature. Fortunately for the spread of books, in the modern sense of the term, the invention of printing was preceded by the important discovery of the art of making paper from linen rags. The precise date of this discovery is not known, nor are writers agreed as to the country in which it was made; but it seems to be ascertained that this kind of paper was in general use in Europe before the end of the 14th century.

An accurate knowledge of the different forms of books is necessary to the bibliographer, as without it no book can be correctly described; and however easy such knowledge may appear, it is yet certain that errors in this respect have been committed even by experienced bibliographers, and that doubts have been entertained as to the existence of editions, owing to their forms having been inaccurately described.

The respective merits of different editions can be ascertained often only by minute inquiries. It is a principal object of the bibliographical dictionaries, to be afterwards mentioned, to point out those editions of important works which such inquiries have discovered to be the best. There are many particulars in which one edition may differ from or excel another. There may be differences or grounds of preference in size, in paper, and in printing. Later revision by the author may give his work, when it comes to be reprinted, a complexion differing largely from what it had at first; while the first edition exhibits his original thoughts as they came fresh from his pen. One edition may derive its superiority from being furnished with notes, an index, or a table of contents. Plates make great differences in the value of editions, and even in the value of copies of the same edition. In the beautifully engraved edition

of *Horace* by Pine, a small error in the first impressions serves as a test whether any copy contains the best engravings of those elegant vignettes which illustrate that edition.

The first productions to which the name of *books* has been applied, were printed, not with movable types, but from solid wooden blocks. These consisted of a few leaves only, on which were impressed images of saints and other historical pictures, with a text or a few explanatory lines. The ink was of a brownish hue, and glutinous quality, to prevent it from spreading. These are known by the name of *Image Books*, or *Block Books*, and are generally supposed to have succeeded the earlier impressions for playing cards, which are dated back to the end of the 14th century. Strictly speaking, they were the immediate precursors, rather than the first specimens of typography; in fact, they mark the transition to that art from engraving. Peignot puts their number at seven or eight, but others extended it to ten. They belong chiefly to the Low Countries, and were often reprinted, as is generally thought, during the first half of the 15th century, and, indeed, after the discovery of printing, properly so called. One of the most celebrated is the *Biblia Pauperum*, consisting of forty leaves, printed on one side, so as to make twenty when pasted together, on which passages from Scripture are represented by means of figures, with inscriptions. It appears to have been originally intended for the use of those poor persons who could not afford to buy complete copies of the Bible. Some fugitive sheets still attest the primitive attempts at printing, in the modern sense of the word. *The Letters of Indulgence* of Pope Nicholas V., two editions of which, on a small sheet of parchment, were printed in 1454, fix the earliest period of the impression of metal types, with a date subjoined. The earliest known book, however, of any magnitude, and probably the first thus printed, was the undated *editio princeps* of the Bible, commonly known as the Mazarin Bible, from a copy having been found by De Bure in the library of the Cardinal. It is undated, but authorities generally concur in ascribing it to a period between 1450 and 1455. The work is usually divided into two volumes, the first containing 324, and the second 317 pages, each page consisting of two columns. The characters, which are Gothic, are large and handsome, and resemble manuscript. No fewer than twenty copies are known to be extant. The first printed book with a date is the *Psalter* of Faust and Schöffer, printed at Mentz in 1457, as a somewhat pompous colophon announces. It was found, in 1665, in the Castle of Ambras, near Innsbruck, where the Archduke Francis Sigismund had collected a quantity of MSS. and printed books, taken chiefly from the library of Corvinus. A few other copies are in existence, one of which was bought under Louis XVIII. for the Royal Library at Paris for the sum of 12,000 francs. Whether the types employed were wooden or metallic has been disputed between Van Praet and Didot. As a specimen of early printing the work is magnificent; it contains richly embellished capitals in blue, red, and purple.

The devices of the early printers are of importance to the bibliographer, since questions occur as to the early editions which can only be ascertained by discovering the printer's name. The invention of marks or vignettes is ascribed by Laire to Aldus; he traces them to a Greek Psalter of 1495. A device, however, consisting of two shields occurs in Faust and Schöffer's Bible of 1462. They were not used by Ulric Zell, the first printer at Cologne, nor by the fathers of the Paris or Venetian presses. Monograms or ciphers were frequently employed, with initial letters of names or other devices curiously interwoven, and these furnish a trustworthy clue to identity. The monograms of the Early English printers are explained in Ames's *Typographical Antiquities*.

The branch which Ebert terms "restricted" bibliography belongs peculiarly to the book-collector and bookseller, if regard be had especially to the inclinations of purchasers, the actual demand, and the marketable value of books. Rarity and price depend very much on each other; rarity makes them dear, and dearness makes them rare. Hallam asserts that the price of books was reduced four-fifths by the inventing of printing. From a letter of Andreas, bishop of Aleria, to the pope, in his preface to the *Epistles of Jerome*, it would seem that 100 golden crowns was the maximum demanded for a valuable MS., and that the first printed books were sold for about 4 golden crowns a volume. At any rate, one natural effect of printing was to restrict the number of rare books to a separate class. Cailleau, who has been followed by most other writers on this subject, distinguishes between *absolute* and *relative* rarity. The former term is applied to those books or editions of which only a small number has been printed. Such for the most part are works printed for private circulation, as those of the Strawberry Hill Press, which are very scarce and enormously dear. Much of the value attached to editions of the 15th century arises from the limited number of impressions. They were seldom more than 300; John of Spira printed only 100 copies of his *Pliny* and *Cicero*; and printers had the example of Sweynheim and Pannartz, who were reduced to poverty by their surplus copies, to avoid exceeding the current demand. Suppressed works belong to the same category, in proportion to the success of prohibition. Others owe their scarcity to accidental destruction; as, for instance, the second volume of Hevelius's *Machina Cœlestis*, 1679, which would have shared the fate of the remainder of his works, on the burning of his house, had the author not previously given some copies to his friends. At the great fire of London in 1666 there were some works of Dugdale, among other writers, as well as the first volume of Prynne's *Records of the Tower*, of which only a few copies escaped; but their value has been reduced by subsequent impressions. The same kind of rarity attaches to *Editions de luxe*, chiefly made for rich amateurs; to large paper copies and *tall* copies, *i.e.*, copies of a work published on paper of ordinary size and barely cut down by the binder; and to books printed on colored paper. A list of the last-named is given by Duclos and Cailleau, and reprinted by Horne in his *Introduction to Bibliography*. It includes an edition of Sterne's *Sentimental Journey*, three copies only of which were printed at Paris in 1802, on rose-colored paper, and the complete *Works of Voltaire*, edited by Beaumarchais (Kehl, 1785), twenty-five copies of which were struck off on blue paper, after some had been requested by Frederick the Great for his own use, on account of the weakness of his eyesight. Vellum copies, again, have been much prized by collectors. They belong to the early days of printing, especially to the Aldine, Verard, and Giunti presses, and to those of the first English printers. Few were made between the latter half of the 16th and the beginning of the last century; but the art was revived in France by Didot and Bodöni, and the folio *Horace* of 1799 by the former is a *chef d'œuvre* of its kind. The Royal Library at Paris has a sumptuous collection of vellum copies, which have been elaborately described by Van Praet. At the sale of the M'Carthy library, the *Psalter* of Fust and Schöffer on vellum was bought by Louis XVIII. for 12,000 francs. Burton's *Anatomy of Melancholy*, which fascinated Dr. Johnson, is an instance of undeserved neglect. For a long time it fell

into disuse, and from being a waste-paper book, became extremely rare, until reprinted in recent times.

In a literary sense, a book, to deserve the title of rare, should be a work of some merit, and not one whose obscurity is due to its worthlessness. Curious books, however, depend very much on the pleasure of the curious; and the follies and caprice of collectors are summed up in the word *Bibliomania*. Some copies of Tuberville's *Book of Hunting*, 1611, were bound in deer-skin; Mr. Jeffery, the bookseller, enclosed Mr. Fox's historical works in fox's-skin; and a story is told of Dr. Askew having caused a book to be bound in human skin, for the payment of which he was prosecuted by the binder. German bibliographers reproach us with undue passion for book curiosities. *Bibliomania* forms the title of an amusing work by Dr. Dibdin, who, though accused of leaning to this weakness, knew well how to value the intelligent study of books. The practice was satirized as early as the time of Brandt, (see his *Ship of Fools.*) It prevailed in England chiefly during last century, and reached its height at the sale of the duke of Roxburghe's library in 1812.

Fortunately for the preservation of ancient literature, the discovery of printing coincided very closely with the full development of that zeal for classical learning, which had begun with the 15th century. To Italy belongs the chief glory of first embodying, in an imperishable form, those materials which the industry of Poggio and others had rescued from the dust of monastic libraries. In rapid succession the first editions of the classics issued from Italian presses; no less than fifty of these are enumerated by Panzer. *Apuleius*, *Aulus Gellius*, *Cæsar*, *Livy*, *Lucan*, *Virgil*, and portions of *Cicero*, were printed by Sweynheim and Pannartz at Rome before 1470; while the rival press of the Spiras at Venice boasted of *Plautus*, *Tacitus*, *Priscian*, *Sallust*, *Catullius*, *Tibullus*, and *Propertius*. From Brescia came *Lucretius*, from Vicenza, *Claudian*; Ferrara and Naples gave birth to *Martial* and *Seneca*. In Germany, France, and the Low Countries, on the other hand, the progress at first was slow. Few classics were printed out of Italy before 1480, or, indeed, until the last ten years of that century. The *De Officiis* of Cicero, it is true, had appeared at Mentz in 1465,—the first portion of any classical work committed to the press, unless precedence is given to the *De Oratore* of Sweynheim and Pannartz at Subiaco. But with that exception the first impressions of *Terence* and *Valerius Maximus* at Strasburg, and of *Sallust*, and, perhaps, *Florus* at Paris, are all that Cisalpine presses contributed of that kind within the period under review.

Most of the Latin classics had appeared in print before the art was employed on any Greek author. This was due rather to the want of adequate editorship than to any indifference to Greek in Italy; for the taste for that language had steadily increased since the arrival of the learned Greeks from Constantinople, and the want of printed editions became general before the close of the 15th century. To Aldus belongs the glory of ministering to that desire, by publishing, in quick succession and with singular beauty and correctness, almost all the principal authors in that tongue. At Paris the first Greek press of importance was established in 1507 by Gourmont, but the days of its chief celebrity date from his successors, Colines and Stephens. Aldus, though the most prolific, was not the earliest Greek printer. The first entire work in that language was the *Grammar* of Constantine Lascaris, printed by Zarot at Milan in 1476. The *absolute* rarity of the first editions of the classics it is difficult to determine with precision. They have been much prized by collectors, especially during the last century, though their price has fluctuated considerably at different times.

Sets of the classics, more or less complete, have been published at different times, and for different purposes. Among the earliest and most important are the *Delphin* editions, prepared, by order of Louis XIV., at the instance of the duke de Montausier, for the use of the Dauphin. The duke had been in the habit of studying the classics on his campaigns, and the want of books of reference appears to have suggested to him the idea of a uniform series of the principal classics, with explanatory notes and illustrative comments. On his becoming governor to the Dauphin, the scheme was carried into execution; and Huet, bishop of Avranches, a preceptor of the prince, was entrusted with the choice of authors and editors, and with the general supervision of the series. A list of the editors is given by Baillet in his *Critiques Grammairiens*. The collection, which, including Danet's *Dictionary of Antiquities*, extends to sixty-four volumes quarto, is of very unequal merit; but the copious verbal indices, which were added by the direction of Huet, afford a useful means of reference to particular passages. Only Latin classics, however, are included in the series; and "it is remarkable," as Dr. Aikin observes, "that *Lucan* is not among the number. He was too much the poet of liberty to suit the age of Louis XIV." The editions most prized by collectors are the Elzevirs and the Foulises. The *Elzevirs*, or properly Elseviers, were a family of famous printers and booksellers at Amsterdam, no fewer than fifteen of whom carried on the business in succession from 1580 to 1712. Their *Pliny* (1635), *Virgil* (1636), and *Cicero* (1642), are the masterpieces of their press; the last of the family brought out editions in 12mo. and 16mo.

Books of this class originate, generally speaking, either from the necessities or the caprice of authorship. Their number, however, has been such as to occupy, at an early time, the attention of bibliographers. In 1689 appeared the *Centuria plagiariorum et pseudonymorum* of John Albert Fabricius, as well as a letter to Placcius from John Mayer, a clergyman of Hamburg, under the title — *Dissertatio Epistolica ad Placcium, qua anonymorum et pseudonymorum farrago exhibitur.* The complete fruits of Placcius's researches were published after his death in a folio volume at Hamburg in 1708, by Matthew Dreyer, a lawyer of that city. The work was now entitled *Theatrum Anonymorum et Pseudonymorum;* and, besides an Introduction by Dreyer and a life of Placcius by Fabricus, it contains, in an Appendix, the before-noticed treatises of Geisler and Decker with the relative letters of Vindingius and Bayle, and the Dissertation of Mayer. This eleborate work contains notices of six thousand books or authors; but it is ill-arranged and frequently inaccurate, besides being cumbered with citations and extracts, equally useless and fatiguing.

The subject of false and fanciful names attached to books had been undertaken in France by Adrien Baillet, nearly about the same period that Placcius commenced his inquiries. In 1690 this author published his *Auteurs Déguisés;* but this is little more than an introduction to an intended catalogue which Baillet never completed, being deterred, as Niceron says, by the fear lest the exposure of concealed authors should in some way or other involve him in trouble. In this piece, which was reprinted in the sixth volume of De La Monnoye's edition of Baillet's *Jugemens des Savans*, there are some curious literary anecdotes, especially with reference to the passion which prevailed after the revival of letters for assuming classical names. In Italy these names were so generally introduced into families, that the names of the saints, hitherto the common appellatives, almost

disappeared from that country. A similar rage for assuming the names of celebrated authors was common among French writers in the 18th century.

Books supposed hurtful to the interests of government, religion, or morality have been sometimes condemned to the flames, sometimes censured by particular tribunals, and sometimes suppressed. Such methods of destruction have been followed in various countries, with regard both to their own and to foreign productions; and lists have been published from time to time of the works so interdicted.

Heathen antiquity supplies some instances of the burning of obnoxious books, such as the reported destruction of the works of Pythagoras at Athens, and of astrological works, as well as the writings of Labienus, by Augustus at Rome. Some Greek works, alleged to have been found in the tomb of Numa in 181 B.C., and ascribed to him, were burnt by order of the Senate; the story of their discovery, however, is a mere fabrication. Tacitus mentions a *History* by Cremutius Cordus, which the Senate, to flatter Tiberius, condemned, because it designated C. Cassius the last of the Romans. Diocletian, according to Eusebius, caused the Scriptures to be burnt, but the early Christian Church was not slow in following the example of intolerance, and the charge of heresy was a ready instrument for putting down works alleged to be injurious to the faith. The first recorded instance is that of Arius, whose writings were condemned to the flames at the Council of Nicæa. Constantine himself threatening with death those who should harbor any copies. The same fate befell the works of Nestorius at the Council of Ephesus, and those of Eutyches at Chalcedon. Pagan works were prohibited at the Council of Carthage in 400. Aristotle was forbidden by the church in the 13th century, but the restriction was relaxed in favor of the universities by Pope Nicholas V. A list of prohibited books is found in a decree of a council at Rome as early as 494. But the chief rigors of persecution began with the Inquisition, and the crusade against literature increased in severity with the multiplication of books through the press. In 1515 the Council of Lateran at Rome appointed clerical censors to examine all works before publication, as if, to use Milton's indignant remonstrance, "St. Peter had bequeathed to them the keys of the press as well as of Paradise." In 1543 Caraffa issued an order that no book should be printed without leave from the Inquisition, and booksellers were, accordingly, required to send in catalogues. Brunet mentions, however, a list of prohibited authors, prepared by order of Charles V., which was printed at Brussels in 1540, and is the earliest of its kind. An *Index generalis scriptorum interdictorum* was published by the Inquisition at Venice in 1543, and similar catalogues followed from the universities of Paris and Louvain. The first Index of the Court of Rome appeared in 1558, and was reprinted in 1559. The subject was discussed at the Council of Trent, who delegated the right of supervision to the Pope, and the result was the *Index Tridentinus* of Pius IV.,—the first strictly Papal Index,—which was printed by Aldus at Rome in 1564. Thence began a long series of literary proscriptions, which was continued by the Congregation of the Index, and of which one of the immediate effects was to drive printing to Switzerland and Germany. The right of dictating what books should or should not be read was a consequence of the claims of the Papacy over the conscience and morals of mankind; and the vitality of persecution has been preserved within the Romish Church by the consistent exercise of such pretensions. The bibliography of these Expurgatory Indices has been copiously treated. Among the earlier victims were Galileo and Copernicus; and English literature is represented by such names as Gibbon, Robertson, Bacon, Hallam, Milton, Locke, Whately, and J. Stuart Mill. In Spain the power of the Inquisition, provoked by the invasion of Lutheranism, was wielded by Fernando de Valdes, whose catalogue of 1559 formed the model of that issued by Pius IV. in the same year. An edict of Philip II. was published at Antwerp in 1570, and a general Index of all books suppressed by royal authority appeared at Madrid in 1790. It is noticeable that Smith's *Wealth of Nations* has been proscribed in that country, "on account of the lowness of its style and the looseness of its morals." A list of books suppressed in France between 1814 and 1850 has been edited by Pillet.

A comprehensive account of works condemned or suppressed in England has yet to be written, but an article in the *Edinburgh Review* supplies some interesting materials on this subject. Peacock's *Precursor*, which the author burnt with his own hand, is an early instance before the invention of printing. The "war against books," however, began under Henry VIII., the suddenness of whose breach with Rome is shown by the circumstance that, whereas in 1526 anti-popery books were condemned as heretical, in 1535 all books favoring popery were decreed to be seditious. Several of the early translations of the Bible were suppressed,—Tyndall's version among others. As many copies of that work as the superior clergy could buy up, were publicly burnt at St. Paul's on Shrove Tuesday, 1527, Fisher, Bishop of Rochester, preaching a sermon on the occasion. An edition of the Bible was suppressed for a misprint, the printer having omitted the word "not" in the seventh commandment, but a copy survives in the Bodleian. A general burning of unlicensed books was ordered by the king in 1530, the *Supplication of Beggars* a well-known invective against Wolsey, being included in the list.

This branch of bibliography has a peculiar interest to the literary historian. It serves to indicate, for the most part, periods of political excitement or religious intolerance. Fortunately, however, the efficacy of persecution has been frustrated by the disseminating power of the press.

The first catalogues, after the invention of printing, were those of the early printers, who, as booksellers, published sale-lists of their works, to attract the attention of the learned. The most ancient of these *catalogi officinales*—the humble predecessors of Bohn's gigantic catalogue—is a simple leaf, entitled *Libri Græci impressi*, printed by Aldus in 1498. The list consists of fourteen articles, distributed into five classes,—grammar, poetry, logic, philosophy, and theology, and may be regarded as one of the first attempts to apply a system of classification to printed books. Its interest is enhanced by its containing the price of the books advertised for sale. The increasing commerce in literature was at once a cause and a consequence of similar catalogues; and the example of Aldus was followed by the Stephens, and by Colines, Wechell, and Vascosan, and other French printers of the first half of the 16th century, whose lists are given in vols. ii. and iii. of Maittaire's *Annales Typographici*, the divisions of subjects increasing with the spread of printed literature. In England the earliest known sale-list of printed books was published by Andrew Maunsell, a London bookseller, in 1595, and contains the titles of many works now lost or forgotten. In 1554 or 1564 appeared the first printed catalogue of the Frankfort book-fair, published by George Weller, a bookseller at Augsburg; and in 1604 it was followed by the general Easter catalogue, printed by permission of the Government.

The different methods, adopted from time to time, of

classing books according to their subject matter, has occasioned a variety of so-called *systems* of bibliography, which it is important to notice, but which space forbids us to describe in detail. A distinction must be observed between a scheme of arrangement applied to a particular library, and limited therefore by its contents, and one which embraces in its divisions and subdivisions the entire range of literature. Nothing, on either head, is learnt from the Greeks and Romans; the classed catalogue of the library of St. Emmeran at Ratisbon, compiled in 1347, and containing twelve divisions, is cited as the earliest specimen of its kind. (See LIBRARIES.) The most ancient system, in the wider sense of the term, is ascribed to the Chinese, who in the 13th century distributed the field of human knowledge into classes numbering from fourteen to twenty, with sectional subdivisions to each.

In England the classification of learning has been treated as a branch of philosophy rather than of bibliography. Locke's *Essay on the Human Understanding* contains, in book iv. c. 21, a "Division of the Sciences;" and Bentham has an "Essay on Nomenclature and Classification" in his *Chrestomathia*, though it does not appear that he intended it to apply to the distribution of books. Coleridge, in his *Universal Dictionary of Knowledge*, 1817, aimed at combining the advantages of a philosophical and alphabetical arrangement, and adopted four leading classes, viz.,—pure sciences, mixed sciences, history, and literature, including philology. Lord Lindsay's *Progression by Antagonism*, 1845, contains another method, based on his theory of the divisions of human thought.

As regards works and collections which cannot with propriety be limited to any one division of knowledge, it would be advisable to refer them to an additional or *miscellaneous* class, as has, in fact, been done by some writers. Camus proposes to enter such work in the class in which their authors most excelled; but this plan would obviously produce much confusion. While, however, a miscellaneous class might properly indicate the collective editions of an author's works, yet his separate treatises should be entered under the subjects to which they belong. A system of cross-reference is in many cases unavoidable, if completeness of general design is to be combined with the cardinal object of a classed catalogue, namely, that of showing what has been written by the authors specified therein on the different branches of knowledge as they may be best arranged.

It has been our object in this article to institute such a division of the subject, as should enable us to point out the best sources of information in regard to all its branches. Some works still remain to be noticed which treat generally of all matters relating to bibliography, though their scope and purpose differ according to the view of the science adopted by the writer. A comprehensive and judicious digest of bibliographical lore is still wanted, but there are several works which may be consulted with advantage. Cailleau's *Essai de Bibliographie*, appended to his *Dictionnaire* of 1790, is an interesting treatise. The *Einleitung in die Bücherkunde* of M. Denis, 1795–96, is an excellent work divided into two parts, the first of them relating to bibliography, and the second to literary history. The *Traité Élémentaire de Bibliographie*, by S. Boulard, Paris, 1806, was intended to serve as an introduction to all works on that subject written up to the date of its appearance. The labors of Peignot, besides his works on suppressed and rare books already noticed, include—(1), the *Manuel Bibliographique, ou Essai sur la connoissance des livres, des formats, des éditions, de la manière de composer une Bibliothèque etc.*, 1801; and (2) the *Dictionnaire raisonné de Bibliologie*, 2 vols 8vo. 1802 The plan of this work, as Brunet admits, is well conceived, and furnishes a convenient mode of reference. Bibliography is certainly indebted to this industrious compiler, but his details have in many respects been rendered obsolete by subsequent research, and his vague notions of the scope and objects of his study have frequently led him into confusion and extravagance. A *Manuel du Bibliophile*, by the same author, appeared at Dijon in 1823. The *Cours Elémentaire de Bibliographie*, by C. F. Achard, Marseilles, 3 vols. 8vo, 1807, derives its chief value from its excellent summary of the different systems of classification applied to books. We learn from the introduction, that M. François de Neufchâteau, when Minister of the Interior, ordered the librarians of all the departments to deliver lectures on bibliography, but that the plan, which indeed appears fanciful, entirely failed, the librarians having been found quite incapable of prelecting upon their vocation. The *Introduction to the Study of Bibliography*, by Thos. Hartwell Horne, 2 vols. in 1, 8vo, London, 1814, is perhaps the most useful book of this kind in the English language, though the compiler would have done better to restrict himself to printed books, instead of ranging discursively over the whole field of MS. literature. His book is chiefly translated and compiled from French bibliographical works, and will be found useful to those who have not access to them. Besides some excellent specimens of early typography, it contains full lists of authorities on bibliography and literary history, and a copious account of libraries. The *Studio Bibliographico* is an Italian treatise of considerable merit. P. Namur's *Bibliographic palæographico-diplomatico-bibliogique*, Liége, 1838, embraces many subjects outside the province of bibliography proper.

BIBLIOMANIA, the passion for accumulating books, either for their intrinsic value, or, as is more often the case, for their rarity or peculiarity. Competition between collectors leads to most extravagant prices being paid for rare volumes or sets. Aldines and Elzevirs are great favorites with bibliomaniacs, while the Mazarin Bible, early copies of the *Decameron*, and the productions of Gütenburg and Fust and their immediate successors bring fabulous prices.

BIBULUS. The best-known of those who bore this surname, which belonged to the Gens Calpurnia at Rome, was Marcus Calpurnius Bibulus, elected consul with Julius Cæsar, 59 B.C. He was the candidate put forward by the aristocratical party in opposition to L. Lucceius, who was of the party of Cæsar; and bribery was freely used (with the approval, says Suetonius, of even the rigid Cato) to secure his election. But he proved no match for his able colleague. He made an attempt to oppose the agrarian law introduced by Cæsar for distributing the lands of Campania, but was overpowered and even personally ill-treated by the violence of the mob. After making vain complaints in the senate, he shut himself up in his own house during the remaining eight months of his consulship, taking no part in public business beyond fulminating edicts against Cæsar's proceedings, which only provoked an attack upon his house by a mob of Cæsar's partizans. When the interests of Cæsar and Pompey became divided, Bibulus supported the latter, and joined in proposing his election as sole consul (52 B.C.) Next year he went to Syria as proconsul, and claimed credit for a victory gained by one of his officers over the Parthians, who had invaded the province, but which took place before his own arrival in the country. After the expiration of his government there, Pompey gave him the command of his fleet in the Ionian Sea. Here also he proved himself utterly incapable; distinguishing himself chiefly

by the cruel burning, with all their crews on board, of thirty transport vessels which had conveyed Cæsar from Brundisium to the coast of Epirus, and which he had captured on their return, having failed to prevent their passage. He died soon afterwards of fatigue and mortification. By his wife Portia, daughter of Cato, afterwards married to Brutus, he had three sons. The two eldest were murdered in Egypt by some of the soldiery of Gabinius; the youngest, Lucius Calpurnius Bibulus, fought on the side of the republic at the battle of Philippi, but surrendered to Antony soon afterwards, and was by him appointed to the command of his fleet. He died while governor of Syria under Augustus.

BICARBONATES differ from carbonates in containing twice as much carbonic acid. Bicarbonates, bisulphurets and bitartrates are words formed on the same principle, but in modern chemical nomenclature the prefix *bi* has been superseded by *di*.

BICEPS ("double-headed"), an anatomical term applied to two muscles, one belonging to the arm and the other to the leg, and distinguished as the *biceps flexor cubiti* and the *biceps flexor crusis*. The first is the muscle which gives a full appearance to the fore-arm; the latter is situated on the back of the thigh.

BICHAT, MARIE-FRANÇOIS XAVIER, a celebrated French anatomist and physiologist, was born in 1771. His father, who was himself a physician, was his instructor. He entered the College of Mantua, and afterwards studied at Lyons. In mathematics and physical sciences he made rapid progress. Becoming passionately fond of natural history he ultimately devoted himself to the study of anatomy and surgery, under the guidance of Petit, chief surgeon to the Hôtel Dieu at Lyons. Petit soon discerned the superior talents of his pupil, and, although the latter had scarcely attained the age of twenty, employed him constantly as his assistant. The revolutionary disturbances compelled Bichat to fly to Lyons and take refuge in Paris about the end of the year 1793. He there became a pupil of the celebrated surgeon Desault, and from that time Bichat became an inmate of his house, and was treated as his adopted son.

Before Bichat had attained the age of eight and twenty he was appointed physician to the Hôtel Dieu, a situation which opened an immense field to his ardent spirit of inquiry. He engaged in a series of examinations, with a view to ascertain the changes induced in the various organs by disease, and in less than six months he had opened above six hundred bodies. In this way he procured a vast store of valuable materials for his course of lectures on the Materia Medica, the completion of which was prevented by his death, occasioned by a fall from a staircase at the Hôtel Dieu, which threw him into a fever. Exhausted by excessive labor, and enfeebled by constantly breathing the tainted air of the dissecting room, he sank under the attack and died on July 22, 1802. His bust, together with that of Dessault, was placed in the Hôtel Dieu by order of Napoleon.

BICYCLE. As the derivation of the term implies, the chief component parts of this machine consist of two wheels. The word is applied to those two-wheeled machines which have been brought to their present state of perfection for human locomotion during the past 10 years. Shortly after the close of the great Continental war in 1815, the first bicycle was introduced into England from France. It was at the best an awkward affair, composed of a couple of heavy wooden wheels of equal diameter, one behind the other, and joined together by a longitudinal bar on which the rider's seat was fixed, the mode of propulsion being the pushing the feet against the ground. That such a cumbersome method of locomotion soon died a natural death is not to be wondered at. For the next fifty years no real progress was made, as various kinds of levers and other attempted appliances were found too intricate. In 1869 M. Michaux of Paris conceived the idea of making the front or driving wheel much larger than the hind wheel; and very soon afterwards, Mr. Magee, another Parisian, still further improved bicycles by making them entirely of steel and iron. The principle of crank action attached to revolving axles having also become developed, the pastime of bicycling was entirely revolutionized. India rubber tires and strong beaks were brought into requisition to relieve jolting; and now-a-days a crack racing bicycle with a driving-wheel from 55 to 60 inches diameter does not exceed 50 pounds in weight, or about half the weight of one of the old wooden machines. Tricycles have been tried, but no great amount of speed will ever be got out of them until the friction and weight can be materially reduced.

The diameter of the front or driving wheel of the modern bicycle varies from 2½ to 5 feet, according to the length of the rider's legs. When it is meant for racing, most of the component parts are lighter, and the rest for relieving the legs when going down hill is dispensed with. The rider sits astride a small saddle, and the motive power is obtained from the feet working the crank treadles attached to the revolving axle of the driving-wheel. There being no lateral support to the machine, the first thing to be learned is balancing, after which it is best to begin riding down a gentle gradient without using the treadles. Steering, which is managed by a transverse handle attached to the driving-wheel and placed in front of the rider, should be mastered in the same manner, after which the feet and legs may be brought into play on the treadles and speed gradually acquired. Falls are inevitable at first, and they are best avoided by slightly turning the driving-wheel in the direction the machine is inclining, not the contrary way. Care must be taken to keep all bearings, etc., oiled from time to time, in order to prevent friction, which lessens speed. With the exception of skating, bicycling is the quickest means of locomotion that man possesses. A fair bicyclist can outstrip a horse in a day, while an expert can do so in an hour. Bicycling has rapidly grown in favor during the past two years; and long tours are now made with the greatest ease. Where the roads are fairly level, and in a tolerably good state of repair, the bicycle is unsurpassed as a means of self-locomotion. In hilly and mountainous countries, where there are no made roads, or where they are much broken up and heavy, it is next to useless, although india rubber tires to a certain extent relieve the jolting over rough ground. Lightness, great strength, and the best of workmanship are necessary in the manufacture of bicycles in order to prevent serious accidents. It is in the two former requisites that steel and india rubber have such an advantage over iron and wood.

Within the time between 1889 and this date, 1893, the bicycle has become one of the most important manufactures of the United States. The changes made in the principle and construction of the machine are radical, the first being the practical abandonment of the single high driving-wheel accompanied by a small one behind it, for a machine in which the two wheels are nearly or quite of the same size, and the saddle is placed on the bar between them, much upon the idea of mounting and riding a

horse. This form at once took the name of the "safety" wheel, since the frequently recurring and dangerous "headers," caused by the rider of the old style being tilted forward of the center of his wheel by the small follower passing over some slight obstacle, are rendered impossible. This new construction gave so great an impetus to use and manufacture that it may be now seen that it saved the pastime of bicycle-riding from taking its place among innumerable passing "fads," and being now almost forgotten.

The "safety" led to a slight modification in the connecting-bar between the two wheels which permits its use by women. Its first use of this kind began about 1889. The new idea was of rapid growth, but since it in no way interfers with the usual dress or appearance of females, and as the mounting and dismounting is readily effected without assistance, such conservative opposition as was at first encountered has entirely disappeared, and women, accompanied or not by men, have now a new and much needed means for the enjoyment of life out-of-doors. The innovation has now ceased to attract attention, and its physical and moral effects are declared to be distinctly noticeable as an improvement upon any form of exercise for women heretofore known.

The next radical change, ball-bearings in all possible modern applications being considered as matters of course in every reputable American machine, consisted in a change from the ordinary rubber tire to the pneumatic tire. This innovation consists, in brief, in filling the hollow tube which sits in the grooves around the periphery of the wheel with air that is retained there under considerable pressure by suitable valves. This pneumatic tire is necessarily much larger, and appears more clumsy, than the old style of rubber tire without air, but its appearance has by habit ceased to be an objection. The air pressure is obtained by the use of a small pump carried in the kit, and its utilities are obvious in lessened jolting, greater tenacity or "bits" in going over hard surfaces, and perfect silence. But the pneumatic improvement is as yet only an experiment of doubtful success, since any accidental piercing or rupture of the rubber tube at once disables the wheel, perhaps miles from home, leaving the rider not only to walk, but to convey his wheel also as best he may. So many and constant are the improvements in bicycles, however, that it is certain that the pneumatic feature will be either soon abandoned or so improved that this difficulty will have been obviated.

BIDDEFORD is situated in Saco county, Me., on the Saco river, six miles from the Atlantic, and ninety-three miles northeast of Boston. It has railroad connections with Boston and Portland, and has considerable exports of lumber and of woolen and cotton goods. Abundant water power is derived from the Saco river, which at this point has a fall of forty-two feet. This is utilized for saw mills, cotton mills and other manufactories. There are two national banks, one daily and three weekly newspapers, ten churches and a full complement of schools. Population in 1890, 14,418.

BIDDLE, JOHN, frequently called the father of English Unitarianism, was born in 1615 at Wottonunder-Edge in Gloucestershire. He graduated as bachelor of arts in 1638 and as master in 1641, and was then appointed to the mastership of the free school in the city of Gloucester. While conducting this school in an admirable manner he diligently prosecuted his theological studies; and the results he arrived at were of such a nature as to draw down upon him the reprobation of the civic authorities. He circulated privately a tract called *Twelve Arguments drawn out of Scripture, wherein the commonly-received opinion touching the diety of the Holy Spirit is clearly and fully refuted;* and towards the close or 1645 he was summoned before the Parliamentary committee then sitting at Gloucester. By them he was committed to prison, though he was at the time laboring under a dangerous fever. He was released on bail after an imprisonment of some duration, and was then called before the Parliament, which desired to inquire into his views. After tedious proceedings Biddle was committed to custody, in which he remained for five years. During that time the Assembly of Divines at Westminster had discussed his opinions, and pressed for an Act by which heretics like Biddle could be put to death. This, however, was resisted by the army, and by many of the Independent Parliamentarians; and after the death of the king, Biddle was allowed to reside in Staffordshire under surveillance. In 1751 the general Act of Oblivion gave him complete freedom, and his adherents soon began the practice of meeting regularly for worship on Sundays. They were called Biddellians, or Socinians, or Unitarians, the name which has now become associated with their opinions. Biddle was not left long in peace. He translated some Socinian books, among others the *Life of Socinus*, and published two catechisms, which excited a fury of indignation against him. He was summoned before the Parliament and imprisoned. The dissolution of that body again set him at liberty for a short time, but he was presently brought up for some expressions used by him in a discussion with a Baptist clergyman. He was put upon trial, and was only rescued by Cromwell, who sent him out of the way to one of the Scilly Islands, and after three years released him. But in 1662 he was again arrested, and fined £100. As he was unable to pay this sum, he was at once committed to prison, where fever carried him off on the 22d of September, 1662.

BIEL (or in French BIENNE), a town of the canton of Bern, in Switzerland, situated at the foot of the Jura Mountains, near the northern end of the lake to which it gives its name. Population, 8,113.

BIEL, GABRIEL, frequently but erroneously styled the last of the scholastics, was born at Spire about the middle of the 15th century. He held for some time a pastoral charge at Mainz, and afterwards removed to Urach. On the foundation of the University of Tübingen in 1477 he was appointed to the professorship of theology, and was twice afterwards promoted to the dignity of rector. Some years before his death, in 1495, he entered a religious fraternity. Biel was a follower of William of Occam, and professes only to develop systematically the principles of his master.

BIELAU, frequently distinguished as Langen Bielau, the longest village in the Prussian monarchy. It is situated in the government of Breslau in Silesia, on a tributary of the Piela, and extends for a distance of rather more than four miles. Population (1890), 15,000.

BIELAYA TSERKOV (*i. e.*, White Church), a township of Russia, in the government of Kieff, 32 miles S. S. W. of Vasilko, on the main road from Kieff to the Crimea. Population, 12,000.

BIELEFELD, a town in the Prussian province of Westphalia, the capital of a circle in the government of Minden. It is situated at the foot of the Osning, and consists of two portions, separated by the River Lutter. Population in 1890, 23,000.

BIELEFF, a town of Russia, in the government of Tula, and 82 miles from that city, on the left bank of the Oka. Population (1890), 9,000.

BIELGOROD (*i. e.*, White Town), a town of Russia

in the government of Kursk, 87 miles S.S.W. from that city, on the right bank of the North Donetz, near the confluence of the Vizelka. Population, 12,000.

BIELITZ, a town of Austrian Silesia, in the circle of Teschen, on the Biala River, a sub-tributary of the Vistula, and opposite the Galician town of Biala, with which it is connected by a bridge. Population, 11,000.

BIELLA, a town of Italy, in the province of Novara, 38 miles N.E. of Turin, with which it is connected by rail. Population in 1889, 11,935.

BIELOPOLI, a town in Russia in the government of Kharkoff, near the Vuira and Kriuga, 37 miles N.W. from the town of Sum. It was founded in 1672. A very extensive trade in wheat, salted fish, salt, pitch, and timber is carried on by the inhabitants, who number upwards of 12,000.

BIELOSTOK (in Polish BIALYSTOK), a town of Russia, in the government of Grodno, 50 miles S.W. of Grodno on the River Biela, a tributary of the Suprasla. There is an important trade in grain, wood, and various industrial articles. In 1889 the population was 16,544, no fewer than 11,288 being Jews.

BIENHOA, the capital of one of the six provinces of Lower Cochin-China, situated about 20 miles to the northwest of Saigon, on a canal that connects it with that city. It was captured by the French admiral Bonard in 1861, and is now one of the fortified posts in the French possessions. The population of the "Inspection" of Bienhoa is 19,260.

BIENNIAL PLANTS are plants which do not flower in the first season of their growth, but flower and bear fruit in their second season and then die. A common example is the foxglove *(Digitalis)*. The stock and wall flower are biennials and so are such plants as carrots, turnips, parsnips, parsley and celery. But biennial plants can, by early sowing and other causes promoting an early development of the flowering stems, be converted into annuals, while on the other hand, if flowering is prevented, or the plant is not permitted to ripen its seed, it will continue to live for a much longer period.

BIEZHETZ, a town of Russia, in the government of Tver, and 181 miles from that city, situated on the right bank of the Mologa. Population, 6,000.

BIGAMY, according to the statute now in force, is the offense committed by a person who "being married shall marry any other person during the life of the former husband or wife."

BIGNON, JEROME, a French lawyer, was born at Paris in 1589. He was uncommonly precocious, and under his father's tuition had acquired an immense mass of knowledge before he was ten years of age. In 1600 was published a work by him entitled *Chorograyhie, ou Description de la Terre Sainte.* In 1620 he was made advocate-general to the grand council, and shortly afterward a councillor of state, and in 1626 he became advocate-general to the parliament of Paris. In 1641 he resigned his official dignity, and in 1642 was appointed by Richelieu to the charge of the royal library. He died in 1656.

BIGORDI, DOMENICO. See GHIRLANDAIO.

BIG HORN, a river which rises near Fremont's Peak in northwest Wyoming, and after a northeast course of 350 miles, falls into the Yellowstone.

BIG RAPIDS, the capital of Mecosta county, Mich., is situated on the Muskegon river, at the intersection of three railroads, 189 miles from Detroit. It is an important lumber town, and was incorporated as a city in 1869. In 1880 it had 3,500 inhabitants, now (1890) increased to 6,500. It contains two banks, several mills, foundries and machine shops, and two weekly newspapers are published.

BIG SANDY, or Chatterawah, an affluent of the Ohio river, which is formed by the junction of two streams in Virginia, and passes through Kentucky.

BIJAINAGAR, or BIJANAGAR, an ancient city in south of India, once the capital of a great Hindu empire, but now in ruins, situated on the south bank of the Tumbhadrá river, directly opposite to Annagundi. The old walls measured more than eight miles in circumference, and were of great strength.

BIJAPUR, or BIJAIPUR, in Southern India, the ancient capital of an independent sovereignty of the same name, and once an extensive, splendid, and opulent city, but now retaining only the vestiges of its former grandeur. It is situated in a fertile plain, and is a place of great extent, consisting of three distinct portions — the citadel, the fort, and the remains of the city. The citadel, a mile in circuit, is a place of great strength, well built of the most massive materials, and encompassed by a ditch 100 yards wide, formerly supplied with water, but now nearly filled up with rubbish, so that its original depth cannot be discovered. It was built in 1489, by Yusaf Adil Sháh, the founder of the dynasty of Bijápur. The fort consists of a rampart flanked by numerous towers, a ditch, and a covered way. Its defenses, which are not less than six miles in circumference, were completed by Ali Adil Sháh in 1566. Outside the fort are remains of a vast city, now for the most part in ruins, but the innumerable tombs, mosques, caravanserais, and other edifices, which have resisted the havoc of time, afford abundant evidence of the ancient splendor of the place. It is asserted by the natives that Bijápur contained, according to authentic records, 1600 mosques and nearly 1,000,000 houses. The number of houses is certainly overrated; that of the mosques, in the opinion of recent travellers, is no exaggeration. Several mosques and mausoleums, adorned with embellishments of Eastern architecture, are still to be seen in Bijápur. The fort in the interior is adorned with many of these edifices, in rather better preservation than the outworks. The mausoleum of Sultan Muhammad Sháh is a plain building, 153 feet square, over which is reared a dome 117 feet in diameter at its greatest concavity, and called by the natives the grand cupola. The mosque and mausoleum of Ibrahim Adil Sháh, king of Bijápur, which was probably completed about the year 1620, is said to have cost $8,500,000, and to have occupied thirty-six years in its construction. Among the curiosities of the capital is the celebrated monster gun, stated to be the largest piece of cast brass ordnance in the world. It was captured from the king of Ahmadnagar by the king of Bijápur about the middle of the 17th century. An inscription on the gun recording that fact was erased by Aurangzeb, who substituted the present inscription, stating that he had conquered Bijápur in 1685. The city is well watered, having, besides numerous wells, several rivulets running through it.

The place, as already intimated, is rich in monuments of the bygone period when Bijápur was the capital of a powerful and flourishing Mahometan kingdom. Such traces of the past it is always desirable to preserve to the greatest possible extent, as they furnish the best commentary upon the history of the times in which they were raised, and, indeed, constitute their history, so far as manners are concerned. It is fortunate that their value was duly appreciated by the late Rájá of Satárá, who took great pains to preserve them; and that the British Government, participating in the same feeling, has, since the country passed into its possession, manifested great zeal in rescuing these magnificient relics from the ravages of time.

BIJNAUR, a district of British India, under the Lieutenant-Governor of the North-West Provinces, is

bounded on the N.E. by the British district of Garhwal, on the E. and S.E. by the British district of Morádábád, and on the W. by the British districts of Mirat, Muzafarnagar, and Saháranpur. The aspect of the country is generally a level plain, but the northern part of it rises towards the Himálayas, the greatest elevation being 1342 feet above the sea-level. The Koh and Rámgangá are the only streams that flow through the district. Population (1890), 750,000.

Until the latter part of the 18th century Bijnaur belonged to the brave Rohilla Afghans, whose subjugation forms so deep a blot on the career of Warren Hastings. In 1774 the mercenary arms of Britain subjected this people to the oppressive rule of the Nawáb of Oudh, who in turn ceded the district to the East India Company in 1802.

BIKÁNIR, a native state of Rájputáná, under the political superintendence of the British Government, is bounded on the N. by the Panjáb, on the E. by the British districts of Hariáná and Shekáwati, on the S. by the native state of Jodhpur or Márwár, and on the W. by the native states of Jasalmér and Bháwalpur. Length of the state from E. to W. 200 miles; breadth, 160 miles; area, 17,676 square miles. The inhabitants are very poor. They live chiefly by pasturage,— rearing camels, and horses of a fine breed, which fetch good prices. From the wool which their sheep yield they manufacture every article of native dress and good blankets. The other industries are leather work, sugar refining, goldsmith's work, iron, brass, copper, stone masonry, tanning and weaving. Population, 260,000.

BILÁSPUR, a district of British India, in the Central Provinces, forms the northern section of the Chhattisgarh plateau, and is bounded on the N. by the native states of Rewá and Koriá; on the E. by the Udaipur tributary state of Chhotá Nágpur, and the district of Sambalpur; on the S. by the Ráipur district; and on the W. by the hilly tracts of Mandlá and Bálághát. Extreme length of the district north and south, 106 miles; extreme breadth from east to west, 136 miles; area, 7798 square miles. The Mahánadi is the principal river of the district, and governs the whole drainage and river system of the surrounding country. Among the Hindus, the Chámárs and Pankás deserve particular notice. The former, who form the shoemaker and leather-dealing caste of the Hindu community, had always been held in utter contempt by the other Hindu castes. But between 1820 and 1830 a religious movement, having for its object their freedom from the trammels of caste, was inaugurated by a member of the caste, named Ghásí Dás, who preached the unity of God and the equality of men. Ghásí Dás gave himself out as a messenger of God; he prohibited the adoration of idols, and enjoined the worship of the Supreme Being without any visible sign or representation. The followers of the new faith call themselves *Satnámís*, or the worshippers of *Satnám* or God. They do not keep the Hindu festivals, and they defy the contempt of the Bráhmans. Ghásí Dás, the founder of the faith, was their first high priest. He died in 1850; his son succeeded him, but was assasinated (it was said by the Hindus), and the grandson is the present high priest.

The early history of the district is very obscure. From remote ages it was governed by kings of the Haihai dynasty, known as the Chhattisgarh Rájás, on account of thirty-six forts, of which they were the lords. A genealogical list of the kings of this dynasty has been carefully kept up to the fifty-fifth representative in the year 1740, when the country was seized without a struggle by the Marhattás of Nágpur. From 1818 to 1830 Biláspur came under the management of the British Government, the Marhattá chief of Nágpur being then a minor. In 1854 the country finally lapsed to the British Government, the chief having died without issue. During the Sepoy mutiny a hill chief of the district gave some trouble, but he was speedily captured and executed.

BILÁSPUR, the chief town of the district of the same name, is situated on the south bank of the River Arpá. It is said to have been founded by a fisherwoman, named Bilása, three hundred years ago, and still retains her name. The place, however, came to note only about one hundred years ago, when a Marhattá official took up his abode there, and began to build a fort which was never completed. In 1862 it was made the headquarters of the district, and is now a rising town.

BILBAO, one of the principal cities of Spain, and capital of the province to which it gives its name, is situated in a small but beautiful fertile valley, bounded on three sides by mountains, about six miles from the sea, on the banks of the River Ansa, which is also known as the Nervion, or, in Basque, as the Ibaizabal. The old town lies on the left bank, while the new town, which is by far the more important, rises on the right in handsome terraces. Population, 34,516. Bilbao, or Belvao, was founded about 1300 by Don Pedro Lopez de Haro, and soon rose into importance. It was captured by the French in 1795, and was again held by them from 1808 to 1813. During the Carlist contest it was gallantly defended against Zumalacarregui in 1835.

BILDERDIJK, WILLEM, a modern Dutch poet, by some considered to be the most eminent that his country has produced, was born at Amsterdam in 1756. In 1776, after completing a wide course of study at Leyden University, he gained the prize from the Leyden Society of Art for his poem on the *Influence of Poetry on States and Governments*. In the following year he gained another prize for his poem *Love of Fatherland*, and in 1779 he translated the *Œdipus Tyrannus* of Sophocles. In 1786 he left Holland on account of the disturbed state of public affairs, and after residing some time in Germany crossed to England, where he remained till 1806. Returning then to his native country he was received with great favor by the new king Louis Napoleon, who made him president of the recently founded Institute of Holland. He died on the 18th December 1831.

BILE. See PHYSIOLOGY, page 4792.

BILFINGER, GEORGE BERNHARD, was born on the 23d January 1693, at Cannstadt in Würtemberg. His father was a Lutheran minister. By a singularity of constitution, hereditary in his family, Bilfinger came into the world with twelve fingers and as many toes. From his earliest years he showed the greatest inclination to learning. He studied in the schools of Blaubeuern and Bobenhausen, and afterwards entered the theological seminary of Tübingen. The works of Wolff, which he studied in order to learn mathematics, soon inspired him with a taste for the Wolffian philosophy and that of Liebnitz,— a passion which made him neglect for some time his other studies. Returning to theology, he wished at least to try to connect it with his favorite science of philosophy; and in this spirit he composed the treatise entitled *Dilucidationes Philosophicæ*, *De Deo*, *Anima Humana*, *Mundo*, etc. He was appointed soon after to the office of preacher at the castle of Tübingen, and of reader in the school of theology. He soon after left for Halle; was afterward professor of logic and metaphysics at St. Petersburg and in 1731 returned to his native country, where he became privy councilor and minister of state. He died at Stuttgart February 18, 1750.

BILL means generally a statement in writing, and is derived from the Latin *bulla*. The word is used in a great many special applications.

BILL, in Congress, is a form of statute submitted to either House, which, after passing both Houses and receiving the assent of the President, becomes an Act..

A BILL OF EXCHANGE is defined as "an unconditional written order from A to B, directing B to pay to C a certain sum of money therein named." A is called the drawer, B the drawee, and C the payee. When the drawer has undertaken to pay the bill he is called the acceptor. Contrary to the general rule in the law of England the benefit of a contract arising on a bill of exchange is assignable, and consideration will be presumed unless the contrary appear. Bills of exchange are believed to have been in use in the 14th century, but the first recorded decision of an English court regarding them occurs in the reign of James I. The courts long regarded them with jealousy as an exception to the common law, and restricted their use to the class of merchants, but their obvious utility overcame the scruples of the judges. The law on this subject has been evolved in a long series of judicial decisions. The following are a few of its leading principles:— A bill to be transferable must contain a direction to the *order* of the payee or to *bearer*. If payable to order it must be transferred by endorsement; but if to bearer, it may be transferred by mere delivery. A *blank* endorsement (*e.g.*, the mere signature of the endorser) makes the bill payable to bearer; a special endorsement directs payment to a person named, or his order. Every endorser of a bill is in effect a new drawer, and is liable to every succeeding holder in default of acceptance or payment. Just as the original drawer contracts to pay the payee, if the acceptor do not, so the endorser contracts that, if the drawer shall not pay the bill, he, on receiving due notice of the bill being dishonored, will pay the holder what the drawee ought to have paid. An endorsement is held to admit "the signature and capacity of every prior party," and an endorser, in default of acceptance or payment, has a right of action against all those whose names were on the bill when it was endorsed to him. When a bill is transferred by delivery without endorsement it is generally regarded as sold, and the instrument is taken with all its risks. There are, however, some exceptions to this rule, as in the case of payment by bill for the precedent debt, &c., and the transferer will be held responsible if he knows at the time of sale that the bills are good for nothing. When a bill is payable to *bearer* it circulates like money, and the *bona fide* possessor is considered the true owner. Bills should be presented as soon as possible to the drawer or his agent for acceptance, which must be in writing on the bill. They should be presented for payment at the proper time, and the laws of commercial countries usually allow three *days of grace* after the day on which the bill becomes due. If the bill is not duly presented by the holder, the antecedent parties are relieved from liability. If the bill is not accepted, or after acceptance not paid, the holder must give *notice of dishonor* to the antecedent parties within a reasonable time, otherwise their liability will be discharged. When a foreign bill is dishonored the custom of merchants requires that it should be *protested*. The protest is a solemn declaration by a notary written under a copy of the bill that payment or acceptance has been demanded and refused. Bills and notes, by the usage of trade, carry interest from the date of maturity. If in an action on a bill it turn out that the bill has been lost, the action may still be maintained provided that an indemnity is given against the claims of other persons upon the instrument. Unless the defendant has obtained leave to appear and has appeared to the action, the plaintiff may sign final judgment for the amount with costs. The defendant, if he wishes to defend the action, must pay the money into court or show by affidavit such facts as may be sufficient to induce the judge to give him leave.

Foreign Bills (as distinguished from Inland Bills) are bills drawn or payable abroad. Foreign bills are usually drawn in sets or parts, each containing a condition to be payable only so long as the others continue unpaid.

When a bill is accepted by the drawee without consideration, and merely in order that the drawer may be able to raise money upon it, it is called an *accomodation* bill. Both parties are liable to the holder; but as between themselves, the drawer is the principal and the acceptor a sort of surety. When acceptance has been refused and the bill protested, a stranger may accept it "*supra protest*, in honor of a drawer or endorser." The effect of this is to render the acceptor liable if the drawer does not pay, and the party for whose honor it was made, and parties antecedent to him, become liable to the acceptor. Payment for the honor of one of the parties may likewise be made by a mere stranger when a bill has been protested for non-payment, who thereupon acquires a claim against such person and all those to whom he could have resorted.

The negotiability of promissory notes and bank cheques is for the most part regulated by the same principles as bills of exchange. A promissory note is a "promise in writing to pay a specified sum at a time therein limited, to a person therein named or his order or to bearer." Cheques which are inland bills of exchange drawn on a banker have become subject to certain peculiar usages. See EXCHANGE.

BILL OF EXCEPTIONS, in law, means a statement of the objections made by counsel during the course of a trial to the rulings of a judge. Especially in criminal trials lawyers seek to multiply objections, as to the admissibility of evidence and indeed on every conceivable point, with a view to getting up a bill of exceptions to be presented to the court of appeal.

BILL OF HEALTH, a certificate signed by consuls or other proper authorities, delivered to the masters of ships at the time of their clearing from port, and specifying the state of health of that port at the time. If no infectious or contagious disease exists a *clear* bill is given; if disease was suspected a *touched* or *suspect* bill is given; if an epidemic, as of cholera or yellow fever, prevailed the bill is *foul*, and the ship will have to go into quarantine.

A BILL OF LADING is a document signed by the master of a general ship and delivered to the owners of goods conveyed therein. It is usually made out in several parts or copies, of which the shipper retains one and sends one or more to the consignee, while the master keeps one for his own guidance.

A BILL OF SALE is an assignment of personal property. It is frequently made by way of security, the property remaining in possession of the vendor. The usage as to commercial bills in the United States varies by statute in the different States.

BILLAUD-VARENNE, JEAN NICOLAS, born at La Rochelle, France, April 23, 1756; became an advocate in Paris and in 1787 joined the Jacobin Club, and took a leading part in the revolutionary movement. He is charged with complicity in the September massacres, and was a violent opponent of Louis XVI. and his family. In 1795 he was condemned to be transported to Cayenne, and remained there twenty years, refusing a pardon offered him by Napoleon, when First Consul. In 1816 he went to New York and thence to Hayti, and he died at Port-au-Prince, June 3, 1819.

BILLETTING. The constitution of the United States provides by its third amendment, adopted in 1791, that "no soldier shall in time of peace be quartered in any house without the consent of the owner; nor in time of war, but in a manner to be prescribed by law." One of the primal causes of the Revolution of 1776 was the attempt of the British government to enforce a Billetting Act.

In European countries the evils of billetting still exist, though modified in England by the Mutiny Act. Under this law all innkeepers and liquor sellers are compelled when called upon by an order from a magistrate to furnish food and sleeping accommodations for soldiers and forage for their horses at a price fixed by law. In time of war, of course, billetting is at the will of the commanding officer.

BILLIARDS is a well-known indoor game of skill, played on a rectangular table with ivory balls, which are driven by means of an ash rod or stick called a "cue," into pockets and against each other according to certain defined rules. Of the origin of billiards comparatively little is known — some considering that the game was invented by the French, and others that it was improved by them out of an ancient German diversion. Even the French themselves are doubtful on the point, some of their writers ascribing the game to the English.

Bouillet says — "Billiards appear to be derived from the game of bowls. It was anciently known in England, where, perhaps, it was invented. It was brought into France by Louis XIV., whose physician recommended this exercise." In another work we read — "It would seem that the game was invented in England." Strutt, a rather doubtful authority, considers it probable that it was the ancient game of Paille-maille on a table instead of on the ground or floor,— an improvement, he says, "which answered two good purposes: it precluded the necessity of the player to kneel or stoop exceedingly when he struck the bowl, and accommodated the game to the limits of a chamber."

The Cue.— The strokes are all made with a cue, which is a long stick of ash, or other hard wood, gradually tapering to the end, which is tipped with leather and rubbed with chalk to prevent it slipping off the surface of the ball struck. The mace or hammer-headed cue, once common, is no longer used, even by ladies. The cue is taken in the right hand, generally between the fingers and thumb, and not grasped in the palm; and with the left hand the player makes a bridge, by resting the wrist and the tips of the fingers on the table, arching the latter, and extending the thumb in such a way as to allow a passage in which the cue may slide.

The Table. — The shape of the table has varied from time to time. At first it was square, with a hole or pocket at each corner to receive the balls driven forward with a cue or mace; then it was lengthened and provided with two other pockets; and occasionally it has been made round, oval, triangular, or octagonal, with or without pockets, according to the game required. It is covered by a fine green cloth, and surrounded by elastic india-rubber cushions. The table must be perfectly level and sufficiently firm to prevent vibration; and its usual height from the floor to the surface is three feet.

The game, as played in America, has taken a distinctive character, both in regard to the manner in which, and the tables on which, it is played. The older American game was the four-ball game (now rarely played by experts), and it was at first played on a six-pocket table, after the English pattern, and then on a four-pocket table, and finally on a pocketless table. Formerly the caroms were combined with winning hazards, losing hazards counting against the player. Caroms and hazards counted two and three points respectively; but latterly, since the abolition of pockets, the points of the game number usually thirty-four, each carom uniformly counting one. At the commencement of the game the players "string for lead," which is done by each simultaneously driving his ball against the bottom cushion, the ball approaching and resting nearer to the head cushion on the rebound deciding the winner, both as to choice of balls and order of play. If the striker fail to hit any ball with his ball he forfeits one to the opposing side, or if he drive his cue ball off the table he forfeits three. If, however, the player's ball be in contact ("froze") with another ball at the time he makes a stroke, he does not forfeit if he fail to strike some other ball. Foul strokes are made when one player plays another's ball; when he plays at a ball in motion; when a player does not withdraw his cue from his ball before that ball comes in contact with another; when a stroke is made while the red ball is off the table and its spot is unoccupied; when a player in making a shot touches his cue-ball twice; when a player in any way obstructs the motion of a ball; when a player has not at least one foot on the floor while making a shot; when a player does not cause a ball in hand to pass outside the string before touching an object ball or a cushion, except when an object ball lies partly outside and partly inside the string; when a player plays directly at a ball inside the string; when a miss is given inside the string when a player is in hand; when a player at some one's suggestion alters his intended stroke.

The three-ball game is played with three balls, two white and one red. The table has three spots, one in center and one each at head and foot of table. The spot at head of table is called the white spot and the one at foot the red spot; the center spot being used only when a ball is forced off the table and the two other spots are occupied. The game is begun by stringing for lead as already described in the four-ball game. Should the first player fail to count, his opponent can play at either ball on the table. A carom consists in hitting both object balls with the cue ball. Each carom scores one. Each miss forfeits one to the opposite side. If a ball jump off the table after counting, the count is good and the ball must be spotted. The foul strokes are about the same as have been given above. When the cue ball is in contact with another the balls are respotted and the player plays ball in hand as at the commencement of the game. The object balls are considered crotched when they lie within a four and one-half inch square at either corner of the table. When in such position three counts only will be allowed unless one or both the object balls be forced out of the square. The crotch has at times on special occasions been enlarged to restrict rail play, but such enlargement is not generally accepted. The cushion carom game is a highly scientific play, it being necessary to a successful carom that the cue ball shall, in the course of the stroke, strike not only both object balls, but the cushion as well. The balk line is another limitation which has been imposed on the older game; in this form of the game a balk line either eight or fourteen inches from the rail is established, and the player is compelled to drive one or both object balls outside the line in order to count. The points of the game are usually thirty-four, fifty or one hundred. In match games various handicaps are agreed on, but the social game is generally played as above described.

In the English game the object of the player is to drive one or other of the balls into one or other of the pockets, or to cause the striker's ball to come into successive contact with two other balls. The one stroke

is known as a hazard, the other as a cannon (or carom); and from hazards and cannons, together with misses, forfeitures and foul strokes, are reckoned the points of the game. When the ball is forced into a pocket the stroke is called a winning hazard; when the striker's ball falls into a pocket after contact with the object ball, the stroke is a losing hazard; and these hazards count two or three to the player's score according as they are made from the white or the red ball — two points for the white, three for the red. Two points are scored for the cannon, three for a *coup* — a term used when the player's ball runs into a pocket without striking a ball; and one point for a miss, whether given purposely or accidentally.

The principal modifications of this game are the four-handed game, which is ordinary billiards by four players in sides of two, each player being allowed to instruct his partner; à la royale, or the game of three; the white winning game, consisting entirely of winning hazards; the white losing game; the red winning game; the red losing game; the cannon game; and the American game.

Pyramids (American fifteen-ball pool) is played by two or more persons — usually each player for himself. It is played with fifteen balls, placed close together in the form of a triangle or pyramid, with the apex toward the player, and a white striking ball. The object of the players is to drive a majority of the balls into the pockets of the table, and each one is generally required to name the pocket into which he intends the ball to go. Failing in this, he loses his shot, and he forfeits one if his cue ball goes into a pocket; if the object ball goes into any other than the pocket named he does not score. In another form of the game the balls are all numbered, from one to fifteen, and the player whose added ball-numbers foot up the highest total is the winner — thus it may happen that a minority of balls may win. In this game the sum of three is deducted from the player's score who pockets the cue ball.

Pin Pool is played with two (or four) white balls and one red ball, together with five small pins, each pin having a number—ranging from one to five. At the beginning of the play each player receives from the marker a ball drawn at random, which marks his order of playing. The object of the game is to knock down the pins after striking a ball, and to do this in such a manner that the numbers of the pins knocked down, added together, shall form, in addition to the private number which the player drew in the beginning of the game, the sum thirty-one. This gives such player the game. But if he exceed thirty-one he "bursts," and must commence again or drop out of the game. He must score thirty-one—no more or less.

BILLITON, or BLITONG, an island of the East Indies, belonging to the Dutch, situated between Sumatra and Borneo, in lat. 3° S. and long. 108° E. It is of a circular form, about 50 miles in length by 45 in breadth; and has an area, according to Melvill van Carnbée, of 2,500 square miles, and a population of 20,000.

BILMA, or KAWAR, a town in the heart of the African desert, and the capital of the wandering tribe called the Tibboos. The place is mean and poor, surrounded with a mud wall.

BILSA, a town of Hindustán, in the territory of Gwálior or the possessions of Sindhiá, situated on the Betwá River. It is inclosed with a stone wall, and defended by square towers and a ditch.

BILSTON, formerly BILSRETON, a market town of England, in the county of Stafford, two and one-half miles southeast of Wolverhampton, indebted for its importance to the iron trade, which it carries on in various departments.

BIMANA (Lat. two-handed), a term first employed by the Göttingen anatomist Blumenbach (1752-1840) to describe the human species in contrast to other mammals. The order was recognized by Cuvier, but in 1863 Huxley showed that the title is deserved by some of the higher apes.

BIMETALLISM is the name given to a monetary system in which both gold and silver are on precisely the same footing as regards mintage and legal tender. The adoption of international bimetallism is advocated not only as a partial remedy for the appreciation of gold, but also as a preventive of fluctuations in the relative values of gold and silver. The United States coins a large amount of silver every year, and it is in this country a legal tender. France and other countries hold large quantities of silver which can still be used as standard money, and which passes nominally at about $1.20 per ounce, whilst the market value may be only 86 cents. Any attempt to adopt gold as the sole standard throughout the world, would, in the opinion of many financiers, produce a disastrous crisis, and the choice seems to lie between an international agreement and the reliance on the self-interest of each particular nation to make no further change.

BINARY THEORY, in Chemistry, assumes that all salts contain merely two substances, which either are both simple, or of which one is simple and the other a compound playing the part of a simple body. This theory was adopted by Liebig, but is now abandoned.

BINGEN, the ancient *Bingium*, a town of the grand-duchy of Hesse-Darmstadt, in the province of Rhenish Hesse, fifteen miles west of Mentz. It is situated almost opposite Rüdesheim, on the left bank of the Rhine, at the confluence of the Nahe (or *Nava*), which is crossed near its mouth by an iron railway bridge resting on old Roman foundations. A considerable trade is carried on in wine, grain, and cattle; and tobacco, starch, and leather are manufactured. A short way down the Rhine is the Bingerloch, a famous whirlpool, the dangers of which were almost removed by blastings undertaken by the Prussian Government in 1834; while about half-way between it and the town rises on a rock, in the middle of the stream, the tower of Bishop Hatto. On a height immediately to the southeast is the ruined castle of Klopp, originally founded by Drusus, and higher still on the Rochusberg the celebrated chapel of St. Roch. Population, 5,938.

BINGHAMTON, the capital of Broome county, N. Y., is situated on the Susquehanna river, near the mouth of the Chenango river, also on the Susquehanna division of the Delaware and Hudson canal, Delaware, Lackawanna and Western, and the New York, Lake Erie and Western roads, and on the Chenango canal. It contains a dozen churches, seven banks, three daily and five weekly papers; a high school, the Dean College, a Catholic academy, etc., and is the location of the New York State Inebriate Asylum, which occupies a massive structure of brick and stone. The manufactures include cigars, steam engines, machinery, scales, iron-work, oils, leather and leather goods, sash, doors and blinds, planed lumber, etc. The population in 1890 was returned at 35,093.

BINGHAM, JOSEPH, a learned scholar and divine, was born at Wakefield, in Yorkshire, England, in September, 1668. He was educated at University College, Oxford, of which he was made fellow in 1689, and college tutor in 1691. He died August 17, 1723.

BINGLEY, a thriving market-town in the West Riding of Yorkshire, on the River Aire, five and one-half miles from Bradford, on the Midland railway.

BINNEY, THOMAS, an English Nonconformist

divine, was born at Newcastle-on-Tyne in 1798, and died February 24, 1874. His first pastoral charge was that of the Congregational church at Newport, Isle of Wight, to which he was inducted in 1824. Five years later—in 1829—he accepted a call to the historic Weigh House chapel, London. Here he at once established what proved to be a lasting popularity, and it was found necessary to build a much larger place of worship on Fish Street Hill, to which the congregation removed in 1834. His liberality of view and breadth of ecclesiastical sympathy entitle him to rank on questions of Nonconformity among the most distinguished of the school of Richard Baxter.

BINOMIAL, in Algebra, is a quantity consisting of two terms or parts—*e. g.*, $a+b$, or 9—5; a *trinominal* consists of three terms, as $a+b+c$, or 10+5—8. The Binomial Theorem gives a remarkable series or analytical formula by which any power of a binomial can be expressed and developed. Thus, the eighth or any other power of $a+b$ can be written without the actual multiplication of $a+b$ by itself for the given number of times Newton was the first to demonstrate its truth for all exponents. The discovery is engraved on his tomb.

BINTANG, one of the islands which mark the south side of the Strait of Singapore. The latter is the exit toward China and Siam of the great channel which we call the Straits of Malacca. Bintang has an area of about 440 square miles, and is surrounded by many rocks and small islands, making navigation dangerous.

BIOGENESIS, as opposed to Abiogenesis, is the name used by Huxley for the theory that living matter always arises by the agency of preëxisting living matter.

BIOGRAPHY is the artistic representation in continuous narrative of the life and character of a particular individual. When written by the subject himself, it is Autobiography. Dr. Johnson thought every man's life could be best written by himself, and doubtless so it could if every man were a Dr. Johnson, and yet, probably, the most interesting of all biographies is that of Johnson, as written by Boswell.

BIOLOGY. The Biological sciences are those which deal with the phenomena manifested by living matter; and though it is customary and convenient to group apart such of these phenomena as are termed mental, and such of them as are exhibited by men in society, under the heads of Psychology and Sociology, yet it must be allowed that no natural boundary separates the subject matter of the latter sciences from that of Biology.

These distinctive properties of living matter are—

1. Its *chemical composition*—containing, as it invariably does, one or more forms of a complex compound of carbon, hydrogen, oxygen, and nitrogen, the so-called protein (which has never yet been obtained except as a product of living bodies) united with a large proportion of water, and forming the chief constituent of a substance which, in its primary unmodified state, is known as *protoplasm*.

2. Its *universal disintegration and waste by oxidation; and its concomitant redintegration by the intussusception of new matter*.

A process of waste resulting from the decomposition of the molecules of the protoplasm, in virtue of which they break up into more highly oxidated products, which cease to form any part of the living body, is a constant concomitant of life. There is reason to believe that carbonic acid is always one of these waste products, while the others contain the remainder of the carbon, the nitrogen, the hydrogen, and the other elements which may enter into the composition of the protoplasm.

This new matter taken in to make good this constant loss is either a ready-formed protoplasmic material, supplied by some other living being, or it consists of the elements of protoplasm, united together in simpler combinations, which consequently have to be built up in protoplasm by the agency of the living matter itself. In either case the addition of molecules to those which already existed takes place, not at the surface of the living mass, but by interposition between the existing molecules of the latter. If the processes of disintegration and reconstruction which characterize life balance one another, the size of the mass of living matter remains stationary, while, if the reconstructive process is the more rapid, the living body *grows*.

3. Its *tendency to undergo cyclical changes*.

In the ordinary course of nature, all living matter proceeds from pre-existing living matter, a portion of the latter being detached and acquiring an independent existence. The new form takes on the characters of that from which it arose; exhibits the same power of propagating itself by means of an offshoot; and, sooner or later, like its predecessor, ceases to live, and is resolved into more highly oxidated compounds of its elements.

Thus an individual living body is not only constantly changing its substance, but its size and form are undergoing continual modifications, the end of which is the death and decay of that individual; the continuation of the kind being secured by the detachment of portions which tend to run through the same cycle of forms as the parent. No forms of matter which are either not living, or have not been derived from living matter, exhibit these three properties, nor any approach to the remarkable phenomena defined under the second and third heads. But in addition to these distinctive characters, living matter has some other peculiarities, the chief of which are the dependence of all its activities upon moisture and upon heat, within a limited range of temperature, and the fact that it usually possesses a certain structure, or organization.

As has been said, a large proportion of water enters into the composition of all living matter; a certain amount of dying arrests vital activity, and the complete abstraction of this water is absolutely incompatible with either actual or potential life. But many of the simpler forms of life may undergo desiccation to such an extent as to arrest their vital manifestations and convert them into the semblance of not-living matter, and yet remain potentially alive. That is to say, on being duly moistened they return to life again. And this revivification may take place after months, or even years, of arrested life.

The properties of living matter are intimately related to temperature. Not only does exposure to heat sufficient to decompose protein matter destroy life, by demolishing the molecular structure upon which life depends; but all vital activity, all phenomena of nutritive growth, movement, and reproduction are possible only between certain limits of temperature. As the temperature approaches these limits the manifestations of life vanish, though they may be recovered by return to the normal conditions; but if it pass far beyond these limits, death takes place.

This much is clear; but it is not easy to say exactly what the limits of temperature are, as they appear to vary in part with the kind of living matter, and in part with the conditions of moisture which obtain along with the temperature. The conditions of life are so complex in the higher organisms, that the experimental investigation of this question can be satisfactorily attempted only in the lowest and simplest forms. It appears that, in the dry state, these are able to bear far greater extremes both of heat and cold than in the moist condition. Thus Pasteur found that the spores of fungi, when dry, could be exposed without destruction to a

temperature of 120°–125° C. (248°–257° Fahr.), while the same spores when moist, were all killed by exposure to 100° C. (212° Fahr.) On the other hand, Cagniard de la Tour found that dry yeast might be exposed to the extremely low temperature of solid carbonic acid (–60° C. or –76° Fahr.) without being killed. In the moist state he found that it might be frozen and cooled to –5° C. (23° Fahr.), but that it was killed by lower temperatures. However, it is very desirable that these experiments should be repeated, for Cohn's careful observations on *Bacteria* show that, though they fall into a state of torpidity, and like yeast, lose all their powers of exciting fermentation at, or near, the freezing point of water, they are not killed by exposure for five hours to a temperature below –10° C. (14° Fahr.), and, for some time, sinking to 18° C. (–0°.4 Fahr.) Specimens of *Spirillum voutans*, which had been cooled to this extent, began to move about some little time after the ice containing them thawed. But Cohn remarks that *Euglenæ*, which were frozen along with them, were all killed and disorganized, and that the same fate had befallen the higher *Infusoria* and *Rotifera*, with the exception of some encysted *Vorticellæ*, in which the rhythmical movements of the contractile vesicle showed that life was preserved.

Thus it would appear that the resistance of living matter to cold depends greatly on the special form of that matter, and that the limit of the *Euglena*, simple organism as it is, is much higher than that of the *Bacterium*.

Considerations of this kind throw some light upon the apparently anomalous conditions under which many of the lower plants, such as *Protococcus* and the *Diatomaceæ*, and some of the lower animals, such as the *Radiolaria*, are observed to flourish. *Protococcus* has been found, not only on the snows of great heights in temperate latitudes, but covering extensive areas of ice and snow in the Arctic regions, where it must be exposed to extremely low temperatures,—in the latter case for many months together; while the Arctic and Antarctic seas swarm with *Diatomaceæ* and *Radiolaria*. It is on the *Diatomaceæ*, as Hooker has well shown, that all surface life in these regions ultimately depends; and their enormous multitudes prove that their rate of multiplication is adequate to meet the demands made upon them, and is not seriously impeded by the low temperature of the waters, never much above the freezing point, in which they habitually live.

The maximum limit of heat which living matter can resist is no less variable than its minimum limit. Kühne found that marine *Amœbæ* were killed when the temperature reached 35° C. (95° Fahr.), while this was not the case with fresh-water *Amœbæ*, which survived a heat of 5°, or even 10°, C. higher. And *Actinophrys Eichornii* was not killed until the temperature rose to 44° or 45° C. *Didymium serpula* is killed at 35° C.; while another *Myxomycete*, *Æthalium septicum*, succumbs only at 40° C.

It appears to be very generally held that the simpler vegetable organisms are deprived of life at temperatures as high as 60° C. (140° Fahr.); but *Algæ* have been found living in hot springs at much higher temperatures, namely, from 168° to 208° Fahr., for which latter surprising fact we have the high authority of Descloiseaux. It is no explanation of these phenomena, but only another mode of stating them, to say that these organisms have become "accustomed" to such temperatures. If this degree of heat were absolutely incompatible with the activity of living matter, the plants could no more resist it than they could become "accustomed" to being made red hot. Habit may modify subsidiary, but cannot affect fundamental, conditions.

Recent investigations point to the conclusion that the immediate cause of the arrest of vitality, in the first place, and of its destruction, in the second, is the coagulation of certain substances in the protoplasm, and that the latter contains various coagulable matters, which solidify at different temperatures. And it remains to be seen, how far the death of any form of living matter, at a given temperature, depends on the destruction of its fundamental substance at that heat, and how far death is brought about by the coagulation of merely accessory compounds.

It may be safely said of all those living things which are large enough to enable us to trust the evidence of microscopes, that they are heterogeneous optically, and that their different parts, and especially the surface layer, as contrasted with the interior, differ physically and chemically; while, in most living things, mere heterogeneity is exchanged for a definite structure, whereby the body is distinguished into visibly different parts, which possess different powers or functions. Living things which present this visible structure are said to be *organized;* and so widely does organization obtain among living beings, that *organized* and *living* are not unfrequently used as if they were terms of co-extensive applicability. This, however, is not exactly accurate, if it be thereby implied that all living things have a visible organization, as there are numerous forms of living matter of which it cannot properly be said that they possess either a definite structure or permanently specialized organs: though, doubtless, the simplest particle of living matter must possess a highly complex molecular structure, which is far beyond the reach of vision.

The broad distinctions which, as a matter of fact, exist between every known form of living substance and every other component of the material world, justify the separation of the biological sciences from all others. But it must not be supposed that the differences between living and not-living matter are such as to justify the assumption that the forces at work in the one are different from those which are to be met with in the other. Considered apart from the phenomena of consciousness, the phenomena of life are all dependent upon the working of the same physical and chemical forces as those which are active in the rest of the world. It may be convenient to use the terms "vitality" and "vital force" to denote the causes of certain great groups of natural operations, as we employ the names of "electricity" and "electrical force" to denote others; but it ceases to be proper to do so, if such a name implies the absurd assumption that "electricity" and "vitality" are entities playing the part of efficient causes of electrical or vital phenomena. A mass of living protoplasm is simply a molecular machine of great complexity, the total results of the working of which, or its vital phenomena, depend,—on the one hand, upon its construction, and, on the other, upon the energy supplied to it; and to speak of "vitality" as anything but the name of a series of operations as if one should talk of the "horology" of a clock.

Living matter, or protoplasm and the products of its metamorphosis, may be regarded under four aspects:—

(1.) It has a certain external and internal form, the latter being more usually called structure;

(2.) It occupies a certain position in space and in time;

(3.) It is the subject of the operation of certain forces, in virtue of which it undergoes internal changes, modifies external objects, and is modified by them; and

(4.) Its form, place, and powers are the effects of certain causes.

In correspondence with these four aspects of its subject, biology is divisible into four chief subdivisions —1.

Morphology; II. Distribution; III. Physiology; IV. Ætiology.

BION, the second of the three Greek bucolic poets, was born in the neighborhood of Smyrna,—according to Suidas, at Phlossa on the River Meles. The few facts known to us of his life are to be gathered from the beautiful *Epitaphios Bionos* of his friend and scholar Moschus. From his account it appears that Bion left his native country and, during the later part of his life, resided in Sicily and cultivated the form of poetry peculiarly associated with that island. He was contemporary with Theocritus and somewhat older than Moschus. His death was due to poison, administered to him by some jealous rivals who afterwards suffered the penalty of their crime. The subjects of his verses are described by Moschus as "Love and Pan;" but though his works are included in the general class of bucolic poetry, they have little of the pastoral imagery and description characteristic of Theocritus. They breathe a more refined air of sentiment, and show traces of the overstrained reflection frequently observable in later developments of pastoral poetry. The longest and best of his extant works is the *Lament for Adonis* the prototype of many modern poems. His other pieces are short and in many cases fragmentary. Two of the Idylls of Theocritus are frequently ascribed to him.

BIOT, Jean Baptiste, French physicist, was born at Paris, 21st April 1774. After leaving school he served for a short time in the artillery, but again resumed his studies at the École Polytechnique. He distinguished himself in mathematics, and was appointed to a professorship at Beauvais. There he carried on his researches with the greatest assiduity, and gained the acquaintance and friendship of Laplace, from whom he solicited and obtained the favor of reading the proof-sheets of the *Mécanique Céleste*. In 1800 he was recalled to Paris as professor of physics at the Collége de France. Three years later he was elected a member of the Academy of Sciences, a distinction rarely accorded to one so young as he was. In 1803 Biot, in concert with Arago, investigated the refracting properties of gases, and in the following year accompanied Gay-Lussac in his balloon ascent. He was again associated with Arago in the great undertaking of the measurement of an arc of the meridian in Spain, and at a later date (1817–18) he crossed over to Britain and measured carefully the length of the seconds' pendulum along an arc extending to the extreme north of Shetland. In 1814 he was made a chevalier of the Legion of Honor, an order of which he became a commander in 1849. He was a member of the French Academy and of the Academy of Inscriptions and Belles-Lettres, as well as of most foreign scientific societies. In 1840 he received the Rumford gold medal for his researches in polarized light. He died at an advanced age in 1862. Biot's researches extended to almost every branch of physical science; but his greatest discoveries were made in the department of optics, mainly in connection with the polarization of light. He had a thorough command of the best methods of analysis, and applied mathematics rigidly and successfully to physical phenomena.

BIR, or Birejik (the former being its Arabic and the latter its Turkish name), a town of Asiatic Turkey, in the pashalik of Rakka, built on the side of a chalky range of hills that skirts the left bank of the Euphrates, about 90 miles N. E. of Aleppo.

BIRBHUM, a district of British India, within the Bardwán division, under the lieutenant-governor of Bengal, is bounded on the N. by the districts of Santál Parganás and Bhágalpur; on the E. by the districts of Murshidábád and Bardwán; on the S. by the River Ajai, separating it from the district of Bardwán; and on the W, by the districts of the Santál Parganás.

Bírbhúm, or Surí, the principal town and administrative headquarters of the district of the same name.

BIRCH (*Betula*), a genus of arboraceous plants constituting the principal portion of the natural order *Betulaceæ*. The various species of birch are mostly trees of medium size, but several of them are merely shrubs. They are as a rule of a very hardy character, thriving best in northern latitudes,—the trees having round, slender branches, and serrate deciduous leaves, with barren and fertile catkins on the same tree and winged seeds. The bark in most of the trees occurs in fine soft membranous layers, the outer cuticle of which peels off in thin white papery sheets. The common birch (*B. alba*) grows throughout the greater part of Europe, and also in Asia Minor, Siberia, and North America, reaching in the north to the extreme limits of forest vegetation, and stretching southward on the European continent as a forest tree to 45° N. lat., beyond which birches occur only in special situations or as isolated trees. It is one of the most wide-spread and generally useful of forest trees of Russia, occurring in that empire in vast forests, in many instances alone, and in other cases mingled with pine, poplars, and other forest trees. The wood is highly valued by carriage-builders, upholsterers, and turners, on account of its toughness and tenacity, and in Russia it is prized as firewood and a source of charcoal. A very extensive domestic industry in Russia consists in the manufacture of wooden spoons, which are made to the extent of 30,000,000 annually, mostly of birch. Its pliant and flexible branches are made into brooms; and in ancient Rome the fasces of the lictors, with which they cleared the way for the magistrates, were made up of birch rods. A similar use of birch rods has continued among pedagogues to times so recent that the birch is yet, literally or metaphorically, the instrument of school-room discipline. The bark of the common birch is much more durable, and industrially of greater value, than the wood. It is impermeable to water, and is therefore used in northern countries for roofing, for domestic utensils, for boxes and jars to contain both solid and liquid substances, and for a kind of bark shoes, of which it is estimated 25 millions of pairs are annually worn by the Russian peasantry. The jars and boxes of birch bark made by Russian peasants are often stamped with very effective patterns. By dry distillation the bark yields an empyreumatic oil, called *diogott* in Russia used in the preparation of Russia leather; to this oil the peculiar pleasant odor of the leather is due. The bark itself is used in tanning; and by the Samoiedes and Kamchatkans it is ground up and eaten on account of the starchy matter it contains. A sugary sap is drawn from the trunk in the spring before the opening of the leaf-buds, and is fermented into a kind of beer and vinegar. The whole tree, but especially the bark and leaves, has a very pleasant resinous odor, and from the young leaves and buds an essential oil is distilled with water. The leaves are used as fodder in northern latitudes. The species which belong peculiarly to America (*B. lenta*, *excelsa*, *nigra*, *papyracea*, &c.) are generally similar in appearance and properties to *B. alba*, and have the same range of applications. The largest and most valuable is the black birch (*B. lenta*), found abundantly over an extensive area in British North America, growing 60 to 70 feet high, and 2 to 3 feet in diameter. It is a wood most extensively used for furniture and for carriage building, being tough in texture and bearing shocks well, while much of it has a handsome grain, and it is susceptible of a fine polish. The bark, which is dark brown or reddish, and very durable, is used by Indians and backwoodsmen in the same way as the bark of *B.*

alba is used in Northern Europe. Concerning the canoe or paper birch (*B. papyracea*), which some regard as a variety of the white birch, Mr. Bernard R. Ross, of the Hudson's Bay Company, writes: — "The canoe or paper birch is found as far north as 70° N. on the American continent, but it becomes rare and stunted in the Arctic circle. It is a tree of the greatest value to the inhabitants of the Mackenzie River district in British North America. Its bark is used for the construction of canoes, and for drinking-cups, dishes, and baskets. From the wood, platters, axe handles, snow-shoe frames, and dog sledges are made, and it is worked into articles of furniture which are susceptible of a good polish. The sap which flows in the spring is drawn off and boiled down to an agreeable spirit, or fermented with a birch-wine of considerable alcoholic strength. The bark is also used by the Christianized American Indians as a substitute for paper."

BIRCH, THOMAS, historical and biographical writer, and one of the early trustees and benefactors of the British Museum, was born in London, November 23, 1705. He was the son of a coffee-mill maker, and was to have followed his father's business; but his active mind and ambition of higher pursuits led him into the paths of literature. His parents were members of the Society of Friends, and therefore he had not the advantages of a university training. But by persevering application to study and to teaching he qualified himself for the ministry of the Church of England. In 1728 he obtained a curacy, and in the same year he married. His wife died in the following year. He was ordained priest in December 1731, and was soon after recommended to the favor of Philip Yorke, then attorney-general, afterwards Lord Chancellor and earl of Hardwicke, to whom he owed his successive preferments in the church. His first benefice was the vicarage of Ulting in Essex. In 1734 he was appointed domestic chaplain to the earl of Kilmarnock, who was beheaded for his share in the rebellion of '45. He afterwards held successively benches in Pembrokeshire, Gloucestershire, and the city of London. His last church preferment was to the rectory of Depden in Essex, to which he was presented in February 1761. In his latter years he was appointed chaplain to the princess Amelia. His literary attainments procured him election as a fellow of the Royal Society in February 1735, and in the following December he was chosen a member of the Society of Antiquaries. He held the office of Secretary to the Royal Society for thirteen years 1752-1765. From the university of Aberdeen he received the degrees first of M.A,, and afterwards (1753) of D.D. The degree of D.D. was also conferred on him about the same time by the archbishop of Canterbury. Dr. Birch was engaged in a large number of literary undertakings. His appetite and his capacity for hard work were extraordinary. Besides his diversified labors of compilation and editing, he transcribed many volumes in the library of Lambeth Palace, and carried on an extensive correspondence with literary men. He was an early riser; and amidst all his labors he found time to take part in social enjoyments. He was only in his sixty-first year when he was killed by a fall from his horse in Hampstead Road, January 9, 1766. He bequeathed his books and manuscripts, with part of his pictures and prints, to the British Museum. The rest of his property, in value about £500, he gave to be invested in Government securities, the interest to be applied in augmenting the salaries of the three assistant librarians.

BIRD, WILLIAM, an English composer, and one of the best organists of his time, was born about 1540, and died at London, 4th July 1623. He was appointed organist of Lincoln cathedral in 1563; and in 1575 he and his master Tallis were gentlemen of the chapel royal, and organists to Queen Elizabeth. Bird was the earliest English composer of madrigals, and some of his numerous sacred compositions are still much esteemed. Most of them were published during his lifetime under a patent from Queen Elizabeth, which secured to him and Tallis the sole right to print and sell music. Between 1575 and 1611 there were issued under this patent eight different collections of his work, with such titles as *Cantiones Sacræ; Gradualia; Psalms, Songs, and Sonnets*, &c. The vocal canon *Non nobis Domine*, generally attributed to him, is well known, and often sung. He also wrote a number of pieces for Queen Elizabeth's Virginal Book, and other similar collections. In his compositions there is a freedom and elegance rarely found in the music of his period.

BIRDS, a little examination will show that the groups made by consideration of any, even the most important, morphological modifications, cannot be *superimposed upon* groups made by reference to the whole sum of the characters of the Bird. This may be easily explained. About half the known birds, 5000 or thereabouts, belong, according to G. R. Gray, to Professor Huxley's group, the *Coracomorphæ*. These birds undergo a peculiar metamorphosis of the naso-palatal structures, and are called by Professor Huxley the *Ægithognathæ* on that account. Now all the *Coracomorphæ* have the ægithognathous palate, but so also have the *Cypselidæ*, or Swifts, which are placed by this author with the Humming-birds and Goatsuckers, both of which groups are simply schizognathous. Moreover, below the Passerine types, and only next above the Semistruthious Tinamous, we find the Hemipods, *Turnicidæ*, or *Turnicimorphæ*, and these have an ægithognathous palate. So also has another type, *Thinocorus*, which lies on the same low zoological level as the Hemipods. This latter bird is essentially a small Geranomorph, but it is below the true Cranes, and unites in its palate characters belonging to the Ostriches below it and the Passerines which ascend, zoologically far above it.

The difficulty of applying this very valuable morphological grouping, and making it fit in with one that is more generally and distinctively zoological (that is, having reference to every character, external and internal), does not take away anything of real value from it. To the anatomist such a mode of viewing the various types is perfectly natural, however hard it may be to satisfy the pure zoologist as to its great value. Certainly, the structures of the skull and face govern the whole body, as it were; every other part of the organism corresponds to what is observable there. Nor must it be forgotten that the true mode of studying any kind of creature is that of its *development;* and the head undergoes the most remarkable morphological changes.

It will seem contradictory to assert the great uniformity of the skulls of Birds, and indeed of the Birds themselves. Yet so it is; and the countless modifications that offer themselves for observation are gentle in the extreme. One form often is seen to pass into another by almost insensible gradations. One thing is certain, namely, that an anatomist not familiar with this class, and coming to its study fresh from the Reptiles, would find himself at fault at every turn; for he would see changes altogether as great as if he had passed from the Helminthoid types and from mere *larvæ* and *pupæ* of the Insects to the (to him supposably) unthought-of *imagines* that spring from those low and worm-like stages.

In the rest of the Birds' organization abundant evidence of the same specialization will be seen. The mind

fails to desire more beauty or to contemplate more exquisite adaptations. An almost infinite variety of Vertebrate life is to be found in this class. Of its members some dig and bury their germs, which rise again in full plumage, whilst others watch and incessantly feed their tender brood in the shady covert or "on the crags of the rock and the strong place." In locomotion some walk, others run, or they may wade, swim, plunge or dive, whilst most of them "fly in the open firmament of heaven."

The spinal column of birds contains numerous and well-ossified vertebræ, a considerable number of which (more than six) are ankylosed together to form a sacrum. Of the vertebræ which enter into the composition of this complex bone, however, not more than from three to five can be regarded as the homologues of the sacral vertebræ of a Crocodilian or Lacertilian Reptile. The rest are borrowed, in front, from the lumbar and dorsal regions; behind, from the tail. The cervical region of the spine is always long; and its vertebræ, which are never fewer than eight, and may be as many as twenty-three, are, for the most part, large in proportion to those of the rest of the body.

The sternum in Birds is a broad plate of cartilage which is always more or less completely replaced in the adult by membrane bone. It begins to ossify by, at fewest, two centres, one on each side, as in the *Ratitæ*. In the *Carinatæ* it usually begins to ossify by five centres, of which one is median for the keel, and two are in pairs for the lateral parts of the sternum. Thus the sternum of a Chicken is at one time separable into five distinct bones.

The fore-limb of a Bird, when in a state of rest exhibits a great change of position, if it be compared with that of an ordinary Reptile; and the change is of a character similar to, but in some respects greater, than that which the arm of a man presents when compared with the fore-limb of a quadrupedal Mammal. The humerus lies parallel with the axis of the body, its proper ventral surface looking outwards. The fore-arm is in a position midway between pronation and supination, and the manus is bent back upon the ulnar side of the fore-arm in a position not of flexion but of abduction.

The *pelvis* of a Bird is remarkable for the great elongation, both anteriorly and posteriorly, of the iliac bones, which unite with the whole length of the edges of the sacrum, and even extend forwards over the posterior ribs of the dorsal region.

The upper articular head of the *femur* is rounded, and its axis is almost at right angles with the body of the bone; a structure which is not found in ordinary *Reptilia*, but exists in the *Iguanodon* and other *Ornithoscelida*.

The *fibula* of Birds is always imperfect, ending in a mere style below. Generally, it is decidedly shorter than the tibia, but it has the same length as that bone in some Penguins. The *tibia*, or rather "tibio-tarsus," is a highly characteristic bone. Its proximal end is expanded, and produced anteriorly, into a great *cnemial* process as in *Dinosauria*.

The cutaneous muscles of Birds are well developed, and form broad expansions in various parts of the body. Special bundles of muscular fibres pass to the great quill feathers of the tail and wings, and others to the *patagium*, a fold of integument which stands between the trunk and brachium behind and between the brachium and ante-brachium in front.

Thus in all birds possessing the power of flight, the *pectoralis major*, the chief agent of the downward stroke of the wing, is very large and thick, taking its origin from the whole length, and a great part of the depth, of the keel of the sternum.

The brain fills the cavity of the skull, and presents a well-developed cerebellum; a mesencephalon, divided above into two optic lobes; and relatively large prosencephalic hemispheres, which attain a considerable size but never conceal the optic lobes.

Birds possess nasal glands, which attain a large size, and lie more usually upon the frontal bone, or in the orbits, than in the nasal cavity.

The eye in many Birds, as in the extinct *Ichthyosauria*, attains very great absolute and relative dimensions.

In the organs of hearing, the Bird is best studied as a culmination of the *Sauropsida*.

Only *Crocodilia* and *Aves* possess a rudiment of an external ear.

In the *Crocodilia* and in *Aves* the walls of the stomach are very muscular, and the muscular fibres of each side radiate from a central tendon or aponeurosis. The thickening of the muscular tissue of the stomach attains its maximum in the Graminivorous Birds; and it is accompanied by the development of the epithelium into a dense and hard coat, adapted for crushing the food of these animals. Birds commonly aid the triturating power of this gastric mill by swallowing stones; but the habit is not confined to them, Crocodiles having been observed to do the same thing.

In Birds, the venous and arterial blood currents communicate only in the pulmonary and systemic capillaries. The auricular and ventricular are complete, as in the *Crocodilia;* but the right ventricle only gives off the pulmonary artery, the left aortic arch has disappeared, and the right arch becomes the most important of all the arches.

The lungs are firmly fixed on each side of the vertebral column, the dorsal surface of each lung being moulded to the super-jacent vertebræ and ribs. The muscular fibres of the diaphragm arise from the ribs outside the margins of the lungs, and form the vertebral column, and end in an aponeurosis upon the ventral surface of the lungs.

The kidneys are composed of a number of lobules of unequal sizes, and these are packed in the concavities of the pelvis, in the same manner as the lungs are packed in the regular intercostal spaces of the upper part of the thorax. The ureters, as in the Reptiles, open directly into the cloaca; but there is no urinary bladder. The *bursa Fabricii* opens into the cloaca above its hinder part.

The testes lie on each side the foremost lobes of the kidneys. They are very small in mid-winter, and largest by the middle of April.

The feathers are of various kinds. Those which exhibit the most complicated structure are called *pennæ*, or *contour feathers*, because they lie on the surface and determine the contour of the body.

The contour feathers are distributed evenly over the body only in a few Birds, as the *Ratitæ*, the Penguins, and some others. Generally, the pennæ are arranged in definitely circumscribed patches or bands, between which the integument is either bare or covered only with down.

FOSSIL BIRDS.

Footprints, or casts of footprints, at the time of their discovery and long afterwards supposed to be those of Birds, were found about the year 1835 in the Triassic formation of the valley of the Connecticut in New England, and were described by Messrs. Deane and Marsh.

The fossils of the Paris Basin and its coeval deposits deserve fuller notice. First brought to light at Montmartre towards the end of the last century, many of the remains fell under the notice of Cuvier, and were by him

determined in a manner more or less exact. Following his investigations, the labors of MM. Gervais, Blanchard, and Desnoyers considerably added to our knowledge of these ornitholites, till finally M. Alphonse Milne-Edwards, having carefully gone over all the specimens discovered, refers them to the genera *Agnopterus*, *Cormoranus* (*i.e.*, *Phalacrocorax*), *Coturnix* (2 spp.), *Falco*, *Gypsornis*, *Leptosomus* (a form now only known from Madagascar), *Limosa*, *Palæocircus*, *Palæortyx*, *Pelidna*, *Rallus*, *Sitta*, and *Tringa* (*?*). Of these are extinct the first, which seems to have been in some measure allied to the Flamingoes (*Phœnicopterida*); the fifth, a Ralline form; and the eighth and ninth, belonging to the diurnal Birds-of-prey and the *Gallinæ* respectively. The footprints of at least seven more species of birds have also been recognized in the same beds, so famed for the remains of *Anoplotherium*, *Palæotherium*, and their contemporaries, which were resuscitated by the great Cuvier.

A great number of Birds' bones have been discovered in caves, and among them some bearing marks of human workmanship. In France we have first a large and extinct species of Crane (*Grus primigenia*), but more interesting than that are the very numerous relics of two species, the concomitants even now of the Reindeer, which were abundant in that country at the period when this beast flourished there, and have followed it in its northward retreat. These are the Snowy Owl (*Oyctea scandiaca*), and the Willow-Grouse (*Lagopus albus*).

SUBFOSSIL BIRDS.

At an uncertain but (geologically speaking) recent epoch in Madagascar, there flourished huge birds of Struthious affinities. The first positive evidence of their former existence was made known in 1851 by M. Is. Geoffroy St. Hilaire, who gave the name of *Æpyornis maximus* to the species which had laid an enormous egg, sent to Paris a short time before; and the discovery of some bones of corresponding magnitude soon after proved to all but the prejudiced the kinship of the producer of this wonderful specimen, which not unnaturally recalls the mythical Roc that figures so largely in Arabian tales. Three, if not four, well-marked species of this genus have now been characterized from remains found in the drifted sands of the southern part of that island.

The most remarkable of birds recently extirpated is the Dodo (*Didus ineptus*), which, on the discovery of Mauritius by the Portuguese under Mascaregnas in the beginning of the 16th century, was found to inhabit that island. Clumsy, flightless, and defenceless, it soon succumbed, not so much to the human invaders of its realm as to the domestic beasts which accompanied them, and there gaining their liberty, unchecked by much of the wholesome discipline of nature, ran riot, to the utter destruction of no inconsiderable portion of the Mauritian fauna.

MIGRATION.

Most strangely and unaccountably confounded by many writers with the subject of Distribution is that of Migration. True it is that owing to the vast powers of locomotion possessed by nearly all Birds, we have individuals belonging in the main to certain groups, but by no means always confined to them, straying from their proper quarters and occurring in places far removed, not only from the land of their birth, but from the country whither they are ordinarily bound in their journeys, to reach which is the object wherefore such journeys are undertaken. It may be that in some measure this erraticism is governed by fixed laws, and indeed indication is not wanting that such laws exist, though as yet we know much too little to lay them down with any approach to confidence. But it is obvious on reflection that granting the existence of most rigorous laws of this kind — determining the flight of every winged vagabond — they must be very different from those which are obeyed by Birds commonly called "Migratory," and migrating year after year according to a more or less fixed rule from one locality to another with the seasons as they roll. The former laws would seem to be created or controlled by purely external circumstances, which if they possess any periodicity at all possess a periodicity of cycles, and are most likely dependent in the main on cycles of the weather, but on this point observation has not yet supplied us with the means of avoiding speculation. We may indeed say almost without much risk of error that so many individuals of a foreign species — whether North-American or Asiatic — will occur in Great Britain so many times in the course of a term of years; but, though we may safely predict that if they appear at all they will do so at a certain season, it is impossible to make a forecast as to the year in which an example will turn up, or whether in one year some half-dozen may or may not occur. At present we can but attribute the appearance of foreign stragglers on our shores, and no doubt the same may be said of other countries, to the influence of storms which have driven the wanderers from their course, and though other more remote causes may possibly be assigned, there seems to be none but this on which we can safely rely. Consequently until the periodicity of storms is brought within our knowledge we must be content to abide in our ignorance of the laws which govern the appearance of the strangers.

But returning to the subject of Migration proper, distinguished as it ought to be from that of the more or less accidental occurrence of stray visitors from afar, we have here more than enough to excite our wonder, and indeed are brought face to face with perhaps the greatest mystery which the whole animal kingdom presents —a mystery which attracted the attention of the earliest writers, and can in its chief point be no more explained by the modern man of science than by the simple-minded savage or the poet or prophet of antiquity. Some facts are almost universally known and have been the theme of comment in all ages and in all lands. The Hawk that stretches her wings toward the south is as familiar to the latest Nile-boat traveller or dweller on the Bosphorus as of old to the author of the book of Job. The autumnal thronging of myriads of Waterfowl by the rivers of Asia is witnessed by the modern sportsman as it was of old by Homer. Anacreon welcomed the returning Swallow, in numbers which his imitators of the colder north, to whom the associations connected with it are doubly strong, have tried in vain to excel. The Indian of the Fur-Countries in forming his rude calendar names the recurring moons after the Birds-of-passage whose arrival is coincident with their changes.

On one point and one only in connection with this subject can we boast ourselves to be clearly wiser than our ancestors Some of them fully believed that the seasonal disappearance of the Swallow, the Nightingale, the Cuckow, and the Corncrake was due to hibernation, while others indeed doubted whether or not this was the true explanation of the fact. It is not so long since this belief and these doubts were in vogue, but now assuredly they have no hold upon the mind of any one capable of appreciating evidence, and this absurd fancy being exploded need not again trouble us.

In considering the phenomena of Migration it will be best first to take the facts, and then try to account for their cause or causes. That a very large number of Birds all over the world change their abode according to the season is well known, and we find that in almost all

countries there are some species which arrive in spring, remain to breed, and depart in autumn; others which arrive in autumn, stop for the winter, and depart in spring; and others again — and these are strictly speaking the "Birds of Passage" — which show themselves but twice a year, passing through the country without staying long in it, and their transient visits take place about spring and autumn. People who have given but little thought to the subject are apt to suppose that these migrants, which may thus easily be classed in three categories, are acted upon by influences of different kinds, whereas very little reflection will show that all are really affected by the same impulse, whatever that may be, and that the at first sight dissimilar nature of their movements is in truth almost uniform. The species which resort to this and to other temperate countries in winter are simply those which have their breeding quarters much nearer the poles, and in returning to them on the approach of spring are but doing exactly as do those species which, having their winter abode nearer the equator, come to us with the spring. The Birds-of-passage proper, like our winter visitants have their breeding quarters nearer the poles, but, like our summer visitants they seek their winter abode nearer the equator, and thus perform a somewhat longer migration. So far there is no difficulty and no hypothesis— the bringing together of these three apparently different categories is the result of simple observation.

There is scarcely a Bird of either Palæarctic or Nearctic Region, whose habits are at all well known, which is not to a greater or less degree migratory in some part or other of its range. Such conclusion brings to us a still more general inference — namely that Migration, instead of being the exceptional characteristic it used formerly to be thought, may really be almost universal, and though the lack of observations in other, and especially tropical, countries do not allow us to declare that such is the case, it seems very probable to be so. Before proceeding however to any further conclusions it is necessary to examine another class of facts which may possibly throw some light on the matter.

It must be within the experience of every one who has been a birds'-nesting boy that the most sedentary of Birds year after year occupy the same quarters in the breeding season. In some instances this may be ascribed, it is true, to the old haunt affording the sole or the most convenient site for the nest in the neighborhood, but in so many instances such is not the case that we are led to believe in the existence of a real partiality, while there are quite enough exceptions to show that a choice is frequently exercised.

With these two sets of facts before us we may begin to try and account for the cause or causes of Migration. In some cases want of food would seem to be enough, as it is undoubtedly the most obvious cause that presents itself to our mind. The need which all animals have of finding for themselves proper and sufficient sustenance is all-powerful, and the difficulties they have to encounter in obtaining it are so great that none can wonder that those which possess the power of removing themselves from a place of scarcity should avail themselves of it, while it is unquestionable that no class of animals has the facility in a greater degree than Birds. Even among many of those species which we commonly speak of as sedentary, it is only the adults which maintain their ground throughout the year. It has long been known that Birds-of-prey customarily drive away their offspring from their own haunts as soon as the young are able to shift for themselves. The reason generally, and no doubt truly, given for this behavior, which at first sight appears so unnatural, is the impossibility of both parents and progeny getting a livelihood in the same vicinity. The practice, however, is not limited to the Birds-of-prey alone, but is much more universal. We find it to obtain with the Redbreast, and if we watched our feathered neighbors closely we shall perceive that most of them indulge in it. The period of expulsion, it is true, is in some Birds deferred from the end of summer or the autumn, in which it is usually performed, until the following spring, when indeed from the maturity of the young it must be regarded as much in the light of a voluntary secession on their part as in that of an act of parental compulsion, but the effect is ultimately the same.

The mode in which the want of sustenance produces Migration may best be illustrated by confining ourselves to the unquestionably migrant Birds of our own northern hemisphere. As food grows scarce towards the end of summer in the most northern limits of the range of a species, the individuals affected thereby seek it elsewhere. Thus doing, they press upon the haunt of other individuals; these in like manner upon that of yet others, and so on, until the movement which began in the far north is communicated to the individuals occupying the extreme southern range of the species at that season; though, but for such an intrusion, these last might be content to stay some time longer in the enjoyment of their existing quarters.

This seems satisfactorily to explain the southward movement of all migrating birds in the northern hemisphere; but when we consider the return movement which takes place some six months later, doubt may be entertained whether scarcity of food can be assigned as its sole or sufficient cause, and perhaps it would be safest not to come to any decision on this point. On one side it may be urged that the more equatorial regions which in winter are crowded with emigrants from the north, though well fitted for the resort of so great a population at that season are deficient in certain necessaries for the nursery. Nor does it seem too violent an assumption to suppose that even if such necessaries are not absolutely wanting, yet that the regions in question would not supply sufficient food for both parents and offspring — the latter being at the lowest computation, twice as numerous as the former — unless the numbers of both were diminished by casualties of travel. But on the other hand we must remember what has above been advanced in regard to the pertinacity with which Birds return to their accustomed breeding-places, and the force of this passionate fondness for the old home cannot but be taken into account, even if we do not allow that in it lies the whole stimulus to undertake the perilous voyage.

For many years past a large number of persons in different countries have occupied and amused themselves by carefully registering the dates on which various migratory Birds first make their appearance, and certain publications abound with the records so compiled. Some of the observers have been men of high scientific repute, others of less note but of not inferior capabilities for this special object. Still it does not seem that they have been able to determine what connection, if any, exists between the arrival of birds and the state of the weather. This is not very wonderful, for the movements of the migrants, if governed at all by meteorological forces, must be influenced by their action in the places whence the travelers have come, and therefore to establish any direct relation of cause and effect corresponding observations ought equally to be made in such places, which has seldom been done. Lay down the paths of migratory Birds, observe their comings and goings, or strive to account for the impulse which urges them forward as we will, there still remains for consideration the most marvellous thing of all — How do the

birds find their way so unerringly from such immense distances? This seems to be by far the most inexplicable part of the matter. Year after year the migratory Wagtail will build her nest in the accustomed spot, and year after year the migratory Cuckoo will deposit her eggs in that nest, and yet in each interval of time the former may have passed some months on the shores of the Mediterranean, and the latter, absent for a still longer period, may have wandered into the heart of Africa. The writer cannot offer an approach to the solution of this mystery. There was a time when he had hopes that what is called the "homing" faculty in Pigeons might furnish a clue, but Mr. Tegetmeir and all the best authorities on that subject declare that a knowledge of landmarks obtained by sight, and sight only, is the sense which directs these Birds — and there is reason to think that there are several such — which at one stretch transport themselves across the breadth of Europe, or even traverse more than a thousand miles of open ocean, to say nothing of those — and of them there are certainly many — which perform their migrations by night.

Other authors there are who rely on what they call "instinct" as an explanation of this wonderful faculty. This with them is simply a way of evading the difficulty before us, if it does not indeed remove the question altogether from the domain of scientific inquiry. Rejecting such a mode of treatment, Herr Palmén meets it in a much fairer spirit. He asserts that migrants are led by the older and stronger individuals among them, and, observing that most of those which stray from their right course are yearlings that have never before taken the journey, he ascribes the due performance of the flight to "experience." But, granting the undisputed truth of his observation, his assertion seems to be only partially proved. That the birds which lead the flock are the strongest is on all accounts most likely, but what is there to show that these are also the oldest of the concourse? Besides this, there are many Birds which cannot be said to migrate in flocks. While Swallows, to take a sufficiently evident example, conspicuously congregate in vast flocks and so leave our shores in large companies, the majority of our summer-visitors slip away almost unobserved, each apparently without concert with others. It is also pretty nearly certain that the same species of Bird does not migrate in the same manner at all times.

SONG.

Leaving then the subject of Migration, the next important part of the economy of Birds to be considered is perhaps their Song — a word, however, in a treatise of this kind to be used in a general sense, and not limited to the vocal sounds uttered by not more than a moiety of the feathered races which charm us by the strains they pour from their vibrating throat, — strains indeed denied by the scientific musician to come under cognizance as appertaining to his art, but strains which in all countries and in all ages have conveyed a feeling of true pleasure to the human hearer, and strains of which by common consent the Nightingale is the consummate master. It is necessary in a philosophical spirit to regard every sound made by a Bird under the all-powerful influence of love or lust as a "Song." It seems impossible to draw any but an arbitrary line between the deep booming of the Emeu, the harsh cry of the Guillemot (which, when proceeding from a hundred or a thousand throats, strikes the distant ear in a confused murmur like the roar of a tumultuous crowd), the plaintive wail of the Plover, the melodious whistle of the Widgeon, "the Cock's shrill clarion," the scream of the Eagle, the hoot of the Owl, the solemn chime of the Bell-bird, the whip-cracking of the Manakin, the Chaffinch's joyous burst, or the hoarse croak of the Raven, on the one hand, and the bleating of the Snipe or the drumming of the Ruffed Grouse, on the other. Innumerable are the forms which such utterances take. In many birds the sounds are due to a combination of vocal and instrumental powers, or, as in the cases last mentioned, to the latter only. But, however produced — and of the machinery whereby they are accomplished there is not room here to speak — all have the same cause and the same effect. The former has been already indicated, and the latter is its consummation. Almost coinstantaneously with the hatching of the Nightingale's brood, the song of the sire is hushed, and the notes to which we have for weeks hearkened with rapt admiration are changed to a guttural croak, expressive of alarm and anxiety, inspiring a sentiment of the most opposite character. No greater contrast can be imagined, and no instance can be cited which more completely points out the purpose which "Song" fulfils in the economy of the bird, for if the Nightingale's nest at this early time be destroyed or its contents removed, the cock speedily recovers his voice, and his favorite haunts again resound to his bewitching strains. For them his mate is content again to undergo the wearisome round of nest-building and incubation. But should some days elapse before disaster befalls their callow care, his constitution undergoes a change and no second attempt to rear a family is made. It would seem as though a mild temperature, and the abundance of food by which it is generally accompanied, prompt the physiological alteration which inspires the males of most birds to indulge in the "Song" peculiar to them. Thus after the annual moult is accomplished, and this is believed to be the most critical epoch in the life of any bird, cock Thrushes, Skylarks, and others begin to sing, not indeed with the jubilant voice of spring, but in an uncertain cadence which is quickly silenced by the supervention of cold weather. Yet some birds we have which, except during the season of moult, hard frost, and time of snow, sing almost all the year round. Of these the Redbreast and the Wren are familiar examples, and the Chiffchaff repeats its two-noted cry, almost to weariness, during the whole period of its residence in this country.

NIDIFICATION.

Following or coincident with the actions just named, and countless more besides, comes the real work of the breeding-season, to which they are but the prelude or the accompaniment. Nidification is with most birds the beginning of this business; but with many it is a labor that is scamped if not shirked. Some of the Auk tribe place their single egg on a bare ledge of rock, where its peculiar conical shape is but a precarious safeguard when rocked by the wind or stirred by the thronging crowd of its parents' fellows. The Stone-Curlew and the Goatsucker deposit their eggs without the slightest preparation of the soil on which they rest; yet this is not done at haphazard, for no birds can be more constant in selecting, almost to an inch, the very same spot which year after year they choose for their procreant cradle. In marked contrast to such artless care stand the wonderful structures which others, such as the Tailor-bird, the Bottle-Titmouse, or the Fantail-Warbler build for the comfort or safety of their young. But every variety of disposition may be found in the Class. The Apteryx seems to entrust its abnormally big egg to an excavation among the roots of a tree-fern; while a band of female Ostriches scrape holes in the desert-sand and therein promiscuously dropping their eggs cover them with earth and leave the task of incubation to the male, who discharges the duty thus imposed upon him by night only,

and trusts by day to the sun's rays for keeping up the needful, fostering warmth. The Megapodes raise a huge hotbed of dead leaves wherein they deposit their eggs and the young are hatched without further care on the part of either parent. Some of the Grebes and Rails seem to avail themselves in a less degree of the heat generated by vegetable decay, and dragging from the bottom or sides of the waters they frequent fragments of aquatic plants form of them a rude half-floating mass which is piled on some growing water-weed — but these birds do not spurn the duties of maternity. Other birds, as the Woodpeckers, hew holes in living trees, even when the timber is of considerable hardness, and therein establish their nursery. Some of the Swifts secrete from their salivary glands a fluid which rapidly hardens as it dries on exposure to the air into a substance resembling isinglass, and thus furnish the "edible birds' nests," that are the delight of Chinese epicures. The Tailor-bird deliberately spins a thread of cotton and therewith stitches together the edges of a pair of leaves to make a receptacle for its nest. Beautiful too is the felt fabricated of fur or hairs by the various species of Titmouse, while many birds ingeniously weave into a compact mass both animal and vegetable fibres, forming an admirable non-conducting medium which guards the eggs from the extremes of temperatures outside.

In the strongest contrast to these amiable qualities is the parasitic nature of the Cuckoos of the Old World and the Cow-birds of the New, but this peculiarity of theirs is so well known that to dwell upon it would be needless. Enough to say that the egg of the parasite is introduced into the nest of the dupe, and after the necessary incubation by the fond fool of a foster-mother the interloper successfully counterfeits the heirs, who perish miserably, victims of his superior strength. The whole process has been often watched, but the reflective naturalist will pause to ask how such a state of things came about, and there is not much to satisfy his enquiry. Certain it is that some birds whether by mistake or stupidity do not unfrequently lay their eggs in the nests of others.

The first thing which strikes the eye of one who beholds a large collection of egg-shells is the varied hues of the specimens. Hardly a shade known to the colorist is not exhibited by one or more, and some of these tints have their beauty enhanced by the glossy surface on which they are displayed, by their harmonious blending, or by the pleasing contrast of the pigments which form markings as often of the most irregular as of regular shape. The depth of coloring whether original or supervening is obviously dependent in a great measure on the constitution or bodily condition of the parent. If a bird, bearing in its oviduct a fully-formed egg, be captured, that egg will speedily be laid under any circumstances of inconvenience to which its producer shall be subjected, but such an egg is usually deficient in coloration — fright and captivity having arrested the natural secretions. In like manner over excitement or debility of the organs, the consequence of ill health, give rise to much and often very curious abnormality. It is commonly believed that the older a bird is the more intensely colored will be its eggs, and to some extent this belief appears to be true.

The composition of this pigment has long excited much curiosity, and it has been commonly and rather crudely ascribed to the secretions of the blood or bile, but very recently unexpected light has been shed upon the subject by the researches of Mr. Sorby (*Proc. Zool. Soc.* 1875, p. 351), who, using the method of spectrum-analysis, has now ascertained the existence of *seven* well-marked substances in the coloring-matter of eggs, to the admixture of which in certain proportions all their tints are due.

In form eggs vary very much, and this is sometimes observable in examples not only of the same species but even from the same mother, yet a certain amount of resemblance is usually to be traced according to the natural group to which the parents belong. Those of the Owls (*Strigidæ*) and of some of the *Picariæ* — especially those which lay the glossy eggs — are often apparently spherical, though it is probable that if tested mathematically none would be found truly so — indeed it may be asserted that few eggs are strictly symmetrical, however nearly they may seem so, one side bulging out, though very slightly, more than the other. The really *oval* form, with which we are most familiar, needs no remark, but this is capable of infinite variety caused by the relative position and proportion of the major and minor axes.

Incubation is performed, as is well known, by the female of nearly all Birds, but with most of the *Passeres* and many others the male seems to share her tedious duties, and among the *Ratitæ*, apparently without exception, the cock takes the office wholly on himself.

The more or less protracted business of reproduction being ended there forthwith follows in the case of nearly all Birds a process of the most vital consequence to them. This is the Moult or shedding of their old and often weather-beaten feathers to be replaced by an entirely new suit. It is probably the severest strain to which bird-life is exposed, and, to judge from its effects on our domesticated pets, produces a greater mortality than an occasional want of proper or even any food does. Important however as are its bearings on every individual of the whole Class, the subject is one which has been sadly neglected by ornithological writers and, with one exception, we are not aware of any connected series of observations on Moult within the whole range of their literature. The structure and mode of growth of feathers has been very well studied and described by several investigators, and must be especially treated in introducing the subject of Pterylography — or the disposition of the various plumed patches on the bird's body — which, having been found to be a most useful auxiliary in Classification, is deferred until that comes to be discussed under the article "ORNITHOLOGY." For the present we have briefly to consider the different phases which the process of Moulting offers.

As a general rule all Birds are subject to an annual Moult, and this, as above stated, commonly begins immediately on the close of the breeding-season, but, as will be explained further on, there are some which undergo in addition a second or even a third partial change of plumage, and it is possible that there may be others still more exceptional, our information respecting these, however, is too meagre to make it worth while saying anything here about them. It must be acknowledged that with regard to the great majority of forms we can only judge by analogy, and though it may well be that some interesting deviations from the general rule exist of which we are altogether ignorant, yet when we consider that the *Ratitæ*, so far as observed, moult exactly in the same manner as other birds, the uniformity of the annual change may be almost taken for granted.

BIRDS OF PARADISE, a group of Passerine Birds inhabiting New Guinea and the adjacent islands, so named by the Dutch voyagers in allusion to the brilliancy of their plumage, and to the current belief that, possessing neither wings nor feet, they passed their lives in the air, sustained on their ample plumes, resting only at long intervals suspended from the branches of lofty trees by the wire-like feathers of the tail, and drawing their food "from the dews of heaven and the nectar of

flowers." Such stories obtained credence from the fact that so late as the year 1760, when Linnæus named the principal species *apoda*, or "footless," no perfect specimen had been seen in Europe, the natives who sold the skins to coast traders invariably depriving them of feet and wings. The birds now usually included under this name belong to two distinct families, the *Paradiseidæ* and the *Epimachidæ*, the former or true Birds of Paradise being closely allied to the Crows, the latter or Long-billed Paradise Birds being usually classed, from the form and size of their bills, with the Hoopoes. Both families occupy the same geographical area, and are alike distinguished by the enormous development of certain parts of their plumage. Of the true birds of paradise, the largest is the Great Emerald Bird (*Paradisea apoda*), about the size of the common jay. Its head and neck are covered with short thick-set feathers, resembling velvet pile, of a bright straw color above, and a brilliant emerald green beneath. From under the shoulders on each side springs a dense tuft of golden-orange plumes, about two feet in length, which the bird can raise at pleasure, so as to enclose the greater part of its body. The two centre tail feathers attain a length of 34 inches, and, being destitute of webs, have a thin wire-like appearance. This splendid plumage, however, belongs only to the adult males, the females being exceedingly plain birds of a nearly uniform dusky brown color, and possessing neither plumes nor lengthened tail feathers. The young males at first resemble the females, and it is only after the fourth moulting, according to A. R. Wallace, who recently studied those birds in their native haunts, that they assume the perfect plumage of their sex, which, however, they retain permanently afterwards, and not during the breeding season only as was formerly supposed. At that season the males assemble, in numbers varying from twelve to twenty, on certain trees, and there disport themselves so as to display their magnificent plumes in presence of the females. Wallace in his *Malay Archipelago*, vol. ii., thus describes the attitude of the male birds at one of these "sacaleli," or dancing parties, as the natives call them; "their wings," he says, "are raised vertically over the back, the head is bent down and stretched out, and the long plumes are raised up and expanded till they form two magnificent golden fans striped with deep red at the base, and fading off into the pale brown tint of the finely-divided and softly-waving points; the whole bird is then overshadowed by them, the crouching body, yellow head, and emerald green throat, forming but the foundation and setting to the golden glory which waves above." It is at this season that those birds are chiefly captured. The bird-catcher having found a tree thus selected for a "dancing party," builds a hut among the lower branches in which to conceal himself. As soon as the male birds have begun their graceful antics, he shoots them one after the other, with blunt arrows, for the purpose of stunning them and bringing them to the ground without drawing blood, which would injure their plumage; and so eager are those birds it their courtship that almost all the males are thus brought down before the danger is perceived. The natives in preparing the skins remove both feet and wings, so as to give more prominence to the commercially valuable tuft of plumes. They also remove the skull, and the skin is then dried in a smoky hut. The Great Emerald Bird, so far as yet known, is only found in the Aru Islands. The Lesser Bird of Paradise (*Paradisea minor*), though smaller in size and somewhat less brilliant in plumage, in other respects closely resembles the preceeding species. It is also more common, and much more widely distributed, being found throughout New Guinea and the neighboring islands. Its plumes are those most generally used as ornaments for ladies' head-dresses. It has been brought alive to Europe, and has been known to live for two years in the gardens of the Zoological Society of London. Both species are omnivorous, feeding voraciously on fruits and insects. They are strong, active birds, and are believed to be polygamous. The King Bird of Paradise (*Cicinnurus regius*) is one of the smallest and most brilliant of the group, and is specially distinguished by its two middle tail feathers, the ends of which alone are webbed, and coiled into a beautiful spiral disc of a lovely emerald green. In the Red Bird of Paradise (*Paradisea rubra*) the same feathers are greatly elongated and destitute of webs, but differ from those in the other species, in being flattened out like ribbons. They are only found in the small island of Waigiou off the coast of New Guinea. Of the Long-billed Paradise Birds (*Epimachidæ*) the most remarkable is that known as the "Twelve-wired" (*Seleucides alba*), its delicate yellow plumes, twelve of which are transformed into wire-like bristles nearly a foot long, affording a striking contrast to the dark metallic tints of the rest of its plumage. Like the *Paradiseidæ* they feed on insects and fruits.

BIRKBECK, George, an English physician and philanthropist, born at Settle in Yorkshire in 1776. He early evinced a strong predilection for scientific pursuits; and in 1799, after graduating as doctor of medicine, he was appointed to the chair of natural philosophy at the Andersonian Institution of Glasgow. In the following year he delivered, for the benefit of the working-classes, a gratuitous course of scientific lectures, which were continued during the two following years and proved eminently successful. He removed to London in 1804, and there he endeavored to prosecute his philanthropic schemes, at first without much encouragement, but ultimately with marked success. In 1827 he contributed to found the Mechanics' Institute, his coadjutors being Bentham, Wilkie, Cobbett, and others. He was appointed director of the institute, which he had originally endowed with the sum of £3700, and held the office till his death in December 1841.

BIRKENHEAD, a seaport, market-town, extra-parochial district, township, and parliamentary borough, in the hundred of Wirral and west division of Cheshire, England, is situated on the western bank of the Mersey, directly opposite Liverpool. It is of considerable antiquity, its history dating from 1150, when a priory was founded in honor of St. Mary and St. James by the third baron of Dunham Massey, and had considerable endowments.

Birkenhead began to develop itself as a market-town in the year 1833, when an Act was obtained for paving, lighting, watching, cleansing, and improving the town, and for regulating the police and establishing a market. By this Act the Improvement Commissioners were originally constituted, and at that time included the mayor, bailiffs, and four aldermen of Liverpool. Immediately after the passing of this Act the town made rapid progress. The principal streets were laid out on a regular plan, intersecting each other at right angles. A line of tramway, the first laid in England, affords every facility of street communication. Hamilton Square, which occupies the summit of the rising ground near the river, forms the basis or starting point for all the parallel or rectangular lines of streets. The houses of the square are four stories in height, with stone fronts, the centres and ends of each terrace being relieved or ornamented with columns and porticos in the Tuscan order of architecture.

Birkenhead Park, opened in 1847, occupies 190½ acres of ground, and was laid out at a cost (including

the land) of £140,000. Birkenhead Cemetery, on Flaybrick Hill, occupies 20½ acres of ground, and cost about £40,000.

The late Mr. William Laird, whose name is so well known in connection with iron shipbuilding, first conceived the idea of turning to advantage the capabilities of Wallasey Pool for the formation of a dock. After a lapse of many years, the Commissioners of Birkenhead, alive to the advantages which this project would confer upon the town, employed the late Mr. Rendel as their engineer, and applied to Parliament for powers to construct the necessary works. The foundation-stone of the new docks was laid in October 1844, and the first dock was opened by the late Lord Morpeth on 5th April 1847. Subsequently, the dock powers of the Commissioners were entrusted to a corporate body of trustees who afterwards transferred the property to the corporation of Liverpool; and ultimately it was vested in the Mersey Docks and Harbor Board, a corporation created by the Act of 1857 for the management of the docks on both sides of the Mersey. At that time the area of the dock space open and in use in Birkenhead was about 7 acres.

The entrances to the Birkenhead Docks are capable of docking the largest class of steamers afloat. The massive iron bridges across the dock entrances are opened and closed by hydraulic power, which is likewise applied to the cranes, coal hoists, warehouse lifts, and other appliances about the docks. At the extreme western end of the West Float are three large graving docks, two about 750 feet in length, and 130 feet and 80 feet in width respectively, and the largest, now in course of construction, measuring about 900 feet in length and 130 feet in width.

In 1847 the Birkenhead Dock Warehousing Company opened their first warehouses, capable of storing 80,000 tons of goods. Each block is detached, and the whole premises are surrounded by a wall 12 feet high. A railway branch, called the Dock Extension Railway, is carried round the property. The company also built blocks of houses for their workmen, known as the Dock Cottages. This property is now in the hands of the Mersey Docks and Harbor Board.

The commerce of Birkenhead is in all respects a branch of that of Liverpool, and chiefly devoted to coal, guano, and grain,—the quantity of coal alone exported being over one million tons per annum.

BIRMINGHAM, the fourth town in size and population in England, and the fifth in the United Kingdom, is situated at the extreme north-west of the county of Warwick, and is 102 miles in a straight line N.W. of London, from which it is distant 112 miles by the North-Western Railway. The Roman Road, known as the Ikenield Street, runs through the town. On the north Birmingham touches Staffordshire, and on the south and west Worcestershire, the suburbs of the town extending largely into both these counties — Harborne and Handsworth being in the former and Balsall, Moseley, and Yardley in the latter. The borough itself, however — both parlimentary and municipal, the boundaries being identical — is wholly in the county of Warwick. It covers an area of 8420 acres (of which 5900 are built upon), and includes the whole of the parishes of Birmingham and Edgbaston, and about one-third of the parish of Aston. It is nearly six miles long, has an average breadth of 3 miles, is 21 miles in circumference, and has 190 miles of street and roads. The population, at the census of 1871, was 343,000; and in June 1875 it was estimated by the registrar-general at 360,000.

The town is built upon the New Red Sandstone, on a boldly undulated site, varying from 200 to 600 feet above the sea-level. The plan of the town is irregular, and the streets are mostly winding and many of them somewhat narrow. In the centre, however, is a large open space, known as the Bull Ring and High Street, at the foot of which stands the mother church of St. Martin, and in which is situated the Market-Hall, one of the largest buildings of its kind in the kingdom.

Of Public Buildings, the Town Hall, a nobly proportioned and impressive edifice, is the principal. It stands at the top of New Street, and on three sides is isolated from all other buildings by broad and handsome streets. The hall, completed in 1850 at a total cost of £52,000, is severely classic, modelled upon a Greek temple. On one side of the Town Hall are the buildings of the Midland Institute and the Free Libraries (of Italian design) occupying the whole of Ratcliff Place, with fronts to Paradise Street and Edmund Street. A new Art Gallery is in course of erection, fronting the latter street. At the back of the Town Hall is the site of the new building of the Mason College (Gothic), and in front of the hall, in Paradise Street, are Christ Church (classic), the Queen's College (Gothic), and the Post-Office. On the side of the hall, in Ann Street, opposite to the Midland Institute, are the new Corporate Buildings (Italian), now being erected at a cost of nearly £200,000. These will give accommodation for the Town Council, law courts, public offices, and the mayor of the borough. Lower down New Street is the building of the Royal Society of Artists (classic), with a noble portico; then comes the Exchange (Gothic) in Stephenson Place; and at the bottom of the latter street is the Central Railway station, used by the North-Western, the Midland, and their branch railways, and fronted by the Queen's Hotel. The station is more than a quarter of a mile in length.

From an early period Birmingham has been a seat of manufactures in metal. Hutton, the historian of the town, claims for it Saxon or even British antiquity in this respect, but without the shadow of foundation. The great staple of Birmingham is metal-working in all its various forms. The chief variety is the brass-working trade, which employs several hundred masters, and about 10,000 work-people, and consumes probably 50,000 tons of metal annually, which is worked up into an infinity of articles of ornament and utility. Iron-working, though largely carried on, is a much less important trade, works of this kind being chiefly established in the Staffordshire district. Jewellery, gold, silver, and gilt come next to brass. Then follow small arms of all kinds, some of the larger establishments being capable of turning out 2000 stand per week. Buttons, hooks and eyes, pins, and other articles used for dress, constitute a large class of manufactures. Glass, especially table glass, is a renowned staple of the town. Screws, nails, &c., are made in enormous quantities; indeed, Birmingham has a monopoly of the English screw trade. Steel pens are also a specialty — as much as, probably, 15 tons or more of steel being the weekly consumption of these articles; the largest maker, Sir Josiah Mason, rolls 5 tons weekly for his own consumption, and has about 60 tons of pens constantly in manufacture in various stages. About 20,000,000 pens are made weekly in the town, and are sold at prices ranges from 1½d. to 12s. per gross of 12 dozen. The fact that each gross requires 144 pieces of steel to go through 12 different processes, renders this cheapness of sale one of the greatest marvels of manufacturing skill and industry. Electro-plating, first established about 1848 by Messrs. Elkington and Mason, is one of the leading trades.

Wealth is more evenly distributed than in most other places. There are no colossal fortunes in Birmingham, and comparatively few large ones, and of these very few are made by speculative operations. To compensate

for these distinctions there is an unusually large comfortable class — people of good though not excessive incomes derived from solid trade, or from savings made by hard personal and associated work. This class, touching the actually wealthy on one side, by easy and almost imperceptible stages touches the actual working-class on the other, and this latter class is constantly rising into the middle rank.

The Birmingham work-people, in their way, are courteous and helpful. This is probably owing to the free and open and common discussion of subjects of political and social interest engaged in without distinction of class. The same principle is adopted educationally — in the Midland Institute, for example — the Act of Parliament which established the Institute providing that the governing council shall always include artizan members. Another noticeable characteristic of the town is the development of means of self-instruction and of self-help. Birmingham was amongst the earliest places to establish a mechanics' institution, the place of which is now more efficiently supplied by the Midland Institute. Birmingham, again, was the birthplace of the freehold land and building societies, by which workmen are enabled, on easy terms, to acquire houses of their own ; and in addition to these institutions, which are numerous and flourishing, it has a very large number of sick and friendly societies, savings-clubs, and other organizations of a provident kind,— more in proportion to population than, probably, any other of the large towns in England.

BIRMINGHAM, the capital of Jefferson county, Ala., is a city of phenomenal growth. In 1880 it had but 3,000 inhabitants, while it has now (1890 census) 26,241. This marvelous expansion is due to the discovery and development of the vast deposits of iron and coal in its immediate neighborhood. Birmingham is situated at the intersection of several railrods, 95 miles northwest of Montgomery and 140 miles southwest of Chattanooga. It contains six national and six savings and other banks, with a paid-up capital of $2,500,000. There are several newspapers, many churches and schools, a fire and police department, street railroads and water-works, and the city is lighted by gas and electric light. Birmingham contains many foundries, machine shops, flouring mills and factories, and other important industries.

BIRMINGHAM, a city of Connecticut, in New Haven county, ten miles west of New Haven. It is situated on the Housatonic and Naugatuck rivers, and contains two banks, several rolling mills and foundries, manufactories of plate, paper and other goods, and has a population of 5,000.

BIRON, ARMAND DE GONTAULT, a baron and marshal of France, and a celebrated general, who signalized himself by his valor and conduct in several sieges and battles in the 16th century. He was made grand master of the artillery in 1569, and commanded at the siege of Rochelle, and in Guienne. He was one of the first who declared for Henry IV.; he brought a part of Normandy under his subjection, and dissuaded him from retiring to England or Rochelle. Biron was killed by a cannon-ball at the siege of Epernay, July 26, 1592.

BIRON, CHARLES DE GONTAULT, son of the above and born in 1562, created duke of Biron and admiral of France by Henry IV., was a man of great intrepidity, but fickle and treacherous. In 1601 he was sent as ambassador to the court of queen Elizabeth to announce his royal master's marriage with Mary of Medici ; but being discovered in a treasonable correspondence with Spain, he was beheaded in the Bastille at Paris, July 31, 1602.

BIRS NIMRUD. See BABYLON.

BISACCIA, a city of Italy, in the Principato Ulteriore, 60 miles E. of Naples. It is a bishopric in conjunction with St. Angelo, and contains 5342 inhabitants.

BISCAY, or VIZCAYA, one of the three Basque provinces of Spain, with the title of Seignory. It is bounded on the N. by the bay to which it gives its name, E. by Guipuzcoa, S. by Alava, and W. by Santander. Its area is 845 square miles, and its population 183,098. In minerals Biscay is very rich. Iron of the finest quality is found in every part, and forms a main article of export. The best mines are those of Somorostro, near the coast. The amount obtained in 1866 was about 80,000 tons. Lead, zinc, alum, and sulphur, are also present in smaller quantities; and marble, lime, and sandstone are abundant. The manufacture of the iron ore is the chief branch of industry; but porcelain, linens, copper and brass wares, ropes, and leather, are also produced. The fisheries are actively prosecuted along the coast by a hardy race of fishers, who were the first of their craft in Europe to pursue the whale, formerly abundant in the Bay of Biscay. The name Biscay is not unfrequently employed geographically equivalent to Basque, in that case including the three provinces of Biscay proper, Guipuzcoa, and Alava.

BISCAY, BAY OF, in French the Golfe de Gascogne, and the Roman *Sinus Aquitanicus*, an extensive gulf or bay of the Atlantic, enclosed by the northern coast of Spain and the western coast of France. It extends from the island of Ushant, on the coast of Finistère, to Cape Ortegal on the north of Galicia. In the Spanish portion of the bay the water is about 200 fathoms deep, while in the French portion it is only 20 fathoms. Navigation is impeded by strong westerly winds, and by Rennel's Current, which sets in from the west and sweeps along the southern and eastern shores sometimes at a rate of 27 miles a day. The Loire, Charente, Gironde, and Adour, besides numerous smaller streams from the Spanish mountains, fall into the bay,

BISCEGLIA, perhaps the ancient *Natiolum*, a fortified seaport of Italy, in the province of Terra di Bari, situated on a rocky promontory on the Adriatic, 21 miles W.N.W. of Bari. Population 25,000.

BISCHWEILER, a town of Alsace, 14 miles N. of Strasburg, on the railway from Hagenau. Pop. 10,000.

BISCUIT, See BAKING.

BISHOP, the title of an ecclesiastical dignitary set over the presbyters and deacons at a very early period in the Christian church. The word is derived from the Saxon *biscop*, which is a corruption of the Greek word *episcopos*, which signifies an "overlooker" or "overseer," and the churches in which the order of bishops is recognized as distinct from and superior to the order of presbyters are styled "Episcopal churches." The early history of the Episcopal order is obscure, but it would appear that the first bishops were established in the chief cities of Christendom, and each bishop had a certain territorial district placed under his superintendence, whence the city was termed the see (*sedes*) of the bishop, and the district his parish, and subsequently his diocese. In course of time the districts assigned to the first bishops became too populous, whereupon the clergy of each diocese, as the case might be, appear to have assembled and subdivided the diocese, and to have selected a second bishop, and so bishops and dioceses were multiplied, according to the wants of the churches, until it was thought expedient to reserve the right of erecting new bishoprics to provincial councils, and this reservation was made a rule of the church by a decree of the Council of Sardica. Meanwhile the bishops of the new sees had grouped themselves round the bishops of the more ancient sees, who exercised over them a certain spiritual authority as primates, and presided in

their councils; and as some of the great cities in which the sees of the first bishops had been established were distinguished by the title of "metropolis," or mother-city, and were in fact the chief cities of civil provinces of the Roman empire, the bishops of those sees came to be distinguished by the title of metropolitan bishops, and exercised a superior authority in the councils of the church in proportion to the greater importance of their respective sees. This superior dignity of the metropolitan bishops over the others was formally recognized at the Council of Nicæa as being in accordance with custom. Upon the establishment of Christianity in the Roman empire a coercive jurisdiction was engrafted on the spiritual superiority of the metropolitan, and the district over which the metropolitan exercised this jurisdiction was termed his province, the earliest ecclesiastical provinces being for the most part conterminous with the civil provinces of the empire. From the circumstance that there was no metropolitan city in Western Africa, the term metropolitan was never adopted in the Carthaginian Church, the senior bishop of that church being termed the primate, and having precedence and authority as such over the other bishops.

In the Church of Rome the Pope claims of right the appointment of all the bishops; but the exercise of this right is modified by concordats with the sovereigns of the respective states. In France, since the concordat between Pope Leo X. and King Francis I., the sovereign has had the exclusive right of nominating the bishops, but the nomination is subject to the Pope's confirmation. In Austria (with the exception of four bishoprics) in Bavaria, in Spain, and in Portugal, the bishops are also nominated by the sovereign. In some countries the bishops are elected by the chapter of the cathedral church, as in Würtemberg, or by the bishops of the province, as in Ireland. In England, in the United States of America, and in Belgium, the Pope selects one out of a list of candidates submitted to him by the chapter. In all cases the bishop-nominate or the bishop-elect, as the case may be, has to obtain from the Holy See certain letters, entitled provisions, to authorize his consecration, and to recommend him to the protection of the sovereign and to the good offices of his metropolitan.

In the Church of Russia, after its separation from that of Constantinople, the right to elect a bishop was for some centuries vested in a synod of bishops, but by a regulation of the Emperor Peter the Great, the Holy Synod was restricted to recommend two persons to the sovereign for him to select one of them to be bishop.

In the Church of the Levant, properly called the Greek Church, which is governed by the four patriarchs of Constantinople, Antioch, Jerusalem, and Alexandria, each patriarch has the right of confirming the election of the bishops within his patriarchate; but the firman or barat of the sultan is likewise necessary to give full authority to the bishops after their confirmation.

The bishops of the Church of England are twenty-eight in number, two of them being metropolitans, namely, Canterbury and York, who enjoy the more dignified title of archbishop, and have a special precedence assigned to them by law (see ARCHBISHOP). The twenty-six diocesan bishops, with the exception of the bishop of the Isle of Man, who is designated the bishop of Sodor and Man, are lords of parliament, and take precedence of the barons in the House of Lords; but the junior bishop for the time being is, by statute, disentitled from being summoned to parliament. From this disqualification the bishops of London, Durham, and Winchester are exempt. These three bishops have precedence over one another in the order in which their names are above mentioned, and they precede all the other bishops, the latter taking precedence of one another according to the date of their appointment. The junior bishop who has a seat in parliament acts as chaplain to the House of Lords.

BISHOP, SIR HENRY ROWLEY, musical composer, was born in London on the 18th November 1786. He received his artistic training from Francisco Bianchi, at whose instance, probably, he was employed to write his first work, the ballet of *Tamerlan et Bajazet*, produced at Covent Garden in 1806. This proved successful, and was followed within two years by several others, of which *Caractacus*, a pantomimic ballet, written for Drury Lane, may be named. In 1809 his first opera, *The Circassian's Bride*, was produced at Drury Lane; but by a singular misfortune the theatre was burned down after one performance, and the score of the work perished in the flames. His next work of importance, the opera of *The Maniac*, written for the Lyceum in 1810, established his reputation, and probably secured for him the appointment of composer for Covent Garden theatre. The numerous works — operas, burlettas, cantatas, incidental music to Shakespeare's plays, &c. — which he composed while in this position, are now in great part forgotten. His English adaptations, or rather mangled versions, of Mozart's *Don Giovanni* and *Figaro*, and Rossini's *Il Barbiere* and *Guillaume Tell*, were certainly no true service to art. It seems almost incredible that a man of Bishop's undoubted genius should have been so misguided as to suppress the incomparable *Figaro* overture of Mozart in favor of one of his own. In 1841 he was appointed to the "Reid" chair of music in the University of Edinburgh, but he resigned the office in 1843. He was knighted by the queen in 1842, being the first musician who ever received that honor. In 1848 he succeeded Dr. Crotch in the chair of music at Oxford. The music for the ode on the occasion of the installation of Lord Derby as chancellor of the university (1853) proved to be his last work. He died on the 30th April 1855 in impoverished circumstances, though few composers ever made more by their labors. Bishop's name will live in connection with his numerous glees, songs, etc.

BISHOP-AUCKLAND, a market-town of England, in the county of Durham, 11 miles south-west of the city of Durham. Population, 8736.

BISHOP-STORTFORD, a market-town of England, on the eastern border of Herts, 11 miles E.N.E. of Hertford, and 32 miles by railway from London. Population (1889), 7000.

BISHOP-WEARMOUTH, a township of Durham in England, now incorporated in the parliamentary borough of Sunderland. See SUNDERLAND.

BISKARA, or BISKRA, a town of Algeria, in the province of Constantine, and the most important of the French military posts of the Sahara. Population in 1889, 7367.

BISMARCK, the capital of North Dakota, and the county seat of Burleigh county, is situated on the Missouri river, 450 miles west of Duluth, Minn. It is on the Northern Pacific railroad, and is a shipping and distributing point of considerable importance. It has made a great advance in the few years of its existence, and now (1890) has a population of nearly 10,000. It contains several public halls and municipal buildings, and has a number of fine stores. Bismarck is surrounded by a rich grazing country.

BISMUTH. This metal appears to have been unknown to the older metallurgical writers, it having been first noticed by Agricola, who speaks of it as a form of lead, and describes the method of separating it from its associated minerals by liquidation.

The principal minerals containing bismuth are:—1. Native bismuth, essentially *the pure metal*, having all

the properties described below. This, the most important ore, occurs in connection with nickel and cobalt ores at Schneeberg, Saxony, at Wheal Sparnon in Cornwall, similarly associated, and with tin ores in the mines of the St. Just district. It is also found in some quantity in Bolivia. 2. Tetradymite, or telluric bismuth, a compound in variable proportions with the isomorphous element tellurium. This contains from 60 to 80 per cent. of bismuth, 15 to 35 per cent. of tellurium, and from 3 to 5 per cent. of sulphur. It occurs usually in association with gold ores; the principal localities are Schemnitz and Retzbanya in Hungary, the gold mining district of Virginia and North Carolina, California and other western States of America.

Bismuth may be readily obtained in crystals by pouring it when melted into a heated iron ladle, and cooling it until a crust is formed on the surface, which must then be pierced by a red-hot iron rod, and the liquid metal poured off. The solidified portion adhering to the ladle is found to be covered with hopper-shaped crystals, which are usually beautifully irised, owing to the formation of a thin film of oxide on the surface, showing the colors of thin plates. This coloring is only obtained when the metal is quite free from arsenic. It may be purified by melting with about 10 per cent. of nitre, and keeping it constantly stirred at a temperature not much above its melting point, whereby the more oxidizable metals are removed and form a slag at the surface. Another method of purifying it from arsenic is by fusing it with from 3 to 5 per cent. of zinc, covering the surface with charcoal to prevent oxidation of the zinc, which takes off the whole of the arsenic, and is subsequently removed by treatment with hydrochloric acid, the purified bismuth remaining insoluble. When prepared by any of these processes, Bismuth is a hard, brittle metal, and the fracture is highly crystalline and white, with a perceptible red tinge by reflected light. The crystalline form is rhombohedral, the angle of the primary rhombohedron being 87° 40′, or very close to a cube. The specific gravity is 9.83, but when subjected to great pressure the density is reduced to 9.6. The melting point is 264° C.

Bismuth unites readily with other metals, the alloys being remarkable for their ready fusibility, and by their property of expanding on solidification. Bismuth may be employed instead of lead for the assay of gold and silver by cupellation, as the melted oxide is absorbed by bone ash in exactly the same manner as litharge.

BISON, a genus of Ruminant Mammals belonging to the family *Bovidæ*, and comprising two widely separated species — the European and American Bisons. They are distinguished from other bovine animals by the greater breadth and convexity of their foreheads, superior length of limb, and the longer spinal processes of the dorsal vertebræ, which, with the powerful muscles attached for the support of the massive head, form a protuberance or hump on the shoulders. The bisons have also fourteen pairs of ribs, while the common ox has only thirteen. The forehead and neck of both species are covered with long, shaggy hair of a dark brown color; and in winter the whole of the neck, shoulders, and hump are similarly clothed, so as to form a "curly felted mane." This mane in the European species disappears in summer; but in the American Bison it is to a considerable extent persistent. The European Bison (*Bison bonassus*), or Aurochs of the Germans, is the largest existing European quadrupeds, measuring about 10 feet long, exclusive of the tail, and standing nearly 6 feet high. Formerly it was abundant throughout Europe, as is proved by its fossil remains found on the Continent and in England, associated with those of the extinct mammoth and rhinoceros. These remains, while indicating larger proportions in the ancient aurochs than in those now living, do not, in Professor Owen's opinion, exhibit any satisfactory specific distinction. Cæsar mentions the aurochs as abounding, along with the now extinct *Bos primigenius*, in the forests of Germany and Belgium, where it appears to have been occasionally captured, and afterwards exhibited alive in the Roman amphitheatres. At that period, and long after, it seems to have been common throughout Central Europe, the Caucasus, and the Carpathian Mountains. It is now only found in one of the forests of Lithuania, where it is saved from immediate extinction by the protection of the emperor of Russia, but notwithstanding this it is gradually dying out. The American Bison (*Bison americanus*) had its home on the eastern slopes of the Rocky Mountains, being seldom found to the west of these, although formerly it had a wide range. Northward it extended to lat. 63° and southward as far as New Mexico. These bisons, or buffaloes, now almost extinct, roamed in enormous herds over the western prairies, in quest of fresh pastures, being specially fond of the tender grass that springs up after a prairie fire. The two sexes live in separate herds during the greater part of the year, although one or two aged bulls, it is said, always accompany the females. During the rutting season, when the sexes come together, the bulls engage in fierce fights among themselves, and at such seasons it is highly dangerous to approach them. At other times they are shy, and retreat before man; but when wounded they become furious, and then all the dexterity of the practiced hunter is needed to make his retreat. The Indians captured them in various ways; by hunting on horseback, and shooting them with bows and arrows, or with firearms; by snaring them within immense enclosures of snow, which the bisons were unable to overleap; or by attracting the herd toward a precipice, and then setting it in motion from behind, so that those in front were pushed irresistibly forward and over. The American bison has rapidly disappeared before the advance of the white settler; and should man in the meantime not succeed in domesticating it, it will probable ere long share the fate which threatens its European congener. To the Indian the bison has hitherto been indispensable as an article of food, and for the many useful purposes to which its horns, skin and hair are applied. Its hide forms an excellent fur wrapper; its great value in this respect was proved during the war, and the skins are now held at a high figure.

BITHYNIA, a province in the N.W. of Asia-Minor, adjoining the Propontis, the Thracian Bosphorus, and the Euxine. According to Strabo it was bounded on the east by the River Sangarius; but the more commonly received division extended it as far as the Parthenius, which separated it from Paphlagonia, thus comprising the district on the sea-coast between these two rivers, which was inhabited by the Mariandyni. Towards the west and south-west it was limited by the River Rhyndacus, which separated it from Mysia; and on the south it adjoined the portion of Phrygia called Phrygia Epictetus, and a part of Galatia. The territory thus defined is in great part occupied by mountains and forests, but has valleys and districts near the sea-coast of great fertility. The most important of the mountain ranges is that known as the Mysian Olympus — from its proximity to that province, though properly included within the limits of Bithynia — which rises to a height of about 6400 feet. It towers in a commanding manner above the city of Broussa, while it forms a conspicuous object as seen from Constantinople, at a distance of 70 miles. Its summits are covered with snow for a great part of the year.

According to the general testimony of ancient authors (Herodotus, Xenophon, Stabo, &c.), the Bithynians were a tribe of Thracian origin who had migrated into Asia by crossing the Bosphorus. The existence of a tribe called Thyni in Thrace is well attested, and the two cognate tribes of the Thyni and Bithyni appear to have settled simultaneously in the adjoining parts of Asia, where they expelled or subdued the previously existing races of the Mysians, Caucones, and other petty tribes, the Mariandyni alone maintaining themselves in the north-eastern part of the country. Herodotus mentions the two tribes, the Thyni and Bithyni, as existing side by side; but ultimately the latter people must have become the more important, so as to give name to the whole country. They were first subdued by Crœsus, and incorporated with the Lydian monarchy, together with which they soon after fell under the dominion of Persia (546 B.C.) During the Persian empire they were included in the satrapy of Phrygia, which comprised all the countries up to the Hellespont and Bosphorus. But even before the conquest by Alexander some obscure native chiefs appear to have asserted their independence in the mountains of Bithynia, and successfully maintained it under two native princes named Bas and Zipœtes, the last of whom transmitted his power to his son Nicomedes I., who was the first to assume the title of king. He became the founder of the city of Nicomedia, which soon rose to great prosperity and opulence; and during his long reign (278–250 B.C.), as well as those of his successors, Prusias I., Prusias II., and Nicomedes II., (149–91 B.C.), the kingdom of Bithynia held a considerable place among the minor monarchies of Asia. But the last king, Nicomedes III., was unable to maintain himself against the increasing power of his neighbor Mithridates, king of Pontus; and although restored to his throne by the interposition of the Roman Senate, at his death, in 74 B.C., he bequeathed his kingdom by will to the Romans. Bithynia was now reduced into the form of a Roman province; but its limits were frequently varied, and it was commonly united for administrative purposes with the neighboring province of Pontus, extending along the southern shore of the Black Sea as far as Trapezus or Trebizond. This was the state of things in the time of Trajan, when the younger Pliny was appointed governor of the combined provinces (103–105 A.D.), a circumstance to which we are indebted for much valuable information concerning the Roman provincial administration. Under the Byzantine empire Bithynia was again divided into two provinces, separated by the River Sangarius, to the westernmost of which the name of Bithynia was restricted.

The most important cities of Bithynia in ancient times were Nicomedia and Nicæa, which disputed with one another the rank of its capital. Both of these were founded after the time of Alexander the Great; but at a much earlier period the Greeks had established on the coast the colonies of Cius (afterwards named Prusias), on the sight of the modern Gemlik; Chalcedon, at the entrance of the Bosphorus, nearly opposite Constantinople; and Heraclea, surnamed Pontica, on the coast of the Euxine, about 120 miles east of the Bosphorus. All these rose to be flourishing and important places of trade. Prusa, at the foot of Mount Olympus, which was founded by the Prusias, was also a considerable town under the Roman empire, but did not attain in ancient times to anything like the importance enjoyed by the modern city of Broussa, which became the capital of the Ottoman Turks before the conquest of Constantinople, and is still (after Smyrna) the second city of Asia Minor. The only other places of importance at the present day are Ismid (Nicomedia) and Scutari, which, from its position on the Bosphorus, may be considered as a mere suburb of Constantinople.

The principal rivers of Bithynia are the Sangarius, still called the Sakaria, which traverses the province from S. to N.; the Rhyndacus, which forms the boundary that separated it from Mysia, the Billæus (Filyas), which rises in the chain of the Ala-Dah, about 150 miles from the sea, and after flowing by the town of Boli (the ancient Claudiopolis) falls into the Euxine, close to the ruins of the ancient Tium, about 40 miles N.E. of Heraclea. It has a course of more than 100 miles. The Parthenius (now called the Bartan), which forms the boundary of the province towards the E., is a much less considerable stream.

BITONTO, a city and bishop's see, in the province of Bari, in South Italy, on the great road from Foggia to Bari, about 12 miles from the latter town. In 1735 it was the scene of a severe battle, in which the Austrians were defeated by the Spaniards under Mortemar, in whose honor Philip V. caused a pyramid to be erected on the spot. Population, 24,978.

BITSCH (French, BITCHE), formerly KALTENHAUSEN, a town and fortress in German Lorraine, on the River Horn, at the foot of the northern slope of the Vosges, between Hagenau and Saargemund. It was originally a countship in the possession of the counts of Alsace and Flanders, but was bestowed by Frederick III. on the dukes of Lorraine, and at length passed with that duchy to France in 1738. After that date it rapidly increased, and its citadel, which had been constructed by Vauban on the site of the ducal palace, was restored and strengthened. The attack upon it by the Prussians in 1793 was repulsed, and although the Bavarians occupied the town in 1815 and 1818, they did not get possession of the fort. In the war of 1870 it was blockaded by the Germans in vain, and only surrendered in 1871, after the campaign was over. A large part of the fortification is excavated in the red-sandstone rock, and rendered bomb-proof; while a supply of water is secured to the garrison by the possession of a deep well in the interior.

BITTERN, a genus of Wading Birds, belonging to the family *Ardeidæ*, comprising several species closely allied to the Herons, from which they differ chiefly in their shorter neck, the back of which is covered with down, and the front with long feathers, which can be raised at pleasure. They are solitary birds, frequenting countries possessing extensive swamps and marshy grounds, remaining at rest by day, concealed among the reeds and rushes of their haunts, and seeking their food, which consists of fish, reptiles, insects, and small quadrupeds, in the twilight. The American Bittern (*Botaurus lentiginosus*) is somewhat smaller than the European species, and is found throughout the central and southern portions of North America, where it forms an article of food

BITTERS, an aromatized alcoholic beverage, so named originally in the United States, where it was first used on account of its flavor and tonic influence. The drink by itself, or as an addition to unflavored spirits, is used with considerable frequency in Europe, and especially in France it has come to be favorably regarded as a substitute for the insidious and deleterious absinthe. In the year 1867 the daily consumption of bitters in Paris alone had reached 4000 litres. The preparation of bitters in Europe was at first a *specialité* of the Dutch, and Dutch bitters are the staple used in Great Britain. A considerable variety of recipes are in use for the preparation of Dutch bitters, but generally gentian root is the leading bitter ingredient in the beverages. The following is given as the composition of brandy bitters: — Gentian root, 4 oz.; orange peel, 5

oz.; cassia bark, 2 oz.; cardamoms, 1 oz.; and proof spirits, 1 gallon, colored with ¼ oz. of cochineal. Bitters prepared in the great French cities—Bordeaux, Rouen, Havre, Paris, etc.—contain extracts of gentian root, bitter orange peel, and orange flowers, with a proportion of sugar, and possess an alcoholic strength of about 40°.

BITTERSWEET, or Woody Nightshade (*Solanum dulcamara*), a plant found in hedges and thickets throughout the palæarctic region of Great Britain; also introduced into North America. The root is perennial and creeping; the annual stems climbing and trailing, four to six feet in length; the flowers purple, in drooping corymbs, much resembling those of its congener, the potato, but much smaller, followed by ovate red berries of tempting appearance, which, although by no means approaching in poisonousness to those of the true nightshade, contain an apparently variable quantity of alkaloid.

BITTERWOOD, a name given to certain species of trees and shrubs remarkable for the bitterness of their wood, particularly the West India *X glabra*. Furniture made of this wood is safe from the attacks of insects. Bitterwood is also the name of *Picræna excelsa*, a tree of the natural order Simarubacæ, a native of Jamaica, the wood of which is now alone used in medicine as Quassia, owing to the scarcity of the *Quassia amara*, to which the name was first given.

BITUMEN, a mineral substance, remarkable for its inflammability and its strong peculiar odor; generally, however, supposed to be of vegetable origin. The name is variously employed, sometimes to include a number of the substances called mineral resins, particularly the liquid mineral substances, called naphtha and petroleum, and the solid ones called mineral pitch, asphalt, mineral caoutchouc, etc. Asphalt occurs plentifully on the shores and floating on the surface of the Dead Sea. It is met with in mass in many other places, as in Trinidad, at Limmer in Hanover, at Lobsan in Alsace, at Val de Travers in Switzerland, etc. Mineral caoutchouc is elastic and flexible like caoutchouc, and may be used for effacing pencil marks.

BIVALVES form a class of shelled animals or molluscs in which the shell consists of two limy plates or valves, lying one on each side of the body. Mussel, oyster, cockle, and clam are very familiar examples. The great majority live a sessile life, except during their youngest stages. To Owen is due the designation Lamellibranchiata, which refers to the plate-like character of their gills, and it is by this title that they are now generally known. The body of the bivalve can usually be split along the middle line into similar halves. It is bilaterally symmetrical. The shell is an organic growth, and consists of three layers—soft and cuticular, prismatic, and mother-of-pearl. The growth takes place on the internal surface, and at the margin of the mantle. The majority of bivalves are marine forms, but not a few occur in fresh water. Many bivalves (oysters, mussel, cockle, clam, etc.) are used for food. Pearl and mother-of-pearl are obtained from Meleagrina and other forms. The valves of Placuna are sometimes used for window-panes. Larger shells are occasionally calcined for lime.

BIVOUAC (through Fr. from Ger. *beiwache: bei*, near, and *wachen*, to watch) is the encampment of soldiers in the open air, without tents, where everyone remains dressed in his place, and with his weapons by him.

BIZERTA, or Benzert, a seaport of North Africa, in Tunis, thirty-eight miles from the capital, on a gulf or salt lake of the same name, which communicates with a shallow freshwater lake in the interior, formerly called Sisara, and now the lake of Gebel Ishkel. It occupies the site of the ancient Tyrian colony Hippo Zaritus, the harbor which, by means of a spacious pier, protecting it from the northeast wind, was rendered one of the safest and finest on this coast. Population, 8,000.

BLACK, Dr. Joseph, a celebrated chemist, was born, in 1728, at Bordeaux, where his father—a native of Belfast, but of Scotch descent—was engaged in the wine trade. He was educated from his twelfth to his eighteenth year at a grammar school in Belfast, whence he removed, in 1746, to the university of Glasgow. There he chose medicine as his profession, and devoted himself earnestly to physical science.

In 1751 he went to complete his medical studies at Edinburgh, and after taking his medical degree there, in 1754, revealed himself as a great scientific discoverer. At that time the causticity of the alkalies was attributed to their absorbing an imaginary fire-essence known as phlogiston, an hypothesis which Black overthrew by showing that their causticity depended on their combining with a ponderable gas, carbonic acid, which he named *fixed air*, meaning that it was found not only as a separate fluid, but as *fixed* in solid bodies.

These works revolutionized chemistry. Previous investigators imagined that atmospheric air was the sole permanently aeriform element, a belief to which even Hales, who had shown that solids contain elastic fluids, had adhered. But when Black proved that a gas not identical with atmospheric air was found in alkalies, it was made plain that various dissimilar gases might exist, and pneumatic chemistry was founded.

Although the full value of this discovery was not immediately visible, it added so greatly to Black's reputation that in 1756 he was chosen to succeed Dr. Cullen as lecturer on chemistry in Glasgow University. He retired from his professorship in 1796, and died on November 26, 1799.

BLACK FOREST (German, Schwarzwald), an extensive upland district on the right bank of the upper Rhine, stretching from that river to the Neckar and upper Danube. See Baden and Wurtemberg.

BLACK SEA, or Euxine, the *Pontus Euxinus* of the ancients, is a large inland sea, bounded on the west by the Turkish provinces of Rumilia, Bulgaria, and Moldavia; on the north by South Russia, including Bessarabia, Kherson, and Taurida; on the east by the Russian provinces of Circassia and Transcaucasia; and on the south by the Turkish provinces of Asia Minor. It is entered from the Mediterranean through the channel of the Dardanelles or *Hellespontus*, the Sea of Mamora or *Propontis*, and the channel of Constantinople or *Thracian Bosphorus;* and it is connected with the Sea of Azoff, or *Palus Mæotis*, by the strait between the Crimea and the isle of Taman, anciently the *Cimmerian Bosphorus*, and known by the various modern names of the Strait of Kertch, of Yenikale, and of Taman.

The basin of the Black Sea is of an irregular ovate form, its long diameter lying nearly east and west. Its greatest length, from the head of the Bay of Burghaz in Rumilia on the west to the boundary between Transcaucasia and Asiatic Turkey near Batum on the east, is about 720 miles. Its greatest breadth is in its western portion, between the estuary of the Dnieper on the north and the mouth of the Sakaria on the south, where it is 380 miles; its middle portion is narrowed, by the projection of the Crimean peninsula on the north and of the coast line of Anatolia between Cape Kerempe and Sinope on the south, to 160 miles; but further east it widens out again between the Strait of Kerth on the north and the mouth of the Kizil Irmak (the ancient (*Halys*) on the south, to 260 miles. Its total area, in-

cluding the Sea of Azoff, is about 172,500 square miles.

The Sea of Azoff may be considered as the wide shallow estuary of the River Don, which discharges its waters into the north-eastern prolongation of the sea, sometimes distinguished as the Gulf of Taganrog; its area is estimated at about 14,000 square miles; and its depth which is nowhere more than 7½ fathoms, diminishes near the shores to 4½ fathoms, and is less that 2 fathoms opposite the town of Taganrog.

The basin of the Euxine communicates with that of the Sea of Marmora by the Bosphorus, a strait about 20 miles long, from ¾ to 2¼ miles wide, and a depth of from 30 to 40 fathoms, resembling a broad river with high banks, which maintain a general parallelism, although the strait has seven distinct reaches. The region on either side presents distinct evidence of recent volcanic action.

The Sea of Marmora lies in the course of the channel that connects the Black Sea with the Ægean. Its bottom is depressed to a depth far greater than that of the channel of which it is an expansion. Its length from strait to strait is 110 geographical miles, and its greatest breadth is 43 miles.

The channel which connects the Sea of Marmora with the Ægean is properly termed the Hellespont, — the name Dardanelles, by which it is commonly known, being really that of the fortifications erected on the two sides of the strait by which its passage is guarded. The Sea of Marmora narrows to a breadth of ten miles towards the north-eastern entrance of the channel; at Gallipoli, the distance between the two shores suddenly contracts to about two miles; and between this and the Ægean end of the strait, that distance is diminished at certain points to even less than a mile.

It is during the winter months, when a large proportion of the drainage area of the Black Sea rivers is covered with snow, that the supply of water is at its minimum; but it is then that the evaporation from its surface is also at its minimum; so that there is no reason to suppose that the level of the Black Sea ever falls below that of the Ægean.

The Basin of the Black Sea is frequented by seals, dolphins and porpoises; and it is said that in the neighborhood of the mouths of the Danube the porpoise is perfectly white, so that the Greek mariners, when they catch sight of it, know that they are in the current of that river, although in 30 fathoms of water, and many leagues from land. The fish of the Black Sea appear to be for the most part the same as those of the Caspian and the Sea of Aral. Its northern rivers bring into it the sturgeon, sterlet, and other fresh-water fish, which can live in and near their estuaries. On the other hand, its waters are elsewhere salt enough for the mackerel, whiting, mullet, turbot, and sole.

BLACKBIRD (*Turdus merula*), belongs to the *Turdidæ* or Thrushes, a family of Dentirostrol Birds. The plumage of the male is of a uniform black color, that of the female various shades of brown, while the bill of the male, especially during the breeding season, is of a bright gamboge yellow.

BLACKBURN, a large manufacturing town and municipal borough of England, situated on a stream called, in *Domesday Book*, the Blackeburn, but now only known as "The Brook," in the north-eastern division of the county of Lancaster, 209 miles from London by railway, 15 E. of Preston, and 30 N.N.W. of Manchester. Besides its numerous churches and chapels, the public buildings of Blackburn comprise a large town-hall, finished in 1856, a market-house, an exchange, built in 1865, a county court (1863), public baths (1864), and, outside the town, an infirmary (1862). A public park of about 50 acres was opened in 1857. Since about 1865, a variety of extensive and important improvements have been effected in the general condition of the town, which is now well paved and lighted, has an elaborate system of drainage, and receives an abundant supply of water. Previous to that date the so-called streets were, over a large area, almost useless for purposes of traffic. The staple trade of Blackburn has long been the manufacture of cotton, for the development of which a great deal was done by some natives of the town, such as Peel and Hargreaves, in the last century. The subordinate branches include woollen factories, engineering works, iron foundries, and breweries. In 1871 there were employed in the cotton factories 14,220 men and 17,075 women, of twenty years of age and upwards; the engineering works gave employment to 356 men, and the iron manufacture to 794. Coal, and lime, and building stone are abundant in the neighboring district, which is, however, very far from fertile. The Leeds and Liverpool canal passes the town, which has also extensive railway communication. Blackburn is a place of some antiquity, and its parish church of St. Mary's (for the most part taken down in 1813), dated from before the Norman Conquest. It was for a time the chief town of a district known as Blackburnshire, and as early as the reign of Elizabeth ranked as a flourishing market town. About the middle of the 17th century it became famous for its "checks," which were afterwards superseded by a similar linen-and-cotton fabric known as "Blackburn greys." A charter of incorporation was obtained in 1851, when W. H. Hornby, one of the largest cotton manufacturers of the place, was elected first mayor. The population of the town, which was only about 5000 in 1790, had increased by 1801 to 11,980. In 1861 there were 11,306 inhabited houses in the municipal borough; and by the census of 1871 the number had increased to 14,690. In the former year the population of the municipal borough was 63,126, and in 1871 it amounted to 76,339.

BLACKCOCK (*Tetrao tetrix*), a Gallinaceous Bird belonging to the family *Tetraonidæ* or Grouse, the female of which is known as the Grey Hen and the young as Poults. In size and plumage the two sexes offer a striking contrast, the male weighing about 4 lb., its plumage for the most part of a rich glossy black shot with blue and purple, the lateral tail feathers curved outwards so as to form, when raised, a fan-like crescent, and the eyebrows destitute of feathers and of a bright vermilion red. The female, on the other hand, weighs only 2 lb., its plumage is of a russet brown color irregularly barred with black, and its tail feathers are of the ordinary form or but slightly forked. The males are polygamous, and during autumn and winter associate together, feeding in flocks apart from the females; but with the approach of spring they separate, each selecting a locality for itself, from which it drives off all intruders, and where morning and evening it seeks to attract the other sex by a display of its beautiful plumage, which at this season attains its greatest perfection, and by a peculiar cry, which is similar to the noise made by the whetting of a scythe. The blackcock is very generally distributed over the highland districts of Northern and Central Europe, and in some parts of Asia. It is found on the principal heaths in the south of England, but is specially abundant in the Highlands of Scotland, where great numbers are killed annually during the statutory shooting season, which commences on August 20 and extends to December 10. The bird does not occur in Ireland, and all attempts that have hitherto been made to naturalize it there have failed, although it now thrives and breeds in the south-west of Scotland within 21 miles of the Irish coast.

BLACK DEATH is a name given to a fearful epidemic which desolated the world from China to Ireland in the fourteenth century. It raged throughout Europe in 1348–49, again in 1361–62 and in 1369. It is believed to have been the Oriental plague with some special symptoms, mainly boils or buboes on the thighs and arms, black blotches, and putrid inflammation of the lungs, with vomiting of blood. In most cases the victims died in two or three days, and sometimes within a day. Boccaccio's *Decameron* gives a singularly vivid view of its ravages in Florence.

BLACK LETTER (Black Letter), the name which came into use about 1600. The first types were copies of the letters in use in Germany and Holland in the middle of the fifteenth century, and were Gothic or "black letter." The black letter was long retained for the printing of Bibles, prayer-books, proclamations, acts of parliament, etc The *Black-letter Saints' Days* of the Anglican calendar were so called from being printed in old calendars in black letters, whereas the greater feasts were usually printed in red (hence Red-letter Days).

BLACKLOCK, Thomas, a Scottish poet and divine, was born at Annan, in Dumfriesshire, in 1721. When not quite six months old he lost his sight by the small-pox. Under this misfortune, his father and friends endeavored to amuse him as he grew up by reading to him various books, among others, the works of Milton, Spenser, Prior, Pope, and Addison. Shortly after the death of his father, which took place in 1740, some of Blacklock's poems began to be handed about among his acquaintances and friends, and a few specimens were brought under the notice of Dr. Stevenson of Edinburgh, who was struck by their merits, and formed the design of giving the author a classical education. Blacklock, in consequence, was enrolled a student of divinity in the University of Edinburgh in 1741, and continued his studies under the patronage of Dr. Stevenson till 1745, when he retired to Dumfries, and resided there until the close of the civil war. When peace had been restored he returned to the university, and while residing in Edinburgh he made the acquaintance of several literary men, in particular of Hume, who was extremely useful to him in the publication by subscription of the 4to edition of his poems in 1756. He died in 1791.

BLACKMORE, Sir Richard, a physician, and voluminous writer of theological and poetical works, was born in Wiltshire about 1650, and died on October 9, 1729.

BLACKPOOL, a seaside town of England, in Lancashire, situated on the coast to the north of the estuary of the Ribble, about twenty miles west of Preston by rail. It is largely frequented as a bathing-place. A good sandy beach, bracing air, and a fine view are its chief attractions. In the end of the last century it was a mere hamlet, but since then it has gradually increased. It has two churches, two market-halls, a court-house, and assembly rooms. Population in 1889, 10,000.

BLACK SNAKE (*Bascanium constrictor*, see Coluber), a species of snake common in the United States, from Louisiana to Connecticut. Barring the white throat, it is of an almost uniform leaden color, is one of the largest serpents in North America, and is remarkable for its great speed. It feeds on small quadrupeds, birds, frogs, and is a persistent enemy of the rattlesnake, which it crushes in its coils. It has no poison fangs.—The commonest Australian snake (*Pseudechis porphyricus*), found in marshy places, is also called the Black Snake. It may measure over six feet in length, is very venomous, belongs to the family Elapidæ, and is nearly allied to the Cobra.

BLACKSTONE, Sir William, an eminent English jurist, was born at London, July 10, 1723. Having made choice of the profession of law, he was entered in the Middle Temple, November 20, 1741. In 1750 he commenced doctor of civil law, and thereby became a member of the convocation, which enabled him to extend his views beyond the narrow circle of his own society, to the benefit of the university at large. In the summer of 1753 he took the resolution of wholly retiring to his fellowship and an academical life, still continuing the practice of law as a provincial counsel.

His lectures on the laws of England appear to have been an early and favorite idea, for in the Michaelmas term immediately after he quitted Westminster Hall he entered on the duty of reading them at Oxford. It was not till the year 1758 that the lectures in the form they now bear were read in the university. Mr. Viner having by his will left not only the copyright of his abridgment, but other property to a considerable amount, to the University of Oxford, in order to found a professorship, fellowships, and scholarships of common law, Blackstone was on October 20, 1758, unanimously elected Vinerian professor; and on the 25th of the same month he read his first introductory lecture, which he published at the request of the vice-chancellor and heads of houses, and afterward prefixed to the first volume of his celebrated *Commentaries*. It is doubtful whether the *Commentaries* were originally intended for the press; but many imperfect and incorrect copies having got into circulation, and a printed edition of them being either published or preparing for publication in Ireland, the author thought proper to print a correct edition himself, and in November, 1765, published the first volume, under the title of *Commentaries on the Laws of England*. The remaining parts of the work were given to the world in the course of the four succeeding years. He was likewise elected to parliament, first for Hindon, and afterward for Westbury in Wilts; but in neither of these departments did he equal the expectations which his writings had raised. The part he took in the Middlesex election drew upon him the attacks of some persons of ability in the senate, and likewise a severe animadversion from the caustic pen of *Junius*. In 1770 he declined the place of solicitor-general; but shortly afterward, on the promotion of Sir Joseph Yates to a seat in the Court of Common Pleas, he accepted a seat on the bench, and, on the death of Sir Joseph, succeeded him there also. He died on February 14, 1780.

BLACKSTONE, a city of Massachusetts, in Worcester county, is situated on the Blackstone river, at the intersection of several railroads. Its principal business interests are the manufacture of cotton and woolen goods. It contains two hotels, two public halls, several churches and schools, etc., and a population of 6,137.

BLADDER (urinary) is a hollow bag for the reception of the urine. When moderately distended it has a capacity of about a pint, but under various conditions it is capable of holding far more, and when completely paralyzed there is no limit to its distension. In general zoölogical usage the term is applied also to that outgrowth from the dorsal surface of the gut which forms the air or swim-bladder of many fishes, and serves in a few cases as an incipient lung.

BLAINVILLE, Henri-Marie Ducrotay de, a distinguished naturalist, was born at Arques, near Dieppe, September 12, 1777. About the year 1795 he entered the school of design at Rouen, but after a very short time went to Paris, where he became a pupil of Vincent the painter. Attracted by the lectures of Cuvier and other eminent professors in the College of France, he commenced the study of anatomy, and in 1808 he took the degree of M.D. He now devoted himself to the study of natural history, particularly the

department of myology, and he soon attracted the attention of Cuvier, who engaged him to draw some figures for one of his works, and to carry out some of the practical work of anatomy. He was also chosen by that illustrious professor to supply his place on occasions at the College of France and at the Athenæum, and in 1812 he obtained the vacant chair of anatomy and zoology in the Faculty of Science at Paris. His somewhat irascible disposition was probably one cause of the subsequent estrangement between him and Cuvier, which ended in an open and irreconcilable enmity. In 1825 Blainville was admitted a member of the Academy of Sciences; and in 1830 he was appointed to succeed Lamarck in the chair of natural history at the museum. This he resigned in 1832, being appointed on the death of Cuvier to the chair of comparative anatomy, which he continued to occupy for the space of eighteen years, and in the conduct of which he proved himself no unworthy successor to his great teacher. Blainville was found dead in a railway carriage while travelling between Rouen and Caen, May 1, 1850.

BLAIR, or PORT-BLAIR, the chief place in the convict settlement of the Andaman Islands in the Indian Ocean, is situated on the south-east shore of the South Andaman Island, in 11° 42′ N. lat. and 93° E. long.

BLAIR, DR. HUGH, was born April 7, 1718, at Edinburgh, where his father was a merchant. He entered Edinburgh University in 1730 and won the favorable notice of Professor Stevenson by an essay on the Beautiful, written for the logic class in his sixteenth year. On taking the degree of M.A. in 1739, he printed a thesis *De Fundamentis et Obligatione Legis Naturæ*, which contains an outline of the moral principles afterwards unfolded in his sermons. He was licensed to preach in 1741, and in a few months the earl of Leven, hearing of his eloquence, presented him to the parish of Collessie in Fife. In 1743 he was elected to the second charge of the Canongate Church, Edinburgh, where he performed the pastoral duties with great success until removed to Lady Yester's, one of the city churches, in 1754. In 1777 the first volume of his *Sermons* appeared. It was succeeded by other four volumes, all of which met with the greatest success. Dr. Samuel Johnson praised them warmly. "I love Blair's *Sermons*," Johnson said, "his doctrine is the best limited, the best expressed; there is the most warmth without fanaticism, the most rational transport." The *Sermons* were translated into almost every language of Europe, and in 1780, to signify the royal approbation, George III. conferred upon him a pension of £200 a year. He died after a brief illness on the 27th December 1801. In the church Blair belonged to the "moderate" or latitudinarian party, and his *Sermons* have been objected to as deficient in doctrinal definiteness. His once brilliant reputation is now becoming forgotten. His works display little originality, but are written in a flowing and elaborate style; and his *Rhetoric*, although inferior to Campbell's, and wanting in research and depth of thought, is unworthy of the neglect it has met with.

BLAIR, ROBERT, author of the well-known poem entitled *The Grave*, was the eldest son of the Rev. Robert Blair, of Edinburgh. He was probably born at Edinburgh about the year 1700, and died of fever February 4, 1746.

BLAKE, ROBERT, the famous English admiral of the Commonwealth, was born at Bridgewater in Somersetshire, in August 1598. His birth thus falls in the year before that of Cromwell; their lives ran parallel in the service of their country; their characters present many points of likeness; and they died within a few months of each other. Blake was the eldest son of a well-to-do merchant, and received his early education at the grammar school of Bridgewater. At the age of sixteen he was sent to Oxford, entering at first St. Alban's Hall, but removing afterwards to Wadham College, then recently founded by his father's friend, Nicholas Wadham, from Oxford, after taking his degree of M.A., he returned to his father's house, where, his thorough honesty, his public spirit and disinterestedness, his courageous utterance of what he thought of the court and the church, of shipmoney and the High Commission Court and the licence of the times, made him a man of mark among his neighbors. And when, after eleven years of kingship without parliaments, a parliament was summoned to meet in April 1640, Blake was elected by the Presbyterian party to represent his native borough. This parliament, named "the Short," was dissolved in three weeks, and the career of Blake as a politician was suspended. Two years later the inevitable conflict began. Blake declared for the Parliament; and thinking, says Johnson, a bare declaration for right not all the duty of a good man, he raised a troop of horse in his county, and rendered such efficient service, that in 1643 he was entrusted with the command of one of the forts of Bristol. This he stoutly held during the siege of the town by Prince Rupert, and was near being hung for continuing his resistance after the governor had capitulated. In the following year Colonel Blake took Taunton by surprise, and notwithstanding its imperfect defences and inadequate supplies, held the town for the Parliament against two sieges by the Royalists, until July 1645, when it was relieved by Fairfax. Blake did not approve of the trial and execution of Charles I.; but he adhered to the Parliamentary party after the king's death, and within a month (February 1649) was appointed, with Colonels Dean and Popham, to the command of the fleet, under the title of General of the Sea. In April he was sent in pursuit of Prince Rupert, who with the Royalist fleet had entered the harbor of Kinsale in Ireland. There he blockaded the Prince for six months; and when the latter, in want of provisions, and hopeless of relief, succeeded in making his escape with the fleet and in reaching the Tagus, Blake followed him thither, and again blockaded him for some months. The king of Portugal refusing permission for Blake to attack his enemy, the latter made reprisals by falling on the Portuguese fleet, richly laden, returning from Brazil. He captured seventeen ships and burnt three, bringing his prizes home without molestation. After revictualling his fleet, he sailed again, captured a French man-of-war, and then pursued Prince Rupert once more to the harbor of Carthagena. The Spanish governor would not allow him to violate the peace of a neutral port, and he therefore withdrew. In January 1651 he at last attacked the Royalist fleet in Malaga harbor, and destroyed the whole with the exception of two ships. In consequence of the Portuguese protest against his proceedings, a formal investigation was instituted in England, which resulted in the approval of the home authorities. The thanks of Parliament were voted to Blake, and he was appointed warden of the Cinque Ports. He was continued in his office of admiral and general of the sea; and in May following he took, in conjunction with Ayscue, the Scilly Islands. For his service the thanks of Parliament were again rewarded him, and he was soon after made a member of the Council of State. In 1652 war broke out with the Dutch, who had made great preparations for the conflict. In March the command of the fleet was given to Blake for nine months; and in the middle of May the Dutch fleet of forty-five ships, led by their great admiral Van Tromp, appeared in the Downs. Blake, who had only twenty ships, sailed to meet them, and the battle took place off Dover on May 19. The

Dutch were defeated in an engagement of four or five hours, lost two ships, and withdrew under cover of darkness. Attempts at accommodation were made by the States, but they failed. Early in July war was formally declared, and in the same month Blake captured a large part of the Dutch fishery-fleet and the twelve men-of-war that formed their convoy. On September 28, Blake and Penn again encountered the Dutch fleet, now commanded by De Ruyter and De Witt, in the Downs, defeated it, and chased it for two days. The Dutch took refuge in Goree. A third battle was fought near the end of November. By this time the ships under Blake's command had been reduced in number to forty, and nearly the half of these were useless for want of seamen. Van Tromp, who had been reinstated in command, appeared in the Downs, with a fleet of eight ships, besides ten fire-ships, Blake, nevertheless, risked a battle, but was defeated, and withdrew into the Thames. It was in his first elation at this victory that Van Tromp carried the broom at his masthead in his passage through the Channel, as a pledge of his determination to sweep the English off the seas. His bravado was speedily avenged. The English fleet having been refitted, put to sea again in February 1653; and on the 18th, Blake, at the head of eighty ships, encountered Van Tromp in the Channel. The Dutch force, according to Clarendon, numbered 100 ships of war, but according to the official reports of the Dutch, only seventy. The battle was severe and continued through three days, the Dutch however retreating, and taking refuge in the shallow waters off the French coast. In this action Blake was severely wounded. The three English admirals put to sea again in May; and on June 3d and 4th another battle was fought near the North Foreland. On the first day Dean and Monk were repulsed by Van Tromp; but on the second day the scales were turned by the arrival of Blake, and the Dutch retreated to the Texel. In November 1654 he was selected by Cromwell to conduct a fleet to the Mediterranean to exact compensation from the Duke of Tuscany, the knights of Malta, and the piratical states of North Africa, for wrongs done to English merchants. This mission he executed with his accustomed spirit and complete success. Tunis alone dared to resist his demands, and Tunis paid the penalty of the destruction of its two fortresses by English guns. In the winter of 1655-56, war being declared against Spain, Blake was sent to cruise off Cadiz and the neighboring coasts, to intercept the Spanish shipping. One of his captains captured a part of the Plate fleet in September 1656. In April 1657 Blake, then in very ill health, suffering from dropsy and scurvy, and anxious to have assistance in his arduous duties, heard that the Plate fleet lay at anchor in the bay of Santa Cruz, in the island of Teneriffe. The position was a very strong one, defended by a castle and several forts with guns. Under the shelter of these lay a fleet of sixteen ships drawn up in crescent order. Captain Stayner was ordered to enter the bay and fall on the fleet. This he did. Blake followed him. Broadsides were poured into the castle and the forts at the same time; and soon nothing was left but ruined walls and charred fragments of burnt ships. The wind was blowing hard into the bay; but suddenly, and fortunately for the heroic Blake, it shifted, and carried him safely out to sea. "The whole action," says Clarendon, "was so incredible that all men who knew the place wondered that any sober man, with what courage soever endowed, would ever have undertaken it; and they could hardly persuade themselves to believe what they had done; while the Spaniards comforted themselves with the belief that they were devils and not men who had destroyed them in such a manner." The English lost one ship and 200 men killed and wounded. The thanks of Parliament were voted to officers and men; and a very costly diamond ring was presented to Blake. This was the last action of the brave Blake. After again cruising for a time off Cadiz, his health failing more and more, he was compelled to make homewards before the summer was over. He died at sea, but within sight of Plymouth, August 17, 1657. His body was brought to London and embalmed, and after lying in state at Greenwich House was interred with great pomp and solemnity in Westminster Abbey.

BLAKE, WILLIAM, poet and painter, was born in London, on 28th November 1757. At the age of ten the boy was sent to a drawing school kept by Mr. Pars, and at the same time he was already cultivating his own taste by constant attendance at the different art sale rooms, where he was known as the "little connoisseur." Here he began to collect prints after Michael Angelo, and Raphael, Durer, and Hemskerk, while at the school in the Strand he had the opportunity of drawing from the antique. After four years of this preliminary instruction Blake entered upon another branch of art study. In 1777 he was apprenticed to James Basire, an engraver of repute, and with him he remained seven years. His apprenticeship had an important bearing on Blake's artistic education, and marks the department of art in which he was made technically proficient. In 1778, at the end of his apprenticeship, he proceeded to the school of the Royal Academy, where he continued his early study from the antique, and had for the first time an opportunity of drawing from the living model.

In 1784 Blake set up in company with a fellow-pupil, Parker, as print-seller and engraver next to his father's house in Broad Street, Golden Square, but in 1787 this partnership was severed, and he established an independent business in Poland Street. It was from this house, and in 1787, that the *Songs of Innocence* were published, a work that must always be remarkable for beauty both of verse and of design, as well as for the singular method by which the two were combined and expressed by the artist. Blake became in fact his own printer and publisher. He engraved upon copper, by a process devised by himself, both the text of his poems and the surrounding decorative design, and to the pages printed from the copper plates an appropriate coloring was afterwards added by hand. The poetic genius already discernible in the first volume of *Poetical Sketches* is here more decisively expressed, and some of the songs in this volume deserve to take rank with the best things of their kind in our literature. In an age of enfeebled poetic style, when Wordsworth, with more weighty apparatus, had as yet scarcely begun his reform of English versification, Blake, unaided by any contemporary influence, produced a work of fresh and living beauty; and if the *Songs of Innocence* established Blake's claim to the title of poet, the setting in which they were given to the world proved that he was also something more. For the full development of his artistic powers we have to wait till a later date, but here at least he exhibits a just and original understanding of the sources of decorative beauty. Each page of these poems is a study of design, full of invention, and often wrought with the utmost delicacy of workmanship. The artist retained to the end this feeling for decorative effect; but as time went on, he considerably enlarged the imaginative scope of his work, and decoration then became the condition rather than the aim of his labor.

Notwithstanding the distinct and precious qualities of this volume, it attracted but slight attention, a fact perhaps not very wonderful, when the system of publication is taken into account. Blake, however, proceeded with

other work of the same kind. The same year he published *The Book of Thel*, more decidedly mystic in its poetry, but scarcely less beautiful as a piece of illumination; *The Marriage of Heaven and Hell* followed in 1790; and in 1793 there are added *The Gates of Paradise*, *The Vision of the Daughters of Albion*, and some other "Prophetic Books."

In 1796 Blake was actively employed in the work of illustration. Edwards, a bookseller of New Bond Street, projected a new edition of Young's *Night Thoughts*, and Blake was chosen to illustrate the work.

The remainder of the artist's life is not outwardly eventful. In 1813 he formed, through the introduction of George Cumberland, of Bristol, a valuable friendship with Mr. John Linnell and other rising water color painters. In 1821 Blake removed to Fountain Court, in the Strand, where he died in 1827.

BLANC, MONT, the highest, and in other respects one of the most remarkable mountains in Europe, is situated in that division of the great Alpine system known as the Pennine Alps. It rises almost in the shape of a pyramid to the height of 15,780 feet, and is visible at a distance of 130 miles to the west. The mass of the mountain is composed of granite, covered with strata of schists and limestones. To the N.E. lies the beautiful vale of Chamouni, and on the S.W. the Allée Blanche. Of the numerous glaciers that send their ice-streams down its sides the most remarkable is the Mer de Glace, which winds down its northern slope towards Chamouni, and gives birth to the River Arve. The ascent of Mont Blanc was first accomplished in 1786 by a guide named Jaques Balmat, who shortly afterwards led Dr. Paccard, a local physician, to the summit, and thus gave him the honor of being the first person of scientific education to make known the possibility of the undertaking. De Saussure, the naturalist, ascended in the following year, and when the Italian naturalist Imperiale de Sant-Angelo made the ascent in 1840 he had been preceded by thirty-three known travellers. The whole journey to the top and back can now be accomplished in 50 or 60 hours; but in general the view can hardly be said to be worth the fatigue, the extreme height of the position, even when the outlook is unclouded, rendering the prospect indistinct. For authorities see ALPS.

BLANE, SIR GILBERT, a distinguished physician, was born at Blanefield in Ayrshire, in 1749, and died in London in 1834.

BLANES, a city of the province of Gerona in Spain, at the mouth of the River Tordera, defended by a castle. The population, 5,900 in number, are principally employed in the fisheries and navigation.

BLANKETS. The best qualities are wholly of wool, though cheaper grades are formed of cotton warp and woolen weft threads, in which the soft wool is spread over the strong cotton web. Certain of the finest American blankets sell at from $30 to $50 a pair, and nothing comparable with them in weight, thickness, softness and perfection of face had ever before been attempted. Some of the American Indians, especially the Navajoes, make blankets, which for beauty, warmth and durability have never been surpassed. Extraordinarily fine woolen blankets are made in Mysore in India; some, it is said, so delicate that, though as much as eighteen feet long, they can be rolled inside a hollow bamboo.

BLANK VERSE, or verse without rhyme, a name applied especially to the iambic pentameter or unrhymed five-foot iambic of English dramatic and epic poetry. The first specimen of blank verse in English is a translation of the second and fourth books of Virgil's *Æneid*, by the Earl of Surrey. Shakespeare's plays are nearly all in blank verse. Milton's *Paradise Lost* (1667) was the first great poem written in blank verse. From Milton's time blank verse has been common for narrative, didactic, or descriptive poetry.

BLARNEY, a small village of Ireland, in the county of Cork, about 5 miles from that city, chiefly celebrated as giving name to a peculiar kind of eloquence, alleged to be characteristic of the natives of Ireland. The "Blarney Stone," the kissing of which is said to confer this faculty, is pointed out within the castle.

BLASPHEMY means literally defamation or evil speaking, but is more peculiarly restricted to an indignity offered to the Deity by words or writing.

BLASTING is the process by which portions of rock, or other hard substances, are disintegrated by means of an explosive agent, such as gunpowder. It is largely resorted to in quarrying, tunnelling, and mining operations.

Of late years there has been rapid advance in the art, through the discovery of new explosives, through improvements in appliances for firing, &c.; so that the older method of blasting has, in many instances, given place to a more complex system, with which much better results are obtained.

In reviewing recent developments of the art of blasting, the application of machinery in the boring of rocks naturally claims some attention. A good rock-boring machine, at least where used in connection with simultaneous firing by electricity, ensures considerable economy in time and labor over the old method of hand-boring. Of such machines, in which the jumper is repeatedly driven against the rock by compressed air or steam, being also made to rotate slightly at each blow, there are several varieties; the Burleigh rock drill is one of the best. It was used in the Hoosac tunnel in Massachusetts from 1869; and the last 5220 yards were completed with only eight of these machines. The rock was gneiss alternating with quartz. With hand-boring, the progress per minute was about 16 yards; with the Burleigh drill it was 48 yards, and the work was about one-third cheaper. According to *Engineering*, the cost of the Mont Cenis tunnel was $975 per linear yard; that of the Hoosac tunnel, notwithstanding much harder rock, only $900. In the recent large blastings at Hellgate, New York, the Burleigh machines also established their superiority, and came to be used exclusively.

Where rapid destruction is to be accomplished there is a saving of labor, of tools, and of time by use of the new explosive agents (such as dynamite or gun-cotton). Their shattering and splitting effect in hard rock is much greater; but in quarrying, the rock is generally not thrown out by them to the same extent. Where a moderate cleaving or splitting effect is desired, with as little local action as possible, gunpowder is best, as in raising large blocks of slate; also where great displacing action is required. In submarine blasting of soft rocks the violent explosives disintegrate the rock into a plastic mass within a limited area, but do not shatter or rend it to any great distance.

As regards comparative safety, there is no doubt that modern explosives offer a relative immunity from the danger arising from fire, to which gunpowder is subject. Neither dynamite nor gun-cotton can be fired by a spark, and if accidentally fired by a flame, they allow reasonable chances of escape. On the other hand, accidents have often happened in the thawing of nitroglycerine preparations when frozen,—a process that requires great care and for which suitable warming-pans are provided. But miners are slow to understand that a cartridge which firing does not set off cannot be slowly heated with the same impunity; hence they will roast the preparations

near a fire, or on hot cinders, or in other ways really dangerous.

It is known that electricity has a thermal effect on wire through which it passes; and the amount of heat produced in any part of the circuit is proportional to the resistance in that part. Thus a piece of wire of small section and conductivity may be made incandescent by a current. On this principle platinum is sometimes employed to fire blasting charges. In making a fuse of this sort, two insulated copper wires are twisted together for a length of about 6 inches, leaving the extremities free for about half an inch, and separated the same distance. A fine platinum (or iron) wire is stretched across this interval, metallic contact being established with the copper. The other ends of the fuse are connected with a battery. Platinum fuses are not much to be relied on for simultaneous blasting of several charges by one battery; for some of the fuses may take a little more time to reach the exploding temperature than others, and thus, as soon as one explodes, the connection between the others and the battery is broken. The batteries to be used with them are such as generate electricity of great quantity. The Bunsen and Leclanché batteries, in some of their varieties, are well suited for this. Twelve cells of Highton's battery will melt a piece of platinum wire over an inch long.

There is, however, another class of fuses, offering certain advantages over those just referred to, in which the spark produced by electricity of tension is the means used to effect the explosion. It might naturally be thought that an electric spark must inevitably cause explosion in a mass of powder or like substance through which it is made to pass; but this is not the case. The heating power of the spark is often insufficient for an explosion. The duration of an induction spark is about the *millionth* of a second; whereas, to ignite powder, it is necessary that a spark should exist for at least the *three hundredth* part of a second. By interposing, however, a suitable priming composition in the interval which the spark is to cross, and in contact with the charge, explosion may be thus effected. In preparing such a composition, the properties of the ingredients as regards conductivity, inflammability, and explosiveness have to be nicely adjusted, according to the degree of tension of the electricity employed. The composition selected by Professor Abel for his fuses is an intimate mixture of subsulphide of copper, subphosphide of copper, and chlorate of potassium. It is a mixture which conducts, but conducts with difficulty, and the fuses made with it are very effective. There are several other varieties, *e.g.*, Ebner's fuse, where the priming consists of a mixture of sulphuret of antimony, chlorate of potash, and graphite.

BLEACHING is the process of whitening or depriving objects of color, an operation incessantly in activity in nature by the influence of light, air, and moisture. The art of bleaching, of which we have here to treat, consists in inducing the rapid operation of whitening agencies, and as an industry it is mostly directed to cotton, linen, silk, wool, and other textile fibres, but it is also applied to the whitening of paper-pulp, bees'-wax, and some oils and other substances. The term bleaching is derived from the Anglo-Saxon *blæcan* to bleach, or to fade, from which also comes the cognate German word *bleichen*, to whiten or render pale. Bleachers, down to the end of last century, were known in England as "whitsters," a name obviously derived from the nature of their calling.

The operation of bleaching must from its very nature be of the same antiquity as the work of washing textures of linen, cotton, or other vegetable fibres. Clothing repeatedly washed, and exposed in the open air to dry, gradually assumes a whiter and whiter hue, and our ancestors cannot have failed to notice and take advantage of this fact. Scarcely anything is known with certainty of the art of bleaching as practised by the nations of antiquity. Egypt in the early ages was the great centre of textile manufactures, and her white and colored linens were in high repute among contemporary nations. As a uniformly well-bleached basis is necessary for the production of a satisfactory dye on cloth, it may be assumed that the Egyptians were fairly proficient in bleaching, and that still more so were the Phœnicians with their brilliant and famous purple dyes. We learn, from Pliny, that different plants, and likewise the ashes of plants, which no doubt contained alkali, were employed as detergents. He mentions particularly the *Struthium* as much used for bleaching in Greece, a plant which has been identified by some with *Gypsophila Struthium*. But as it does not appear from Sibthorp's *Flora Græca*, published by Sir James Smith, that this species is a native of Greece, Dr. Sibthorp's conjecture that the *Struthium* of the ancients was the *Saponaria officinalis*, a plant common in Greece, is certainly more probable.

In modern times, down to the middle of the 18th century, the Dutch possessed almost a monopoly of the bleaching trade, although we find mention of bleachworks at Southwark near London as early as the middle of the 17th century. It was customary to send all the brown linen, then largely manufactured in Scotland, to Holland to be bleached. It was sent away in the month of March, and not returned till the end of October, being thus out of the hands of the merchant more than half a year.

The Dutch mode of bleaching, which was mostly conducted in the neighborhood of Haarlem, was to steep the linen first in a waste lye, and then for about a week in a potash lye poured over it boiling hot. The cloth being taken out of this lye, and washed, was next put into wooden vessels containing butter-milk, in which it lay under pressure for five or six days. After this it was spread upon the grass, and kept wet for several months, exposed to the sunshine of summer.

In 1728 James Adair from Belfast proposed to the Scotch Board of Manufactures to establish a bleachfield in Galloway; this proposal the board approved of, and in the same year resolved to devote £2000 as premiums for the establishment of bleachfields throughout the country. In 1732 a method of bleaching with kelp, introduced by R. Holden, also from Ireland, was submitted to the board; and with their assistance Holden established a bleachfield for prosecuting his process at Pitkerro, near Dundee.

The bleaching process, as at that time performed, was very tedious, occupying a complete summer. It consisted in steeping the cloth in alkaline lyes for several days, washing it clean, and spreading it upon the grass for some weeks. The steeping in alkaline lyes, called *bucking*, and the bleaching on the grass, called *crofting*, were repeated alternately for five or six times. The cloth was then steeped for some days in sour milk, washed clean, and crofted. These processes were repeated, diminishing every time the strength of the alkaline lye, till the linen had acquired the requisite whiteness.

For the first improvement in this tedious process, which was faithfully copied from the Dutch bleachfields, manufacturers were indebted to Dr. Francis Home of Edinburgh, to whom the Board of Trustees paid £100 for his experiments in bleaching. He proposed to substitute water acidulated with sulphuric acid for the sour milk previously employed, a suggestion made in consequence of the new mode of preparing sulphuric acid, contrived some time before by Dr. Roebuck, which re-

duced the price of that acid to less than one-third of what it had formerly been. When this change was first adopted by the bleachers, there was the same outcry against its corrosive effects as arose when chlorine was substituted for crofting. A great advantage was found to result from the use of sulphuric acid, which was that a souring with sulphuric acid required at the longest only twenty-four hours, and often not more than twelve; whereas, when sour milk was employed, six weeks, or even two months, were requisite, according to the state of the weather. In consequence of this improvement, the process of bleaching was shortened from eight months to four, which enabled the merchant to dispose of his goods so much the sooner, and consequently to trade with less capital.

No further modification of consequence was introduced in the art till the year 1787, when a most important change was initiated by the use of chlorine, an element which had been discovered by Scheele in Sweden about thirteen years before. Berthollet repeated the experiments of Scheele in 1785, and by the prosecution of further investigations he added considerably to the facts already known. He showed that this substance (called by Scheele *dephlogisticated muriatic acid*) is a gas soluble in water, to which it gives a yellowish green color, an astringent taste, and the peculiar smell by which the body is distinguished.

The property which this gas possesses of destroying vegetable colors, led Berthollet to suspect that it might be introduced with advantage into the art of bleaching, and that it would enable practical bleachers greatly to shorten their processes. In a paper on dephlogisticated muriatic acid, read before the Academy of Sciences at Paris in April 1785, and published in the *Journal de Physique* for May of the same year (vol. xxvi. p. 325), he mentions that he had tried the effect of the gas in bleaching cloth, and found it answered perfectly. This idea is still further developed in a paper on the same substance, published in the *Journal de Physique* for 1786. In 1786 he exhibited the experiment to Mr. James Watt, who, immediately upon his return to England, commenced a practical examination of the subject, and was accordingly the person who first introduced the new method of bleaching into Great Britain. We find from Mr. Watt's own testimony that chlorine was practically employed in the bleachfield of his father-in-law, Mr. Macgregor, in the neighborhood of Glasgow in March 1787. Shortly thereafter the method was introduced at Aberdeen by Messrs. Gordon, Barron, and Co., on information received from M. de Saussure through Professor Copland of Aberdeen. Mr. Thomas Henry of Manchester was the first to bleach with chlorine in the Lancashire district, and to his independent investigations several of the early improvements in the application of the material were due.

No very great amount of success, however, attended the efforts to utilize chlorine in bleaching operations till the subject was taken up by Mr. Tennant of Glasgow. He, after a great deal of most laborious and acute investigation, hit upon a method of making a saturated liquid of chloride of lime, which was found to answer perfectly all the purposes of the bleacher. This was certainly a most important improvement, without which, the prodigious extent of business carried on by some bleachers could not possibly have been transacted. Such was the acceleration of processes effected by the new method that, it is stated, a bleacher in Lancashire received 1400 pieces of gray muslin on a Tuesday, which on the Thursday immediately following were returned bleached to the manufacturers, at the distance of sixteen miles, and were packed up and sent off on that very day to a foreign market.

In the year 1798 Mr. Tennant took out a patent for his new invention, and offered the use of it to practical bleachers, for a fair and reasonable portion of the savings made by its substitution for potash, then in general use. Many of the bleachers, however, used it without paying him, and a combination was formed to resist the right of the patentee. In December 1802, an action for damages was brought against Messrs. Slater and Varley, nominally the defendants, but who, in fact, were backed and supported by a combination of almost all the bleachers in Lancashire. In consequence of this action, the patent right was set aside by the verdict of a jury and the decision of Lord Ellenborough, who used very strong language against the patentee. The grounds of this decision were, that the patent included a mode of *bucking* with quicklime and water, which was not a new invention. It was decided that, because one part of the patent was not new, therefore the whole must be set aside. Lime was indeed used previous to the patent of Mr. Tennant; but it was employed in a quite different manner from his, and he would have allowed the bleachers to continue their peculiar method without any objection, because it would have been productive of no injury to his emolument.

In consequence of this decision the use of liquid chloride of lime in bleaching was thrown open to all, and speedily came to be universally employed by the bleachers in Britain. Mr. Tennant, thus deprived of the fruits of several years of anxious and laborious investigation, advanced a step further, to what may be considered as the completion of the new method. This consisted in impregnating quicklime in a dry state with chlorine, an idea originally suggested by Mr. Charles M'Intosh of Cross Basket, then a partner with Messrs. Tennant and Knox. A patent for this was taken out on the 13th of April 1799, and he began his manufacture of solid chloride of lime, at first upon a small scale, which has ever since been gradually extending, and the manufactory is now the largest of the kind in Great Britain.

The various processes for the preparation of the so-called chloride of lime, or bleaching-powder, as conducted at the present day, and its other applications in arts, will be found described under the head of CHLORINE.

BLEACHING OF COTTON.

Of the two great staples, cotton and linen, to the whitening of which the art of the bleacher is directed, cotton is the more easily and expeditiously bleached. The basis of all vegetable fibres is cellulose or ligneous tissue, a pure white substance, and it is to obtain this body in a state of purity, free from the resinous matter naturally associated with it, as well as from adventitious impurities imparted in the process of spinning and weaving, that is the object of bleaching. The operations, although apparently complex and numerous, are essentially simple, though frequently repeated, and the greatest variety of detail is connected with the finishing of cloth, which is in reality a separate industry, frequently conducted in distinct establishments under the name of calendering and finishing works. Bleaching proper resolves itself into washing with suitable detergents, and subjecting the washed material to the influence of chlorine, whereby the coloring matter either belonging to the fibre or imparted to it is oxidized and discharged.

BLEACHING OF LINEN.

The bleaching of linen is a much more tedious and difficult operation than the bleaching of cotton. The process of water-retting, or rotting, by which the fibre is separated from the woody portion of the stalk, lodges a large proportion of coloring matter in the fibre, with

which it enters into very intimate combination. The amount of coloring matter which has thus to be dealt with in the bleaching of linen is very great, being as much as one-third of the entire weight of the fibre. In the early part of the century a great amount of public attention was given to a plan proposed by Mr. James Lee for preparing flax fibre without the process of steeping or retting, by which it was affirmed that, among other advantages, it would only be necessary simply to wash, in soap, linen fabrics made from fibre so prepared, to render them pure and white. Mr. Lee obtained a special Act of Parliament allowing the specification of his patent to remain sealed for seven years, and his plans were entered into in a most full and laborious manner by the Irish Linen Board. After the expenditure of many thousands of pounds on his machines and experiments, the plan had to be entirely abandoned as a failure.

The bleaching of linen to the present day is conducted much more in the primitive fashion of last century than is the practice with cotton-bleaching. Owing to the stiffness and elasticity of flax fibres, a great part of the machinery used for cotton is not available for linen, and solutions of acid and bleaching-powder require to be used in a very dilute condition for linen fabrics, involving frequent repetitions of the various processes before a satisfactory white is produced. "Crofting," or exposure to the air on grass, is also very largely resorted to in the bleaching of linens, especially for plain shirting and sheeting, which necessitates the possession of very extensive grass parks in connection with works, and renders the process both tedious and subject to the influence of the weather. A large proportion of linen cloth is half-bleached or improved in the yarn before being woven, and it consequently requires less bleaching than that which comes in its original "green" condition.

Bleaching of Paper-Making Materials.

In addition to cotton and linen rags, esparto or Spanish grass *(Macrochloa tenacissima)* is now very largely used for the manufacture of the better classes of paper. Wood, especially the wood of the aspen *(Populus tremula)*, is also now applied as a paper-making material. Jute has been used for printing paper, and straw is very largely employed, but chiefly for brown and packing papers. These and the numerous other substances used for paper-making are all reduced to the condition of "half-stuff" before they come to undergo the operation of bleaching, and the treatment they receive in this stage varies only in the amount of whitening required, and consequently in the proportions of bleaching solution used. It is therefore unnecessary to notice more than the process followed in the bleaching of the "half-stuff," which is very frequently prepared from a mixture of esparto fibre and rags. The bleaching solution of chloride of lime is either prepared in specially constructed cisterns, fitted with revolving agitators and stored in a reservoir for use, or prepared for immediate use in a wooden vessel. When the solution is made up to the requisite strength, and all insoluble sediment has sunk to the bottom of the vessel, it is ready for pouring into the engine. From 4 to 10 lbs. of ordinary bleaching powder are used for every 100 lbs. of rag half-stuff, but a much larger proportion is required for esparto. Sulphuric acid in not more than a proportion of 1 lb. to 4 lbs. of bleaching powder is thereafter added in a highly diluted condition, and the whole, after mixing in the engine, is turned into the drainer, which is a large tank provided with a false bottom of perforated wood covered with wire netting or bagging. In some cases the bleaching liquids are not added to the pulp material till it is deposited in the drainer; and the acid solution may be poured in first, or both solutions may be alternately used in small quantities. The bleaching process is sometimes carried on in separate engines constructed of materials not affected by the corrosive action of acid substances. Drained half-stuff may also be bleached in a suitable apparatus by the direct application of chlorine gas.

It is of the greatest importance to free the pulpy material from the last traces of chlorine before it is made into paper, as it would react upon the manufactured product and render it brittle. To eliminate the free chlorine and acid, &c., the pulp is washed in the beater with pure water till it ceases to redden litmus paper, or give other characteristic indications of the presence of such compounds. The prejudicial effects of chlorine and its combinations are also overcome by the addition of "antichlor," the hyposulphite of soda or of lime, which forms with them compounds that do not affect the color of the paper, although it is desirable, as far as possible, to remove such compounds also by washing with water.

Bleaching of Straw.

The fine wheat-straw used in Tuscany and elsewhere for straw-plaiting, after being cut, dried, and tied up in bundles, is stacked for a month. It is then spread out in a meadow, and exposed to the action of the sun and air, being frequently turned during that period. The lower joint of the straw is then separated, leaving only the upper joint with the ear attached,—this being the only part of the straw used. It is then steamed, and after that exposed to the action of sulphurous acid gas prepared by burning sulphur, which complete the bleaching. It is then tied up in bundles, in which state it is ready for the market. In the strawplait-making centres of Great Britain—Luton, Dunstable, &c., in Bedfordshire—straw is bleached, chiefly, after plaiting, by the influence of sulphurous acid gas.

Bleaching of Wool.

The bleaching of wool and animal fibres generally is a much simpler and less important operation than is the whitening of vegetable fibres. Wool is covered with a peculiar varnish or greasy matter which impairs its qualities, and which it is the object of the bleacher to remove.

Scouring is performed by means of an ammoniacal lye, prepared of river or other soft water mixed with stale purified urine, which is found to contain a large quantity of ammonia, upon which its action probably depends.

It is known that the wool is properly scoured by its filaments being smooth, long, slender, white, and perfectly free from foreign substances, and not having lost their natural tenacity. If this scouring be properly done there is no need of further washings in soaps, or otherwise, till the wool is subjected to the process called "sulphuring;" and in point of fact, it is very rarely passed through any other process. Some, however, recommend for the finer wools, where a very delicate white is wished, that they should be passed through one, two, or more baths of soft soap. The process of sulphuring is now much more expeditiously performed by Thom's sulphuring process. The goods are passed on a long chain up and down over a series of rollers in a small chamber filled with sulphurous acid vapors, and a few minutes suffice for the operation. Sulphite of soda acidified with hydrochloric acid is also used in France for the bleaching of woolen fabrics.

Bleaching of Silk.

Raw silk is covered with a kind of varnish, the nature of which was first thoroughly investigated by M. Roard.

He showed that this varnish, instead of being a gum, as was usually believed, resembled a mixture of bees' wax and oil, with a resinous coloring matter, and in raw silk constituted 23 or 24 per cent. of the weight. The varnish is soluble in water, and affords a solution which forms a lather like soap. The yellow varnish is of a resinous nature, and is insoluble in water, but is soluble in alcohol. The waxy substance exists in all silks, but the whiter the silk the less wax does it contain.

White or yellow silks may be completely scoured in one hour in the soap bath, using about 15 lb of water for each pound of silk, and a suitable quantity of the finest soap. The soap and silk should be put into the water half an hour before it is brought to the boiling point, and then be boiled one hour. They are then removed, wrung out, washed in pure water, and either exposed to the vapor of sulphur or passed through a solution of sulphurous acid gas in water.

BLEEK, FRIEDRICH, one of the greatest Biblical scholars that Germany has produced in modern times, was born on the 4th July 1793, at Ahrensbök, in Holstein, a village near Lübeck. While attending the elementary school there, he gave evidence of such ability that his father sent him, after he had acquired some knowledge of Latin and Greek, in his sixteenth year, to the gymnasium at Lübeck, where he spent three years, and there imbibed so great a love for the languages of antiquity, that he abandoned the idea of a legal career, which he had once entertained, and resolved to devote himself to the study of theology. After spending some time at the University of Kiel, he repaired to Berlin, and there, from 1814 to 1817, enjoyed the instructions of De Wette, Neander, and Schleiermacher. The teaching of these distinguished men, especially of the last named, exercised a decisive influence upon the whole of his after life. So highly were his merits appreciated by his professors — Schleiermacher was accustomed to say of Bleek that he possessed a special *charisma* for the science of "Introduction" — that in 1818, after he had passed the necessary examinations for entering the church, he was recalled to Berlin to occupy the position of *Repetent* or tutor in theology, a temporary post which the theological faculty had obtained for him, with a view of retaining his services in connection with that department of the university. In this position, besides discharging his duties in the theological seminary, he published, in Schleiermacher's and Lücke's *Journal* (1819, 1820, 1822), two dissertations, one on the "Origin and Composition of the Sibylline Oracles," and another on the "Authorship and Design of the Book of Daniel." These articles attracted much attention, and were distinguished by those qualities of solid learning, thorough investigation, and candor of judgment, which characterized all the productions of his pen. Bleek's merits as a rising scholar were recognized by the minister of public instruction, who continued his stipend as *Repetent* for a third year, and promised further advancement in due time. But the attitude of the political authority underwent a change. The excitement caused in academic circles by the dismissal of De Witte from his professorship in 1819, in consequence of certain injudicious expressions in the letter of sympathy which he had written to the mother of Sand, the murderer of Kotzebue, had not died out, and the odium and punishment which fell upon De Witte were shared in a greater or less degree by his friends. Bleek, who had been a favorite pupil of the banished professor, incurred the suspicion of the Government as one who was believed to hold extreme democratic opinions. Not only was his stipend as *Repetent* discontinued, but his nomination to the office of extraordinary professor, which had already been signed by the minister Altenstein, was withheld for two years. The mystery at last was cleared up. Bleek had been confounded with another individual of a similar name. Tardy justice was at length done, and in 1823 Bleek received the appointment to which his merits so well entitled him.

In 1829 he was induced, on the death of Lücke, to accept his chair in the recently-founded university of Bonn, and entered upon his duties there in the summer of the same year. For the space of thirty years he labored with ever-increasing success, attracting students to his lectures, not by any attractions of manner nor by the enunciation of novel or bizarre opinions on theological subjects, but by the soundness and thoroughness of his investigations, the remarkable impartiality of his critical judgments, and the exceeding clearness of his method of presentation. In 1843 he was raised to the office of consistorial councillor, and was selected by the university to hold the office of rector, a distinction which has not since been conferred upon any theologian of the Reformed Church. After a long and honored academic life he died suddenly of apoplexy on the 27th February 1859.

Bleek's works belong entirely to the departments of Biblical criticism and exegesis. His great merits as a critic and exegete consist, as has been already observed, in the thoroughness of his investigations, and especially in the candor of his judgment. The latter quality, indeed, he possessed in so remarkable a degree, that, as a recent writer has remarked, it has become "proverbial." His views, indeed, on questions of *Old* Testament criticism would be regarded in this country as those of the "advanced" school; for on all the disputed points concerning the unity and authorship of the books of the Old Covenant he was led to form conclusions opposed to received opinions. But with respect to the *New* Testament, his position was highly conservative. His defence of the genuineness and authenticity of the gospel of St John is still regarded as the ablest that has yet appeared; and although, on some minor points, his views did not altogether coincide with those of the traditional school, his critical labors on the New Testament must nevertheless be regarded as among the most important contributions to the maintenance of orthodox opinions that the present century has produced. Bleek's works were published partly during his lifetime, and partly after his death. His greatest work, his commentary on the epistle to the Hebrews, appeared in three parts, in 1828, 1836, and 1840 respectively. Of it De Wette said that "It was so distinguished for comprehensive learning and thorough untiring industry, for so pure and transparent a love of truth and so profound a theological feeling, that it was entitled to one of the foremost, if not the very foremost, place among the exegetical works of our time;" and Delitzsch adds that "every one acquainted with the subject will endorse the judgment."

BLEEK, WILHELM HEINRICH IMMANUEL, son of the preceding, distingnished by his researches in African philology, was born in 1827 at Berlin, and died at Cape Town on the 17th August 1875. His works, which are of the first importance for African and Australian philology, consist of the *Vocabulary of the Mozambique Language*, Lond., 1856; *Handbook of African, Australian, and Polynesian Philology*, Cape Town and Lond., 3 vols., 1858–63; *Comparative Grammar of the South African Languages*, vol. i., Lond., 1869; *Reynard the Fox in South Africa, or Hottentot Fables and Tales*, Lond., 1864; *Origin of Language*, Lond., 1869.

BLENHEIM (German, BLINDHEIM), a small village of Germany, in the kingdom of Bavaria, and circle of Swabia, situated on the left bank of the Danube, a few

miles below Hochstädt. It is only remarkable as the scene of the defeat of the French and Bavarians, on the 13th of August 1704, by the English and the Austrians under the duke of Marlborough and Prince Eugene. Population, 751.

BLENHEIM HOUSE, a princely mansion erected by Parliament for the duke of Marlborough at Woodstock, near Oxford, and with the manor of Woodstock, settled on the duke and his heirs, in consideration of his military service, and especially his decisive victory at Blenheim.

BLESSINGTON, MARGARET POWER, COUNTESS OF, novelist and miscellaneous writer, was born near Clonmel, Tipperary, Ireland, September 1, 1790. Her childhood was made unhappy by the bad temper, improvidence, and loose living of her father, and by the reduced circumstances of the family. Her early womanhood was made unhappier still by her compulsory marriage at fifteen to one Captain Farmer, whose drunkenness involved him in debt, and whose debts brought him to the King's Bench prison, where he was killed by a fall in one of his drunken fits, in October 1817. His wife had some time before left his house, and in February 1818 she was married a second time to the earl of Blessington. Celebrated for her wit, her literary accomplishments, her generosity, and her social attractions, she was no less distinguished by her passion for pleasure and her craving for show and a high style of living. In the gratification of these tastes debts were accumulated, and the estates of the earl soon became burdened with "incumbrances." In the autumn of 1822 they set out on a Continental tour, and remained abroad till the death of the earl, which took place at Paris in May 1829. Some years earlier they had become acquainted with Count Alfred d'Orsay, a man of fashion and seeker of pleasure, who was then serving in the army, but quitted it for the sake of joining them. In 1827 he had connected himself with the family by his marriage with the only daughter of the earl by a former wife. After Lord Blessington's death Count d'Orsay, who had separated from his wife, came to England with the countess, and they lived together in London till her death. The home of the beautiful and brilliant countess (first Seamore Place, and afterwards Gore House, Kensington) became a centre of attraction for whatever was distinguished in literature, learning, art, science, and fashion. Ambitious of the distinction of authorship, Lady Blessington had published in 1822 her first work entitled *Sketches*, in two volumes. Ten years later she made herself favorably known by a *Journal of Conversations with Lord Byron*, which appeared first in successive numbers of the *New Monthly Magazine*, and soon afterwards as a separate work. This was followed by a long series of works, most of them novels of high life several of which obtained considerable popularity. Her *Idler in Italy* and *Idler in France* were rendered temporarily attractive by personal gossip and anecdote, descriptions of nature, and sentiment. Lady Blessington was for some years editor of Heath's *Book of Beauty* and the *Keepsake*, the popular annals of the day, and also contributed largely to magazines and newspapers. Early in 1849, in consequence of failing resources, the splendors of Gore House were extinguished; its furniture and decorations were sold to pay debts, and its presiding genius withdrew to Paris, whither her friend Count d'Orsay had previously gone. She died there, June 4, 1849. Her *Literary Life and Correspondence*, 3 vols., edited by R. R. Madden, appeared in 1855.

BLICHER, STEEN STEENSEN, Danish lyrical poet and novelist, was born at Vium in Viborg, Jutland, on the 11th October 1782. He was extremely delicate in constitution, and after having passed a year or two at the university, which he joined in 1799, was compelled to give up his studies on account of a consumptive complaint. He accepted a situation as tutor in a family at Falster, and by vigorous physical exercise and flute-playing succeeded in restoring himself to health. He afterwards returned to the university, and completed his course in 1809. Several years were then spent at his father's parsonage, preparing for the ministry and managing the farm. In 1819 he was called to the church of Thorning, and in 1825 to a more remunerative charge at Spentrup. Here he died in 1848.

BLIDAH, the chief town of an arrondissement in the province of Algiers in Algeria, about 30 miles inland from the capital, on the railway from that city to Oran. Blidah was a town of some importance under the Turks, but in 1825 it was nearly destroyed by an earthquake. It was not till 1838 that it was finally held by the French, though they had been in possession for a short time eight years before. In 1867 it suffered from another earthquake which also nearly ruined the village of Chiffa.

BLIGH, WILLIAM, admiral, was born of a good family in the south of England in 1754. He accompanied Captain Cook in his second expedition as sailing-master of the "Resolution," and in 1787 was despatched to the Pacific in command of H.M.S. "Bounty," for the purpose of introducing in the West Indies the bread-fruit tree from the South Sea Islands. Bligh sailed, in 1787, from Otaheite, where he had remained about six months; but, when near the Friendly Islands, a mutiny broke out on board the "Bounty," headed by Fletcher Christian, the master's mate, and Bligh, with eighteen others, was set adrift in the launch. This mutiny, which forms the subject of Byron's *Island*, did not arise so much from tyranny on the part of Bligh as from attachments contracted between the seamen and the women of Otaheite. After suffering severely from hunger, thirst, and storms, Bligh and his companions landed at Timor in the East Indies, having performed a voyage of about 4000 miles in an open boat. Bligh returned to England in 1790, and he was soon afterwards appointed to the "Providence," in which he effected the purpose of his former appointment by introducing the bread-fruit tree into the West India Islands. He showed great courage at the mutiny of the Nore in 1797, and in the same year took part in the battle of Camperdown, where Admiral Duncan defeated the Dutch under De Winter. In 1801 he commanded the "Glatton" at the battle of Copenhagen, and received the personal commendations of Nelson. He was subsequently made governor of New South Wales, and vice-admiral of the blue. He died at London in 1817.

BLIND. The blind, as a class, are limited to such narrow spheres of action that those unacquainted with the subject fail to realize how large a number of the human race are deprived of sight. In the temperate regions of the globe about 1 in every 1000 of the population is blind, but in less favorable climates the percentage is much greater. When we consider what medical skill has already accomplished in Europe and America, not only for the relief but the positive prevention of blindness, we may readily conclude that in warmer and less civilized countries the class is more numerous and their condition more deplorable.

We rejoice that much can still be done by proper care and treatment to prevent blindness; for instance, ophthalmia of infants is a very common cause, and ought not to terminate in loss of sight, which in most cases results from neglect and dirt. Glaucoma is also a fruitful source of blindness, invariably causing loss of

sight if left to itself; but, thanks to Professor Gräfe's brilliant discovery, these cases are generally curable if operated on early. Another very common cause of blindness is serious injury to one eye, which is thus lost, and if the injured organ be not at once removed, sympathetic inflammation and destruction of the other is very apt to follow, resulting in total blindness; whereas, if the injured eye be at once removed the other is generally preserved.

Loss of sight from small-pox is now comparatively rare, owing to the general practice of vaccination, but much undoubtedly may still be done towards diminishing the frequency of blindness by further advances in the art of treating eye-disease, and especially by spreading among all classes a knowledge of what has already been done in this direction.

It often occurs that children become blind through the most trivial causes by parents consulting unskillful practitioners. The improvement and increase in the number of well regulated hospitals now makes it possible for every parent, however poor, to have the best medical advice and attendance.

In all ages of the world the blind have been the objects of pity and commiseration, yet it has only been within the past century that Christian civilization in its grand onward march has taken them in its embrace, and shed the influence of its life upon their midnight darkness. During recent years leading philanthropists have given much earnest thought to the best methods of ameliorating and improving the condition of the blind. Nearly all the European Governments and the States of the American Union have made liberal provision for their education and special training. In Great Britain the work has been left thus far to charitable enterprise. Much, however, has been done,—almost every large town having its asylum, workshop, or home teaching society.

The institutions of America are not asylums, but in the truest sense of the word educational establishments, in which the blind, without regard to their future, receive a thorough education. The blind in the United States are socially far above those of any other country; large numbers of them become eminent scholars and musicians, and even their blind workmen enjoy a degree of comfort unknown in England or on the Continent.

The results achieved by the Perkins Institution at Boston, U.S., are particularly instructive. High-class musical training was commenced there about 30 years ago, previous to which time the results in this respect were far from satisfactory. The report of 1889 states that music is now taught to all of both sexes whose natural abilities make it probable that, under proper instruction, they will succed as organists, teachers of music, or piano tuners, and goes on to say — "The teaching of music and playing is now the largest field open to the blind as a means of support, and it seems to be growing larger. People are becoming more disposed to employ them; and as they go forth from the school they have more and more ground of hope that they will find opportunities to earn their living in this way." The whole tone of mind among the musical pupils has been changed, for instead of looking forward to the future with fear and anxiety, they now feel a well-grounded confidence in themselves. It seems that in Boston, and in America generally, the blind are able to earn more as teachers of music than as tuners, which is exactly the reverse of the state of things existing in Paris, and may arise either from differences in the condition of the two countries, or from the training for teachers being more thorough at Boston than at Paris; but their experience is identical in one respect, which is, that the blind who have the requisite amount of talent are almost certain to make a good income out of music; but to attain this they must aim high. It will not do to be equal to the average seeing teacher or tuner; they must be superior; and this involves a good musical notation with first-rate masters, instruments, and appliances, and above all, a determination on the part of managers and teachers to overcome all obstacles.

A few paragraphs from American reports will sufficiently illustrate the enlightened views held in that country in regard to the education of the blind.

"A school for the higher education of the blind should be specially adapted to the condition and wants of the persons to be trained. In it the course of study should be the same as in our best colleges. All instruction should be oral, and the apparatus and modes of illustration be addressed to the touch. It should be supplied with text-books, maps, diagrams, and the like, in raised characters. It should have large collections of models of various kinds, such as weights, measures, tools, machinery, and the like; mannikins and models showing the anatomy of plants and animals, as well as their outward form. It should have collections of shells, crystals, minerals, and the like; models and sections showing geological strata; philosophical apparatus adapted to the touch; in short, everything that can be represented by tangible forms.

"It would amaze those who have not reflected upon it to know how much can be done in this way. Saunderson, the blind professor of mathematics in Cambridge, not only knew ordinary money well, but he was an expert numismatist, and could detect counterfeits in a collection of antique coins better than ordinary persons could do by sight.

"Such an institute should have able professors and teachers, with special aptness for adapting their lessons to the condition of their scholars. It should furnish special facilities for the study of languages, ancient and modern, of mathematics, of pedagogy, and especially of music. It should also be well provided with everything necessary in a good conservatory of music, and have funds for the payment of competent teachers.

"It is evident that there are a large number of persons to whom such an institute would be a source of great happiness, and a means of preparation for great usefulness.

"A little reflection shows what a great advantage generous culture would be to a blind man, even if he were to be only a musician. Let him be ever so accomplished in his immediate art, he is under great disadvantages."

BLISTER-BEETLE, a popular name for a number of beetles in a family of Coleoptera known as Vesicantia, or in two distinct families, Meloidæ and Cantharidæ. The name refers to the vesicating or blister-raising properties of their body-juice. The Spanish fly and the Oil beetle are familiar illustrations.

BLISTERS are medicinal agents which, when applied to the skin, raise the cuticle into vesicles filled with serous fluid, serving as counter-irritants. The common blister is made of Cantharides or Spanish fly (*Cantharis vesicatoria*). Mustard (*Sinapis nigra*) is frequently used to redden the skin, but seldom left on sufficiently long to produce blistering. Tincture of cantharides, croton oil, strong liquor ammoniæ, turpentine, tartar emetic ointment, and many other drugs are used for the purpose.

BLIZZARD is a sudden, fierce storm of bitter frosty wind, with fine, blinding snow, common to our northwestern states and territories. In one which visited Dakota, Montana, Minnesota, Nebraska, Kansas and Texas, in January, 1888, some 235 persons lost their lives. The word, which seems to be akin to *blast*, *bluster*, was in colloquial use in the west early in the century.

BLOCH, Mark Eliezer, a German naturalist, born at Ansbach, of very poor Jewish parents, about the year 1730. Having entered the employment of a surgeon at Hamburg, he was enabled by his own exertions to supply the want of early education, and made great progress in the study of anatomy, as well as in the other departments of medical science. After taking his degree as doctor at Frankfort-on-the-Oder he established himself as a physician at Berlin, and found means to collect there a valuable museum of objects from all the three kingdoms of nature, as well as an extensive library. His first work of importance was an essay on the different species of worms found in the bodies of other animals, which gained the prize offered by the Academy of Copenhagen. Many of his papers on different subjects of natural history, comparative anatomy, and physiology, were published in the collections of the various academies of Germany, Holland, and Russia, particularly in that of the Friendly Society of Naturalists at Berlin. But his greatest work was his *Allegemeine Naturgeschichte der Fische* (12 vols., 1782–95), which occupied the labor of a considerable portion of his life, and is considered to have laid the foundations of the science of ichthyology. The publication was encouraged by a large subscription, and it passed rapidly through five editions in German and in French. Bloch made little or no alteration in the systematic arrangements of Artedi and Linnæus, although he was disposed to introduce into the classification some modifications depending on the structure of the gills, especially on the presence or absence of the fifth gill, without a bony arch. To the number of genera before established he found it necessary to add nineteen new ones; and he described 176 new species, many of them the inhabitants of the remotest parts of the ocean, and by the brilliancy of their colors or the singularity of their forms, as much objects of popular admiration as of scientific curiosity. In 1797 he paid a visit to Paris, in order to examine the large collections of such subjects of natural history as had been inaccessible to him on the shores of the Baltic; and he returned to Berlin by way of Holland. His health, which had hitherto been impaired, began now to decline. He went to Carlsbad for its recovery, but his constitution was exhausted, and he died there on the 6th of August, 1799.

BLOCK MACHINERY. A block is a case with its contained pulley or pulleys, by means of which weighty objects are hoisted or lowered with facility.

The process of manufacturing blocks by machinery may be described as follows:—Pieces of wood are cut roughly to the size of the block, and the first operation is then performed by the *boring-machine*, which bores a hole for the pin, and one, two, or three holes, as the case may be, for single, double, or treble blocks, to receive the first stroke of the mortising chisel; the block is next taken to the *mortising-machine*, where the mortise or mortises for the sheaves are cut; after this, to a *circular saw*, conveniently arranged for cutting off the corners and so preparing the block for the *shaping-machine*, which consists principally of two equal and parallel circular wheels moving on the same axis, to which one of them is firmly fixed, but on which the other is made to slide; so that these two wheels may be placed at any given distance from each other, and blocks of any size admitted between their two rims or peripheries. For this purpose, both rims are divided into ten equal parts, for the reception of ten blocks, which are firmly fixed between the two wheels. When the double wheel with its ten attached blocks is put in motion, the outer surface of the blocks, or those which are farthest from the centre, strike against the edge of a chisel or gouge fixed in a movable frame, which, being made to slide in a curved direction in the line of the axis, cuts those outward faces of the blocks to their proper curvature. A contrivance is attached to the cutting tool which allows of the curvature being altered in any required way. One side being shaped, the ten blocks are then, by a single operation, each turned one fourth part round, and another side is exposed to the cutting instrument moving in the same direction as before. A third side is then turned outwards, and after that the fourth side, when the whole ten blocks are completely shaped.

The velocity with which the wheels revolve, and the great weight with which their peripheries are loaded, would make it dangerous to the workmen or bystanders, if, by the violence of the centrifugal force, any of the blocks should happen to be thrown off from the rim of the wheels; to prevent the possibility of such an accident, an iron cage or guard is placed between the workman and the machine.

The last operation is performed by the *scoring-machine*, which cuts a groove to receive the binding or strapping of the block. The binding may be of iron or rope, and is very frequently of wire rope.

The Sheaves.—The machinery employed for making this part of the block consists of a *circular saw*, by which the log is cut into plates of the thickness required for the sheaves, according to their several diameters. These plates are next carried to a *crown saw*, which bores the central hole, and at the same time reduces them to a perfect circle of the assigned diameter. The sheave, thus shaped, is next brought to the *coaking-machine*, a piece of mechanism not inferior in ingenuity to the shaping machine for the shells. A small cutter, in traversing round the central hole of the sheaves, forms a groove for the insertion of the *coak* or *bush*, the shape of which is that of three semicircles, not concentric with each other, nor with the sheaves, but each having a centre equally distant from that of the sheave. The manner in which the cutter traverses from the first to the second, and from this to the third semicircle, after finishing each of them, is exceedingly ingenious. So very exact and accurate is this groove cut for the reception of the metal coak, and so uniform in their shape and size are the latter cast, the casting being made not in sand but in iron moulds, that they are invariably found to fit each other so nicely that the tap of a hammer is sufficient to fix the coak in its place. The coaks are cast with small grooves or channels in the inside of their tubes, which serve to retain the oil or grease for the pins.

The sheave, with its coak thus fitted in, is now taken to the *drilling-machine*, which is kept in constant motion. In casting the coaks a mark is left in the centre of each of the three semicircles. This mark is applied by a boy to the point of the moving drill, which speedily goes through the two coaks and the intermediate wood of the sheave. Rivets are put in these holes and clenched by hand. The next operation is performed by the *facing-machine*, which has two cutters, so arranged as to finish the side and groove the edge simultaneously; then the hole for the pin is enlarged to its exact size by the *broaching-machine*. The pins which form a very important part of the block, are now made at Portsmouth, not of *iron* but of *steel*, carefully tempered by special appliances. They are turned by a *self-acting lathe*, and are then reduced to the exact required diameter, and polished in the *pin-polishing machine*. They are also, in this machine, subjected to a proof strain proportional to their sectional area, and thus the strength of the pin is guaranteed.

The blocks are invariably made of English elm, the grain of the wood running lengthways of the block; but in Germany recently, blocks have been made with the

grain of the wood running across the block, the reason being that they are less likely to be split by the pressure on the pin of the sheave. The sheaves are made of lignum vitæ.

BLOCKADE. It appears to have been the ancient practice of belligerents at the outset of the war to forbid by proclamation all trade on the part of neutrals with the enemy, and to treat as enemies all those who contravened the proclamation; and neutrals acquiesced tacitly in this practice until the commencement of the 17th century. In the course of that century the ancient practice came into question, as imposing on the commerce of neutrals an inconvenience not justified by any adequate necessity on the part of belligerents, and it has since fallen into desuetude. Belligerents, however, have still maintained, without any question on the part of neutrals, the practice of intercepting supplies going over sea to an enemy under certain conditions, namely, when a belligerent has invested an enemy's port, with the intention of reducing the enemy to surrender from the failure of supplies, and for that object a stoppage of all supplies to such port has become a necessary operation of the war. Any attempt, under such circumstances, on the part of a neutral merchant to introduce supplies into the invested port is a direct interference with the operations of the war, and is inconsistent with neutrality, and it accordingly subjects the offending party to be treated as an enemy by the belligerent. The question, What constitutes such a belligerent investment of an enemy's port as to create an obligation on the part of neutrals to abstain from attempting to enter it, has been much controverted since the "armed neutrality" of 1780; but all uncertainty as to the principle upon which the decision in each case must proceed, has been put an end to by the declaration of the powers assembled in congress at Paris in 1856, that "Blockades, in order to be binding, must be effective, that is to say, must be maintained by a force sufficient really to prevent access to the enemy's coast." The question of fact will still be a subject of judicial inquiry in each case of capture, whether the conditions under which a blockade has been maintained satisfy the above declaration. If an asserted blockade is maintained in a manner which satisfies the above declaration, there is no limit to the extent of an enemy's coast which may be placed under blockade. There is also a general consent amongst nations that a neutral merchant must have knowledge of a blockade in order to be liable to be treated as an enemy for attempting to break it; but there is not any uniform practice amongst nations on this subject further than that when a blockade has become notorious, the knowledge of it will be presumed against every neutral vessel which attempts to enter the blockaded port. On the other hand, where a blockade is not notorious, it is in accordance with the practice of nations to give some notice of it to neutrals; and this notice may be communicated to them either by actual warning given to each neutral vessel which seeks to cross the line of blockade, or by a constructive warning to all neutrals resulting from an official notification of the blockade on the part of the blockading power to all powers in amity with it. It is a growing practice, if not altogether an established practice, amongst nations which accredit to one another resident envoys, for belligerents to notify diplomatically to the neutral powers the fact that they have placed an enemy's port under blockade; and it is the rule of the prize courts of Great Britain and of the United States of America to hold that, where such an official notification has been made, all the subjects of the neutral powers may be presumed to have knowledge of the blockade. Other powers, amongst which France may be mentioned, have been accustomed to direct their blockading cruisers to give warning of the blockade to each vessel that attempts to cross the line of blockade, and not to capture any vessel unless she attempts to break the blockade after such warning; but the practice of France agrees with the practice of other powers in not giving such warning after a blockade has become notorious. There is, further, a general practice amongst nations to treat the act of sailing with an intention to enter a blockaded port as an unneutral act, which will warrant the capture of a neutral merchant vessel by a belligerent cruiser on any part of the high seas, unless clear evidence is forthcoming from the captured vessel that the intention has been abandoned, or that its execution was contingent on the blockade being raised. After a port has been placed under blockade, egress is prohibited to all neutral vessels, except to such as have entered the port before the blockade was established, if they come out either in ballast or with cargoes taken on board before the commencement of the blockade. No warning is required to affect such vessel with a knowledge of the blockade, and if any such vessel should succeed in passing through the blockading squadron it becomes liable to capture as good prize by a belligerent cruiser on any part of the high seas, until it has reached its port of destination, when the offense is considered to be purged. Under the ancient practice both ship and cargo were confiscable for the breach of a blockade, and even the captain and crew were liable to be treated as enemies. A milder practice is now generally observed as regards the captain and crew, and a certain equity is administered in the British and American prize courts towards the owners of cargo, where the ship and the cargo do not belong to the same parties, and the owners of the cargo have not any knowledge of the blockade, or have been unable to countermand the shipment of the cargo since the blockade has become known to them. In such cases the cargo is released, although the ship may be rightfully condemned to the captors.

BLOIS, the chief town of the department of Loir-et-Cher in France, is situated in the form of an amphitheatre on the steep slope of a hill on the right bank of the Loire, 35 miles of Orleans. The castle is an immense structure built at different periods, part as early as the 13th century. It was the birth-place of Louis XII., and is noted as the scene of the assassination of the duke of Guise and his brother the cardinal by command of Henry III. Among the other remarkable buildings in the town are the Hôtel de Ville, the episcopal palace, now occupied by the prefecture, the cathedral of St. Louis (a modern structure) and the churches of St. Vincent and St. Nicholas. An ancient aqueduct, cut in the solid rock by the Romans, conveys the water of several springs to a reservoir, whence it is distributed to different parts of the town. Blois is the seat of a bishopric founded by Louis XIV., and has a communal college, a normal school, and two diocesan seminaries; an exchange, a hospital, a theatre, a botanical garden, a public library, and an agricultural society.

BLOOMFIELD, Charles James, bishop of London, was born on the 29th May 1786, at Bury-St-Edmund's. His career at Trinity College, Cambridge, which he entered in 1804, was brilliant. He gained the Browne medals for Latin and Greek odes, and carried off the Craven scholarship. In 1808 he graduated as third wrangler and first medallist, and in the following year was elected to a fellowship at Trinity College. The first-fruits of his scholarship was an edition of the *Prometheus* of Æschylus, in 1810; this was followed by editions of the *Septem contra Thebas*, *Persæ*, *Choephoræ*,

and *Agamemnon*, of Callimachus, and of the fragments of Sappho, Sophron, and Alcæus. Bloomfield, however, soon ceased to devote himself to mere scholarship. He had been ordained in 1810, and held for a short time the curacy of Chesterford. He was then presented to the rectory of Quarrington, and shortly afterwards to that of Dunton, in Buckinghamshire, where he remained for about five years. In 1817 he was moved to the benefices of Great and Little Chesterford and Tuddenham, and he was in the same year appointed private chaplain to Howley, bishop of London. In 1819 he was nominated by Lord Liverpool to the rich living of St. Botolph's, Bishopsgate, and in 1822 he became archdeacon of Colchester. Two years later he was raised to the bishopric of Chester, and in that position began his career of incessant labor for the advancement of the church. Many reforms were needed in the diocese, and the new bishop's energy and ardor succeeded in effecting much, though not without stirring up enemies. In 1828 he was transferred to a wider sphere of activity, being raised to the bishopric of London. This important office he held for eight-and-twenty years, laboring incessantly in a field where unremitting exertion was absolutely necessary. He gave his whole heart to the endeavor to extend the influence and efficiency of the church, and his strenuous activity was not without result. In all political or social movements which concerned the church the bishop took a prominent part. He was noted as being one of the best debaters on the episcopal bench in the House of Lords; he took a leading position in the action for church reform, which culminated in the Ecclesiastical Commission; and he did much for the extension of the colonial episcopate. His health gave way under his unceasing labors, and in 1856 he was permitted to resign his bishopric, retaining Fulham palace as his residence, along with a pension of £6000 per annum. He died at Fulham on the 5th August 1857.

BLONDEL, David, a Protestant clergyman, distinguished by his proficiency in ecclesiastical and civil history, was born at Charlons-sur Marne in 1591, and died in 1665.

BLOOD. See Anatomy and Physiology.

BLOOD, Thomas generally known by the appellation of *Colonel Blood*, was a disbanded officer of the Parliamentary army. Bearing a grudge against the duke of Ormond, who had defeated a conspiracy he engaged in to surprise the castle of Dublin, Blood seized the duke one night in his coach in St. James's street, and carried him off a considerable distance, resolving to hang him at Tyburn; but Ormond struggled for his liberty and was rescued by his servants. Soon after, in 1671, Blood formed the design of carrying off the crown and regalia from the Tower,—an attempt which very nearly proved successful. He had bound and wounded Edwards, the keeper of the jewel-office, and had escaped out of the Tower with his prey; but he was overtaken and seized, together with some of his associates. One of these was known to have been concerned in the attempt upon Ormond, and Blood was immediately concluded to be the ringleader. When questioned he frankly avowed the enterprise, but refused to discover his accomplices. All these extraordinary circumstances induced Charles II. to seek an interview with him, which not only led to his pardon, but to the king's granting him an estate of £500 a year in Ireland, encouraging his attendance about his person, and showing him great favor. He died August 24, 1680.

BLOOMFIELD, Robert, was born of very humble parents at the village of Honington, in Suffolk, in 1766. Losing his father at the age of eleven, he was apprenticed to a farmer, and could only cultivate his literary tastes by perusing such books as he could borrow. Thomson seems to have been his favorite author, and *The Seasons* inspired him with the ambition of being a poet. He went to London and composed *The Farmer's Boy* in a garret in Bell Alley. The manuscript fell into the hands of Capel Lofft, who encouraged him to print it, and it succeeded so well that above 26,000 copies of it were sold. His reputation was increased by the appearance of his *Rural Tales*, *Songs and Ballads*, *News from the Farm*, *Wild Flowers*, and *The Banks of the Wye*. These are of unequal merit; but all breathe a spirit of purity and enthusiasm for the beauties of nature, that place the name of Bloomfield among the most natural and amiable of the pastoral poets. The extensive sale of *The Farmer's Boy* and *Wild Flowers* seems to have done little for the benefit of the poet, who died in poverty at Shefford in Bedfordshire in 1823.

BLOOMFIELD, a city of New Jersey, in Essex county, four miles from Newark and twelve miles northwest of New York city. It is an important railway center and has manufactures of woolen goods, musical instruments, and a population of 6,500.

BLOOMINGTON, the capital of McLean county, Ill., is a flourishing manufacturing and shipping town, with a population (1890) of 22,242. It is reached by four important railroads, and is situated 44 miles north of Decatur and 126 miles south-southwest of Chicago. It is the seat of the Illinois Wesleyan University, and the State Normal University is located near by. Bloomington has six banks, two daily and five weekly newspapers, fifteen churches, an opera-house, a high school and a full complement of graded schools. The manufactories include mills and factories of all kinds, and there are extensive deposits of coal in the immediate vicinity. Among the public buildings is a very fine new court-house, built at an expense of $100,000. The machine shops of the Chicago and Alton railroad employ over 1,000 men. The city has water-works and is lighted by gas and electricity.

BLOOMINGTON, a city of Monroe county, Ind., sixty miles from Indianapolis, is the seat of the Indiana State University. It contains a national bank, two newspaper offices, some foundries and woolen mills, and has a population of 4,000.

BLOOMSBURG, capital of Columbia county, Penn., is a town of 4,659 inhabitants, situated on Fishing creek eighty miles northeast of Harrisburg. It contains a national bank and two other banks, the State Normal School, ten churches, three newspaper offices, and four foundries.

BLOUNT, Charles, younger son of Sir Henry Blount, was born at Upper Holloway, April 27, 1654, and died 1693. He gained considerable reputation as a politician and a man of letters, but his abilities were not great, and his strength lay in scoffing infidelity.

BLOW, John, an English musical composer, was born in 1648 at North Collingham in Nottinghamshire, and died in 1708. None of his compositions, most of which are anthems, attain the highest order of merit.

BLOWPIPE, a tube for directing a jet of air into a fire or into the flame of a lamp or gas jet, for the purpose of producing high temperature by complete and rapid combustion. The blowpipe has been in common use from the earliest times for soldering metals and working glass; and since 1733, when Anton Swab first applied it to analysis of mineral substances, it has become a valuable auxiliary to the mineralogist and chemist, in the chemical examination and analysis of minerals. Its application has been variously improved at the hands of Cronstedt, Bergmann, Gahn, Berzelius, Plattner, and others.

The simplest and oldest form of blowpipe (still used by gasfitters, jewelers, &c.), is a conical brass tube, about 7 inches in length, curved at the small end into a right angle, and terminating in a small round orifice, which is applied to the flame, while the larger end is applied to the mouth. Where the blast has to be kept up for only a few seconds, this instrument is quite serviceable; but in longer chemical operations inconveniences arises from the condensation of moisture exhaled by the lungs in the tube. Hence many blowpipes are made with a cavity for retaining the moisture. Cronstedt placed a bulb in the centre of his blowpipe. Dr. Black's convenient instrument consists of a conical tube of tin plate with a small brass tube, supporting the nozzle, inserted near the wider end, and a mouth-piece at the narrow end.

If the flame of a candle or lamp be closely examined, it will be seen to consist of four parts — (*a*) a deep blue ring at the base, (*b*) a dark cone in the centre, (*c*) a luminous portion round this, and (*d*) an exterior pale blue envelope. The blue ring is formed chiefly by combustion of carbonic oxide. In the central cone the combustible vapors from the wick, though heated, are not burned, atmospheric oxygen not reaching it. In the luminous portion the supply of oxygen is not sufficient for complete combustion; the hydrogen takes up all or most of it, and carbon is precipitated in solid particles and ignited. In the exterior envelope, lastly, the temperature is highest, and combustion most complete,— sufficient oxygen being supplied to convert the carbon and hydrogen into water and carbonic acid.

In blowpipe work only two of these four parts are made use of, viz., the pale envelope, for *oxidation*, and the luminous portion, for *reduction*. To obtain a good *oxidizing flame*, the blowpipe is held with its nozzle inserted in the edge of the flame close over the level of the wick, and blown into gently and evenly. A conical jet is thus produced, consisting of an inner cone, with an outer one commencing near its apex:— the former, corresponding to (*a*) in the free flame, blue and well defined; the latter, corresponding to (*d*), pale blue and vague. The heat is greatest just beyond the point of the inner cone, combustion being there most complete. Oxidation is better effected (if a very high temperature be not required) the farther the substance is from the apex of the inner cone, so far as the heat proves sufficient, for the air has thus freer access.

To obtain a good *reducing flame* (in which the combustible matter, very hot, but not yet burned, is disposed to take oxygen from any compound containing it), the nozzle, with smaller orifice, should just touch the flame at a point higher above the wick, and a somewhat weaker current of air should be blown. The flame then appears as a long, narrow, luminous cone,— the end being enveloped by a dimly visible portion of flame corresponding to that which surrounds the free flame, while there is also a dark nucleus about the wick. The substance to be reduced is brought into the luminous portion, where the reducing power is strongest.

The flame of an oil-lamp is the best for blowpipe operations where gas is wanting; candle flame may be used when great heat is not required. The blowpipe lamp of Berzelius, supplied with colza oil, is probably the most suitable. The wick, when in use, should be carefully trimmed and clean, so as to avoid a smoking flame. The general introduction of gas has quite driven out the use of oil-lamps for blowpipe purposes in laboratories.

Various materials are used as supports for substances in the blowpipe flame; the principle are charcoal, platinum, and glass. *Charcoal* is valuable for its infusibility and low conductivity for heat (allowing substances to be strongly heated upon it), and for its powerful reducing agency by the production of carbonic oxide when ignited; so that it is chiefly employed in trying the fusibility of minerals, and in reduction. The best kind of charcoal is that of close-grained pine or alder; it is cut in short prisms, having a flat smooth surface at right angles to the rings of growth. In this a shallow hole is made with a knife or borer, for receiving the substance to be held in the flame. *Platinum* is employed in oxidizing processes, and in fusion of substances with fluxes with a view to try their solubility in them, and note the phenomena of the bead; also in observing the coloring effect of substances on the blowpipe flame (which effect is apt to be somewhat masked by charcoal). Most commonly it is used in the form of wire, with a small bend or loop at the end. In flux experiments this loop is dipped when ignited in the powdered flux (*e. g.*, borax), then held in a lamp flame till the powder is fused, and the process is repeated, if necessary, till the loop is quite filled with a bead of the flux; to this is now added a little of the substance to be examined. Platinum is also used in the form of foil and of spoons, and for the points of forceps. Metals and easily reducible oxides, sulphides, or chlorides should not be treated upon platinum, as these substances may combine with and damage it. Tubes of hard German *glass*, 5 to 6 inches long, about ⅛th inch diameter, and open at both ends, are useful in the examination of substances containing sulphur, selenium, arsenic, antimony, and tellurium; these, when heated with access of air, evolve characteristic fumes. They are put in the tube near one end (which is held slightly depressed), and subjected to the blowpipe flame. The sublimates often condense on the cooler parts of the tube. Small tubes, closed at one end, are used, where it is required to detect the presence of water, mercury, or other bodies which are volatilized by heat without access of air.

The most important fluxes used in blowpipe analysis are carbonate of sodium, borax, and microcosmic salt. The first (which must be anhydrous and quite free from sulphates) serves chiefly in reducing metallic oxides and sulphides on charcoal, decomposing silicates, determining the presence of sulphur, and discriminating between lime and other earthy bases in minerals. Pure *borax*, or acid borate of sodium deprived of its water of crystallization by heating, is used for the purpose of dissolving up metallic oxides, when in a state of fusion at a red heat, such fused masses usually having characteristic colors when cold. In some cases the color and transparency change on cooling. *Microcosmic salts*, or ammonio-phosphate of sodium, is used on platinum wire in the same way as borax; on heating, water and ammonia are given off. The following are some other reagents for certain cases — nitrate of potash, bisulphate of potash, nitrate of cobalt, silica, fluoride of calcium, oxide or oxalite of nickel, protoxide of copper, tinfoil, fine silver, dry chloride of silver, bone ash, and litmus and Brazil-wood paper.

The blowpipe was first applied in the quantitative determination of metals by Harkort in 1827, and was brought to a high degree of perfection by Plattner. The methods are substantially those adopted in the assay of ores on the large scale in the wind furnace or muffle, thin capsules of clay or cavities in charcoal blocks being substituted for crucibles, and steel basins faced with bone ash, for cupels, in silver and gold assaying. From the small size of the beads obtained, especially when the ores of the precious metals are operated upon, the results are often such as cannot be weighed, and they are then measured by a tangent scale, and the weight computed from the observed diameter. This method, devised by Harkort, gives very accurate results when

carefully used, but owing to the difficulty of sampling the minute quantities operated upon so as to represent the bulk of the mineral fairly, the quantitative blowpipe assay has not made much progress. Perhaps the most useful quantitative application is in the determination of nickel and cobalt. This depends upon the fact that when the compounds of these metals, as well as those of copper and iron, with arsenic, are melted in contact with an oxidizing flux, such as borax or salt of phosphorus, iron is first taken up, then cobalt, and next nickel, and finally copper; and as the oxides of these metals give very different colors to the flux, we are enabled by examining the slag to detect the exact moment at which each is removed. For the details of the process the reader is referred to Plattner's work.

BLÜCHER, GERHARD LEBERECHT VON, field-marshal of the Prussian armies, prince of Wahlstadt in Silesia, was born at Rostock in 1742. In his fourteenth year he entered into the service of Sweden; and in the war between that power and Prussia he was taken prisoner. He afterwards entered into the service of Prussia, in which he became distinguished by his activity; but conceiving himself neglected by the great Frederick, he became a farmer in Silesia, and by his enterprise and perseverance in fifteen years he acquired an honorable independence. On the accession of Frederick-William II. he was recalled to military service, and replaced as major in his old regiment, the Black Hussars, where he distinguished himself in six general actions against the French, rose to the rank of colonel and major-general in 1793–4, and gained a high reputation by his energy, promptitude, and foresight. He was in a subordinate command in the disastrous battle of Jena in 1802; but he made a masterly retreat with his column to Lübeck, and extorted the praises of his adversaries, who testified on his capitulation that it was caused by "want of provisions and ammunition." He was soon exchanged for General Victor, and was actively employed in Pomerania, at Berlin, and at Königsberg, until the conclusion of the war. When Prussia shook off the French yoke in 1813, he first obtained a separate command. At the head of 60,000 troops, chiefly composed of raw militia, he defeated four French marshals at Katzbach, and rapidly crossing the Elbe, materially contributed to the signal victory of Leipsic. In several severe actions he fought his way to Paris, which he entered on 31st March 1814; and there, it has been stated, but for the intervention of the other allied commanders, he was disposed to make a severe retaliation for the calamities that Prussia had suffered from the armies of France. Blowing up the bridge of Jena across the Seine was said to be one of his contemplated acts. When war again broke out in 1815, the veteran was at the head of the Prussian armies in Belgium, and exhibited his wonted enterprise and activity. But partly owing to his own confidence and temerity, partly to the skilful strategy of his celebrated opponent, he was defeated in the severe battle of Ligny on 16th of June; yet with his characteristic spirit and energy, Blücher rallied his defeated forces, and appeared on the field of Waterloo on the 18th, just as Wellington had repulsed the last attack of Napoleon on the British position. At that critical moment Blücher was seen emerging from the wood of Frichemont on the French right; and the simultaneous irresistible charge of the British forces converted the retreat of the French into a tumultuous flight. The allied commanders met on the Genappes road, near the farm called the Maison du Roi, where the British forces were halted. The pursuit was continued through the night by sixteen fresh Prussian regiments with terrible carnage. The allies soon again entered Paris, where Blücher remained for several months; but the health of the aged commander having declined, he retired to his Silesian residence at Kirblowitz, where he died on September 12, 1819, aged seventy-seven.

BLUE. The blue pigments in common use by artists are few in number, and consist of native and artificial ultramarine, cobalt, indigo, and Prussian blue. Genuine ultramarine, prepared from the mineral lapis lazuli, and ordinary cobalt blue, sold for artists' work, are permanent colors. Excepting indigo these pigments are all mineral.

BLUEBEARD, the hero of a well-known nursery tale, so named from the color of his beard. In the common version Bluebeard is a seigneur of great wealth, who marries the daughter of a neighbor, and a month after the wedding goes on a journey, leaving his wife the keys of his castle, but forbidding her to enter one room. Yielding to her curiosity she opens the door to find the bodies of all of Bluebeard's former wives. Bluebeard, on his return, discovers from a spot of blood upon the key that his wife has disobeyed, and tells her that she must die. She begs for a short respite for prayer, sends her sister Anne to the top of the tower to look for help, and finally, in the nick of time, her two brothers burst in and dispatch Bluebeard. The story in various forms is widely distributed.

BLUE-BELL is the English popular name of the common wild hyacinth (*Scilla nutans*). The "bluebells of Scotland" are the flowers of *Campanula rotundifolia*, called hare-bell in England.

BLUEBIRD, BLUE WARBLER, BLUE REDBREAST, or BLUE ROBIN (*Sylvia or Sialia sialis*), a favorite American bird, which appears in the Northern States early in the spring, and frequents inhabited regions. The bluebird is known as an inhabitant of the Bermudas, Mexico, the West Indies, Guiana, and Brazil.

BLUE-BOTTLE FLY (*Musca vomitoria*), an insect of the same genus with the common house-fly. It much exceeds the latter in size, but is smaller than the blow-fly. The head is black, with rust-colored cheeks, the thorax grayish, the abdomen blue, with a whitish shimmer, and with three black bands. The expanse of wings is nearly one inch. It deposits its ova on flesh.

BLUE-COAT SCHOOL, a name commonly given to Christ's Hospital in London, and to similar schools elsewhere in England, from the uniform.

BLUE EARTH, a county in Minnesota. Population, about 20,000. Capital, Mankato.

BLUE-EYE (*Entomyza cyanotis*), a beautiful little bird, abundant in New South Wales. It is one of the honey-eaters.

BLUEFISH (*Pomatomus saltatrix* or *Temnodon saltator*), a fish of the family Scomberidæ, of a genus having no detached finlets, no isolated dorsal spines and no lateral armature of the tail, two dorsal fins, the first of which is small, and two deeply-hidden spines, in front of the anal fin. The only known species is abundant on the east coast of North America. It goes southward in the winter, and migrates northward in spring, and is widely spread in tropical and subtropical seas. The upper parts are of a bluish color, the lower parts whitish, a large black spot at the base of the pectoral fins. The mouth is crowded with teeth, the jaws are furnished with large ones. The bluefish preys on other fishes, such as the menhaden and mackerel, the shoals of which it pursues. It is very swift, strong, and voracious. It sometimes attains a length of three or even five feet, and a weight of fourteen pounds. Trolling for bluefish is a very popular sport on the east coast.

BLUE GRASS (*Poa pratensis*) is a permanent grass found in Europe and North America. By reason of its creeping root-stocks it forms a dense turf. It is

valued for pasture. The blue grass pastures of Kentucky have long been celebrated.

BLUE ISLAND, a suburb of Chicago, in Cook county, Ill., with considerable manufacturing interests, and a population (1890) of 5,000.

BLUE-JAY *(Cyanocitta cristata)*, a common North American bird of the Crow family. They are mischievous birds, but devour large numbers of injurious caterpillars. The length is almost a foot; the color is "grayish purple above, black on the neck, lilac-brown to white below." The long-tailed blue-jays belong to a rarer genus (Xanthura) found in Central and in South America.

BLUE LAWS. The alleged laws regulating social life in New England colonies, said to have been adopted in the middle of the seventeenth century. These laws were said to have been of the most stringent character; for instance, there was a penalty for shaving on the Sabbath, or for kissing one's wife upon that day. The truth is that no such laws were ever passed in any of the colonies, but the term is applied to any attempted interference with the domestic rights and liberties of the individual.

BLUE LICK SPRINGS. Celebrated springs in Nicholas county, Ky.

BLUE MOUNTAINS. The name of a branch of the Dividing Range, New South Wales, which run very nearly parallel with the coast, about eighty miles inland. The highest point, Mount Beemarang, is 4,100 feet high. The Blue Mountains in the center of Jamaica attain in the West Peak, 7,105 feet.

BLUE PILL *(Pilula hydrargyri)* consists of two parts of mercury rubbed up with three parts of conserve of roses, till globules of mercury can no longer be detected; to this is added one part of powdered liquorice-root, so that a pill of three grains contains one grain of mercury. In cases of torpid condition of the liver or inflammation of that organ, blue pill is used as a purgative, either alone or combined with some other drug, such as rhubarb.

BLUE RIBBON, a term applied to any great prize from the blue ribbon worn by Knights of the Garter. —*Blue Ribbon Army* was the name adopted in England for the "Murphy Temperance Movement."

BLUE RIDGE, the most easterly range of the Alleghanies. It forms the continuation of the chain called South Mountain in Pennsylvania and Maryland. It is known as Blue Ridge till it crosses the James river; thence till North Carolina as Alleghany Mountains; and in North Carolina again as Blue Ridge.

BLUE-STOCKING, a name given to learned and literary women, who display their acquirements in a vain and pedantic manner. The name is derived from a literary coterie formed in London about 1750, of which a certain member, Benjamin Stillingfleet, was in the habit of wearing blue stockings. *Bas Bleu* is the corresponding French phrase.

BLUETHROAT, or BLUEBREAST *(Cyanecula suecica)*, a beautiful and melodious bird, nearly allied to the nightingale. It is very little larger than an English redbreast, and much resembles it.

BLUE-WING, a variety of duck, either a sub-genus of Anas, or a special genus Cyanopterus. The best-known species, the common or Lunate Blue-wing *(Anas* or *Cyanopterus discors)*, is generally called the Blue-winged Teal in this country, where it is very abundant. The summer migrations of the species extend as far north as the 57th parallel. In size it is rather larger than the common teal. The flight is extremely rapid and well sustained. The flocks are sometimes so numerous and so closely crowded together on the muddy marshes near New Orleans, that Audubon mentions having seen eighty-four killed by the simultaneous discharge of the two barrels of a double-barrelled gun. There are other species of blue-wing, also American; but this alone seems to visit the more northern regions. No member of the duck tribe is in higher esteem for the table, and it has therefore been suggested that the blue-wing is particularly worthy of domestication, of which it seems to be very easily susceptible.

BLUFFTON, the county seat of Wells county, Ind., is situated on the Wabash river, twenty-four miles south of Fort Wayne. It contains a national bank, two newspaper offices, saw-mills, planing mills, woolen mill, and three carriage factories, and has a population of 5,000.

BLUM, ROBERT, a leader in the Revolution of 1848, was born at Cologne in 1807. He was elected one of the vice-presidents of the Provisional Parliament at Frankfort. In the National Assembly he became leader of the Left. He went to Vienna in October and joined the insurgents, was arrested, and was shot on November 9th.

BLUMENBACH, JOHANN FRIEDRICH, a distinguished physiologist, was born at Gotha on May 11, 1752. He studied medicine at Jena, and afterward at Göttingen, where he took the degree of doctor in 1775. In physiology he was of the school of Haller, and was in the habit of illustrating his theory by a careful comparison of the animal functions of man with those of the lower animals. His reputation was much extended by the publication of his excellent *Institutiones Physiologicæ*, a condensed, well-arranged view of the animal functions, expounded without discussion of minute anatomical details. This work appeared in 1787, and between its first publication and 1821 went through many editions in Germany, where it was the general text-book of the science. It was translated into English in America in 1798, and in London in 1807.

Although the greatest part of Blumenbach's long life was passed at Göttingen, in 1789 he found leisure to visit Switzerland, and gave a curious medical topography of that country in his *Bibliothek*. He was in England in 1788 and 1792. The Prince Regent conferred on him the office of physician to the royal family in Hanover in 1816, and made him knight companion of the Guelphic order in 1821. The Royal Academy of Paris elected him a member in 1831. He died at Göttingen on January 22, 1840.

BLUSHING is a sudden reddening of the skin, induced by various mental states, particularly those involving shame or humiliation, shyness or modesty. It usually affects only the face and neck; rarely, among civilized peoples, the breast and other parts of the body. The phenomenon results from relaxation of the control exercised over the circulation of the blood by the nervous system.

BOA, a name formerly applied to all large serpents, which, devoid of poison fangs, killed their prey by constriction, but now confined to that section of them occurring in America, the Old World forms being known as Pythons. The true boas are widely distributed throughout tropical America, occurring most abundantly in Guiana and Brazil, where they are found in dry, sandy localities, amid forests, on the banks of rivers and lakes, and in the water itself, according to the habits of the various species. They feed chiefly on the smaller quadrupeds, in search of which they often ascend trees, suspending themselves from the branches by the tail, and thus awaiting motionless the approach of their victim. While so hanging they are partly supported by two spine-like hooks, situated one on each side of the vent, which are connected with several small bones concealed beneath the skin and attached to the mair

skeleton. These bones, terminating thus in an external claw, are characteristic of the family *Boidæ*, and are recognized by anatomists as the rudiments of those which form the hind limbs in all quadrupeds. The size of the boa's prey often seems enormously beyond its apparent capacity for swallowing, a difficulty which disappears on acquaintance with the peculiar structure of the creature's jaws. The bones composing these are not knit together as in Mammals, but are merely connected by ligaments, which can be distended at pleasure. The mouth of the boa can thus be made to open transversely as well as vertically; and in addition to this the two jaws are not connected directly as in other animals, but by the intervention of a distinct bone, which adds greatly to the extent of its gape. It has also the power of moving one-half of the jaw independently of the other, and can thus keep a firm hold of its victim while gradually swallowing it. The boa possesses a double row of solid sharp teeth in the upper jaw, and a single row beneath, all pointing inward, so that, its prey once caught, it would be well-nigh impossible even for the boa itself to release it. After feeding, boas, like all other reptiles, become inactive, and remain so while the process of digestion is going on, which, in the case of a full meal, may extend over a few weeks, and during this period they are readily killed. All the species are ovoviviparous. The Jiboya or *Boa constrictor*—the latter name having been loosely given to all the species—is an inhabitant of the dry and sandy districts of tropical America, and rarely exceeds twenty feet in length. Its food consists chiefly of the agoutis, capybaras and ant-bears, which abound in those districts. It seeks to avoid man, and is not feared by the inhabitants, who kill it readily with a sharp blow from a stick. The Water-boa or Anaconda (*Eunectens murinus*) is a much more formidable creature, attaining, it is said, a length of forty feet, and being thus probably the largest of living serpents. It inhabits the lakes, rivers and marshes of Brazil and Guiana, and passes a considerable portion of its existence in the water. It is exceedingly voracious, feeding on fishes and on such animals as may come to the banks of the stream to drink, for which it lies in wait with only a small part of its head above the surface of the water. It also occasionally visits the farmyards, carrying off poultry and young cattle, and it has been known to attack man.

BOABDIL (properly Abu-Abdallah, and nicknamed Ez-Zogoiby, the unlucky), the last Moorish King of Granada, was defeated by the Castilians in 1491. He crossed to Africa and died in battle.

BOADICEA, a British queen in the time of the Emperor Nero. She was wife of Prasutagus, king of the Iceni, a people inhabiting the eastern coast of Britain. On his deathbed, 60 A. D., Prasutagus named the emperor heir to his accumulated treasures conjointly with his own two daughters, in expectation of securing thereby Nero's protection for his family and people; but he was no sooner dead than the emperor's officers seized all. Boadicea's opposition to these unjust proceedings was resented with such cruelty that orders were given that she should be publicly whipped, and her daughters exposed to the brutality of the soldiers. The Britons took up arms, with Boadicea at their head, to shake off the Roman yoke; the colony of Camalodunum or Colchester was taken, and the Romans were massacred wherever they could be found. The whole province of Britain would have been lost to Rome, if Suetonius Paulinus had not hastened from the Isle of Mona, and at the head of 10,000 men engaged the Britons, who are said to have amounted to 230,000. A great battle was fought, which resulted in the complete defeat of the Britons (62 A. D.). Boadicea, who had displayed extraordinary valor, soon after dispatched herself by poison.

BOAR, WILD (*Sus scrofa*), an important species of *Suidæ*, a family of Pachydermatous Mammals, and generally regarded as the original stock of our domestic breeds of swine. In size it is equal to the largest of the domestic kinds, while exceeding them all in strength of body and ferocity of disposition. It is of a greyish-black color, covered with short woolly hair, thickly interspered with coarse stiff bristles, which assume the form of a mane along the spine. The canine teeth are largely developed, forming two pairs of prism-shaped tusks, which thus become formidable weapons. In old age those tusks in the lower jaw gradually curve inward and upward over the snout until they are rendered useless for purposes of attack, when, according to Darwin, they become serviceable for defense in the frequent fights which take place during the rutting season. At the same time, the canines of the upper jaw begin to develop outward and upward, and these take the place of the lower ones as offensive weapons. The wild boar is a native of the temperate regions of Europe and Asia, where it inhabits the deepest recesses of forests and marshy grounds. Vambery, in his recent journey through Central Asia, found them in enormous numbers in the extensive swamps of Turkestan. The wild boar was for many centuries a favorite beast of chase with the nobility of Europe. It was hunted on foot with the spear; its great strength and its ferocity when at bay rendered the sport alike exciting and dangerous.

BOAT is the general name for a small open vessel. It may be slight or strong, sharp or flat-bottomed, swift for despatch or roomy for cargo, ornamental for pleasure or plain for hard service, deep or light of draught for deep or shallow water. Competition among oarsmen has brought into existence the racing-boat with outrigged rowlocks. These boats are usually built of cedar for lightness, canvas-covered, and so light in construction that a sculling-boat (termed a wager-boat) thirty feet long weighs no more than thirty pounds.

BOATBILL (*Cancroma cochlearia*), a bird of the Heron family, the only known species of a genus differing from the true herons in little else than the form of the brown bill, which is comparatively short and very broad. The boatbill is about the size of a domestic fowl, has shorter limbs than most of the herons, but resembles them in plumage, and is abundantly provided on the back of the head and neck with elongated feathers, which it erects when irritated.

BOAT-BUILDING. See SHIP-BUILDING.

BOAT-FLY (*Notonecta*), a genus of insects of the order Hemiptera, sub-order Heteroptera, and family Hydrocores, or Water-bugs. They swim on their backs and rest in this posture suspended at the surface of the water.

BOBBINS are small wooden reels or rollers, flanged at the ends, and bored through the center lengthwise, so that they can be placed on a spindle or skewer. Bobbins are used in the spinning processes for cotton, flax and wool.

BOB-O-LINK, or BOBLINK, REED BIRD, or RICE BIRD (*Dolichonyx oryzivorus* or *Icterus acripennis*), a common American bird of passage found from Paraguay to Canada, the only one of its kind. The beak is short and straight; the nostrils surrounded by a fold of skin; the wings are long, especially in their first feather; the tail-feathers are stiff-pointed. In the male the head, lower surface and tail are black, while the upper surface is lighter, yellowish white in front, black with yellow streaks behind. The female is much plainer—yellowish brown with darker streaks above, and pale grayish yellow below.

BOBRUISK, a town of Russia, in the government of Minsk, 110 miles southeast of that city, on the right bank of the Berezina, near the confluence of the Bobruiska, on the high road from Mogileff to Brest-Litovsk.

BOCCACCIO, GIOVANNI. Comparatively little is known of Boccaccio's life, particularly of the earlier portion of it. He was born in 1313, as we know from a letter of Petrarch, in which that poet, who was born in 1304, calls himself the senior of his friend by nine years. The place of his birth is somewhat doubtful, Florence, Paris, and Certaldo being all mentioned by various writers as his native city. Boccaccio undoubtedly calls himself a Florentine, but this may refer merely to the Florentine citizenship acquired by his grandfather.

About 1333 Boccaccio settled for some years at Naples, apparently sent there by his father to resume his mercantile pursuits, the canon law being finally abandoned. The place, it must be confessed, was little adapted to lead to a practical view of life one in whose heart the love of poetry was firmly rooted. The court of King Robert of Anjou, at Naples, was frequented by many Italian and French men of letters, the great Petrarch among the number. At the latter's public examination in the noble science of poetry by the king, previous to his receiving the laurel crown at Rome, Boccaccio was present, without, however, making his personal acquaintance at this period. In the atmosphere of this gay court, enlivened and adorned by the wit of men and the beauty of women, Boccaccio lived for several years. On Easter-eve, 1341, in the church of San Lorenzo, Boccaccio saw for the first time the natural daughter of King Robert, Maria, whom he immortalized as Fiammetta in the noblest creations of his muse. Boccaccio's passion on seeing her was instantaneous, and (if we may accept as genuine the confessions contained in one of her lover's works) was returned with equal ardor on the part of the lady.

About the year 1341 Boccaccio returned to Florence by command of his father, who in his old age desired the assistance and company of his son. Florence was at that time disturbed by civil feuds, and the silent gloom of his father's house could not but appear in an unfavorable light to one accustomed to the gay life of the Neapolitan court. But more than all this, Boccaccio regretted the separation from his beloved Fiammetta. The thought of her at once embittered and consoled his loneliness. Three of his works owe their existence to this period. With all of them Fiammetta is connected; of one of them she alone is the subject.

By the intercession of an influential friend, Boccaccio at last obtained (in 1344) his father's permission to return to Naples, where in the meantime. Giovanna, granddaughter of King Robert, had succeeded to the crown. Being young and beautiful, fond of poetry and of the praise of poets, she received Boccaccio with all the distinction due to his literary fame. It was by her desire, no less than by that of Fiammetta, that he composed (between 1344 and 1350) most of the stories of his *Decameron*, which afterward were collected and placed in the mouths of the Florentine ladies and gentlemen.

In 1350 Boccaccio returned to Florence, owing to the death of his father, who had made him guardian to his younger brother Jacopo. He was received with great distinction, and entered the service of the Republic, being at various times sent on important missions to the Landgrave of Brandenburg, and to the courts of several Popes, both in Avignon and Rome.

In the chronological enumeration of our author's writings we now come to his most important work, the *Decameron*, a collection of one hundred stories, published in their combined form in 1353, although mostly written at an earlier date. This work marks in a certain sense the rise of Italian prose.

A detailed analysis of a work so well known as the *Decameron* would be unnecessary. The description of the plague of Florence preceding the stories is universally acknowledged to be a masterpiece of epic grandeur and vividness. It ranks with the paintings of similar calamities by Thucydides, Defoe, and Manzoni. Like Defoe, Boccaccio had to draw largely on hearsay and his own imagination, it being almost certain that in 1348 he was at Naples, and therefore no eye-witness of the scenes he describes. The stories themselves, a hundred in number, range from the highest pathos to the coarsest licentiousness. A creation like the patient Griselda, which international literature owes to Boccaccio, ought to atone for much that is morally and artistically objectionable in the *Decameron*. It may be said on this head, that his age and his country were not only deeply immoral, but in addition exceedingly outspoken. Moreover, his sources were anything but pure. Most of his improper stories are either anecdotes from real life, or they are taken from the *fabliaux* of mediæval French poets.

About 1360 Boccaccio seems to have retired from the turbulent scenes of Florence to his native Certaldo, the secluded charms of which he describes with rapture. In the following year took place that strange turning-point in Boccaccio's career, which is generally described as his conversion. His later works, although written in Latin and scientific in character, are by no means of a religious kind. During the next ten years Boccaccio led an unsettled life, residing chiefly at Florence or Certaldo.

In 1373 we find Boccaccio again settled at Certaldo. Here he was attacked by a terrible disease which brought him to the verge of death, and from the consequences of which he never quite recovered. But sickness could not subdue his intellectual vigor. When the Florentines established a chair for the explanation of the *Divina Commedia* in their university, and offered it to Boccaccio, the senescent poet at once undertook the arduous duty. He delivered his first lecture October 23, 1373. The commentary on part of the *Inferno*, already alluded to, bears witness of his unabated power of intellect. In 1374 the news of the loss of his dearest friend Petrarch reached Boccaccio, and from this blow he may be said to have never recovered.

In his last will Boccaccio left his library to his father confessor, and after his decease to the convent of Santo Spirito in Florence. His small property he bequeathed to his brother Jacopo. His own natural children had died before him. He himself died December 21, 1375, at Certaldo, and was buried in the church of SS. Jacopo e Filippo of that town.

BOCCALINI, TRAJANO, an Italian satirist, was born at Loretto in 1556. The son of an architect, he himself adopted that profession, and it appears that he commenced late in life to apply to literary pursuits. Pursuing his studies at Rome, he had the honor of teaching Bentivoglio, and acquired the friendship of the cardinals Gaetano and Borghesi, as well as of other distinguished personages. By their influence he obtained various posts, and was even appointed by Gregory XIII. governor of Benevento in the states of the church. Here, however, he seems to have acted imprudently, and he was soon recalled to Rome, where he shortly afterward composed his most important work, the *Ragguagli di Parnaso*, in which Apollo is represented as receiving the complaints of all who present themselves, and distributing justice according to the merits of each particular case. The book is full of light and fantastic satire on the actions and writings of his eminent contempora

ries, and some of its happier hits are among the hackneyed felicities of literature. To escape, it is said, from the hostility of those whom his shafts had wounded, he returned to Venice, and there, according to the register in the parochial church of Sta Maria Formosa, died in 1613.

BOCHART, SAMUEL, a learned writer of the 17th century, specially distinguished as an Oriental scholar, was born at Rouen in Normandy, May 30, 1599. He was many years pastor of a Protestant church at Caen, and became tutor to Wentworth Dillon, earl of Roscommon, author of the *Essay on Translated Verse.* While at Caen he particularly distinguished himself by his public disputations with Father Veron, a Jesuit, and celebrated as a polemic. The dispute was held in the castle of Caen, in the presence of a great number of Catholics and Protestants, the duke of Longueville being among the former. In 1652, Christiana, queen of Sweden, invited him to Stockholm, whither he repaired, accompanied by Huet. On his return to Caen he resumed his duty as a minister of the gospel, married, and was received into the academy of that city. Bochart was a man of profound erudition; he possessed a thorough knowledge of the principal Oriental languages, including Hebrew, Syriac, Chaldaic, and Arabic; and such was his zeal for extending his acquirements, that at an advanced age he wished to learn Ethiopic. He was remarkable for modesty and candor; but so absorbed was he in his favorite study, that he saw Phœnician, and nothing but Phœnician, in everything, even in the words of the Celtic, and hence the prodigious number of chimerical etymologies which swarm in his works. He died at Caen, May 16, 1667.

BOCHNIA, the chief town of a district in Austrian Galacia, on the River Raba or Uswica, a tributary of the Vistula. Population (1890), 8,000.

BOCHUM, the chief town of a circle in the Prussian province of Westphalia and government of Arnsberg, on the railway between Duisburg and Dortmund.

BODE, JOHANN ELERT, a celebrated German astronomer, born January 19, 1747, at Hamburg, where his father kept a commercial academy. From his earliest years he was devoted to the mathematical sciences, especially astronomy. In the garret of his father's house, with the aid of a telescope constructed by himself, he eagerly made observations of the heavens; and at eighteen years of age he had acquired so great a knowledge of astronomy, that when Dr. Reimarus visited his father, young Bode was found occupied in calculating an eclipse of the sun. This incident was the means of introducing him to the notice of Professor Büsch, who at once afforded him every facility for prosecuting his labors with success. Shortly afterwards Bode gave the first public proof of his knowledge by a short work on the solar eclipse of August 5, 1766; and this was followed by an elementary treatise on astronomy, which was eminently successful, and has since gone through numerous editions. In 1772, being called to Berlin by Frederick II., he was made astronomer to the Academy of Sciences, and afterwards a member of that institution. The well-known periodical work entitled *Astronomische Jahrbücher*, which is continued to the present day, was commenced by Bode in 1774; but that on which his fame chiefly rests is the *Uranographia*, published in 1801, in which the industrious author has given observations of 17,240 stars, or 12,000 more than are to be found in any older charts. This veteran observer, who may justly be said to have been the first to diffuse a general taste for astronomy in Germany, died at Berlin, Nov. 23d, 1826. He was the author of a curious empirical law, which still bears his name.

BODIN, JEAN, one of the ablest political thinkers in France during the 16th century, was born at Angers in 1530. He studied law at Toulouse, and, after taking his degree, lectured there for some time on jurisprudence. Thence he proceeded to Paris, and began to practice at the bar.

His great work — *Les six livres de la Republique* (Paris, 1576) — passed through various editions in its author's lifetime, that of 1583 having as an appendix *L'apologie de René Herpin* (Bodin himself). In 1586 he issued a Latin version, for the use chiefly of English students of law and politics. It is the first elaborate attempt in modern times to construct a system of political science. Bodin was, of course, greatly indebted to Aristotle for his knowledge of the working of political causes, but he made use of what his illustrious predecessor taught him in no servile way, and added much from his own reflections, his large acquaintance with history, and his vivid personal experience. The *Republic* is a work of which it is quite impossible to give a brief account, and, as there have been many lengthened summaries of it, it may suffice to say that those to be found in Hallam's *Lit. of Europe* (vol. ii. 1st ed.), Heron's *History of Jurisprudence*, Lerminier's *Introduction à l' Histoire du Droit*, and Bluntschli's *Geschichte des Staatsrechts*, give a good general view of its character, while that in Professor Baudrillart's *J. Bodin et son Temps* is so exceedingly careful and excellent that scarcely a thought of any value in the original has escaped being indicated. Although he was himself regarded by most of his contemporaries as a skeptic, and by some as an atheist, he denounced all who dared to doubt of sorcery, and zealously urged the burning of witches and wizards. It might, perhaps, have gone hard with himself if his counsel had been strictly followed, as he confessed to have had from his thirty-seventh year a friendly demon who, if properly invoked, touched his right ear when he purposed doing what was wrong, and his left when he meditated doing good. He died of the plague in Paris in 1596, and was buried in the church of the Carmelites.

BODLEIAN LIBRARY, the public library of Oxford University, restored by Sir Thomas Bodley in 1598. The Bodleian Library is particularly rich in biblical codices, rabbinical literature, and materials for British history. It is estimated to contain about 400,000 volumes, and between 20,000 and 30,000 manuscripts.

BODLEY, SIR THOMAS, founder of the Bodleian library at Oxford, was born at Exeter in 1544, and died at his house in London, January 28, 1612.

BODMIN, a parliamentary and municipal borough and market-town of England, in the county of Cornwall, 235 miles from London, and thirty from Plymouth by rail. Population (1890), 8,260. It is an important shipping point.

BODONI, GIAMBATTISTA, superintendent of the royal press at Parma, chief printer to his Catholic Majesty, member of various academies in Italy, and knight of several orders, was born in 1740, at Saluzzo in Piedmont, where his father owned a printing establishment. While yet a boy he began to engrave on wood. He at length went to Rome, and there became a compositor for the press of the Propaganda. He made himself acquainted with the Oriental languages, and thus was enabled to render essential service to the Propaganda press, by restoring and accurately distributing the types of several Oriental alphabets which had fallen into disorder. The beauty of his typography, &c., leave nothing further to be desired; but the intrinsic value of his editions is seldom equal to their outward splendor. His Homer, however, is a truly magnificent work, and indeed, his Greek letters are faultless imitations of the best.

Greek manuscript. His editions of the Greek, Latin, Italian, and French classics are all highly prized for their typographical elegance, and some of them are not less remarkable for their accuracy. Bodoni died at Padua in 1813, aged 73.

BOECE, or BOYCE, HECTOR, a distinguished Scottish historian, was born at Dundee, about the year 1465, being descended of a family which for several generations had possessed the barony of Panbride or Balbride. He received his early education at Dundee, and completed his course of study in the University of Paris, where he took the degree of B.D. He was appointed a professor of philosophy in the college of Montaign; and in this seminary he became intimately acquainted with Erasmus, who in two epistles has testified his esteem for Boece's character. In his academical station he had already distinguished himself when King's College was founded at Aberdeen by the munificence of William Elphinstone, bishop of the diocese. The Papal bull for the erection of a university had been obtained in the year 1494, but the buildings were not sufficiently advanced, nor did the lectures commence, till about the year 1500. It was not without some degree of hesitation that he consented to quit the lettered society of Paris, and to become principal of this new college; but having at length accepted the conditions, he proceeded to Aberdeen, and experienced a kind reception from the canons of the cathedral, several of whom he has commemorated as men of learning. It was a part of his duty as principal to read lectures on divinity. The common branches of science and literature were taught with zeal and success; and the prosperity of the institution was greatly promoted by the influence of Boece.

The emoluments of his office were not such as appear very dazzling to modern eyes. "Boethius, as president of the university," says Dr. Johnson, "enjoyed a revenue of forty Scottish marks, about two pounds four shillings and sixpence of sterling money. In the present age of trade and taxes, it is difficult even for the imagination so to raise the value of money, or so to diminish the demands of life, as to suppose four and forty shillings a year an honorable stipend; yet it was probably equal not only to the needs but to the rank of Boethius. The wealth of England was undoubtedly to that of Scotland more than five to one, and it is known that Henry the Eighth, among whose faults avarice was never reckoned, granted to Roger Ascham, as a reward of his learning, a pension of ten pounds a year." But it is necessary to recollect that this was not the only preferment which Boece enjoyed: he was not only principal of King's College, but was likewise a canon of Aberdeen, and rector of Tyrie in the same county.

The composition of Boece's history displays much ability; and if the style does not always reach the standard of ancient purity, it displays a certain vein of elegance which generally renders it attractive. The author's love for his native country, and his anxiety to emblazon the heroic deeds of his countrymen, are conspicuous in every part of the work; nor must we leave unnoticed those aspirations after political freedom, by which he was honorably distinguished at a period when the human mind was so generally chained to the earth by the most lavish maxims of submission. It may be recorded as commendation instead of reproach, that his principles of polity have been represented as no better than those of Buchanan.

In 1528, soon after the publication of his history, Boece took the degree of D.D. at Aberdeen; and on this occasion the magistrates voted him a present of a tun of wine when the new wines should arrive, or, according to his option, the sum of £20 to purchase a new bonnet. He appears to have survived till the year 1536; for on the 22d of November in that year, the king presented John Garden to the rectory of Tyrie, vacant by the death of "Mr. Hector Boiss." He died at Aberdeen, and, according to the most probable conjecture, he had then attained, or at least approached, the age of seventy.

BOECKH, AUGUST, one of the greatest scholars that Germany has produced in modern times, was born in Karlsruhe, November 24, 1785. He was sent to the gymnasium of his native city, and remained there until he left for the University of Halle. There he devoted himself to the study of theology, as his intention was to enter the church. He had the privilege of listening to the lectures of Schleiermacher and other eminent theologians; but at this time in Halle F. Wolf was exercising a spell over the young men and creating an enthusiasm for classical studies. August Boeckh felt the spell, passed from theology to philology, and became the greatest of all Wolf's scholars. At Easter of 1806 he went to Berlin to study in the seminary for secondary teachers, conducted by Gedike; but the disturbances which then agitated the country sent him home. In the summer of 1807 he came out as privatdocent in the University of Heidelberg, and in the autumn of the same year he was appointed a professor extraordinarius. Two years after (1809) he was nominated ordinary professor. In 1811 he removed to Berlin, having been appointed professor of eloquence and ancient literature in the university newly established there. Here he remained till his death, which took place August 3, 1867. He was elected a member of the Academy of Sciences of Berlin in 1814, and for a long time acted as its secretary. Many of the speeches contained in his *Kleine Schriften* were delivered in this latter capacity.

Boeckh worked out the idea of Wolf in regard to philology, and illustrated them by his practice. Discarding the old notion that philology lay in a minute acquaintance with words and the exercise of the critical art, he believed it to be the entire knowledge of antiquity, historical and philosophical. He divides philology into five parts: first, an inquiry into public acts, with a knowledge of the times and places, into civil institutions, and also into law; second, an inquiry into private affairs; third, an exhibition of the religions and arts of the ancient nations; fourth, a history of all their moral and physical speculations and beliefs, and of their literatures; and fifth, a complete explanation of the language. These ideas in regard to philology Boeckh gave out in a Latin oration delivered in 1822.

From 1806 till the time of his death, Boeckh's literary activity was unceasing. His principal works were — (1.) An edition of Pindar, the first volume of which (1811) contains the text of the Epincian odes; a treatise *De Metris Pindari*, in three books; and *Notæ Criticæ*: the second (1819) contains the *Scholia*; and part ii. of volume ii. (1821) contains a Latin translation, a commentary, the fragments, and indices. It is the most complete edition of Pindar that we have. But it was especially the treatise *De Metris Pindari* in the first volume which placed Boeckh in the first rank of scholars. This treatise forms an epoch in the treatment of Greek metres. In it the author threw aside all attempts to determine the Greek metres by mere subjective standards, pointing out at the same time the close connection between the music and the poetry of the Greeks. He investigated minutely the nature of Greek music as far as it can be ascertained, as well as all the details regarding Greek musical instruments; and he explained the statements of the ancient Greek writers on rhythm. In this manner he laid the foundation for a new treatment of Greek metres. (2.) *Political Economy of the Athenians*,

2 vols., Berlin, 1817 (2d improved edition, Berlin, 1851), translated into English by Sir George Cornewall Lewis, 2 vols., London, 1828. Boeckh shows in this work an imperfect acquaintance with the principles of the modern science of political economy. The book might have been written by an ancient Greek. But this imperfection does not much impair its great value and extraordinary merits. Boeckh has in it investigated a subject of peculiar difficulty with profound learning. He has amassed information from the whole range of Greek literature, he has carefully apprised the value of the information given, and he shows throughout every portion of it rare critical ability and insight.

These were Boeckh's great works; but his activity was continually digressing into widely different fields. He has gained for himself a foremost position amongst investigators into ancient chronology, and his name will occupy a parallel place with those of Ideler and Mommsen.

BOEHME, JAKOB, (1575-1624), a mystical writer, whose surname (of which Fechner gives eight German varieties) appears in English literature as Beem, Behmont, &c., and notably in the form BEHMEN, was born at Alt-Seidenberg, in Upper Lusatia, a straggling hamlet among the hills, some ten miles S.E. of Görlitz. He came of a well-to-do family, but his first employment was that of herd boy on the Landskrone, a hill in the neighborhood of Görlitz, and the only education he received was at the town-school of Seidenberg, a mile from his home. Seidenberg, to this day, is filled with shoemakers, and to a shoemaker Jakob was apprenticed in his fourteenth year (1589), being judged not robust enough for husbandry. Ten years later (1599) we find him settled at Görlitz as master-shoemaker, and married to Katharina, daughter of Hans Kuntzschmann, a thriving butcher in the town. After industriously pursuing his vocation for ten years, he bought (1610) the substantial house, which still preserves his name, close by the bridge, in Neiss-Vorstadt. Two or three years later he gave up business, and did not resume it as a shoemaker; but for some years before his death he made and sold woollen gloves, regularly visiting Prague fair for this purpose.

Boehme's authorship began in his 37th year (1612) with a treatise, *Morgen Röthe im Auffgang*, which though unfinished was surreptitiously copied, and eagerly circulated in MS. by Karl von Ender. This raised him at once out of his homely sphere, and made him the centre of a local circle of liberal thinkers, considerably above him in station and culture. The charge of heresy was, however, soon directed against him by Gregorius Richter, then pastor primarius of Görlitz. Feeling ran so high after Richter's pulpit denunciations, that, in July 1613, the municipal council, fearing a disturbance of the peace, made a show of examining Boehme, took possession of his fragmentary quarto, and dismissed the writer with an admonition to meddle no more with such matters. For five years he obeyed this injunction. But in 1618 began a second period of authorship; he poured forth, but did not publish, treatise after treatise, expository and polemical, in the next and the two following years. In 1622 he composed nothing but a few short pieces on true repentance, resignation, &c., which, however, devotionally speaking, are the most precious of all his writings. They were the only pieces offered to the public in his lifetime and with his permission, a fact which is evidence of the essentially religious and practical character of his mind. Their publication at Görlitz was the signal for renewed clerical hostility. Boehme had by this time entered on the third and most prolific though the shortest period (1623-4) of his speculations. His labors at the desk were interrupted in May 1624 by a summons to Dresden, where his famous "colloquy" with the Upper Consistorial Court was made the occasion of a flattering but transient ovation on the part of a new circle of admirers. Richter died in August 1624, and Boehme did not long survive his pertinacious foe. Seized with a fever when away from home, he was with difficulty conveyed to Görlitz. His wife was at Dresden on business; and during the first week of his malady he was nursed by a literary friend. He died, after receiving the rites of the church, grudgingly administered by the authorities, on Sunday, 17th November. Clerical ill-will followed him to the grave, and the malice of the vulgar defaced his monument.

BŒOTIA a country of Central Greece, bounded on the S. by the Gulf of Corinth, Megaris, and Attica; on the E. by Attica and the Euripus, which separates it from Eubœa; on the N, by the territory of the Locri Opuntii; and on the W. by Phocis. Its surface is estimated at 1119 English square miles. Surrounded nearly on all sides by mountains, it divides itself naturally into three parts, the low country about Lake Copais, or, as it is now called, the Lake of Topolias, the valley of the River Asopus (now Oropo), and the coast district between Mount Helicon and the Corinthian Gulf. The country about the lake is a large valley, so completely surrounded by hills that it is connected with the Eubœan Sea by subterranean passages only. The natural passages, or *katavothra*, not being sufficient to carry off the great masses of water accumulating in the valley, which is traversed by the Cephisus, the principal river in the country, the early inhabitants often suffered severely from inundations; and at a very remote period large artificial drains were constructed, probably by the Minyans of Orchomenos, to supplement the natural outlets. Remains of these works, as stupendous as any that were executed in antiquity, still excite the admiration of the traveller. They formerly rendered that part of Bœotia one of the most fertile districts of Greece, but being neglected for centuries, the shores of the lake became an extensive marsh. A large stretch of country is still often under water during the winter, but it begins to dry up in spring, and in summer forms fine wheatfields and meadows. Between this valley of the Copals and the basin of the Asopus is situated the Theban plain, which is still distinguished for its fertility, especially in grain. The lowlands and valleys of Bœotia were notorious in antiquity for their moist and thick atmosphere, which was believed to render the inhabitants dull and stupid. For these characteristics the Bœotians are frequently satirized by the Attic writers; and it is certain that comparatively few names were added to the long roll of Greek literature from this portion of the Greek soil. One writer alone, perhaps, the poet Pindar, stands out in striking contrast to the national character; the two others who alone of his fellow-countrymen can claim to be also his intellectual kinsmen, Hesiod and Plutarch, bear no small trace of a Bœotian origin. The dialect spoken by the Bœotians was a broad Æolic. During the Middle Ages and under the Turkish domination, Livadia, the ancient Lebadea, was the capital of the country, which indeed was frequently called after that city. The district is now united in one *Nomos* with Attica (Attikoviotia), and is divided into two eparchies that take their names from Thebes and Livadia. The population in the eastern part is largely Albanian, and is engaged in the growing of grain and culture of the vine.

BOERHAAVE, HERRMANN, one of the most celebrated physicians of modern times, was born at Voorhout near Leyden, December 31, 1668. Destined for the clerical profession, to which his father belonged, he

received a liberal education, and early displayed unusual abilities. At the age of sixteen he entered the University of Leyden, where he studied under Gronovius, Ryckius, Trigland, and other distinguished men, and obtained the highest academical honors. In 1690 he took his degree in philosophy; on which occasion he delivered an inaugural dissertation *De distinctione mentis a corpore*, wherein he attacked the doctrines of Epicurus, Hobbes, and Spinoza. Being left, on the death of his father, without any provision, he was compelled to support himself by teaching mathematics. By the advice of Vandenberg, the burgomaster of Leyden, Boerhaave now applied himself with ardor to the study of medicine, to which indeed he had early manifested a decided inclination. The works of Hippocrates among the ancients, and those of Sydenham among the moderns, were the especial objects of his study; but his reading was by no means confined to these authors. In 1693 he took his degree of M.D. at Harderwyck in Guelderland, and immediately entered on the studies of his profession. His merits were soon recognized, and in 1701 he was appointed by the University of Leyden to supply the place of Drelincourt as lecturer on the institutes of medicine. His inaugural discourse on this occasion was entitled *De commendando Hippocratis studio*, in which he recommended to his pupils that great physician as their model. In 1709, the university appointed him successor to Hotton in the chair of botany and medicine, in which capacity he did good service, not only to his own university, but also to botanical science, by his improvements and additions to the botanic garden of Leyden, and by the publication of numerous works descriptive of new species of plants. He was appointed in 1714 rector of the university. In the same year he succeeded Bidloo in the chair of practical medicine, and in this capacity he had the merit of introducing into modern practice the system of clinical instruction. Four years later he was appointed to the chair of chemistry, and delivered an inaugural discourse, which contains the germs of his celebrated *Elements of Chemistry*. In 1728 he was elected into the Royal Academy of Sciences of Paris, and two years later into the Royal Society of London; to both of which he communicated his chemical researches. In 1729 declining health obliged him to resign the chairs of chemistry and botany; and in 1731 he resigned the rectorship of the university, to which office he had been re-elected. This great and good man died, after a lingering and painful illness, on the morning of the 23d September 1738.

From the time of Hippocrates, no physician had more justly merited the esteem of his contemporaries and the admiration of posterity than Boerhaave. To uncommon intellectual abilities he united those amiable qualities of the heart which give them so great a value to society. His personal appearance was simple and venerable. He taught very methodically, and with great precision; his style was eloquent, and his delivery dignified and graceful. He sometimes also gave his lectures a lively turn; but his raillery was never coarse or satirical.

Of his sagacity, and the wonderful penetration with which he often discovered and described, at first sight, such distempers as betray themselves by no symptoms to common eyes, very surprising accounts have been transmitted to us. Yet so far was he from having presumptuous confidence in his own abilities, or from being puffed up by prosperity, that he was condescending to all, and remarkably diligent in his profession. His great skill and celebrity as a physician brought him a large fortune. He left his only surviving daughter two millions of florins.

The genius of Boerhaave raised the fame of the University of Leyden, especially as a school of medicine, so as to make it a resort of strangers from every part of Europe. All the princes of Europe sent him disciples, who found in this skilful professor not only an indefatigable teacher, but an affectionate guardian. When Peter the Great went to Holland in 1715, to instruct himself in maritime affairs, he also took lessons from Boerhaave. The reputation of this eminent man was not confined to Europe; a Chinese mandarin wrote him a letter directed "To the illustrious Boerhaave, physician in Europe," and it reached him in due course. The city of Leyden raised a splendid monument to his memory in the church of St. Peter, inscribed "To the health-giving genius of Boerhaave."

BOETIUS, ANICIUS MANLIUS SEVERINUS, is described by Gibbon "as the last of the Romans whom Cato or Tully could have acknowledged for their countrymen." The events of his life are involved in uncertainty. The historians of the day give us but imperfect records or make unsatisfactory allusions. Later chroniclers indulged in the fictitious and the marvellous, and it is almost exclusively from his own books that trustworthy information can be obtained.

The date of his birth is unknown, but it is conjectured on good grounds that he was born at Rome somewhere about the year 475 A.D. He was, therefore, too young to see the last of the Roman emperors (476) and his boyhood was spent in Rome while Odoacer, king of the Heruli, was monarch of that city. We know nothing of his early years. His father, Flavius Manlius Boetius was consul in the year 487. It is probable that he died soon after, for Boetius states that when he was bereaved of his parent men of the highest rank took him under their charge. He soon became well known for his energy and ability, and his high rank gave him access to the noblest families. When Theodoric, the king of the Ostrogoths, displaced Odoacer no change of fortune for the worse seems to have befallen Boetius. On the contrary he became a favorite with that monarch, and was one of his intimate friends. Boetius attained to the consulship in 510, and his sons, while still young, held the same honor together (522). Boetius regarded it as the height of his good fortune when he witnessed his two sons, consuls at the same time, convoyed from their home to the senate-house by a crowd of senators amidst the enthusiasm of the masses. On that day, he tells us, while his sons occupied the curule chairs in the senate-house, he himself had the honor of pronouncing a panegyric on the monarch, and placed between his two sons he distributed largesses among the people in the circus. But his good fortune did not last, and he attributes the calamities that came upon him to the ill-will which his bold maintenance of justice had caused, and to his opposition of every oppressive measure. A famine had begun to rage. The prefect of the praetorium was determined to satisfy the soldiers, regardless altogether of the feelings of the provincials. He accordingly issued an edict for a *coemptio*, that is, an order compelling the provincials to sell their corn to the Government whether they would or not. This edict would have utterly ruined Campania. Boetius interfered. The case was brought before the king, and Boetius succeeded in averting the *coemptio* from the Campanians. He also rescued Paulinus, a man of consular rank, from the jaws of those whom he calls *palatinæ canes* (dogs of the palace), and who, he says, had almost devoured his riches. And he gives as a third and crowning instance in that he exposed himself to the hatred of the informer Cyprianus by preventing the punishment of Albinus, a man of consular rank. He mentions in another place that when at Verona the king was anxious to transfer the accusation of treason brought against Albinus to the whole senate, he defended the senate at great

risk. In consequence of the ill-will that Boetius had thus roused he was accused of treason towards the end of the reign of Theodoric. Three accusers appeared against him. The first, Basilius, had been expelled from the monarch's service, and in consequence of debt he had become an informer and now appeared against Boetius. The other two were Opilio and Gaudentius, on whom sentence of banishment had been pronouuced on account of innumerable frauds. They first took refuge in a church, but when this fact became known, a decree was issued that if they did not leave Ravenna before a prescribed day, they were to be driven out with a brand upon their forehead. On the very last day allowed them they gave information against Boetius, and their information was received. The accusation which these villains brought against him was that he had conspired against the king, that he was anxious to maintain the integrity of the senate, and to restore Rome to liberty, and that for this purpose he had written to the Emperor Justin. Justin had, no doubt, special reasons for wishing to see an end to the reign of Theodoric. Justin was an orthodox, Theodoric was an Arian. The orthodox subjects of Theodoric were suspicious of their ruler; and many would gladly have joined in a plot to displace him. The knowledge of this fact may have rendered Theodoric suspicious. But Boetius denied the accusation in unequivocal terms. He did indeed wish the integrity of the senate. He would fain have desired liberty, but all hope of it was gone. The letters addressed by him to Justin were forgeries, and he had not been guilty of any conspiracy. Notwithstanding his innocence he was condemned and sent to Ticinum (Pavia) where he was thrown into prison. It was during his confinement in this prison that he wrote his famous work *De Consolatione Philosophiæ*. His goods were confiscated, and after an imprisonment of considerable duration he was put to death in 525. Procopius relates that Theodoric soon repented of his cruel deed, and that his death, which took place soon after, was hastened by remorse for the crime he had committed against his great counsellor.

Two or three centuries after the death of Boetius writers began to view his death as a martyrdom. Several Christian books were in circulation which were ascribed to him, and there was one especially on the Trinity which they regarded as proof that he had taken an active part against the heresy of Theodoric. It was therefore for his orthodoxy that Boetius was put to death. And these writers delight to paint with minuteness the horrible torture to which he was exposed and the marvellous actions which the saint performed at his death. He was canonized as Saint Severinus. The brick tower in Pavia in which he was confined was a hallowed building. And finally, in the year 996, Otho III. ordered the bones of Boetius to be taken out of the place in which they had lain hid, and to be placed in the church of St. Augustine within a splendid marble tomb, for which Gerbert, who afterwards became Pope under the name of Silvester II., wrote an inscription. It should be mentioned also that some have given him a decidedly Christian wife, of the name of Elpis, who wrote hymns, two of which are still extant (Daniel, *Thes. Hymn.*, i. p. 156). This is a pure supposition inconsistent with chronology, unauthenticated by authority, and based only on a misinterpretation of a passage in the *De Consolatione*.

The contemporaries of Boetius regarded him as a man of profound learning. Priscian the grammarian speaks of him as having attained the summit of honesty and of all sciences. Cassiodorus, the chancellor of Theodoric and the intimate acquaintance of the philosopher, employs language equally strong. And Ennodius, the bishop of Pavia, knows no bounds for his admiration. "You surpass," he says to Boetius, "the eloquence of the ancients in imitating it." The king Theodoric had a profound idea of his great scientific abilities. He employed him in setting right the coinage. When he visited Rome with Gunibald king of the Burgundians, he took him to Boetius, who showed them, amongst other mechanical contrivances, a sun-dial and a water-clock. The foreign monarch was astonished, and, at the request of Theodoric, Boetius had to prepare others of a similar nature, which were sent as presents to Gunibald. It was Boetius also whom Theodoric consulted when Clovis, king of the Franks, wished a musician, who could sing to the accompaniment of the lyre, and Boetius was charged with the duty of selecting him.

The fame of Boetius increased after his death, and his influence during the Middle Ages was exceedingly powerful. His circumstances peculiarly favored this influence. He appeared at a time when contempt for intellectual pursuits had begun to pervade society. In his early years he was seized with a passionate enthusiasm for Greek literature, and this continued through life. Even amidst the cares of the consulship he found time for commenting on the *Categories* of Aristotle. The idea laid hold of him of reviving the spirit of his countrymen by imbuing them with the thoughts of the great Greek writers. He formed the resolution to translate all the works of Aristotle and all the dialogues of Plato, and to reconcile the philosophy of Plato with that of the Stagirite. He did not succeed in all that he designed; but he did a great part of his work.

By far the most important and most famous of the works of Boetius is his book *De Consolatine Philosophiæ*. Gibbon justly describes it as "a golden volume, not unworthy of the leisure of Plato or Tully, but which claims incomparable merit from the barbarism of the times and the situation of the author." It was a favorite book of the Middle Ages, and deserves to be a favorite still. The high reputation it had in mediæval times is attested by the numerous translations, commentaries, and imitations of it which have appeared.

BOGHAZ-KEUY, or Boghas-Koei (*i.e.*, the Village of the Gorge), a small hamlet in Asia Minor, remarkable for its ruins, which are identified with the ancient Pterium or Pteria.

BOGODUKHOFF, a town of Russia, in the government of Kharkoff, about 43 miles N.W. of that city, in 50° 10′ N. lat. and 36° 32′ E. long., on the sandstone heights along the River Merl.

BOGOMILI, a heretical sect of the Greek Church, who came into notice during the 12th century. In origin they are probably Bulgarian, and their name appears to be a compound of the Slavonic words *Bog*, God, and *milui*, have mercy. In doctrine they are closely assimilated to the Euchites of the preceding century, and they may be looked on as an offshoot of that older sect. The peculiarity of their system of belief is the place assigned to Satan, who, under his original name Satanael, is held by them to be the first-born son of God. But Satanael, though seated at the right hand of his father and endowed with universal sway, was discontented and desired to become independent. He led away a section of the angels from their allegiance, and with their aid formed out of chaos a new world — the earth, and a new race — man. But he was unable to give to man a portion of his own living spirit, and therefore besought God to bestow life on this new creation, promising that the vacant places of the seceded angels should be filled up by the spirits of men. Repenting of this promise, however, he resolved to bring forth an evil race which should overwhelm the good among mankind. He accordingly seduced Eve, who gave birth

to Cain, the first of the descendants of the evil principle. His power also enabled him to deceive the greater part of mankind, particularly the Jews, to whom he represented himself as Jehovah. At last God sent out from himself the *Logos*, or angel Michael, who came upon earth in an ethereal form which was in appearance only an earthly body. Christ overcame Satanael, and deprived him of his creative power, *El*, from which time he is called Satan. Christ then ascended and took his place beside the Father, who again sent forth an emanation, the Holy Ghost, for the comfort and edification of believers.

BOGOTA, or SANTA FÉ DE BOGOTA, the capital of the United States of Colombia, in South America, is situated in the state of Cundinamarca. It occupies a fine position at the base of the mountains La Guadalupe and Montserrato, on a table-land that forms part of the eastern ridge of the Andes, between the extensive valley of the Magdalena and the plains that are watered by part of the Orinoco system. The surrounding country is exceedingly fertile, and produces abundant crops of wheat and barley and the leguminous plants cultivated in Europe. The city of Bogota is the finest in the republic; its streets are well built, and run at right angles to each other; and within recent years most of them have been supplied with side pavements. The private houses are built of sun-dried bricks, and whitewashed; and owing to the prevalence of earthquakes they are mostly but one story in height. Of the streets the largest and finest is the Calle-Keal or Calle de la Republica, which ends in a large square or plaza containing some of the chief buildings in the city. The cathedral, rebuilt in 1814, possesses very little external beauty; but its interior is fitted up with considerable elegance, its ornaments are rich and valuable, and the image of the Virgin, the patron saint, is covered with a profusion of precious stones. There are about thirty other churches in the city, but many of them are in a state of decay, while several of the monastic buildings are appropriated to secular uses,—the religious communities having been dissolved by Mosquera, and their revenues devoted in great measure to educational purposes. The convent of San Francisco is of great extent, and contains some of the productions of Vasquez, a native artist of merit. A large and elegant building—a capitol, for the reception of Congress and for the various offices of state has recently been erected. Besides the university there are three endowed colleges, a school of chemistry and mineralogy, a national academy, a public library, botanic garden, and a military school, which is supported out of the public funds, and has produced some good engineers. The mint, one of the three in the republic, is a large and handsome building, and is well supplied with the necessary machinery. There are manufactures of soap, cloth, leather, and the precious metals; an active trade is carried on; and the neighborhood is rich in minerals of various kinds. The population in 1800 amounted to 21,464, exclusive of strangers and temporary residents; in 1821 it was estimated at 30,000, and in 1889 at about 100,000. Santa Fé de Bogota was founded in 1538 by Gonzalez Ximenes de Quesada, and received its name from his birthplace Santa Fé, with the addition of Bogota, in honor, it is said, of a native prince of that time. It soon increased in size and importance, and became the capital of the Spanish vice-royalty of New Granada. In 1811 the citizens threw off the Spanish yoke and a republic was proclaimed; the city, however, in 1816, fell into the hands of Murillo the Spanish general. Delivered by Bolivar in 1819 it was made capital of the republic of Colombia; on the separation of the three states it remained the chief city of New Granada, and it is now the capital of the United States of Colombia, forming itself an independent federal territory. It is the seat of the supreme court and the other offices of the Federal Government, and the residence of the foreign diplomatic representatives.

BOGRA, correctly BAGURÁ, a district in the Rájshahi division, within the Lieutenant-Governorship of Bengal, is bounded on the N. by the districts of Dinájpu and Rangpur, on the E. by the districts of Rangpur and Maimansinh, on the S. by the district of Pabná, and on the W. by the districts of Rájsháh and Dinàjpur. The revenue area of the district is 2000 square miles, of which 1750 were returned as under cultivation, 125 as cultivable but not actually cultivated, and 125 as uncultivable waste. Population (1890), 750,000.

BOHADDIN, or, more properly, BLHA-EDDYN, an eminent Arabian writer and statesman, better known in the East under the appellation of IBN-SJEDDAD. He was born at Mosul 1145 A.D. (539 A.H.), and early became eminent in the study of the Koran, as well as in jurisprudence. At the age of twenty-seven he obtained the place of lecturer at Baghdad, and, soon after, a professor's chair at Mosul. In 1187 he made the pilgrimage to Mecca, and then proceeded to visit Jerusalem and Hebron. In passing through Damascus he was sent for by Saladin, who was then employed in the siege of Kancab. Bohaddin observed, as he himself mentions, that the whole soul of the monarch was engrossed by the war which he was then waging against the enemies of the faith, and saw that the only mode of acquiring his favor was by urging him to its vigorous prosecution. With this view he composed a treatise on the *Laws and Discipline of Sacred War;* and this work, on his return, he presented to Saladin, who received it with peculiar favor. Bohaddin, from this time, remained constantly attached to the person of the sultan, and was employed in various important embassies and departments of civil government. He was also appointed judge of the army, and judge of Jerusalem. After Saladin's death Bohaddin was active in securing the throne to his son, Melik-al-Dhaker, and was by that prince created cadi of Aleppo. He then founded a college in that city of which he himself was the principal professor. When Melik-al-Dhaker died, his son Melik-al-Aziz was a minor, and Bohaddin obtained the principal sway in the regency. This gave him an opportunity of introducing learned men at court, and loading them with honors. As the prince, however, approached to manhood, Bohaddin, though he still retained his offices, found it expedient to retire from court. Even after he was unable to go to college, he continued to give lectures in his own house; and he persevered in these learned labors till the age of ninety, when he died 1235 A.D. (633 A.H.) Bohaddin wrote on jurisprudence and Muslim divinity; but his principal work is his *Life of Saladin*, which, with several other pieces connected with the same subject, was published by Schultens, at Leyden, in 1732, accompanied by a Latin translation, with notes and a geographical index. This work affords a favorable specimen of the historical compositions of the Arabs. It is written with some spirit, and yet it is free from that inflation which so frequently disfigures Oriental composition. Whatever relates to Saladin breathes the highest tone of panegyric; yet the enthusiasm with which everything concerning him is narrated, and the anecdotes which the author, from his personal knowledge, is able to communicate respecting that extraordinary character, give his work a great degree of interest.

BOHEMIA (German BÖHMEN or BÖHEIM), a kingdom of the Austrian empire, situated between 48° 33′ and 51° 4′ N. lat., and 12° 5′ and 16° 25′ W. long., and

bounded on the N. by Saxony and Prussian Silesia, E. by Moravia, S. by Upper and Lower Austria and W. by Bavaria. Its area is estimated at 19,983 square miles. It belongs almost entirely to the basin of the Elbe, which rises within the territory, and is joined by the Aller, the Iser, the Moldau, and the Eger before it passes the frontier. The boundaries are pretty clearly marked by mountain ranges on all sides,—the Böhmerwald dividing the country from Bavaria, the Erzgebirge and Riesengebirge from Saxony and Silesia, and the Moravian Hills from the basin of the Danube. The climate is healthy, but varies considerably in different districts; the soil in many parts is highly fertile, and grain of various kinds, potatoes, hops, flax, hemp, vines, and fruits are extensively cultivated. The mineral springs of Bohemia—Carlsbad, Teplitz, Marienbad, and Franzensbrunn, &c.,—are justly famous. The industry of the kingdom is highly developed in various directions. Most important of all is the manufacture of woollen goods, principally carried on at Reichenberg and in the neighborhood. The cotton manufacture is also extensively prosecuted in the same district; and at Rumburg and other places linen stuffs are largely produced. Bohemian glass has been celebrated for centuries, and is still exported to all parts of Europe. Porcelain and earthenware of different sorts, iron and steel wares, copper, tin and pewter articles, wooden wares, chemical stuffs, and paper are all the objects of a considerable industry. Beetroot sugar is largely manufactured, the refineries numbering 160 in 1889. At the same date there were 968 breweries in the country, and 324 brandy distilleries. The chief commercial city is the capital, Prague; but Reichenberg, Pilsen, Haida, Rumburg, Leitmeritz, and Budweis are all important centers. Bohemia is divided into twelve circles—Prague, Budweis, Pisek, Pilsen, Eger, Saaz, Leitmeritz, Bunzlau, Jiczin, Königgrätz, Chrudin, Czaslau, and Tabor, and these are subdivided into 91 departments.

Bohemia derives its name from the Boii, a Celtic race expelled from the country by the Marcomanni, who, after establishing a considerable kingdom under Marbod and being converted to Christianity, were in their turn supplanted by the Slavonic race, which is still predominant. The new comers were in danger of expulsion or conquest by the Bvars, but were defended and established, according to their own possibly mythical account, by the heroic Samo; and somewhat later, as the story goes, his place was filled by the good knight Krok, whose daughter Libussa, marrying Premysl, became the founder of a regular dynasty. Bohemia was for a time absorbed in the great Carlovingian monarchy, but soon reasserted its independence. In the course of the 9th century Christianity was introduced. Under Boleslas I. the bounds of Bohemia were extended and its unity secured; but after a vigorous defence he had to recognize the overlordship of Otto I. of Germany. Under his grandchildren his kingdom fell to pieces; a Polish conquest followed, and the restoration of the native dynasty was only effected by the help of Henry II. of Germany. In 1086 Wratislas II. received the title of king from the emperor for himself; and Premysl Ottocar I. (1197–1230) became the founder of a hereditary series of kings. He was a bold defender of his independence, and at the same time gave great encouragement to German immigration. By the introduction of the right of primogeniture in the succession to the throne, he put an end to the disputes and contests which so often followed the death of a king. In 1241 his son and successor was the successful defender of Europe against a Mongolian invasion; but he was eclipsed by Ottocar II. (1253–1278), who added greatly by conquest to the extent of his dominions, and made himself a formidable rival to the emperor himself. The Premysl dynasty was at last extinguished in 1306; and after a few years of uncertainty and dissatisfaction the Bohemian crown was bestowed on John of Luxembourg (son of the emperor Henry VII.), who thus became the founder of a dynasty which lasted till 1437. This warlike and prosperous monarch was succeeded by his son Charles I., who obtained the imperial dignity as Charles IV., and left Bohemia in a flourishing and influential position at his death in 1378. Under his successors, who fell far below the character of their ancestor, the country was thrown into confusion by the Hussite reformation, which resulted in a protracted war (1419–1434). The success of the reforming party led to an elective monarchy, and after various vicissitudes, George of Podiebrad mounted the throne in 1458; and in spite of Papal bull and Hungarian arms maintained his position till his death in 1471. His successor, the Polish prince Ladislas, ultimately obtained also the crown of Hungary; but under him and his son Louis (1517–1526) the nobility made themselves more and more independent of the king, and the common people were crushed deeper into serfdom. On the death of Louis, in a battle against the Turks at Mohacz, Bohemia passed into the hands of Ferdinand of Austria, who treated the kingdom in the most despotic manner, and in 1547 declared it a hereditary possession. He was followed in succession by his son Maximilian II. and his grandson Rudolph II., who left the country as distracted as they found it. The son of Matthias, the next king, was rejected by the Protestant party, which chose in his stead Frederick V. of the Palatinate; but the victory at the White Mountain in 1620 left Bohemia at the mercy of the emperor, who inflicted a terrible vengence on his enemies, and in 1627 declared the country a purely Catholic and hereditary kingdom of the empire. Owing to this no fewer than 30,000 families are said to have gone into exile and the population of the country was reduced to 800,000. On the death of Charles VI. Charles Albert of Bavaria laid claim to the crown, which continued to be an object of dispute though the Silesian campaigns and the Seven Years' War, but was successfully defended by Maria Theresa and her son Joseph II. The country was greatly benefited in many ways by the government of that monarch; but he destroyed the independence of the royal towns, and treated the whole land as a mere province of the empire. Its religious condition was considerably improved, however, by an edict of toleration published in 1781. Under the succeeding reigns the circumstances of Bohemia underwent but little alteration, and it was hardly affected by the first French Revolution. In 1848, however, a determined "national" movement agitated the country. The demands of the Liberal party gradually increased, and nothing short of a full share in the constitutional government of their country would suffice. The movement was not confined to Bohemia, but spread through the whole Austrian empire, to the article on which the reader is referred.

The Bohemians or Czechs speak a Slavonic language, which has been subjected to literary culture from about (if not before) the ninth century.

BOHEMOND, MARC, one of the leaders of the Crusades, born about 1056, was the eldest son of Robert Guiscard, a Norman, who had obtained by conquest the dukedom of Apulia and Calabria. From 1081 to 1085 he served his father in a war against the Byzantine emperor Alexander Comnenus, whom he twice defeated, though he had to return to Italy without reaping any substantial fruits of his success. In 1085 his father died, leaving Apulia and Calabria to a younger son, while Bohemond obtained only the small principality of Taren-

tum. A war between the brothers followed, from which, however, Bohemond was speedily diverted by the Crusades, which opened up a wider field for his ambition. Accompanied by his cousin Tancred, he led an army of 10,000 cavalry and 20,000 infantry, with which he would have besieged Constantinople had he been able to persuade Godfrey of Bouillon to join him. He took a leading part in the battle of Dorylæum (1097), and the other engagements of the campaign in Asia Minor. A year later he besieged and captured Antioch, of which he assumed the principality. In 1101 he was defeated and taken prisoner by the Turks. Released, after a captivity of two years, on the payment of a very heavy ransom, he returned to Europe to collect troops. In 1106 he visited France, and married Constance, a daughter of Phillip I. With an army levied in France, in right of his marriage, he renewed war with Alexius, but being unsuccessful in the siege of Durazzo he was obliged to conclude a peace in 1108. He died in Canossa in Apulia in 1111.

BOIARDO, Count Matteo Maria, of a noble and illustrious house established at Ferrara, but originally from Reggio, was born at Scandiano, one of the seignoral estates of his family, near Reggio di Modena, about the year 1434, according to Tiraboschi, or 1420 according to Mazzuchelli. At an early age he entered the University of Ferrara, where he acquired a good knowledge of Greek and Latin, and even of the Oriental languages, and was in due time admitted doctor in philosophy and in law. At the court of Ferrara, where he enjoyed the favor of Duke Borso d'Este and his successor Hercules, he was entrusted with several honorable employments, and in particular was named governor of Reggio, an appointment which he held in the year 1478. Three years afterwards he was elected captain of Modena, and reappointed governor of the town and citadel of Reggio, where he died in the year 1494, though in what month is uncertain. Almost all his works, and especially his great poem of the *Orlando Inamorato*, were composed for the amusement of Duke Hercules and his court, though not written within its precincts. The *Orlando Inamorato* deserves to be considered as one of the most important poems in Italian literature, since it forms the first example of the romantic epic worthy to serve as a model, and, as such, undoubtedly produced the *Orlando Furioso*.

BOIELDIEU, François-Adrien, is the chief representative of the national school of comic opera in France, a branch of art in which everything that is most lovable and at the same time most national in the French character has found its full expression. He was born at Rouen in 1775, and received his first musical education from M. Brouche, the organist of the cathedral of that city. He began composing songs and chamber music at a very early age,—his first opera *La Famille Suisse*, being produced on the stage of Rouen in 1795, where he met with an enthusiastic reception. Not satisfied with his local success he turned his eyes to that loadstar of youthful ambition, Paris. He went to the capital in 1795, full of hope and expectation. The score of his opera was submitted to the leading musicians of the day, such as Cherubini, Méhul, and others, but met with little approbation. Altogether the time was not favorable for the comic muse. The heroic passions roused by the revolutionary events of the preceding years required commensurate efforts of musical art; the grand opera was the order of the day. Boieldieu had to fall back on his talent as a pianoforte-player for a livelihood, and to wait for a chance of higher success in the meantime. This success came at last from a source whence it was little expected, and perhaps, less desired. Garat, a fashionable singer of the period, admired Boieldieu's touch on the piano, and made him his accompanyist. He also sung in the drawing-rooms of the Directoire the charming songs and ballads with which the young composer supplied him but too willingly. In this manner Boieldieu's reputation gradually extended to wider circles. In 1797 his above-mentioned opera appeared for the first time on a Paris stage, and was well received. Several others followed in rapid succession, of which only the last, *Le Calife de Bagdad* (1799), has escaped oblivion. It tends to show Boieldieu's true artistic vocation, that, after the enormous success of this work, he felt the want of a thorough musical training, and voluntarily descended from the position of a successful *maestro* to that of a humble pupil. He took lessons from Cherubini, and the influence of that great master is distinctly discernible in the higher artistic finish of Boieldieu's later compositions. In 1802 Boieldieu took to sudden flight, in order to escape the domestic troubles caused by his marriage with a celebrated ballet-dancer of the Paris Opera. The frightened husband went to Russia, where he was received with open arms by the emperor Alexander. During his prolonged stay at St. Petersburg he composed a number of operas which it is unnecessary to name. He also set to music the choruses of Racine's *Athalie*, one of his few attempts at the tragic style of dramatic writing. In 1811 he returned to his own country, where the following year witnessed the production of one of his finest works, *Jean de Paris*. The charming coquetry of the queen of Navarre, the chivalrous *verve* of the king, the officious pedantry of the seneschal, and the amorous tenderness of the page — all this rendered in the finest touches that music, and only French music, is capable of, will not soon be forgotten. We pass over a number of other operas of lesser value, partly written in collaboration with other composers, and turn at once to the second and greatest master-piece of Boieldieu's genius, his *Dame Blanche* (1825). The libretto, written by Scribe, was partly suggested by Walter Scott's *Monastery*, and several original Scotch tunes cleverly introduced by the composer add not a little to the melodious charm and local color of the work. *La Dame Blanche* marks the highest development of the French school of comic opera. Grétry stood at the head of this school; Cherubini with his *Deux Journées* followed in his wake; Boieldieu, greater than both (in this particular branch of art), reached a perfection which was to some extent sustained by the works of Auber. Boieldieu's pupil, Adam, has in his *Derniers Souvenirs d'un Musicien* left a charming sketch of the genesis of Boieldieu's masterpiece. The chief characteristics of his style are an easy flow of graceful melodies, a refined though occasionally somewhat meagre instrumentation, admirable phrasing, and a most distinct enunciation of the words. The outer events of Boieldieu's career may be summed up in few words. For a long time he occupied the position of professor of composition and pianoforte at the Conservatoire; in 1817 he was made a member of the Institute. The *Dame Blanche* was his last opera but one. Soon after its production he was seized with a violent attack of pulmonary disease. To stop the rapid progress of the illness he traveled in Italy and the South of France, but fell a victim to it on October 8, 1834.

BOII, a Celtic people, who at an early date crossed the Alps and established themselves between the Po and the Apennines to the south of the Insubres and Cenomani. On the defeat of their neighbors the Senones by the Romans they joined the Etruscans against the conquerors, and were involved in the disastrous results of the battle at the Vadimonian Lake in 283 B.C. Equally unsuccessful in the following year, they formed a treaty

of peace with the Romans, which they kept for a considerable time, till the encroachments of their conquerors led them to engage in the Great Gallic war of 225 B.C. From that period they continued to indulge their hostility on all occasions, and on the outbreak of the Punic wars gave valuable aid to the Carthaginians from time to time. At length their strength was broken by Scipio Nasica in 191 B.C.; a large proportion of their territory was appropriated and secured by the colonies of Bononia, Parma, and Mutina; and before long the whole race seems to have been constrained to recross the Alps. They betook themselves to that district of country which is still called in consequence Bohemia; but before many centuries they were expelled by other hostile tribes and their separate existence as a people was lost.

BOIL (Old Eng. *byl*, Middle Eng. *bile;* akin to prov. Eng. and Scotch *beal*, to suppurate; its present spelling having arisen through confusion with the verb *boil*, which is from the French) is a hard, painful swelling of the skin. The boil starts in a small pimple, which gradually increases from the proportions of a slight lump in the flesh until it has attained its maximum size. The lump consists of healthy pus, which is thick and viscid, and sometimes deeply imbedded in the flesh, in which case a poultice will serve to soften the lumpy matter, rendering it unhealthy and hastening its discharge. A thin slice of fat meat put in contact with the boil for about twelve hours will cause a yellow spot to appear on the surface, which may be safely punctured, when pressure on the sides of the boil will expel its contents. Should the boil be situated on the nose, so that fat meat cannot be conveniently applied during the day, fasten it on at night with strips of adhesive plaster, and over them place a piece of woolen cloth or oil silk, to protect the bedclothing. Boils are sometimes erroneously regarded as beneficial; whereas, they are an unhealthy sign, and should lead the person afflicted with them to correct his manner of living and improve the state of his blood. For the latter purpose the compound syrup of sarsaparilla is a time-honored household remedy, which, if it renders but little real service, is at least harmless and agreeable. The boil itself may be poulticed with flaxseed, or bread and milk, with laudanum if painful. Lancing is recommended as soon as a "head" appears, though as this merely prevents a couple of days of additional suffering, it is not necessary, should the patient dread the knife.

BOILEAU-DESPREAUX, NICHOLAS, was born at Paris on November 1, 1636. Crône, not far from the capital, has been frequently stated to be his birthplace, but the matter seems to be pretty nearly settled by the researches of M. Labat, who has discovered the very house in the Rue de Jérusalem where the poet was born. He was educated at the College of Beauvais, and was at first destined for the legal profession. Such of his early poems as have been preserved hardly contain the promise of what he ultimately became. The first piece in which his peculiar powers were displayed was a satirical poem, *Adieus of a Poet to the City of Paris*, published in 1660. This was quickly followed by eight others, and the number was at a period later increased to twelve. His fame was quickly established; he received a pension, and was made historiographer along with his friend Racine. In 1664 he composed his prose *Dialogue des heros de roman*, which is a refined satire on the elaborate romances of the time. It may be said to have once for all abolished them. From 1669 onward appeared the *Epistles*, graver in tone than the satires, maturer in thought, more exquisite and polished in style. In 1674 his two masterpieces, *L'Art Poetique* and *Le Lutrin*, were published. Boileau does not merely lay down rules for the language of poetry, but analyzes carefully the various kinds of verse composition, and enunciates the principles peculiar to each. Of the four books of the *Art Poetique*, the first and last consists of general precepts, inculcating mainly the great rule of *bon sens;* the second treats of the pastoral, the elegy, the ode, the epigram, and satire; and the third of tragic and epic poetry. Though the rules laid down are of value, the tendency is rather to hamper and render too mechanical the efforts of poetry. Boileau himself, though a great critic in verse, cannot be considered a great poet. The *Lutrin*, a mock heroic poem, of which four cantos appeared in 1674, is by French critics considered the best of Boileau's works. It has furnished the model for the *Rape of the Lock*, but the English poem is superior in richness of imagination and subtilety of invention. Boileau died March 13, 1711.

BOILER. See STEAM ENGINE, Vol. IX, p. 555.

BOIS D'ARC (sometimes corrupted into BODOCK), also bow-wood, or osage-orange (*Maclura aurantiaca*), a tree belonging to the Artocarpaceæ, sub-order Moraceæ, is a native of the Southern States. Its spines make it useful as a hedge plant.

BOISE CITY, the capital of Idaho, is situated on the Boisé river, about fifty miles southwest of Idaho City, in a district rich in minerals. It became the capital of the (then) territory in 1864, and has now (1890) a population of 5,000. It contains a United States assay office, two national banks and some public buildings. There are a number of schools, a printing office and a prison located here. Since Idaho became a State, Boisé City has grown in importance and it has a considerable trade.

BOISGOBEY, FORTUNE DU, a French sensational novelist, was born in 1824, at Granville in Normandy, and has achieved considerable fame as a writer.

BOIS-LE-DUC, 's HERTOGENBOSCH, or 's BOSCH, a city of Holland, capital of the province of North Brabant, 28 miles S.S.E of Utrecht. Population, 26,000.

BOISSARD, JEAN JACQUES, a classical antiquary and Latin poet, was born at Besançon in 1528. He studied at Louvain; but, disgusted by the severity of his master, he secretly left that seminary, and after traversing a great part of Germany reached Italy, where he remained several years, and was often reduced to great straits. His residence in Italy developed in his mind a taste for antiquities, and he soon formed a collection of the most curious monuments of Rome and its vicinity. He then visited the islands of the Archipelago, with the intention of travelling through Greece, but a severe illness obliged him to return to Rome. Here he resumed his favorite pursuits with great ardor, and having completed his collection, returned to his native country; but not being permitted to profess publicly the Protestant religion, which he had embraced some time before, he withdrew to Metz, where he died, October 30, 1602.

BOISSONADE, JEAN FRANÇOIS, French classical scholar, was born at Paris, 12th August, 1774. In 1792 he entered the public service during the administratiou of General Dumouriez. Driven from it in 1795, he was restored by Lucien Bonaparte, during whose time of office he served as secretary to the prefecture of the Upper Marne. He then definitely resigned public employment and devoted himself to the study of Greek, for which he had always a strong inclination. In 1809 he was named professor of Greek at the faculty of letters at Paris, though he did not assume the title till the death of Larcher, who held the chair, in 1812. In 1828 he succeeded Gail in the chair of Greek at the Collége de France. He also held the offices of librarian of the Bibliothèque du Roi, and perpetual secretary of the

Academy of Inscriptions. He died 12th September 1857.

BOKHARA, BUKHARA, or BUKHARIA, a country and khanate of Central Asia, in Turkistan or Independent Tartary. Its extent has been greatly diminished during recent years both on the N. and S.,—in the former direction by the conquests of Russia, and in the latter by the encroachments of Afghanistan. A considerable stretch of country, including the important towns of Balkh, Andkhoi, and Meimene, was at various times regarded as an integral part of the khanate; but at present the River Oxus forms for the most part its southern boundary. To the W. it is conterminous with the khanate of Khiva and the desert of Kharezm, which now form part of the Russian empire; and on the E. it stretches to the khanate of Kunduz and Khokand. Its area is estimated at 100,000 square miles. A large part of the western half of the land consists of a desolate steppe of argillaceous clay, broken by hills of slate and bare granite rocks; the eastern parts are occupied by offshoots of the Hindu-Koh and Tien-Shan ranges, and the Pamir steppe. The cultivated land is confined almost entirely to the immediate neighborhood of the rivers, of which the most important are the Amu or Oxus, the Zer-Affshan, and the Karshee. The Amu (Sogd or Kohik), which only belongs to the khanate in the middle part of its course, flows from S.E. to N.W., and varies in width from 300 to upwards of 800 yards. The Zer-Affshan, inferior to the Amu in the volume of its water, and superior to it in the populousness and cultivation of its banks, rises in the high lands east of Samarkand, and, passing north of that city and of Bokhara, forms a lake in the province of Karakul about 25 miles in length. Its whole course is about 340 miles. The Karshee rises in the same high lands as the Zer-Affshan, and passes through Shehr-Sebz and Karshee, below which it is lost in the desert.

There are no gold mines in Bokhara, but that metal is found among the sands of the Oxus in greater abundance, perhaps, than in any other rivers which flow from the Hindu-Koh. The climate of Bokhara is exposed to great variations. In summer the heat is often very great, and in winter the cold is proportionally severe. The frosts commence about the end of November, and continue till towards the end of April. The Amu is generally frozen over for some weeks in winter so as to be passable for caravans. In the desert the heat in summer exceeds 100° Fahr. Thunder-storms and earthquakes are not unfrequent, especially in the spring; and there are sometimes violent tornadoes, generally blowing from the N.W.

The population of Bokhara, composed of Tadjiks, Arabs, Uzbeks, Turkomans, Persians, Mervi, and Jews, may be estimated at between 1,000,000 and 2,000,000. Meyendorff estimates it at 2,478,000, Khanikoff at from 2,000,000 to 2,500,000, Burns at less than 1,000,000, and Wolff at 1,200,000. The Tadjiks are the aborigines of the country, and are said to have come from the west, and settled on the banks of the Zer-Affshan at a time when the country was uninhabited, and a jungle of reeds covered the place where the town of Bokhara now stands. Except in the town of Bokhara, where they constitute the majority of the population, there are few Tadjiks now in the khanate. They are mostly engaged in commerce, are peaceful or even cowardly in their disposition, and are characterized by avarice, faithlessness, and deceit. They are usually tall, with handsome and regular features, fair complexion, and black eyes and hair. The number of Arabs, though not considerable, exceeds that of the Tadjiks. They are descendants of the followers of Kutribe, who conquered the country about the beginning of the 8th century, and compelled the inhabitants to adopt the Mahometan faith. Their numbers are stated at 60,000, and they inhabit the northern part of the khanate, especially the neighborhood of Vardanzi and Vafkend. Like their ancestors they still continue to lead a wandering life, their chief occupation being the tending of their flocks. Their moral qualities seem to be of a higher character than those of the Tadjiks. The Uzbeks, the last people that conquered this country, are the most numerous, and are at present the dominant race. They are divided into a number of tribes, of which the principal is that of Manghit. To it the reigning dynasty belongs. Some of the Uzbeks are nomadic in their habits, others are engaged in agriculture or live in towns. They are more bold and straightforward in their manners than the Tadjiks, but have unfortunately degenerated from contact with that race. There are a considerable number of Persians in Bokhara, most of whom have been brought as slaves from their native country. They are readily distinguished by the regularity of their features, and their bushy black hair. Large numbers of them rise by their intelligence and faithfulness to occupy important situations. Although outwardly conforming to the faith and manners of the country, they cordially hate the native races, and are ready to hail with joy any political revolution which might shake the power of the Uzbeks. The Jews, though long established in the country, form but a very inconsiderable part of its inhabitants. They are chiefly to be found in Bokhara and some of the larger towns, where they have separate quarters assigned to them. Their privileges are very restricted. The Mervi, who number about 40,000, are the people who were transplanted from the city of Merv on its destruction about 1810 by Emir Said Khan. The Turkoman and Kirghiz part of the population is wholly nomadic, and is chiefly to be found in the regions south of the Oxus.

The orchards in the neighborhood of the larger towns are numerous and highly cultivated. They produce grapes, figs, peaches, pomegranates, apricots, plums, apples, pears, and quinces. The cultivation of cotton, tobacco, and lucerne is extensively carried on, as is also that of the mulberry, beet, cabbage, carrots, radishes, onions, cucumbers, pease, beans, lentils, melons, and pumpkins. The soil being of a saline nature requires to be cultivated with some care, so that it is to be found to be much more profitably laid out in gardens than in fields; indeed, the returns from the former exceed by sevenfold the returns from the same quantity of the latter. Wheat, rice, barley, millet, and joar (*Sorghum vulgare*) are the principal kinds of grain grown. The last-named is one of the most useful productions of the khanate, and as it is cheap and nutritious, it forms the chief subsistence of the poor.

The horses of Bokhara are numerous, but are more remarkable for strength than for beauty. Asses are also very plentiful, and are large and sturdy. The camels, by means of which the entire traffic of Bokhara is carried on, are reared chiefly by the wandering tribes, particularly the Turkomans. They have a sleek coat as fine as that of a horse, and shed their hair in summer; from the hair a fine waterproof cloth of close and rather heavy texture is manufactured. The goats are about the common size, of a dark color, and yield a shawl-wool inferior only to that of Kashmir. The bulls and cows are miserably small, and in very wretched condition. The rearing of sheep is much attended to, particularly by the Arabs. There is a peculiar breed, said to thrive only in the district of Karakul, which produces a jet-black curly fleece that is much valued. The wild animals are few. Tigers of a diminutive species are found in the valley of the Oxus; wild hogs, herds of deer,

antelopes, and the wild ass roam on the plains; and foxes, wolves, jackals, and ounces are found in some parts. All kinds of game are scarce. The scorpion is common. The most valuable insect is the silk-worm, which is reared in all parts of the khanate where there is water — every rivulet being lined with the mulberry.

Bokhara owes its importance to its central position. Lying on the route between Europe and the richest part of Asia it is the seat of a considerable transit trade. The government has established custom-houses, built caravanserais, and constructed cisterns along such caravan roads as are insufficiently supplied with water, but otherwise does nothing to encourage traffic; and the roads are generally in a wretched condition. Religious fanaticism formerly rendered it impossible for any except Mohametan merchants to trade with safety in the country; but since 1868 all at least who are in any way under the protection of Russia have full freedom to import or transport their wares throughout the country.

Bokhara has for ages been reckoned the centre of Musselman erudition; and if we look at the number of its schools and the state of education among its people, we cannot but admit that, in that respect, it ranks first among the states of Central Asia. About one-fourth of the population is said to be able to read and write.

The government is a hereditary despotism, the khan having the power of life and death over his subjects.

Bokhara was known to the ancients under the name of Sogdiana. It was too far removed to the east ever to be brought under the dominion of Rome, but it has shared deeply in all the various and bloody revolutions of Asia.

BOLBEC, a town of France, capital of a canton in the department of Lower Seine, 18 miles E.N.E. from Havre on the railway to Paris, which here passes over high embankments and a viaduct.

BOLEYN, Anne, or, as the name is variously spelled, Bullen, Bouleyn, Boullan, or Boulain, queen of England, and second wife of Henry VIII., was the daughter of Sir Thomas Boleyn, a distinguished politician, and Lady Elizabeth Howard, daughter of the earl of Surrey, afterwards duke of Norfolk. Considerable obscurity rests over the date of her birth, which has been variously stated as 1501 and 1507; perhaps the earlier date is the most probable. She received a very careful education, and in 1514 became maid-in-waiting to Mary Tudor, then the affianced bride of Louis XII. of France. She crossed to France in Mary's train, but did not return with her, having entered the service of Queen Claude, where she was celebrated for her beauty, talents, and accomplishments. The period of her return to England has been matter of dispute; some, following Herbert and others, would make the date about 1522, others 1527. It may be assumed with some confidence that she returned about the earlier date. About this time occurred her love affair with Percy, afterwards earl of Northumberland, which was broken off by Wolsey, acting apparently under the directions of the jealous king. Henry seems already to have begun to direct his affections towards the fair Boleyn, who was then one of the maids of honor attached to his consort, Katherine of Aragon. He advanced her family, but is said to have been repulsed by her when he made an offer of his love. In 1527, after some absence from the court, she seems to have returned, and Henry's attentions to her became more marked than before. His passion soon opened his eyes more clearly to the sin of his marriage with his deceased brother's wife, and the subject of the divorce began to be seriously discussed. Towards 1530 Anne Boleyn was accustomed to keep state almost as queen; in 1532 she was raised to the peerage with the title of marchioness of Pembroke, and accompanied Henry in his visit to France. On January 25, 1533, according to a contemporary report, her ambition was crowned by a private marriage with Henry. On the 12th of April she was openly proclaimed queen, and the marriage was again solemnized; and on the 8th of May the king's previous marriage was declared to have been null and void. The coronation took place on the 19th of May, and on the 7th September, a princess, the famous Elizabeth, was born.

Little is known of the new queen's married life. She to some extent favored the Reformers, and countenanced the translation of the Bible. In January 1536 she gave birth to a prince, still-born. It is said that this mishap was occasioned by her suddenly becoming aware of Henry's attention to Lady Jane Seymour. In April 1536 a committee sat privately to inquire into certain accusations of adultery against the queen. A special commission was called on the 24th April, and orders were issued for the arrest of the Viscount Rochford, the queen's brother, Sir Henry Norris, Sir Wm. Brereton, Sir Francis Weston, and Mark Smeton, all her alleged paramours. At the same time writs were issued for a new parliament. On the 2d May the queen was arrested and summoned before the privy council. Smeton, Norris, and Weston were afterwards examined, and of these Smeton confessed, though it was said under torture. Norris is said to have made some admission, which, however, he afterwards withdrew. All three were committed to the Tower, to an apartment in which the queen was also consigned. Henry wrote to her, holding out hopes of pardon if she would be open and honest. Her reply, however, strongly affirms her innocence, and its general tone goes far in her favor. The juries of Middlesex and Kent, before whom proceedings opened, found true writs charging the queen with adultery, committed with the above-named Rochford, Brereton, Weston, Norris, and Smeton, and all with conspiring against the king's life. On the 12th May, Brereton, Norris, Weston, and Smeton were tried at Westminter, found guilty, and condemned. On the 15th Annie Boleyn and her brother were tried before twenty-seven peers, found guilty and sentenced. On the 17th Smeton was hanged, the others beheaded. Their remarks on the scoffold were general, and can be interpreted fairly in neither way. Before the queen's execution she is said to have confessed to Cranmer some previous impediment which rendered her marriage with the king null and void, but what the confession was is absolutely unknown. On the 19th May she suffered death on Tower Green. On the next day Henry was married to Jane Seymour.

BOLI, a town of Asiatic Turkey, in Anatolia, situated about 85 miles N. W. of Angora, on the Philios Chai, to the south of the Boli Dagh. It is the capital of a sandjak and the seat of a governor, and contains a ruined castle and numerous mosques and baths, nowise remarkable in their structure.

BOLINGBROKE, Henry St. John, Viscount, was born in October, 1678. His father, Sir Henry St. John, the descendent of an old and noble family, was a noted rake of the Restoration period, who continued to live his life of pleasure and indolence for upwards of ninety years. Of his mother little is known, save that she was a daughter of the earl of Warwick. The education of her son was entrusted to the care of his grandmother, Lady St. John, who was a professed Puritan and of a pious disposition. His tutor was a Dr. Burgess, then renowned for his wit not less than for his piety, whose instructions in divinity seem to have been somewhat distasteful, if we are to accept the pupil's account of the dreary studies he was compelled to engage in. At an early age he was sent to Eton, where he ap-

pears to have been a school-fellow, though hardly a rival, of Walpole, and then proceeded to Christ Church, Oxford. The life he led at the university was typical of his later career. His brilliant talents and unusually retentive memory enabled him to amass an immense amount of information — more, indeed, than he was given credit for; while at the same time he began to acquire an equally high reputation for dissipation and licentiousness.

For two years, from 1698 to 1700, he resided on the Continent, and during that time acquired the thorough mastery of the French language which was afterwards of so much service to him. On his return his friends, in the hope of withdrawing him to some extent from his loose mode of life, negotiated a marriage with the wealthy daughter of Sir Henry Winchescomb, a baronet of Berkshire. Marriage, however, effected little or no change in St. John; and, though his wife was never formally separated from him, and always retained a true affection for her husband, the married life was unhappy and divided. In February of the year following he entered Parliament as member for Wooton-Basset.

The Tory party, from a combination of circumstances, were then all-powerful in the House of Commons. The Partition Treaty, a measure of which, indeed, little can be said, had not met with popular favor, while William's large grants to foreigners, together with the general coldness and repulsiveness of his manners, had rendered him most unpopular. A perfect storm of discontent had arisen, and the Tories were nearly bewildered with the power which had been suddenly placed in their hands. Harley, perhaps, at that time, from his moderation, the most influential man of the party, led the House as speaker. St. John enrolled himself among the Tories with the utmost enthusiasm, and from the first displayed such brilliant powers as placed him at once in the front rank, and gave him an almost unique position. The rush of popular favor to the Tory party was checked by Louis's acknowledgment of the Pretender as legitimate king of England. There was no opposition made to the proposed war, which was not interrupted by the death of William and the accession of Anne. Godolphin and Marlborough, both moderate Tories, were strongly in favor of the war, and consequently found themselves gradually drawn into harmony with the Whigs rather than with the extreme members of their own party. Several of the latter were removed from the cabinet, and among the new officials were Harley, and, curiously enough, St. John, the former being made Secretary of State, the latter Secretary at War. It has been doubted to what influence St. John owed this singular promotion. Harley's power was hardly great enough to effect it, and it is more than probable that it was in great part, if not entirely, the work of Marlborough, who had a very considerable affection and respect for St. John, and who doubtless desired a friend of his to fill the office with which he had so many transactions. As secretary St. John discharged his duties with great efficiency, and manifested the most enthusiastic admiration for Marlborough's military genius and success. Meantime Harley had been tampering with the secret springs which moved so much of the political machinery. His relative Mrs. Masham was supplanting the imperious duchess of Marlborough, and through her influence the queen was becoming convinced that the interests of the nation should be confided to Harley and the Tories. She was ready to dismiss Godolphin at the first opportunity, but the Whigs were as yet too strong, and Harley's schemes having been discovered, he was in 1708 compelled to resign. St. John, who can hardly be thought to have had no cognizance of what was afoot, resigned along with him, and spent two years in philosophical retirement, studying diligently and living loosely as before. During these years a gradual undercurrent of feeling swelled up against the Whig party. The war was distasteful, and its prolongation was looked upon as altogether the work of Marlborough. Above all, the queen was thoroughly alienated from her old friend and under the influence of Mrs. Masham. Yet the strength of the Whig party might have enabled them to carry through their policy successfully had not an act of suicidal imprudence completely ruined them. The prosecution of Sacheverell was the signal for a perfect storm of insanely loyal feeling throughout the country. A Tory ministry would evidently meet with popular approval and Anne had therefore no hesitation in dismissing Godolphin and the Whigs. Harley became Chancellor of the Exchequer and virtually premier; St. John was made Secretary of State.

The political problem, how, under all contigencies, to retain power, was somewhat complicated. The queen's health made the succession the main question. Now, the accession of the Elector meant the restoration of the Whigs to power. It was hardly possible for the Tory leaders to oust the Whig party from the graces of the House of Hanover, with whom their policy was so knit up. Prudence, therefore, as well as principle, made them lean towards the exiled House of Stuart, and for a time extreme Tory was synonymous with Jacobite. But the hopes of James to a great extent depended on the assistance of France, and consequently peace with France became their primary object. To attain it they were urged also by the loudly expressed wishes of a large section of the people, and by their hatred of the Whigs, with whom the war was identified. Active steps in the matter were taken mainly by St. John, and in the beginning of 1712 he had at last brought affairs to such a pass that the duke of Ormond, who had superseded Marlborough, received secret orders not to attack the French, while private intimation of this order was sent to the French Government. Arrangements were then made with the French minister De Torcy, whereby the fundamental articles of the league with the allies were broken, Britain engaging to enter into a separate peace with France, receiving certain special advantages, and quietly abandoning some of the allies, as the Catalans. Nothing can possibly extenuate the baseness of these proceedings, and our judgment of them cannot be altered by our opinion as to the advisability of the peace. The Whig party were wholly unable to throw any obstacles in the way; their majority in the House of Lords had been swamped by the creation of twelve new peers; and Walpole had been impeached on a petty charge and committed to the Tower. Finally, St. John, now Viscount Bolingbroke, visited Paris to push on negotiations so that peace might be announced to the next Parliament. It has been said, though he himself denied it, that during this visit he had interviews with the Pretender. In April 1713 the famous treaty of Utrecht was signed, and the Parliament of that year had the articles read to them. This, however, had not the effect anticipated by Bolingbroke. There was a lurking feeling of discontent with regard to it, and the commercial articles, bearing on the trade with France, excited great indignation among the mercantile classes.

Bolingbroke and the Tories seemed, however, to be at the zenith of their power; but the foundations of that power were unstable, and there was dissension among the leaders. Harley had become Earl of Oxford, and Bolingbroke was indignant at receiving only the rank of viscount. His anger was increased on failing to receive the garter vacant by the death of Godolphin. The disputes between the former allies became open and violent.

By unscrupulous bribery Bolingbroke managed to secure the interest of Mrs. Masham, and through her wrought upon the queen. In the Parliament of 1714 he dealt the death-blow to Oxford's power, by compelling him to vote upon the Schism Bill; and finally, on the 27th July, after a stormy discussion, which greatly excited the queen, Oxford was dismissed. Bolingbroke, however, had but a brief taste of power, for on the 30th the queen was seized with apoplexy. At the council held upon the emergency the dukes of Argyle and Somerset boldly presented themselves, and proposed and carried a resolution that the duke of Shrewsbury should be recommended as Lord Treasurer. Bolingbroke was obliged to yield. Anne was able to give assent; the Whig party had already made all their arrangements, and immediately on the queen's death (August 1) the Elector was proclaimed king, and special messengers were despatched to bring him over. Bolingbroke and his friends seemed bewildered; they were, indeed, thoroughly taken by surprise, and their half-formed schemes disconcerted. Atterbury alone urged Bolingbroke boldly to proclaim James, but either the courage of the latter failed, or, as is more probable, his intentions were not sufficiently definite. It is not an unreasonable supposition that, had a fair time been granted to him, he would have endeavored to make favor with the House of Hanover. Any such hope was then out of the question; the duties of his office were transferred temporarily to Addison, and within the month in which the queen died he was formally dismissed.

It was soon known that the new Parliament, who were mainly Whigs, intended to impeach Oxford and Bolingbroke for their share in the recent peace. From what we now know of the actual accusation, it is plain that it did not amount to high treason. Had there been nothing further it would have been the best plan to have stayed and faced the trial. This, accordingly, was done by Oxford; but Bolingbroke, after showing himself ostentatiously in public, fled over to France in disguise, even before the impeachment had been made in the House. In the letter he left behind him for Lord Lansdowne he gives as his excuse that he had certain and repeated informations from some who were in the secret of affairs that a resolution was taken to pursue him to the scaffold. In the famous letter to Sir Wm. Windham he takes somewhat different ground, and accounts for his flight from his intense dislike of Oxford, and his resolution not to be associated with him in any way. It was not till the 10th June that he was formally impeached, on 6th August he was attainted and summoned to appear before the 10th September. On the 16th September, he not having made his appearance, his name was struck off the list of peers, and sentence of banishment was passed. Long before this, however, Bolingbroke had thrown in his lot with the Pretender. He had secret interviews with the duke of Berwick immediately after his arrival in Paris, while professing the most loyal sentiments to Lord Stair, the British ambassador, and in the month of July he was formally installed as Secretary of State to the prince. Whatever plans he might have hoped to carry through in this capacity were thoroughly thwarted by the numberless irregular agents and advisers who swarmed about the petty court, and by the impracticable disposition of the prince himself. The expedition to Scotland, undertaken against Bolingbroke's advice, proved a complete failure; and in February 1716 he was dismissed with scant ceremony from the prince's service, while a formal impeachment was drawn up, accusing him of dilatoriness and want of energy. Rumor was busy with his name, and every species of treachery was imputed to him. The celebrated letter to Sir Wm. Windham, in many respects the best of his writings, was drawn up in the following year, and contains an elaborate sketch of the events of his political career and a justification of his proceedings. The letter may have been circulated to a slight extent in print or in manuscript, but it was undoubtedly not made public till 1753, two years after Bolingbroke's death. He died at Battersea on the 12th December 1751.

BOLIVAR, Simon, the hero of South American independence, was born in the city of Caracas, Venezuela, on the 24th July 1783. After acquiring the elements of a liberal education at home, Bolivar was sent to Europe to prosecute his studies, and with this view repaired to Madrid, where he appears to have resided for several years. Having completed his education, he spent some time in travelling, chiefly in the south of Europe, and visited the French capital, where he was an eye-witness of some of the last scenes of the Revolution. Returning to Madrid, he married, in 1801, the daughter of Don N. Toro, and embarked with her for America. His plans were frustrated by the premature death of his young wife, and Bolivar again visited Europe, in order, by change of scene, to alleviate the sorrow occasioned by this bereavement.

On his return home in 1809 he passed through the United States, where, for the first time, he had an opportunity of observing the working of free institutions; and soon after his arrival at Venezuela he appears to have identified himself with the cause of independence which had already agitated the Spanish colonies for some years. Being one of the promoters of the movement at Caracas in April 1810, he received a colonel's commission from the revolutionary junta, and was associatad with Luis Lopez Mendez in a mission to the court of Great Britain. Venezuela declared its independence of the mother country in July 5, 1811, and in the following year the war commenced in earnest by the advance of Monteverde with the Spanish troops. Bolivar was intrusted with the command of the important post of Puerto Cabello, but not being supported he had to evacuate the place; and the Spaniards recovered their hold over the country.

Like others of the revolutionists Bolivar took to flight, and succeeded in reaching Curaçoa in safety. He did not, however, remain long in retirement, but in September 1812, repaired to Carthagena, where he received a commission to operate against the Spanish troops on the Magdalena River. In this expedition he proved eminently successful, driving the Spaniards from post to post, until arriving at the confines of Venezuela he boldly determined to enter that province and try conclusions with General Monteverde himself. His troops did not number more than 500 men; but, in spite of many discouragements, he forced his way to Merida and Truxillo, and succeeded in raising the population to his support. Forming his increased forces into two divisions, he committed the charge of one to his colleague Rivas, and pushing on for Caracas the capital, issued his decree of "war to the death." A decisive battle ensued at Lastoguanes, where the Spanish troops under Monteverde sustained a crushing defeat. Caracas was entered in triumph on the 4th of August 1813, and Monteverde took refuge in Puerto Cabello. General Mariño effected the liberation of the eastern district of Venezuela, and the patriots obtained entire possession of the country in January 1814. This success was, however, of very brief duration. The royalists, effectually roused by the reverses they had sustained, concentrated all their means, and a number of sanguinary encounters ensued. Bolivar was eventually defeated by Boves near Cura, in the plains of La Puerta, and compelled to embark for Cumana with the shattered remains of his

forces. Caracas was retaken by the Spaniards in July; and before the end of the year 1814 the royalists were again the undisputed masters of Venezuela. From Cumana Bolivar repaired to Carthagena, and thence to Tunja, where the revolutionary congress of New Grenada was sitting. Here, notwithstanding his misfortunes and the efforts of his personal enemies, he was received and treated with great consideration. The congress appointed him. o conduct an expedition against Santa Fé de Bogota, where Don Cundinamarca had refused to acknowledge the new coalition of the provinces. In December 1814 he appeared before Bogota with a force of 2000 men, and obliged the recalcitrant leaders to capitulate,—a service for which he received the thanks of congress. In the meanwhile Santa Martha had unfortunately fallen into the hands of the royalists, and Bolivar was ordered to the relief of the place. In this, however, he was not successful, General Morillo having landed an overwhelming Spanish force. Hopeless of the attempt, he resigned his commission and embarked for Kingston, Jamaica, in May 1814.

From Kingston Bolivar repaired to Aux Cayes in Hayti, where he was furnished with a small force by President Petion. An expedition was organized, and landed on the mainland in May 1816, but proved a failure. Nothing daunted, however, he obtained reinforcements at Aux Cayes, and in December landed first in Margarita, and then at Barcelona. Here a provisional government was formed, and troops were assembled to resist Morillo, who was then advancing at the head of a strong division. The hostile forces encountered each other on the 15th of February 1817, when a desperate conflict ensued, which lasted during that and the two following days, and ended in the defeat of the royalists. Being now recognized as commander-in-chief, Bolivar proceeded in his career of victory, and before the close of the year had fixed his headquarters at Angostura on the Orinoco. At the opening of the congress which assembled in that city on the 15th February 1819 he submitted an elaborate exposition of his views on government, and concluded by surrendering his authority into the hands of congress. Being, however, required to resume his power, and retain it until the independence of the country had been completely established, he reorganized his troops, and set out from Angostura, in order to cross the Cordilleras, effect a junction with General Santander, who commanded the republican force in New Grenada, and bring their united forces into action against the common enemy. This bold and original design was crowned with complete success. In July 1819 he entered Tunja, after a sharp action on the adjoining heights; and on the 7th of August he gained the victory of Bojaca, which gave him immediate possession of Bogota and all New Grenada.

This campaign is unquestionably Bolivar's most brilliant achievement, and deserves much of the praise which has been lavished on it. His return to Angostura was a sort of national festival. He was hailed as the deliverer and father of his country, and all manner of distinctions and congratulations were heaped upon him. Availing himself of the favorable moment, he obtained the enactment of the fundamental law of 17th December 1819, by which the republics of Venezuela and New Grenada were henceforth to be united in a single state, under his presidency, by the title of the Republic of Colombia. The seat of government was also transferred provisionally to Rosario de Cucuta, on the frontier of the two provinces, and Bolivar again took the field. Being now at the head of the most numerous and best appointed army the republicans had yet assembled, he gained important advantages over the Spaniards under Morillo, and on the 25th November 1820, concluded at Truxillo an armistice of six months, probably in the hope that the Spaniards would come to terms, and that the further effusion of blood might be spared. If such were his views, however, they were disappointed. Morillo was recalled, and General Torre assumed the command. The armistice was allowed to expire, and a renewal of the contest became inevitable. Bolivar therefore resolved, if possible, to strike a decisive blow; and this accordingly he did at Carabobo, where, encountering Torre, he so completely routed the Spaniards, that the shattered remains of their army were forced to take refuge in Puerto Cabello, where two years after they surrendered to Paez. The battle of Carabobo may be considered as having put an end to the war in Venezuela. On the 29th June 1820 Bolivar entered Caracas, and by the close of the year the Spaniards were driven from every part of the province except Puerto Cabello. The next step was to secure, by permanent political institutions, the independence which had been so dearly purchased; and, accordingly, on the 30th of August 1821, the constitution of Colombia was adopted with general approbation, Bolivar himself being president, and Santander vice-president.

There was, however, more work for him to do. The Spaniards, though expelled from Colombia, still held possession of the neighboring provinces of Ecuador and Peru; and Bolivar determined to complete the liberation of the whole country. Placing himself at the head of the army, he marched on Quito in Ecuador. A severe battle was fought at Pichincha, where, by the prowess of his colleague Sucre, the Spaniards were routed, and Quito was entered by the republicans in June 1822. Bolivar then marched upon Lima, which the royalists evacuated at his approach; and entering the capital in triumph, he was invested with absolute power as dictator, and authorized to call into action all the resources of the country. Owing, however, to the intrigues of the republican factions in Peru he was forced to withdraw to Truxillo, leaving the capital to the mercy of the Spaniards under Canterac, by whom it was immediately occupied. But this misfortune proved only temporary. By June 1824 the liberating army was completely organized; and taking the field soon after, it routed the vanguard of the enemy. Improving his advantage, Bolivar pressed forward, and on the 6th of August defeated Canterac on the plains of Junin, after which he returned to Lima, leaving Sucre to follow the royalists in their retreat to Upper Peru,—an exploit which the latter executed with equal ability and success, gaining a decisive victory at Ayacucho, and thus completing the dispersion of the Spanish force. The possessions of the Spaniards in Peru were now confined to the castles of Callao, which Rodil maintained for upwards of a year, in spite of all the means that could be employed for their reduction. In June 1825 Bolivar visited Upper Peru, which having detached itself from the government of Buenos Ayres, was formed into a separate state, called Bolivia, in honor of the liberator. The first congress of the new republic assembled in August 1825, when Bolivar was declared perpetual protector, and requested to prepare for it a constitution of government.

We now come to that period in the liberator's career when his care was directed to the administration of the affairs of the freed provinces. He had been successful in raising those districts to the position of independent states, and now devoted himself to the framing of such laws as seemed to him most suitable to the inhabitants. His endeavors to satisfy his countrymen in this respect did not always meet with encouragement, and sometimes exposed him to slander. In December 1824 Bolivar convoked a constituent congress for the February following; but this body, taking into con-

sideration the unsettled state of the country, thought it proper to invest him with dictatorial power for another year. A grant of a million dollars was offered him but declined, and the congress adjourned, leaving the dictator absolute governor of Peru. His project of a constitution for Bolivia was presented to the congress of that state on the 25th May 1826, accompanied with an address, in which he embodied his opinions respecting the form of government which he conceived most expedient for the newly-established republics. This code, however, did not give satisfaction. Its most extraordinary feature consisted in the provision for lodging the executive authority in the hands of a president for life, without responsibility and with power to nominate his successor, a proposal which alarmed the friends of liberty, and excited lively apprehensions amongst the republicans of Buenos Ayres and Chili; while in Peru, Bolivar was accused of a design to unite into one state Colombia, Peru, and Bolivia, and to render himself perpetual dictator of the confederacy.

In the meanwhile the affairs of Colombia had taken a turn which demanded the presence of Bolivar in his own country. During his absence Santander had administered the government of the state ably and uprightly, and its independence had been recognized by other countries. But Paez, who commanded in Venezuela, having been accused of arbitrary conduct in the enrolment of the citizens of Caracas in the militia, refused obedience to the summons of the senate, and placed himself in a state of open rebellion against the Government, being encouraged by a disaffected party in the northern departments who desired separation from the rest of the republic.

Accordingly, having intrusted the government to a council nominated by himself, with Santa-Cruz at its head, Bolivar set out from Lima in September 1826, and hastening to Bogota, arrived there on the 14th November. He immediately assumed the extraordinary powers which by the constitution the president was authorized to exercise in case of rebellion. After a short stay in the capital he pressed forward to stop the effusion of blood in Venezuela, where matters had gone much farther than he could have contemplated. On the 31st December he reach Pureto Cabello, and the following day he issued a decree offering a general amnesty. He had then a friendly meeting with Paez and soon after entered Caracas, where he fixed his headquarters, in order to check the northern departments, which had been the principal theatre of the disturbances. In the meanwhile Bolivar and Santander were re-elected to the respective offices of president and vice-president, and by law they should have qualified as such in January 1827. In February, however, Bolivar formally resigned the presidency of the republic, at the same time expressing a determination to refute the imputation of ambition which had been so freely cast upon him, by retiring into private life, and spending the remainder of his days on his patrimonial estate. Santander combatted this proposal, urging him to resume his station as constitutional president, and declaring his own conviction that the troubles and agitations of the country could only be appeased by the authority and personal influence of the liberator himself. This view being confirmed by a resolution of congress, although it was not a unanimous one, Bolivar decided to resume his functions, and he repaired to Bogota to take the oaths. Before his arrival, however, he issued simultaneously three separate decrees,—one granting a general amnesty, another convoking a national convention at Ocaña, and a third for establishing constitutional order throughout Colombia. His arrival was accelerated by the occurrence of events in Peru and the southern departments, which struck at the very foundation of his power. Not long after his departure from Lima, the Bolivian code had been adopted as the constitution of Peru, and Bolivar had been declared president for life on the 9th December 1826, the anniversary of the battle of Ayacucho.

At this time the Colombian auxiliary army was cantoned in Peru, and the third division, stationed at Lima, consisting of veteran troops under Lara and Sands, became distrustful of Bolivar's designs on the freedom of the republic. Accordingly, in about six weeks after the adoption of Bolivar's new constitution, a counter-revolution in the goverment of Peru was effected by this body of dissatisfied veterans, and the Peruvians, availing themselves of the opportunity, abjured the Bolivian code, deposed the council appointed by the liberator, and proceeded to organize a provisional government for themselves. After this bloodless revolution the third division embarked at Callao on the 17th March, 1827, and landed in the southern department of Colombia in the following month. Intelligence of these events reached Bolivar while in the north of Colombia, and he lost no time in preparing to march against the refractory troops, who formerly had placed such implicit confidence in him. But he was spared the necessity of coming to blows, for the leaders, finding the government in the hands of the national executive, had peaceably submitted to General Ovando. In the meanwhile Bolivar had accepted the presidency, and resumed the functions belonging to his official position. But although Colombia was, to all external appearance, restored to tranquility, the nation was divided into two parties. Bolivar had, no doubt, regained the personal confidence of the officers and soldiers of the third division; but the republican party, with Santander at their head, continued to regard with undisguised apprehension his ascendency over the army, suspecting him of a desire to imitate the career of Napoleon. In the meanwhile all parties looked anxiously to the convention of Ocaña, which was to assemble in March 1828, for a decided expression of the national will. The republicans hoped that the issue of its deliberations would be favorable to their views; whilst the military, on the other hand, did not conceal their conviction that a stronger and more permanent form of government was essential to the public welfare. The latter view seems to have prevailed. In virtue of a decree, dated Bogota, the 27th August 1828, Bolivar assumed the supreme power in Colombia, and continued to exercise it until his death, which took place at San Pedro, near Santa Martha, December 17, 1830. He conquered the independence of three states and called forth a spirit in the southern portion of the New World which can never be extinguished. He purified the administration of justice; he encouraged the arts and sciences; he fostered national interests; and he induced other countries to recognize their independence.

BOLIVAR, the name of several States and Territories of South America.—(1) A State of Colombia, lying west of the Magdalena. Area, 21,345 square miles; population (1887), 300,000. Capital, Cartagena; chief port, Barranquilla.—(2) The largest of the United States of Venezuela, extending across the center of the country from Colombia to the Atlantic. Area, 88,383 square miles; population (1884), 267,251. The State is better known as Guayana; its capital is Ciudad Bolivar. —(3) A national Territory of Columbia; population, 7,751.—(4) An agricultural settlement of Venezuela, thirty miles northeast of Carácas, founded in 1874 to receive immigrants.—(5) One of the new Territories of Buenos Ayres, 170 miles southwest of the capital. Area, 2,070 square miles; population, 2,055.

BOLIVIA. This name was given in honor of Boli-

war (see last article) to a state in South America, formed in 1825 from the provinces of Upper Peru which formerly constituted part of a vice-royalty of Buenos Ayres. The bulk of the country extends from 10° to 23° S. lat., and from 58° to 71° W. long., and it is bounded on the N. by Peru and Brazil, on the E. by Brazil and Paraguay, on the S. by the Argentine Republic and Chili, and on the W. by the Pacific Ocean and Peru. The greater part of Bolivia is a mountainous and elevated country, more particularly at its western and central parts; but towards the east it becomes much less so, and at length terminates in extensive plains, which are bounded on the east by Brazil. From the Pacific coast the southern boundary of Bolivia runs along the 24th parallel of latitude (the limit decided by treaty with Chili in August 1866), to as far as the crest of the Andes; turning S. it follows the line of the mountains to 26° S. lat., in which parallel it crosses the plateau to the inner Cordillera, along which it lies N.N.E. to the 22d parallel. This line of latitude forms the boundary of territory which is certainly Bolivian, as far as the River Paraguay; but Bolivia, in common with the Argentine Republic and Paraguay, has claims on the unexplored territory of the Gran Chaco, which lies south of this line, and between the rivers Pilcomayo and Paraguay. From 22° on the River Paraguay, the frontier with Brazil was decided, by treaty of March 1867, to be a line following that river northward to the Bahia Negra in 21° 11′, along the Negra to its termination, and thence through the midst of the lagoons of Caceres, Mandioré, Gaiba, and Uberaba (lying immediately west of Paraguay River), to Corixa Grande; thence in a straight line to Boa Vista and the source of the Verde; down that river to the Guapore, and along the latter to where the Beni joins it in 10° 20′ S.; thence in a straight line towards the source of the River Javary (in 7° S.) The present Government of Bolivia appears inclined, however, to repudiate this treaty, and to return to the older frontier, which included the tributaries of the Amazons as far as 6° 28′ S. On the Peruvian or western frontier the boundary follows a more or less northerly direction from the mouth of the River Loa in Atacama, along the Cordillera, crossing Lake Titicaca, and passing north thence to the line running from the Beni to the Javary.

Before the formation of the republic, Bolivia, or the former province of Charcas, consisted of four great districts or "intendencias," which were under the rule of the viceroy of Rio de la Plata. These were —

1. Santa Cruz, formed of the districts of its bishopric —Mojos Chiquitos, Santa Cruz, Valle Grande, Misque, and the special jurisdiction of its Cochabamba;
2. La Paz, consisting of the dioceses of its bishopric;
3. Potosi, comprising Tarija, Chichas, Lipez, Atacama, Porco, and Chayanta;
4. The province of La Plata, which embraced all remaining portions of the archbishopric.

At the present time the republic is divided politically into departments, provinces, and cantons. The departments, which are named La Paz de Ayacucho, Cochabamba, Potosi, Chuquisaca, Oruro, Santa Cruz de la Sierra, Tarija, Beni, and Atacama, have each one or two capital towns; the provinces and cantons have also each its chief place. Each department has a governor, who stands in direct communication with the Government; the subdivisions have their corregidors and alcaldes, who are subject to the governor.

The westerly departments of La Paz, Oruro, and Potosi are situated in the highest regions of the plateau of Bolivia, and are more valuable on account of their mineral riches than their vegetable products, of which a coarse grass is characteristic. The first consists of a series of high ranges and deep valleys, in which the climate and production vary with the elevation; the second lies also in the high table-land or Puna region; both are rich in veins of gold, silver, and tin, but the mining of these has not yet been fully developed. The third, Potosi, belongs entirely to the highest regions of Bolivia, and is bare and dry, with a cold and rude but healthy climate; this is the greatest mining region in the country.

The central departments of Cochabamba, Chuquisaca, and Tarija lie partly on the high plateau, partly on the lower slopes and plains eastward, and pass thus through the whole series of changing climates and zones of production, from the bare high land to the tropical regions of the low lands. The first is eminently the granary of Bolivia and southern Peru, excelling in the cultivation of wheat; the industries of woollen and cotton manufactures are also most highly developed in the department, but its mines are not worked. Chuquisaca, of which only a third part lies in the high land, is also a vegetable growing region, in which wheat, barley, rice, peas, vines, and all sorts of vegetables are cultivated; cattle and horses are also numerous. The forests of this department and of Tarija, which slope down to the wooded and pastoral plains of the tributaries of the Paraguay, afford many species of valuable timber.

The departments of Beni (or Veni) and Santa Cruz de la Sierra lie altogether in the low lands of the east, stretching to the Rio Maderia and the Paraguay. The former is as yet little explored, but is a land of tropical forests, rivers, and swamps, with an unhealthy climate. Santa Cruz is also characterized by a hot, damp atmosphere, but produces garden and field fruits in astonishing richness,—coffee, cocoa, vanilla, sugar-cane, maize, and cotton. The forests of both of these departments afford an infinity of valuable timber trees, and in the latter there is much pasture land well fitted for cattle breeding.

Western Bolivia is the highest and most mountainous country of the two Americas. Five separate systems of mountains, curving from Peru in the north-west and passing south into Chili, may be distinguished as forming its high land. Nearest the Pacific is the range of the outlying *coast mountains*, which does not exceed 5000 feet in altitude. The range of the true *Andes* rises farther inland, forming part of the vast chain which extends along the whole of America; in Bolivia it attains an average height of 15,000 feet, and has a general width of 20 miles, having its highest known point here in the volcano of Sahama, 23,000 feet in elevation. Next follows the central system of the *Cordillera Real*, also named the eastern Cordillera, presenting a succession of sharp, rugged peaks, reaching up into the region of eternal ice and snow, higher generally than the Andes, but less massive; the peaks of Illimani (21,300 feet) and Sorata (24,800 feet) are its culminating points. Between the Andes and the Cordillera Real there are various *Serrania* or isolated groups of mountains, and cerros of less altitude, rising from the enclosed plateau to 17,000 feet in some instances. The last system is that of the numerous minor Cordilleras, which run south-eastward from the Cordillera Real into the lowlands of eastern Bolivia, of which the most important is that of Cochabama, stretching out to 62° 40′ E. long. The elevation of the snow line in the highlands of Bolivia appears to vary between 16,000 and 18,000 feet, modified in many cases by the aspect of the mountains and the nature of the country surrounding them, being raised where heat is powerfully reflected from the surface of the bare high plains, or lowered where the mountains are exposed to cold southerly winds. Volcanoes are frequent in the Andes and coast ranges; those of Sahama and Isluga, with Tua, Olca, and Ollagua farther south, are constantly smoking

These mountain systems divide Bolivia into a high region, containing many very elevated plains stretching between the enclosing heights of the west, and a low land forming the eastern side of the country, beneath the mountains, and at a comparatively small elevation above the sea. The high plains or basins of the plateau enclose a continental water system, from which there is no outlet to the ocean, the rivers terminating in lakes, of which Lake Titicaca is the chief, or in swamps, or in vast dried up salt fields,—rapid evaporation disposing of and balancing the supply of water flowing to these by the mountain streams.

The valley or plateau which is occupied by the Lake of Titicaca and the Rio Desaguadero forms the most elevated table-land on the globe, with the exception of that of Thibet, which presents only mountain pastures, covered with sheep; while this table-land of the New World presents towns and populous cities, affords support to numerous herds of cattle, *llamas*, *guanacos*, and sheep, and is covered with harvests of maize, rye, barley, and wheat, at an elevation which has nothing to equal it in any other part of the world. The Lake of Titicaca or Chuquito, which occupies its northern extremity, is 12,600 feet above the level of the sea, and its extent is equal to fourteen times that of the Lake of Geneva, or 3220 square miles, the greatest depth being upwards of 700 feet. It is surrounded by numerous towns and villages, and a rich and fertile country, and contains several islands, the largest of which is called Titicaca, and was long held in great veneration by the Peruvian Indians, in consequence of its having been the place whence Manco Capac and his consort Manco Oello Huaco, the great founders of the empire of the Incas, issued, to spread civilization, industry, and good government among the surrounding nations. The Lake of Titicaca is very irregular in its form. It admits of extensive navigation for small vessels, though not unattended with danger, as it is subject to sudden storms and violent gusts of wind from the neighboring mountains. This lake communicates with the smaller Lake of Pansa, or of the "Pampa Aullagas," situated at the southern extremity of the valley, by means of the Rio Desaguadero, which flows out of the Lake of Titicaca, and has a breadth of from 80 to 100 yards. This river and lake form part of the western boundaries between the Republics of Bolivia and Peru. Over the river was formed, in the time of the Incas, a suspension bridge, composed of cables and cords made of the grasses and rushes which grow on its borders; and the work was constantly renewed from time to time, to obviate the effects of decay, as it constituted the only line of communication between the opposite sides of the valley. These lakes, with the Desaguadero, form the only receptacles for the water of those rivers and streams which descend from the surrounding mountains and enter this extensive plain, which has no visible outlet whereby its contents can escape otherwise than by evaporation.

Those rivers which take their rise from the western declivity of the Andes, and flow into the Pacific, are so inconsiderable in magnitude, and so short in their course, as scarcely to merit observation, and are only useful in supplying the means of a partial irrigation to the arid plains which separate these mountains from the Pacific. But those numerous rivers taking their origin on the eastern declivity of the Cordillera Real, which is the main water-parting of Bolivia, present a very different aspect, and are of much greater importance, since they communicate with large navigable rivers, which terminate in the Atlantic Ocean.

Bolivia lies, as has been noticed, for the most part within the tropical zone: but from its peculiar formation, its climate and productions are dependent rather upon the elevation of different parts of the land than upon its geographical situation.

In the punas the air is always dry and perceptibly cold, though the temperature may rise high in the sun, and cold, cutting blasts of air from the mountains are of frequent occurrence. In the Valle and upper Yunga a perpetual spring seems to reign, and night frosts are rare. The western side of the Andes is completely rainless, all moisture-bearing clouds rolling up from the ocean being quickly evaporated, or condensed in the higher mountain regions in snow or hail; but the whole of the remaining eastern region of Bolivia has a rainfall. In the low lands this is regular in season; but in the upper regions of the Puma and the Cabezera de Valle, a rainy season generally begins in the middle of November and concludes in the beginning of March, often accompanied by furious thunder-storms, with hail and snow in the higher regions. The climate of Potosi, at an elevation of 13,300 to 13,600 feet, is so various that in one day it frequently exhibits the vicissitudes of the four seasons of the year.

The animals which distinguish the more elevated parts of Bolivia are the *guanaco*, the *llama*, the *alpaca* (the first supposed to be the original from which the second and third varieties have been domesticated), and the *vicuña*. These animals, in their structure and habits, are all closely allied to the camel of Africa.

The vicuña (*Camelus vicugna*) is a smaller animal than the guanaco or the llama, and only useful for its fleece. The chinchilla (*Chinchilla lanigera*) is also an inhabitant of the mountainous parts of Bolivia.

The sheep pasturing in the highlands of Bolivia are supposed to number about seven millions, and in the lower regions of the east horned cattle are very numerous.

The geological structure of the colossal mountains situated in Bolivia has hitherto been very imperfectly examined. We learn from Humboldt, however, that the metalliferous mountains near Potosi are principally composed of trachytic porphyries; and Mr. Pentland discovered trachyte also in the mountain of Pichu, one of the most elevated of the western Cordillera. In the same chain there likewise exist various volcanic mountains, some of which are in an active state. There is perhaps no part of the world which affords a more interesting field for the investigations of the geologist than Bolivia, not only on account of the great elevation which it attains, but also from the exhibitions of internal structure presented by volcanic agency and otherwise,—not to mention the aid afforded by such inquiries in the prosecution of mining enterprises.

The great variety, extent, and value of the mineral productions of the mountainous districts of Bolivia have given to this part of America an importance and celebrity which it would not otherwise have obtained, and have caused large and populous cities and towns to be built at elevations where the rigors of the climate and the deficient vegetation would otherwise have afforded very few inducements for fixing the abodes of industry. Mining is, however, at the present time in a ruinous state.

Gold is found in considerable quantities in the mountainous parts of Bolivia; but, owing to the expense of extracting the metal from the ore, the mines which produce it have not been worked to the extent of which they are capable. In these it is usually found in the form of grains or nodules, or intermixed with antimony, silver, and other substances, and is separated by reducing the whole to a fine powder, and by amalgamation with quicksilver. The mountain of Illimani, is believed to contain great quantities of gold, in consequence of that metal having been found in a native state in con-

siderable quantities in the lake of Illimani, situated at its base. Several districts of the departments of Potosi, Chuquisaca, Santa Cruz, and Tarija, are also rich in gold, but the greater part of the mines formerly worked have now been abandoned, or the known veins have not been explored.

Silver, however, has hitherto been the staple metallic production of Bolivia, and has given to it that celebrity which it has long possessed. In the rich mountains of Potosi alone, according to the records kept at Potosi of the *quintas* or royal duties from the year 1545 to the year 1800, no less than 823,950,509 dollars were coined during that period; and if the other produce of the mines be taken into account, it is estimated that not less than 1,647,901,018 dollars must have been obtained from this source alone during those 255 years.

Among the other mineral riches of Bolivia copper takes the next rank, and is also widely distributed. The province of Ingavi in La Paz possesses mines from which 15,000 to 20,000 cwts. of copper are annually taken. The departments of Potosi, Chuquisaca, Oruro, and Atacama are also rich in copper. Tin is mined to some extent in Potosi and Oruro, where it is found along with the silver. Lead is also frequently found in the neighborhood of silver as well as quicksilver. Coal and iron have been found in the departments of Chuquisaca, Oruro, and Beni, though the extent or value of these products is yet unknown. Precious stones, chiefly the hyacinth and opal, have been found in the department of Santa Cruz, and diamonds in Beni.

Very valuable beds of guano extend along the Pacific coast between 23° and 25° S., those of Mexillones being specially famous. Nitrate of soda also exists in great quantity in the deserts of Atacama, and is profitably worked.

The roads which form the means of communication between Bolivia and the surrounding countries, and between the various provinces of the republic, are in no respect sufficient for the important purposes which they are destined to serve.

The productions furnished by Bolivia as articles of commerce are chiefly the precious metals, vicuña and alpaca wool, guano, nitrate of soda, leather, coffee, cacao, and chinchona bark; but from the fact that no direct commercial intercourse has ever existed with the outer world, these products are frequently ascribed to the countries through which they must pass.

The population of Bolivia consists of a mixture of various races, chiefly of the Spaniards with the Indian natives. A third of their number live in towns or "villas," the rest in smaller villages, or in the open camp.

The population of Bolivia has greatly increased since the year of independence, 1825, when the whole number did not exceed 979,000; in 1831 it exceeded 1,000,000; at the census of 1888 it had risen to 2,303,000.

The constitution given to the country by Bolivar, which, in the frequent revolutions of later times has often been modified and altered, and sometimes set aside altogether, is founded on the strictest principles of justice, in as far as regards the civil rights and privileges of the community; but in other respects, and particularly in reference to the supreme executive authority, its provisions savor strongly of a monarchical spirit. The supreme authority is vested in a *presidente vitalicio*, or president for life, with the power of naming his successor. It guarantees to the Bolivians civil liberty, security of persons and property, and equality of rights; the free exercise and communication of thoughts and opinions, either by the press or otherwise; liberty to remain or leave the territory of the republic with their property, at their pleasure, but without prejudice to others; equality in the imposition of taxes and contributions, from the payment of which none can be exempted; and the abolition of all hereditary employments, privileges, and entails. No profession, trade, or employment can be prohibited, unless repugnant to public feeling, or injurious to the health and security of the community; and every inventor is secured in the benefits of his discovery. No one can be arrested without previous information of the alleged fact of delinquency, unless when taken *flagranti delicto*. All trials and judgments are public; and in criminal cases none can be imprisoned more than forty-eight hours without having presented to him the charges preferred against him, and being delivered over to the proper tribunal or judge.

By this constitution all legitimate power emanates directly from the people, and is in the first instance exercised by all who can justly claim the privilege of citizens. Of these every ten nominate an elector, who exercises his delegated authority for a period of four years. At the commencement of each year all the electors assemble in the capitals of their respective provinces, and regulate their proceedings and the exercise of their various functions by a plurality of votes. They elect the members of the three legislative chambers, the number of each amounting to thirty; those for the chamber of tribunes being nominated for four years, and renewed by moieties every two years; those for the senate for eight years, and renewed by moieties every four years; and those for the chamber of censors being nominated for life.

The executive government consists of a president, vice-president, and three secretaries of state. The president of the republic is named for the first time by a majority of the collective legislature, and retains the dignity during life, with the power of naming his successor.

The early history of that part of the empire of the Incas which now forms the Republic of Bolivia is so intimately connected with that of Peru, that the consideration of it may with propriety be deferred until we come to treat of that country, in which Cuzco, the capital of the Incas, is situated.

BOLLANDIST FATHERS, The, the authors of the famous *Acta Sanctorum*. During the Roman Catholic revival in the end of the 16th and beginning of the 17th centuries a great number of martyrologies were published, and it occurred to a Jesuit father, Heribert Rosweyd, to collect all the various legends about the martyrs and saints of the church into one great standard martyrology, which he proposed should fill 18 vols. folio. Rosweyd died in 1629 without having been able to carry out his plan. His idea, however, was taken up by John Bolland, a Jesuit father of the Low Countries, who had settled in Antwerp. He began an extensive correspondence, writing to every one throughout Europe who he supposed was able to help him. The public libraries and the libraries of convents and churches were thoroughly examined for MSS. about saints and martyrs, and so much material was found that the original plan of the work was soon widened.

BOLOGNA, a province of northern Italy, having an area of 1385 square miles. It consists in the north of a fertile plain, well watered by several tributaries of the Po, while the southern portion is occupied by the Apennines, which separate it from Tuscany.

Bologna, the chief city of the above province and the see of an archbishop, is situated between the rivers Reno (*Rhenus*) and Savena, at the foot of the lower slopes of the Apennines, 399 feet above the level of the Adriatic, and 23 miles S. E. of Modena, on the main line of railway that runs across the north of Italy.

Bologna is said to have been founded by an Etruscan king, and was originally called Felsina after his name. It was held for some time by the Boian Gauls, and on their expulsion became, in 189 B.C., a Roman colony under the name of Bononia. Its importance rapidly increased, but it does not appear much in history till the time of the civil wars. The terms of the second triumvirate were settled in 43 B.C. in an interview held between Octavius, Antony and Lepidus.

BOLOGNA PHIAL, or PHILOSOPHICAL PHIAL, is a short, thick, narrow glass vessel, closed at one end and open at the other, which the glass-blower prepares from each pot of metal before employing it in the fashioning of tumblers, glasses and bottles.

BOLOGNA STONE, or BONONIAN STONE. In the end of the sixteenth or the beginning of the seventeenth century, Vincent Casciorlo, a shoemaker of Bologna, made the very remarkable discovery that the mineral now known as heavy spar (barium sulphate), which is found near Bologna, when reduced to a fine powder and mixed with gum, dried, and strongly heated in a covered crucible, is converted into a substance having the property of shining in the dark. The well-known "luminous paint" is made up of this or of other similar and similarly prepared sulphides.

BOLOGNE, JEAN (or Giovanni Bologna, as he was called in Italy), a celebrated sculptor, was born at Douay in 1524, and died at Florence in 1608.

BOLOMETER, an instrument invented (1881) by Professor Langley for the measurement of the intensity of radiant heat. It consists essentially of a Wheatstone's Bridge, arranged so that no current passes through the galvanometer. The instrument may be made much more sensitive than a thermopile. A good one can measure variations of temperature of $\frac{1}{10000}$ of a degree centigrade, and can detect a variation of $\frac{1}{100000}$.

BOLONCHEN TICUL, a city of the Republic of Mexico, in the State of Yucatan, a short distance from the coast. Population, 7,500.

BOLSENA, a town of Italy, in the province of Rome, and the district of Viterbo, ten miles south by east of Orvieto. It is situated on the north shore of the lake of the same name (*Lago di Bolsena*), and probably occupies the site of the Roman city of Volsinii.

BOLTON, or BOLTON LE MOORS, a municipal and parliamentary borough of England, in the county of Lancashire. Population (1891), 110,000.

BOLTON ABBEY, Yorkshire, is situated in a highly picturesque district on the River Wharfe, six miles east of Skipton, and eighteen northwest of Leeds. Founded for Augustinian canons about 1150, it has been celebrated by Wordsworth in *The White Doe of Rylstone* and *The Force of Prayer*. The remains range from Early English to Perpendicular; and the nave of the church has been restored for service. The old barn of the abbey is still in use; and the gateway, familiar through Landseer's picture, has been incorporated in Bolton Hall, a modern seat of the Duke of Devonshire.

BOLZANO, BERNHARD, Catholic theologian and philosopher, was born at Prague on October 5, 1781. He distinguished himself by his proficiency in mathematics, a study for which he always retained a predilection, and in philosophy. He died at Prague in 1848. Bolzano's works are very numerous, filling, according to Erdman, twenty-five volumes.

BOMARSUND, a Russian fortress on Aland Island, commanding the Gulf of Bothnia. In August, 1854, it was destroyed by an Anglo-French force, after a six day's bombardment. The treaty of Paris bound Russia not to restore it.

BOMB, BOMB-SHELL, or SHELL, is a hollow projectile, usually of cast-iron, fired from a mortar or other large piece of ordnance, filled with gunpowder, and fitted with a time-fuse, which causes it to burst at any required instant after it is fired. The fragments are most destructive both to men and material, and the flame of the explosion sets fire to anything inflammable with which it comes into contact—even earthen parapets are much damaged by bombs, which, lodging in them and then bursting, have the same effect as a mine sprung under them. Such projectiles were formerly fired from mortars only; but all modern pieces of artillery now fire them. The name *shell* has, however, been generally substituted for that of *bomb*, especially since the introduction of rifled guns firing elongated projectiles. The thirteen-inch is the largest spherical shell in ordinary use. It weighs about 195 pounds, with a thickness of metal varying from one and a half to two inches at different parts; it bursts with about eight pounds of powder. The ten-inch bomb, weighing about ninety pounds, is proportionately less in all dimensions than that just described; and so on for those of smaller diameters. The smallest is the hand-grenade of three pounds weight.

BOMBA was an opprobrious epithet bestowed in Italy on Ferdinand II. of Naples (1810–59), in consequence of his cruel bombardment of Naples, Messina, and other cities of his realm during the revolutionary troubles of 1849.

BOMBARD, a kind of cannon in use about the close of the fourteenth century, and later; short, thick and wide in the bore, sometimes capable of throwing balls of stone of 200 and even 500 pounds weight.

BOMBARDIER, the lowest non-commissioned officer in the British artillery, ranking with corporals in the infantry and cavalry. The name was applied in the seventeenth and eighteenth centuries to a man employed about the mortars and howitzers.

BOMBARDIER BEETLE, a name given to several species of beetles, of the genera Brachinus and Aptinus, in the sub-family Carabidæ. The name refers to their offensive and defensive habit of discharging an acrid volatile fluid with explosive force from the abdomen. Some ants and other insects exhibit the same curious protective device.

BOMBARDMENT is an attack upon a fortress or fortified town by means of shells, red-hot shot, carcasses, rockets, etc., to destroy the fortifications, burn the houses and kill the people. It is most likely to be successful against a place destitute of bomb-proof cover, or one having a large civil population. A bombardment is more frequently a naval than a military operation, and in that case is undertaken without an investment, or any intention of capturing the place, but simply with the object of destroying it. The stores required for a vigorous bombardment are immense. In January, 1871, the Germans bombarding Paris and its forts threw 10,000 shells daily into the place, of which 500 fell into the city itself. The siege and bombardment of Strasburg in August and September is also memorable. The bombardment of the forts of Alexandria by the British fleet on July 11, 1882, is a recent example of the effect of the enormous modern shells. It was directed against the fortifications with the intention of destroying them, and not against the town, though the latter was set on fire in several places by these far-ranging projectiles. The forts were silenced in twenty-four hours.

BOMBAY, the Western Province of India, with a governor appointed by the crown, a legislative council, and a European and native garrison under a local commander-in-chief. Bombay, including Sind and Aden, comprises twenty-four British districts, and nineteen native or feudatory states, and contains 107,887 square

miles, of which 73,753 are in native states. The Nerbudda river divides the presidency, as in accordance with the old name it is still often called, into two portions: in the north is Guzerat, chiefly consisting of alluvial plains, with the Cutch and Kathiawar peninsulas; to the south is the Mahratta country, which includes parts of the Deccan, Carnatic, and Konkan or coast-districts. The political control of Baroda was transferred in 1875 from Bombay to the supreme government of India. The small territories of the Portuguese—Goa, Daman and Diu—have an area of 1,062 square miles. The coast-line is irregular, broken by the gulfs of Cambay and Cutch, with several fine natural harbors, Bombay and Karachi (Kurrachee) being the most important. The chief mountain-ranges run north and south; in the north are the Khirthar Mountains; in the southeast are the Western Aravalli range; south of the Tapti are the Sahyadri Mountains or Western Ghats, which run almost parallel with the coast; the Satpura range runs east, and forms the water-shed between the Tapti and Nerbudda. Sind is watered and fertilized throughout its whole length by the Indus; the Subarmati and Mahi flow through the plains of North Guzerat; the Nerbudda pursues a western course into the Gulf of Cambay. The Tapti flows through Khandesh district, entering the sea above Surat. Beside these there are numerous hill streams, which are torrents during the rains and dry up in the hot season. The Runn of Cutch, in the west of Guzerat, covers an area of about 8,000 square miles, and is the great source of salt supply for the presidency. There are few minerals, and no coal; iron is mined at Teagar in Dharvar, and there is gold among the quartz. Good building-stone is abundant, with limestone and slate. As to climate: in the dry, sandy districts of Sind the thermometer has reached 130° in the shade; the mean temperature in Lower Sind, during the hottest months in the year, is 98° in the shade. In Cutch and Guzerat the heat is slightly less. The coast-districts are hot and moist, with a heavy rainfall during the monsoon, which sometimes reaches 300 inches. The tableland of the Deccan has an agreeable climate, except during the hot months.

Besides an Anglican bishop and clergy, there are chaplains of the Church of Scotland. In 1890 the entire number of schools and colleges aided by government, or under its inspection, was 6,726, with 438,416 pupils. The University of Bombay was founded in 1857; 840 candidates passed for admission in 1885. There were about ninety libraries, and seventy-five newspapers (nineteen Anglo-vernacular) in 1884–85. During the mutiny of 1857 the local army remained, on the whole, steady and faithful; and a portion of it, under Sir Hugh Rose, aided in the suppression of the insurrection. The army consisted in 1890 of 35,942 men, of whom 21,000 were natives. The headquarters is at Poona. Bombay has benefited vastly from the establishment and extension of the Indian railway system. The first railway in India was opened in Bombay in 1853; the presidency has now more than 3,500 miles of railway, giving communication with all the important towns of India. A cable telegraph from Bombay to Aden was laid in 1869; there are now private company cables, while the Government Indo-European Telegraph Department has its headquarters at Karachi.

Of late years, manufacturing industries have been extremely active in Bombay. Commanding the richest cotton fields in India, it has improved to the utmost its natural advantages. The stoppage of the American cotton supply during the civil war gave a grand impulse to the Bombay trade, the exports of cotton during the five years 1861 to 1866 averaging in value £21,582,847 a year. The wealth poured into Bombay at this period led to a vast extension of the trade, which partly continued after the period of inflation had passed. The first mill was started in 1854, and ten years later there were thirteen. In 1887 the presidency had seventy-five large steam factories, with 14,926 looms and 1,779,220 spindles, employing on an average 54,785 hands daily. In that year 3,917,929 hundredweight of raw cotton were exported, valued at £9,963,144. But, in addition to this, 1,898,536 hundredweight were consumed in the local industry. In 1886 the imports of piece goods amounted to 679,000,000 yards, and of yarns to 16,000,000 pounds Not only does Bombay now compete with Manchester in the Indian market; it exports its own manufactures, the returns for 1887 being 89,000,000 pounds of twist and yarn, valued at £3,240,480, and of piece goods, 41,000,000 yards, worth £509,282. After cotton, the other great staples are opium, wheat, and seeds. The trade in opium is worth nearly five millions sterling, two millions being the clear revenue derived by government from a pass duty of 550 rupees a chest. Although of recent origin, the wheat trade has assumed large proportions. In 1887 the exports amounted in value to £5,587,500. Other principal exports are sugar, tea, raw wool, woolen shawls, fibers, and drugs; while among the imports are machinery, metals, oils, coal and liquors. There is a considerable trade in Arab horses, of which 3,126 were imported in 1887. The total imports in 1886–87 (including nine millions of treasure) amounted to £32,906,637, and the exports to £35,468,942. Silk weaving is carried on at Ahmedabad, Surat, Nasik, Yeola, and Poona; carpets are made at Ahmednagar; leather work and pottery in Sind; brass ware in Bombay city, Nasik, and Poona; cutlery, armor, and gold and silver work in Cutch. Population (1889) of native states, excluding Baroda, 6,941,249; of British territory, 16,489,274, of whom nearly 18,000,000 were Hindus, 3,750,000 Mohammedans, less than 1,000,000 aborigines, 145,154 Christians, 127,130 Sikhs, 498,443 Jains, 73,973 Parsees, 9,023 Jews, etc.

Bombay City occupies the entire breadth of the southeast end of Bombay Island or Peninsula, bordering at once on the harbor inside, and on Back Bay outside. The island, now permanently connected by causeways and breakwaters with Salsette Island and the mainland, is over eleven miles long by from three to four broad. For administrative purposes the city constitutes a district by itself, with an area of twenty-two square miles. Its harbor, studded with islands and crowded with shipping, is one of the finest in the world, the space available for shipping being about fourteen miles in length by five broad. Bombay is the most European in appearance of all the cities of India. In the business parts there are several streets continuously lined with splendid buildings; while the bazaars, which extend from the fort toward Mazagaon, are traversed by fairly wide streets, extensive lines of tramways passing through even the most crowded parts. Many of the private houses of European residents are built on the suburb of Malabar Hill, the ridge running into the sea forming the west of Back Bay; and at Breach Candy looking seaward. The Hindus and the Mohammedans form the largest section of the population, and the rest are Parsees, native Christians, Europeans, Indo-Portuguese, Jews, etc. Amid these various classes, the Parsees rank next to the English in position and influence. The Banias, or Hindu traders, rank next to the Parsees. On the esplanade, facing toward Back Bay, are the secretariat, the university, senate-hall, high court, offices of public works, sailors' home and statue of the

Queen. In the neighborhood of the fort are the town-hall, the mint, cathedral and custom-house. The terminus of the Great Indian Peninsular railway, opened in 1876, is the finest building in Bombay. On the promontory to the east of Back Bay stood the old fort, now a mere garrison, its walls having been demolished; the harbor is defended by batteries and two ironclads. It has an extensive system of quays, wharves and docks; Princes Dock is said to have cost over a million sterling. Mazagaon Bay, the center of shipping activity, is at the head of the harbor. The city water-supply is drawn from Vihar Lake, fifteen miles northward. Always favorably situated for foreign trade, Bombay has profited largely by being the first important port reached by vessels from Europe, and being the chief mail line to India by Suez and Aden, Bombay now surpasses Calcutta in the amount of her trade; in 1886–87, 36.9 per cent. of the trade of India was done through Calcutta, and 42.70 through Bombay. This proportion is partly accounted for by the fact that the bulk of the treasure imports to India are received in Bombay. The chief articles of export are cotton, wheat, shawls, opium, coffee, pepper, ivory and gums; the chief imports, piece-goods, thread, yarn, metals, wine, beer, tea and silk. The chief industries are dyeing, tanning and working in metal. The population, which is exceedingly heterogeneous and dense — as many as thirty-one persons, on an average, inhabiting each house — amounted, in 1881, to 773,196. Less than 13,000 of this number are British born.

In 1509, about a year before the capture of Goa, the Portuguese visited the island; and by 1532 they had made it their own. In 1661 they ceded it to Charles II. of England, as part of the dowry of his bride, the Infanta Catharine. In 1668 his majesty granted it for an annual payment of £10 to the East India Company, which, in 1685, transferred what was then its principal presidency to Bombay from Surat. The name of the island, styled Maimbi by the Portuguese of the sixteenth century, is said to be derived from the goddess Mumbadevi; Colonel Yule has traced it back to Mayamba, the name of the Konkan kingdom in the sixteenth century. The bay toward the mainland, even in its natural state, presents one of the finest havens in India. The connected islands from north to south are Bassein, Versova, Salsette, Bombay, Old Woman's Island and Colaba. Within the harbor, and between these and the mainland, are Trombay, Elephanta, Butchers' Island, Gibbet Island and Karanja. Bombay is the terminus of the great Peninsular and Baroda railways. Much has been done to improve the approaches to Bombay, and at present the scheme of harbor defenses is being greatly extended. In 1888 the English Government intimated that they proposed building a dock sufficient to hold the largest ironclad.

BOMBAY DUCK, or BUMMALOTI (*Saurus ophiodon*), a fish of the family Scopelidæ, nearly allied to the salmon and trout family. It is a small but voracious fish of elongated form, with large fins and a very large mouth. It is a native of the coasts of India, particularly of the Bombay and Malabar regions, from which it is exported in large quantities, salted and dried, to other parts of India and elsewhere, being highly esteemed for its rich flavor, and often used as a relish.

BOMBAZINE is a cloth for dresses, in which the distinguishing characteristic is that the warp is silk, and the weft worsted. The cloth has thus a bare look. It is rather fine and light in the make, and may be of any color. The fabric is now little used.

BOMB-PROOFS are military structures of such immense thickness and strength that shells cannot penetrate them. In every fort the barracks, hospitals, stores, and magazines are covered with masonry and earth, or, in some cases, with thick armor-plates so as to be impervious to the fire of the most powerful siege-guns and mortars.

BONA (French *Bône*), a seaport town of Algeria, in the Province of Constantine, 220 miles west of Tunis. Since the occupation of Bona by the French in 1832, the town has been much improved, and the exposed roadstead has been made into a fair harbor. There are iron and copper mines near Bona. Pop. (1890), 24,291.

BONA DEA (the good goddess), a mysterious Italian goddess of fertility, who is variously described as the wife, sister, or daughter of Faunus. She was worshiped at Rome from the most ancient times, but only by women, even her name being concealed from men.

BONA FIDES, a Latin expression signifying good faith, enters as a legal doctrine largely into the consideration of matters of agreement, contract, damage, trusts, and other departments of law; and in all of them it requires the absence of fraud or unfair dealing. It is the foundation of many just and enlightened maxims in the Roman jurisprudence.

BONALD, LOUIS GABRIEL AMBROISE, VICOMTE DE, philosopher and politician, was born at Monna, near Milhaud, in Rouergue, France, on October 2, 1754. He served for some years in the king's musketeers, and after his marriage was made mayor of his native place. Dissatisfied with the revolutionary principles then being acted upon, he emigrated in 1791, and joined the army of the Prince of Condé. Soon afterward he settled, with his family, at Heidelberg, where he wrote his first important work, *Théorie du pouvoir politique et religieux dans la Société civile*, in which his conservatism and reactionary views are fully expounded and illustrated. He took no part in public affairs after 1830, but retired to his country-seat at Monna, where he died on November 23, 1840.

BONANZA (Spanish, a fair wind, prosperity), a term originally applied in the mining territories of the United States to the discovery of a rich vein or "pocket"; a mine was said to be *in Bonanza* when producing a profitable ore. It has since been used colloquially of successful enterprises generally, in the sense of a "mine of wealth."

BONAPARTE, or, as it was originally spelled, BUONAPARTE, the name of the Italian family from whom the great Napoleon was descended. The father of the first emperor, Carlo Maria Bonaparte, was born at Ajaccio in 1746. He was a lawyer by profession, and took a vigorous part in Paoli's insurrection. In 1781, he was one of the members of the council of Corsican nobility; he also held the post of assessor of Ajaccio. In 1785 he died of cancer in the stomach at Montpellier, whither he had removed for his health. His wife, Letizia Ramolino, born in 1750, was celebrated for her majestic beauty and resolute courage. She accompanied her husband through the campaigns with Paoli, and in 1793 emigrated with her family to Marseilles, where for a time she lived in great penury. After her son was made first consul she removed to Paris; and, on the establishment of the empire, received the title of Madame Mére. She cared little for display; and her frugal style of living frequently displeased Napoleon. After the battle of Waterloo she took up her abode in Rome, where she continued to reside till her death in 1836. Of her large family of thirteen, eight survived their father and have become known in history. These in order of age are:

I. JOSEPH, the eldest son, born on January 7, 1768. He was placed, along with his younger brother Napoleon, at the school of Autun, from which the latter was soon afterward withdrawn. On completing his

education he contemplated a military career, but, on the death of his father, devoted himself to the care of his family. He studied law at the University of Pisa, and was received as an advocate in Corsica. He and his brother eagerly embraced the revolutionary side; and in 1793 the whole family were compelled to emigrate to Marseilles. In the following year he married Mlle. Clary, daughter of a rich merchant, whose younger sister afterward became the wife of Bernadotte. Two years later, when Napoleon was made general of the army of Italy, Joseph accompanied him as commissary-general. In 1797 he was elected to the Council of Five Hundred, and sent as ambassador to the Pope. On the establishment of the consulate he was made councilor of state, and by his suave and courteous manners rendered good diplomatic service. He conducted the negotiations with the United States in 1800, concluded the Treaty of Luneville in 1801, and was similarly engaged at the Treaty of Amiens in 1802. In 1805, after refusing various posts offered by his brother, he was left in charge of the government during the war in Germany. In the following year, however, he was compelled to take command of the army of Naples, and soon after he set out it was announced to him that he must assume the throne of that kingdom.

The Neapolitans soon discovered that their king was but a mouthpiece, and learned to despise him; and his rule was disturbed by constant insurrections. In 1808 Napoleon wrote to him that the Spanish throne was vacant, and that he had destined it for him. Joseph was obliged to accept; and for a short time matters seemed sufficiently smooth. But the smoldering discontent soon broke out into open flame over the land, and the Spaniards, assisted by the British and Portuguese, made a struggle for freedom. Thrice the new king was compelled to fly from Madrid, and it was with difficulty that he escaped after the final battle of Vittoria. During the great struggle of 1814 Joseph acted as lieutenant-general of the empire, and as adviser-in-chief to the empress-regent. While Napoleon was in Elba Joseph took up his residence in Switzerland; but he rejoined his brother in Paris during the Hundred Days. After the abdication he had an interview with the fallen emperor at the Isle of Aix, and generously offered to give up to him his own means of escape. The proposal not being accepted, he sailed for America and settled near Philadelphia, at Point Breeze, on the banks of the Delaware. Here he lived for some years under the title of Comte de Survilliers, endeared to the inhabitants by his liberality and gracious manners. After the July revolution of 1830 he wrote a long and eloquent letter, advocating the claims of his nephew, the duke of Reichstadt, to the French throne. Two years later he visited England, where he resided for some years, and to which he paid a second visit in 1839. In 1841 he was permitted to enter Genoa and Florence, where his wife resided. In the latter city he died on Ju'y 28, 1844.

II. NAPOLEON, born 1769. See NAPOLEON I.

III. LUCIEN, Prince of Canino, was born at Ajaccio, March 21, 1775. He was educated at Autun, Brienne and Aix, and rejoined his family in Corsica in 1792. Already imbued with the principles of the Revolution, he turned against Paoli when the latter declared against France, and was spokesman of the deputation sent to Marseilles to solicit aid from the republic. He did not return to Corsica, as the whole Bonaparte family soon afterward emigrated to France, and he obtained employment in the commissariat at Saint Maximin. Here he married Mlle. Christine Boyer, of poor but good family, and began to take the leading part in the popular meetings of the place. He was elected president of the Republican committee of the town, and, by his moderation and firmness, prevented excesses such as occurred in other parts of the country. After the fall of Robespierre he was in danger of being taken for one of his partisans, but resolutely maintained his ground, and declined to take refuge in flight. In 1795 he left Saint Maximin for Saint Chamans, where he had been appointed inspector of military stores, and where he was arrested and confined for six months. His release was obtained through his brother's influence with Barras, and he retired for a time to Marseilles. In 1795 he was made commissary to the army of the north, and spent some time at Brussels and in Holland; but his heart was in the political warfare of Paris, and in 1796 he obtained permission to resign. He had a short interview with Napoleon in Italy, and spent the two succeeding years in Corsica. In 1798 he was elected deputy to the Council of Five Hundred, and at once set off for Paris. He was an ardent adherent of the constitution of 1795 (the year III.), and sympathized rather with the Abbé Sieyès than with the extreme party. His abilities were soon recognized; he was an able and powerful speaker, with a calm courage that defied all popular tumult. His house, also, was the resort of the best literary society of Paris. It gradually became clear to him that the power of the Directory was divided and broken, and that a *coup d'état* was required to prevent another sanguinary revolution. There was but one man in a position to effect this change — his brother Napoleon, whose unexpected arrival on October 10, 1799, was received with the utmost joy. A week after, Lucien was elected president of the Council of Five Hundred. Careful preparations were made, and on the 18th Brumaire the principles of the Revolution ceased to have a living power. On that day the coolness, promptitude and courage of Lucien alone preserved Napoleon from destruction. He took part in preparing the new scheme of government, and was appointed to succeed La Place as minister of the interior. His competency for the post was undoubted, but differences with his brother had already begun, and these were fomented by the treacherous Fouché; so that, in little more than a year he gave up office, and was sent as ambassador to Spain. He succeeded in his negotiations, though not entirely to Napoleon's satisfaction, and after his return to Paris took an active part in the arrangement of the Concordat and the establishment of the Legion of Honor.

After the consulate had been settled on Napoleon for life Lucien was made a senator, and received the estate of Seppelsdorf. But his marriage in 1803 with the beautiful Madame Jouberthon was displeasing to the First Consul, who already contemplated royal alliances for his brothers. Lucien, who did not approve the project of making the consulate hereditary, thought it advisable to leave France, and settled first at Milan, but finally at Rome. He lived in great magnificence, indulging his literary tastes, and apparently indifferent to the growth of the imperial power. After the peace of Tilsit Napoleon had an interview with him, and offered him a kingdom provided he would look upon it as in all respects a province of the empire. Lucien refused, and his brother then gave him to understand that he must quit the Continent. He withdrew from Rome and settled on the estate of Canino, whence he took his title of prince, but soon came the resolution of sailing for America. He embarked on August 1, 1810, was captured by an English cruiser, and was carried to England, where for some time he was kept under surveillance in Ludlow Castle. He afterward purchased a house near London, in which he resided until 1814, when he returned to Rome. In two letters to Elba he offered assistance to his brother; and during the Hundred Days

he sat in the Chamber of Peers as a French prince. After Waterloo he advised Napoleon to dissolve the assemblies and proclaim himself dictator, and it was on his recommendation that the second abdication was made in favor of Napoleon's son. All his efforts to obtain a regency were unavailing, and soon after parting from his brother on June 29, he left France. Arrested at Turin he was kept for three months in confinement before he was suffered to settle again at Rome. He passed the remainder of his life in Italy, surrounded by his family and busily engaged in literary and antiquarian labors. The grounds around Canino proved unusually rich in gems and Etruscan curiosities, of which a valuable cabinet was formed. He died at Viterbo, June 29, 1840.

IV. MARIE ANNE ELISA, born at Ajaccio, on January 3, 1777. She married in 1797 Felix Bacciochi, captain of infantry, who was poor but of good family. In 1805 Lucca and Piombino were erected into a principality for her, and she gave such proofs of administrative ability as to be named the Semiramis of Lucca. After the fall of Napoleon she lived for some time at Brunn, and later at Santo Andrea, near Trieste, where she died in 1820.

V. LOUIS, the father of Napoleon III., was born at Ajaccio in 1778. He received the greater part of his military education at the school of Chalons, and accompanied his brother throughout the famous Italian campaigns. He distinguished himself in various engagements, particularly at the battle of Arcola, but manifested little enthusiasm for a military career. He took part in the Egyptian expedition, and was sent back from Cairo to report the state of affairs and solicit reënforcements. In 1802, with the greatest reluctance, for he was enamored of another, he was prevailed on to marry Hortense Beauharnais, Josephine's daughter. The forced marriage proved exceedingly unhappy. After the consulate he became general, and in 1804 was raised to the dignity of prince. He was commissioned to organize the army of the north in 1805, and performed his task to the complete satisfaction of Napoleon. Soon afterward the States-general of Holland sent a deputation to the emperor praying that one of his brothers might be made their king. Louis, who was selected for this dignity, consented with considerable reluctance, and was proclaimed on June 6, 1806.

At the meeting of the two brothers in December, 1809, there was a bitter quarrel; and Louis, who felt that his country was looked on as merely a province of the empire, was detained as a prisoner, while Holland was overrun with French troops. Before obtaining his release he was compelled to sign a new treaty with the emperor which greatly curtailed his power. Matters were not improved after his return to Amsterdam, and on July 1, 1810, he abdicated at Haarlem in favor of his elder son Napoleon Louis. He then set out for Töplitz, where he resided under the assumed title of Comte de St. Leu. His kingdom was soon united to the empire, and no attention was paid to the arrangement he had made. After the Russian campaign he offered his services to his brother, and tried again, but in vain, to resume his power in Holland. In 1815 he instituted proceedings against his wife to obtain from her the custody of his elder son, and gained his cause. He refused to take any part in the Hundred Days, and settled in Rome, where he passed most of the remainder of life. His wife was reunited to him, but the death of his elder son, in 1831, was a blow from which he never recovered. The unfortunate attempts of Louis Napoleon at Strasburg and Boulogne also affected him deeply; and he in vain attempted to procure his son's liberation from the prison of Ham. After the escape of the prince his father earnestly desired to see him, but passports for Italy could not be granted. The disappointment was too much for Louis, who was seized with apoplexy, and died on July 25, 1846.

VI. MARIE PAULINE, born at Ajaccio, 1780. In 1801 she was married to General Leclerc, whom she accompanied in the same year to St. Domingo. Her husband died there of yellow fever in 1802, and she returned to France. On August 26, 1803, she was married, through her brother's influence, to Camillo, Prince Borghese, a wealthy Italian nobleman. It was not long before they separated; and Pauline, with the rank of duchess of Guastalla, lived in a style of easy magnificence. She was good tempered, fond of art and liberal. She died June 9, 1825.

VII. MARIE ANNONCIADE CAROLINE, born at Ajaccio, 1782. In 1800 she was married to Murat; in 1806 she became grand-duchess of Berg and of Cleves, and in 1808 queen of Naples. In 1815, after the flight of her husband, she was compelled to leave the capital, and surrendered to the Austrians. She was for a short time imprisoned at Trieste, and was then permitted to reside at Haimburg, near Vienna. She afterward obtained leave to take up her abode at Trieste with her sister Elisa. In 1838 she obtained a pension from the French Government, but did not enjoy it long. She died on May 18, 1839.

VIII. JÉRÔME, the youngest brother of Napoleon, was born at Ajaccio in 1784. In 1800 he entered the navy and served in the Mediterranean, and under Villaret Joyeuse in the West Indies. In 1802–3 he was recalled; but the port in which his vessel lay being blockaded by the English cruisers, he made his way to Boston, whence he intended to take a passage to France. He was well received in the United States, and fell violently in love with a beautiful young American, Miss Elizabeth Paterson, daughter of a Baltimore merchant, whom he married on December 24, 1803. He remained in America till 1805. Meanwhile Napoleon, excessively displeased, had passed a decree annulling the marriage, and declined to allow the lady to enter France. Jérôme's submission was rewarded by high command in the navy, in which he showed himself a competent officer. In 1806 he was made brigadier-general in the army, and distinguished himself in Silesia. On July 8th of the following year he was made king of Westphalia; and on August 22d he married the daughter of Frederick, king of Würtemberg. He accompanied Napoleon on the Russian campaign, but was disgraced for apparent want of success in some engagement, and retired to his kingdom. After his first abdication he lived for some time at Trieste, but at once rejoined the emperor in 1815, and took a conspicuous part in the hurried events of the Hundred Days. After Waterloo and the second abdication, Jérôme retired to the kingdom of of his father-in-law, where he lived in a species of imprisonment. He moved afterward to Trieste, Rome, Florence and Lausanne, and in 1847 was permitted to visit Paris. In the following year he was made governor of the Invalides, and in 1850 marshal of France. In 1852 he was president of the senate, but after that time he took no active part in politics. He died on June 24, 1860.

BONAR, REV. DR. HORATIUS, Free Church minister and popular hymn-writer, was born in Edinburgh, December 19, 1808, and educated at the High School and University there. He was ordained to the ministry at Kelso in 1837, where he remained for nearly thirty years, when he was translated to Chalmers Memorial Free Church, Edinburgh. For a time editor of the *Christian Treasury*, *Presbyterian Review*, and *Quarterly Journal of Phrophecy*, he has published besides

more than twenty volumes of a religious character; but is best known as the author of *Hymns of Faith and Hope* (three series, 1857–66), selections from which have found their way into all collections for church use.

BONAVENTURA, JOHN OF FIDANZA, or FIDENZA, more commonly known as St. Bonaventura, was born at Bagnarea in the Papal States, in the year 1221. He was at an early age destined by his mother for the church, and is said to have received his cognomen of Bonaventura from St. Francis of Assisi, who performed on him a miraculous cure. He entered the Franciscan order in his twenty-second year, and is said to have studied at Paris under Alexander of Hales. This does not seem very probable, but he certainly studied under Alexander's successor, John of Rochelle, to whose chair he succeeded in 1253. Three years before that period his fame had gained for him permission to read upon the *Sentences*, and in 1255 he received the degree of doctor. Bonaventura was instrumental in procuring the election of Gregory X., who rewarded him with the titles of cardinal and bishop of Albano, and insisted on his presence at the great Council of Lyons in the year 1274. At this meeting he died.

BONCHAMP, CHARLES, MARQUIS DE, one of the bravest of the Vendean leaders, was born at the château of Jouverteil, in Anjou, May 10, 1760. He served as a volunteer in the American Revolutionary War, and was a captain in the French army at the outbreak of the French Revolution. A strong royalist, he naturally disliked the revolution, and consequently lived in retirement until chosen leader of the Anjou insurgents. In conjunction with La Rochejacquelein and Cathelineau he fought with great bravery and frequent success, but his superior knowledge of military tactics was not sufficiently made use of by the insurgent army. In the sanguinary encounter at Cholet, October 17, 1793, Bonchamp received a fatal shot in the breast, and when his followers vowed to avenge his death on 5,000 republican prisoners, the dying hero exclaimed: "Spare your prisoners. I command it." This last command was obeyed.

BOND, in Law, is an instrument on stamped paper, by which the party granting it becomes bound to pay a sum of money, or perform any act or duty, according to the terms of agreement. In England and the United States, a bond is said to be an instrument under seal, whereby one person becomes bound to another for the payment of a sum of money, or for the performance of any other act or thing. The person who is thus bound is called the obligor, and he to whom the bond is given, the obligee; and this obligation may be either by or to one or several persons. The bond may be unconditional simply for the payment of money, or it may be accompanied with a condition, the performance of which is secured by a penalty; but in any event, the debt created by a bond is a specialty debt, which, however, has now no preference over simple debts, the only distinction being that a specialty debt takes twenty instead of six years to prescribe. In the United States, where the law is based on that of England, the period of prescription varies from six years for simple contracts, to ten, fifteen or twenty years for bonds in some of the States.

BOND, EDWARD AUGUSTUS, born at Hanwell, December 31, 1815, entered the British Museum in 1838, became keeper of the MSS., and in 1878 was appointed principal librarian. He has published catalogues of MSS. and fac-similes of Anglo-Saxon charters in the museum; and among other works, he has edited the *Statutes of Oxford University* (1853), Fletcher's *Russe Commonwealth* and Horsey's *Travels in Russia in the Sixteenth Century* (1856) for the Hakluyt Society, *Speeches in the Trial of Warren Hastings* (4 vols 1859-61), and *Chronica Monasterii de Melsa* of Meaux (Rolls Ser. 3 vols. 1866–68). He has also helped to edit the *Fac-similes* published by the Palæographic Society, of which he is a founder and president. He was made LL.D. of Cambridge in 1879, and a Companion of the Bath in 1885.

BOND, WILLIAM CRANCH, an American astronomer, born September 19, 1789, at Portland, Me., became a watchmaker, and erected one of the first private observatories in the United States. In 1838 he accompanied the exploring expedition sent by government to the South Sea, and in 1840 he became director of the observatory at Harvard University. Here he and his son, George Phillips Bond (1826–65), discovered a satellite of Neptune and the eighth satellite of Saturn. He died January 29, 1859.

BONDI, CLEMENTE, an Italian poet, was born June 27, 1742, at Mezzano, in Parma. He was educated by the Jesuits, and when still very young, was appointed to deliver lectures on rhetoric in the Royal Convent at Parma. Here he produced his first work, *Giornata Villereccia* (1773), a comic picture of the rural pleasures of the brotherhood. For having celebrated in verse the abolition of the Jesuit order, he was compelled to fly to the Tyrol; and after his return he lived at Venice, at Mantua, and at Milan, where he found a patron in the Austrian Archduke Ferdinand, who appointed him his librarian at Brünn. Later he lived at Vienna, where he died, June 20, 1821. His poems are lyrical, descriptive, satirical, and elegiac, written in pure style and graceful verse.

BONDU, a kingdom of Western Africa, lying to the west of Bambouk, from which it is separated by the River Faleme. The country is an elevated plateau, with hills in the southern and central parts.

BONE is the hard material of the skeleton of mammalian animals, reptiles, birds and certain fishes. When the different bones of the skeleton are connected together they form a framework which affords support to soft parts, and protects delicate organs from injury, while at the same time preserving the shape of the body. Further, the bones, being movably joined to each other, and being acted upon by the attached muscles, become a series of levers capable of executing various movements, and thus, in the case of the bones of the lower extremity, they are the passive instruments of locomotion. In color, bone is white, but in the living body it has in addition a pink and slightly bluish tint. Besides being *hard*, it possesses a certain amount of *toughness* and *elasticity*, properties which are well marked in the ribs and clavicle. It consists of an animal and an earthy part intimately combined together. The uses to which a bone may be put are various. In the cooking of soups, bones form a constant ingredient, and become useful in supplying gelatine, which gives a *body* to the soup it would not otherwise possess. Bone is largely used in making the handles of small brushes, table-knives and forks, and pen-knives, and in the manufacture of combs. Our forefathers, before the metals were known, fashioned fish-hooks out of bone, and used the spines in the tail and back fin of certain fishes for pointing arrows. These uses of bone, coupled with the employment of the serrated teeth of sharks as a war-weapon, are still practiced by many uncivilized tribes. Bone is likewise serviceable in the arts in yielding bone ash, bone-black, bone-dust, dissolved bones, phosphorus, superphosphates, also certain oils and fats, which are employed in forming lampblack, and in the manufacture of soap. Bone may suffer from atrophy, hypertrophy, or degeneration, often from constitutional affections due to Scrofula or Syphilis; Caries and Necrosis are specific

bone diseases; inflammation of the bone causes Ostitis; of the periosteum, Periostitis; of the medulla, Osteonyelitis.

BÔNE, Bona, Bounah, Beled-el-A'Neb (*the town of jujubes*), or Annaba, a fortified town and seaport of Algeria, in the province of Constantine, eighty-five miles northeast of the city of that name, on a bay of the same name at the mouth of the Seybouse. Population in 1888, 16,196, about half of whom are European.

BONE, Henry, R. A., the most eminent enamel painter of his time in Great Britain, was born at Truro in 1755. He was much employed by London jewelers for small designs in enamel before his merits as an artist were well known to the public. He died in 1834.

BONE-ASH, or Bone-earth, is obtained by the complete combustion of bones in an open furnace, when the oxygen of the air burns away the organic matter or gelatine, and leaves the earthy constituents as a white friable mass, the size of the original bone, but readily reducible to the condition of coarse powder which is bone-ash. A very large quantity of bone-ash is exported from South America to other countries, especially Britain. The used-up bone-black of the sugar-refiner is also employed as a source of bone-ash, by being heated in a furnace exposed to the air. Bone-ash of good quality contains about 80 per cent. of phosphate of lime, and 20 per cent. of carbonate of lime, phosphate of magnesia, soda, and chloride of sodium (common salt); but it is occasionally found mixed with sand, especially that procured from South America. Bone-ash is employed to some extent as a source of phosphorus, and in the making of cupels for the process of assaying; but its most extensive use is in the manufacture of artificial manures, such as dissolved bones and superphosphates.

BONER, Ulrich, one of the oldest German fabulists, was a preaching friar of Bern, and is frequently mentioned in documents of the years 1324–49. His collection of a hundred fables was entitled *Der Edelstein*, and was first printed, with woodcuts, at Bamberg, in 1461. Only two copies now exist. Breitinger published a complete edition of the work at Zurich in 1757 under the title of *Fabeln aus den Zeiten der Minnesinger*, which supplied materials to Lessing for his studies on the philosophy of fable. A more complete edition was published in 1844 by Franz Pfeiffer as vol. IV. of *Dichtungen des Deutschen Mittelalters*.

BONESETTERS are a class of men who often possess a considerable local reputation for success in the treatment of injuries to the limbs, especially in cases where stiffness and pain have persisted long after an accident. They are usually uneducated men; and the knowledge they possess has been handed down by oral tradition, often for many generations and in the same family. Their chief method in the cases alluded to consists in effecting a sudden forcible movement of the effected part. As they are ignorant of anatomy, and of the signs of disease, they sometimes do immense harm by applying their method to unsuitable cases. But without doubt they have sometimes effected a cure where regular practitioners have failed. A detailed account of their methods, etc., was given to the medical profession by Dr. Wharton Hood in a book *On Bonesetting* (1871).

BONFIGLI, Benedetto, an Italian painter, whose reputation is not equal to his importance. One of the most remarkable circumstances in the history of art in the peninsula is the sudden advance made by the school of the Umbrian province; which, until near the middle of the fifteenth century, was far behind those of Florence and the North, but which, in the person of Perugino and some of his followers, came into the very first rank.

BONFIRE, a fire kindled in celebration of some event of public interest, usually in an open conspicuous place, as the top of a hill, or the center of a village-green, but applied also to any great blazing fire of whatever material. Such fires were especially lighted on certain anniversaries, as the eves of St. John and St. Peter, and their origin in England may be traced to pre-Christian times. The Scotch form *banefire* best shows the origin of the word — a *fire* for burning *bones*, and Dr. Murray notes that for the annual midsummer "banefire" or "bonfire" in the burgh of Hawick old bones were regularly collected and stored up down to about 1800.

BONGO, a people of Central Africa, who inhabit the country which is watered by five important tributaries of the Bahr-el-Ghazel. The Bongo are a brachycephalous race of medium height, with a red-brown complexion and black hair.

BONHAM, the county seat of Fannin county, Tex., is situated on Bois d'Arc creek, twenty-seven miles east of Sherman. It contains a bank, flour mills and manufactures of wagons and harness. Population, 5,000.

BONI, a kingdom or confederation in the island of Celebes, stretching along a part of the western shores of a great bay of the same name, which indents the south side of the island to the depth of nearly 180 miles. It has an area of 450 square miles at most, and its present population is estimated at about 200,000.

BONIFACE, St., the Apostle of Germany, whose real name was Winifrid, was born at Crediton, in Devonshire, England, in 680. In 715 he set out on a missionary expedition to Friesland, but his efforts were frustrated by the war then being carried on between Charles Martel and Radbod, king of the Frisians. For five years he labored in Thuringia, Hessia, and Friesland, and then returned to Rome to report his success. He again set out for Germany, and, armed with full powers from the Pope, baptized thousands of the heathens, and brought back to the Church of Rome many Christians who had in a measure separated themselves from the fold. After another visit to Rome in 738 he proceeded to Bavaria, and founded there the bishoprics of Salzburg, Regensburg (Ratisbon), Freisingen and Passau. He had never relinquished his hope of converting the Frisians, and in 755 he set out with a small retinue for Friesland. He baptized a great number, and summoned a general meeting for confirmation at a place not far from Dokkum, between Franeker and Groningen. Instead of his converts, however, there appeared a mob of armed pagans, who fell upon the aged archbishop and slew him.

BONIFACE, the name of nine popes.

Boniface I., bishop of Rome from 418 to 422, was a contemporary of St. Augustine, who dedicated to him some of his works.

Boniface II., 530–532, was by birth a Goth, and owed his election to the influence of the Gothic king. He had for some time an anti-pope, Dioscurus.

Boniface III., February 15 to November 12, 606, obtained from Phocas recognition of the headship of the Church at Rome.

Boniface IV., 608–615, received from Phocas the Pantheon at Rome, which was converted into a Christian church.

Boniface V., 619–625, did much for the Christianizing of England.

Boniface VI. was elected in April, 897, and died fifteen days afterward.

Boniface VII., who attained the papal chair in 974, is sometimes styled an anti-pope. He is supposed to have put his predecessor, Benedict VI., to death. A popular tumult compelled him to flee to Constantino-

ple; but he carried with him vast treasure, and in 948 he returned, and removed, by murder, John XIV., who had been elected in his room. He died in 985 or 986.

BONIFACE VIII., Benedict Cajetan, a man of great ability, was elected in 1294, Celestine V. having been persuaded to resign. He meddled incessantly in foreign affairs, and put forward the strongest claims to temporal as well as spiritual supremacy. He was about to lay all France under an interdict when he was seized at Agnani by a party of horsemen under Nogaret, an agent of Philip, and Sciarra Colonna. After three days' captivity he was rescued by the townspeople, but the agitation he had undergone caused his death on October 11, 1303.

BONIFACE IX. was elected in 1390 and died in 1404. During this time the so-called Clement V. continued to hold state as pope in Avignon.

BONIFACIO, a town at the southern extremity of Corsica, in the arrondissement of Sartene, near the strait to which it gives its name. It is one of the most picturesque and interesting places in the island, its white houses being built on the top of a white calcareous rock that can only be reached on foot or on horseback. Population (1890), 4,000.

BONINGTON, RICHARD PARKES, painter in oil and water-colors, was born at Arnold, near Nottingham, on October 25, 1801. His father, who had been governor of Nottingham prison, after many vicissitudes settled at Calais, where the son was placed under Louis Francia, the water-color painter; and he afterward studied in Paris — in the Louvre, at the Institute, and under Baron Gros. His water-colors sold rapidly. In 1822 he began to exhibit in the Salon, and received a premium from the Société des Amis des Arts for his views of Havre and Lillebonne; and two years later he was awarded a medal at the Salon, when Constable and Copley Fielding were similarly decorated. He died in London, September 23, 1828.

BONITO, a name common to several fishes of the mackerel family (Scombridæ). — (1) One of these, *Thynnus pelamys*, sometimes called the stripe-bellied Tunny, and of the same genus with the Tunny, is well known to sailors as an inhabitant of the tropical parts of the Atlantic and Indian oceans, and as one of the fishes most frequently seen pursuing the flying fish. — (2) The Mediterranean Bonito (*Pelamys sarda*) is closely allied. It has the same blue back and dark transverse bars reaching from the dorsal ridge to the lateral line. It is plentiful in the Black Sea, and has been found in the North Sea. — (3) The Plain Bonito (*Auxis vulgaris* or *A. rochei*), found in the Mediterranean, may be distinguished at once from both of these by its more uniform blue color, without stripes or bands, and by the widely separated dorsal fins. — The Sucking-fish (*Echeneis remora*), credited with retarding ships, the gorgeous John Dory (*Zeus faber*), the beautiful "Dolphins" (*Coryphæna*), are allied genera of the same family.

BONN, the chief town of a circle of Rhenish Prussia, situated on the left bank of the Rhine, about sixteen miles by rail south-southeast of Cologne. The town also possesses a "Rathhaus," of modern erection, a courthouse, a hospital, a gymnasium, and a theater. By far the finest of its buildings, however, is its famous university, which occupies the larger part of the southern frontage of the town. The present establishment only dates from 1818, and owes its existence to the king of Prussia; but as early as 1786 the academy which had been founded about nine years before was raised by Archbishop Maximilian Frederick of Cologne to the rank of a university, and continued to exercise its functions till 1794, when it was dissolved by the last elector. The building now occupied was originally the electoral palace, constructed about 1717 out of the materials of the old fortifications. It was remodeled after the town came into Prussian possession. Population (1890), 28,000.

BONNAT, LÉON JOSEPH FLORENTIN, was born at Bayonne (1833), and studied at Madrid under Frederic Madrazo, and in Paris under Léon Cogniet. He gained the second *Grand Prix de Rome*, and, aided by his friends, went to Italy in 1858, where he resided for four years. He was first brought into notice by his *Adam and Eve finding the Body of Abel* (1860), now in the gallery at Lille; and his *Pasqua Maria* (1863) was much praised. He devoted himself to Italian *genre* pictures of moderate size, varied by such religious subjects as *The Assumption* (1869), and the terribly realistic *Christ on the Cross* (1874), commissioned for the Palais de Justice, Paris. More recently his works have dealt with Eastern life, and he has produced several remarkable portraits, among the rest those of M. Thiers and Victor Hugo.

BONNER, or BONER, EDMUND, an English prelate, notorious for his persecutions of the Protestants during the reign of Queen Mary, was born at Hanley in Worcestershire, about the end of the fifteenth century. After the death of Wolsey he adopted Lutheran sentiments, and insinuated himself into the favor of Henry VIII., who made him one of his chaplains, and employed him in several embassies abroad. In 1532 he was sent to Rome with Sir Edward Carne, to answer for the king in regard to the divorce of Queen Catharine. In 1533, being again dispatched to Pope Clement VII., then at Marseilles, to intimate Henry's appeal to a future general counsel from the sentence pronounced against his divorce, he threatened the Pope with so much resolution, that his holiness talked of having him burned alive or thrown into a caldron of melted lead. Clement did not foresee that the man whom he had thus menaced with the flames was destined to burn heretics in England in support of the very faith which, under Henry, he had lent his aid to overthrow. In 1538, being then ambassador at the court of France, he was nominated bishop of Hereford; but before consecration, he was translated to the see of London, and was enthroned in April, 1540. When Henry VIII. died in 1547, Bonner was ambassador at the court of the Emperor Charles V. During Henry's reign he was constantly zealous in his opposition to the Pope, and favored the Reformation in obedience to the king, who exacted rigid compliance with all his caprices. On the accession of Edward, however, Bonner refused to take the oath of supremacy, and was committed to the Fleet, where he remained until he promised obedience to the laws. After his release he assented to the Reformation, but with such manifest reluctance, that he was twice reprimanded by the privy council, and in 1549 was, after a long trial, committed to the Marshalsea, and deprived of his bishopric, to which, however, he was restored on the accession of Mary; and soon afterward he was appointed, in place of Cranmer, vicegerent and president of the Convocation. From this time he became the chief instrument of persecution, and is said to have condemned no less than 200 Protestants to the flames in the space of three years. On the accession of Elizabeth he appeared with the rest of the bishops at Highgate, to congratulate her; but the queen refused to permit him to kiss her hand. Having, in the second year of her reign, refused to take the oath of supremacy, he was again committed to the Marshalsea, where he died, September 5, 1569, after a confinement of ten years.

BONNET, a covering for the head, of which there are many varieties. The French, from whom we have the

word, apply it as we do to male as well as female headdress. The *bonnet rouge*, or "cap of liberty," of the Revolution, was shaped like a man's night-cap (*bonnet de nuit*). A felt cap of this shape, such as was worn by the Phrygians, was among the Romans the emblem of liberty, and was assumed by slaves when manumitted. The English bonnet of former times was made of cloth, silk or velvet, more or less ornamented. It was generally superseded by the hat in the early part of the sixteenth century; but in Scotland, bonnets were commonly worn for two centuries later. The genuine old bonnet of the Lowland Scottish peasantry was of a broad, round, flat shape, overshadowing the face and neck, and of a dark blue color, excepting a red tuft on the top. The fabric was thick, milled woolen, without seam or lining, and exceedingly durable.

Ladies' Bonnets.—Those made of the fine stunted wheat straw, grown for the purpose in Tuscany, and called Leghorn and Tuscan bonnets, are everywhere known to the female world. These have formed an important trade in that province for nearly two centuries. Split straw plait and bonnets formed of it are made on a large scale at Luton and Dunstable, England. Willow chip bonnets are made extensively in the neighborhood of Modena. Bonnets, partly or entirely of richer materials, such as horsehair, crape, velvet and satin, with trimmings of feathers, lace and artificial flowers, are made on a great scale in Paris. There are large manufactories in the Eastern and Northwestern States, particularly Massachusetts and Wisconsin.

BONNET, CHARLES, an eminent naturalist and philosophical writer, was born at Geneva on March 13, 1720, and died in 1793. In 1740 Bonnet communicated to the Academy of Sciences a paper containing a series of experiments establishing what is now termed parthenogenesis in *aphides* or tree-lice, which obtained for him the honor of being admitted a corresponding member of the academy. In 1741 he instituted a set of experiments respecting the production of worms by fission; and in the following year he discovered that the respiration of caterpillars and butterflies is performed by pores, to which the name of *stigmata* has since been given. In 1743 he was admitted a fellow of the Royal Society; and in the same year he became a doctor of laws. His first published work appeared in 1745, entitled *Traité d'Insectologie*, in which were collected his various discoveries regarding insects, along with a preface on the development of germs and the scale of organized beings. Botany, particularly the leaves of plants, next attracted the attention of Bonnet; and after several years of diligent study, rendered irksome by the increasing weakness of his eyesight, he published, in 1754, one of the most original and interesting of his works, *Traité de l'usage des feuilles*, in which, among other things, he advances many considerations tending to show that plants are endowed with powers of sensation and discernment. In 1754 his *Essai de Psychologie* was published anonymously in London. This was followed in 1760 by the *Essai analytique sur les facultés de l'âme*, in which he develops his views regarding the physiological conditions of mental activity. He returned to physical science, but to the speculative side of it, in his *Considérations sur les corps organisés*, Amsterdam, 1762. All the most interesting and well-ascertained facts respecting the origin, development and reproduction of organized bodies, to refute the theory of *epigenesis*, and to explain and defend the doctrine of preëxistent germs. In his *Contemplation de la Nature*, which next appeared (1764–65), one of his most popular and delightful works, he sets forth, in eloquent language, the theory that all the beings in nature form a gradual scale, rising from lowest to highest, without any break in its continuity. His last important work is entitled *Palingénesie Philosophique* (Geneva, 1769); in it he treats of the past and future of living beings, and supports the idea of the survival of all animals, and the perfecting of their faculties in a future state.

BONNE TERRE, an old French settlement in St François County, Missouri, with a population of about 5,100.

BONNEVAL, CLAUDE ALEXANDRE, COMTE DE, a celebrated French adventurer, known also as Achmet Pasha, was the descendant of an old family of Limousin. He was born on July 14, 1675, at Coussac, and at the age of thirteen he joined the Royal Marine Corps. After three years he entered the Guards whence he was transferred to the infantry regiment of Latour. He served in the Italian campaigns under Catinat, Villeroi, and Vendôme, and in the Netherlands under Luxembourg, giving proofs of indomitable courage and great military ability. His insolent bearing toward Chamillard, minister of war, was made matter for a court-martial. He was condemned to death, but saved himself by flight to Germany. Through the influence of Prince Eugene he obtained a command in the Austrian army, and fought with great bravery and distinction against France, and afterward against Turkey. He was severely wounded at Petrewardein, and after his recovery paid a visit to Paris. The proceedings against him in France had been allowed to drop, and he married a daughter of Marshal de Biron, whom, however, he deserted after a week or two. He returned again to the Austrian army, and fought with distinction at Belgrade. His ungovernable temper led him into a quarrel with the Marquis de Prié, governor of the Netherlands, who answered his challenge by placing him in confinement. A court-martial was again held upon him, and he was condemned to death; but the emperer commuted the sentence to one year's imprisonment and banishment from the imperial domains. Bonneval, soon after his release, offered his services to the Turkish Government, professed the Mohammedan faith, and took the name of Achmet. He was made a pasha of three tails and appointed to the command of the artillery. He rendered valuable services to the Sultan in his war with Russia, and with the famous Kouli Khan. As a reward he received the governorship of Chios, but soon fell under the suspicion of the Porte, and was banished for a time to the shores of the Black Sea. He was meditating a return to Europe and Christianity when he died at Constantinople, March 27, 1747.

BONNIVARD, FRANÇOIS DE, the "prisoner of Chillon," was born at Seyssel in 1496. Educated at Turin, he succeeded, in 1510, to the priory of St. Victor, just outside the walls of Geneva, his uncle having resigned in his favor. Of ardent republican principles he espoused the cause of the Genevese against the duke of Savoy, who was seeking to assert the seignorial rights that had just been ceded to him by the prince bishop. In 1519, on the entrance of the duke into Geneva, Bonnivard was arrested and imprisoned for two years at Grolée. On his liberation he returned to his priory. In 1530, when traveling in the service of the republic, he was unfortunate enough to fall into the hands of robbers, who delivered him over once more to the duke of Savoy. His imprisonment in the castle of Chillon, which has been celebrated in Byron's poem, lasted till 1536, when he was liberated by the combined forces of the Bernese and Genevese. On his return to Geneva, which had now completely emancipated itself, he received the honors and rewards that were due to his patriotism, being made a member of the Council of Two Hundred, and endowed with a pension. He died about 1570, the precise date being uncertain

BONNY, or BONI, a town and river of Guinea, now in the British Niger Protectorate. The river forms an eastern debouchure of the Niger, and falls into the Bight of Biafra, in about 4° 30′ N. latitude, and 7° 10′ E. longitude. On the east side, near the mouth, is the town of Bonny, notorious from the sixteenth to the nineteenth century as the rendezvous of slave-trading ships.

BONOMI, JOSEPH, architect, was born at Rome in 1739, settled in England in 1767, became an Associate of the Royal Academy, and died on March 9, 1806.—His son, JOSEPH BONOMI, the younger, born in Rome, October 9, 1796, studied art in London, and became famous as a draughtsman, especially of Egyptian remains. He published a work of his own on Nineveh, and at his death, March 3, 1878, he was Curator of Soane's Museum.

BONPLAND, AIMÉ, French traveler and botanist, was born at Rochelle, August 22, 1773. After serving as a surgeon in the French navy and studying under Corvisart at Paris, he accompanied Humboldt during five years of travel in Mexico, Colombia, and the districts bordering on the Orinoco. He died in 1858.

BONSTETTEN, CHARLES VICTOR DE, was born at Bern in 1745, of a noble and ancient family. He received the elements of his education in his native town, and at fourteen was sent to Yverdun, and soon after to Geneva. There he imbibed many revolutionary doctrines both in religion and politics, which ill fitted him for a career as a Bernese senator of the traditional type. On returning to Bern he became a member of the avoyer's council, and soon after was appointed magistrate of Gessenay. Thence he was removed in 1787 to Nyon in the Pays de Vaud, a place attractive to him for its proximity to the intellectual life and society of Geneva and Lausanne, but in other respects unsuitable; for the Pays de Vaud, as well from its nearness to France and to Geneva, as from the weight of the Bernese yoke, was nearly ripe for revolt, and Bonstetten was, as a magistrate, trusted neither by his revolutionary friends and former allies, nor by his fellow-rulers in the government of Bern. He firmly declared that he should stand by his order, a declaration that was not without good effects; but in 1792, when Geneva was threatened by the army of the Convention, he took certain steps to avert the danger, which, as he had not received a military training, were not very judicious. He died in February, 1832.

BONVICINO, ALESSANDRO. See MORETTO.

BOOK, the common name of any literary production of bulk, now applied particularly to a printed composition forming a volume. The name is also used for the literary divisions of a work.

The earliest writings were purely monumental, and accordingly those materials were chosen which were supposed to last the longest.

Tablets of ivory or metal were in common use among the Greeks and Romans. When made of wood—sometimes of citron, but usually of beech or fir—their inner sides were coated with wax, on which the letters were traced with a pointed pen or stiletto, one end of which was used for erasure. It was with this *stylus* that Cæsar stabbed Casca in the arm when attacked by his murderers. Two such tablets, joined together, were called *diptycha*, the earliest specimens of bookbinding. They were fastened together at the back by wires, which acted as hinges; the pages were called *ceræ*, from their waxen coatings, and a raised margin was left round each to prevent obliteration by friction. The earliest, though long obsolete, flexible material of importance was made from the concentric coats which wrapped the stalk of the Egyptian *papyrus*, from which is derived our word *paper*. The time of its introduction has been much disputed, but it was certainly known long before Herodotus. The length of the Greek papyri varied from eight to twelve inches; the Latin often reached sixteen. Some rolls, however, have been found as long as thirty feet. They were written on with reeds dipped in gum-water, colored with charcoal or soot of resin, the writing being readily obliterated with a sponge; and it is conjectured that the surface was sometimes prepared for that purpose with a wash of varnish. Pliny mentions also the ink of the cuttle fish as having been used for writing, as well as a decoction of the lees of wine. Red ink consisted of a preparation from cinnabar. The next material commonly employed after papyrus was parchment, made from the skins of animals, usually of sheep or lambs. Vellum is a finer substance, consisting of prepared calf-skin. Parchment is commonly ascribed to Eumenes, king of Pergamus, in Asia Minor; but he was, in all probability, not the inventor but the improver. Writing on skins is mentioned by Herodotus as common in his day; and Diodorus and Ctesias speak of ancient Persian records on leather. The word itself (*pergamena*) first occurs, according to Mabilion, in the writings of Tatto, a monk of the fourth century. It appears to have superseded papyrus about the seventh century; but its quality afterward deteriorated. At first only one side was written on, the back being frequently stained. Parchments written on both sides are called by Pliny *opisthographi*. The term *boc-fell* is found, in early English, to designate this material. Its dearness in classical times led to the practice of erasing the original writing for the purpose of substituting new. Parchments so obliterated are known as *palimpsests*, from a Greek word signifying twice rubbed, or prepared for writing; and they are alluded to under that name by Cicero. Paper made from cotton came into use, according to Montfaucon, toward the end of the ninth or the beginning of the tenth century; and the invention was opportune, as it checked the further use of palimpsests, which, from the scarcity of parchment and the demand for books of devotion, had imperiled the preservation of much classical literature. Cicero's *De Republica* was discovered by Angelo Mai in the Vatican library written under a commentary of St. Augustine on the Psalms; and the *Institutiones* of Gaius, in the library of the chapter at Verona, were deciphered in like manner under the works of St. Jerome. But the invention of linen paper gave the first real impulse to book production. The precise date of this invention is disputed; Mabilion refers it to the twelfth century. Montfaucon, however, found no specimens earlier than 1270, and Maffei none before 1300; the most numerous of them belong to the fourteenth century. Scaliger ascribes the invention to the Germans, Maffei to the Italians, and others to certain Greek refugees at Basel; while Duhalde refers it to the Chinese, and Prideaux to the Saracens in Spain. For further particulars respecting the various substances of early books, the reader may consult the first volume of the *Nouveau traité de diplomatïque*, by the Benedictines of St. Maur, and the *Essai sur l'histoire du Parchemin et du Vélin*, by Peignot, who has given a list of authorities on this subject.

The form of ancient books differed with the materials of which they were composed. When flexible matter came into use, it was found convenient to make books in the form of rolls, and the two names are synonymous in legal phraseology to this day. The papyrus, and afterward the parchment, was joined together to form one sheet, and then rolled upon a staff into a volume (*volumen*). The *volumen*, however, in most cases, was far from containing as much as our ordinary books, even in an octavo form. The square form, originally applied to

the *diocese* or wax tablets joined together in the way described above, was resorted to afterward for separate leaves, the same name being retained with altered materials. Martial speaks of this latter kind of *codex* as a novelty in his day. It was common, however, in Greek MSS., among the earliest of which Montfaucon discovered few specimens of rolls. The term *liber* in the fourth century is applied to both rolls and squared leaves, but the former were discontinued in the Middle Ages, and covers of boards were gradually introduced, the leaves being stitched together as well as folded.

The internal arrangement of books has undergone many modifications, which belong, however, chiefly to the subject of early writing. At first the letters were divided only into lines, then into separate words, and these by degrees were noted with accents, and distributed by points and stops into periods, paragraphs, chapters, and other divisions. In some countries, as among the Orientals, the direction of the characters was from right to left, in others, as among the Northern and Western nations, from left to right. The early Greeks followed the two directions alternately, — a method which was called *boustrophedon*, from its analogy to the path of oxen when ploughing. In most countries the lines run from side to side, but in some, particularly among the Chinese, their direction is vertical.

The characteristics of early printed books are noticed under the head of BIBLIOGRAPHY (*q.v.*) The folio and quarto sizes, originally adopted from the largeness of the types in the infancy of printing, are now generally restricted to works of bulk, as dictionaries and other books of reference. The size of a printed book is named from the dimensions of the paper and the number of leaves into which it is folded. The ordinary sizes for a long time were royal, demy, and crown; and the demy 8vo is now the commonest size in use. Post and foolscap are frequently but inaccurately described in catalogues as duodecimo. "Paper-molds," says Mr. W. Blades, a competent authority on this subject, "have fixed conventional sizes; but since the introduction of machines for making paper, and the consequent disuse of molds, makers work more by a given number of inches than by names of sizes."

The trade in books is of a very ancient date. The early poets and orators recited their effusions in public to induce their hearers to possess written copies of their poems or orations. Frequently they were taken down *viva voce*, and transcripts sold to such as were wealthy enough to purchase. In the book of Jeremiah the prophet is represented as dictating to Baruch the scribe, who, when questioned, described the mode in which his book was written. These scribes were, in fact, the earliest booksellers, and supplied copies as they were demanded. Aristotle, we are told, possessed a somewhat extensive library; and Plato is recorded to have paid the large sum of one hundred minæ for three small treatises of Philolaus and Pythagorean. When the Alexandrian library was founded about 300 B.C., various expedients were resorted to for the purpose of procuring books, and this appears to have stimulated the energies of the Athenian booksellers. In Rome, toward the end of the Republic, it became the fashion to have a library as part of the household furniture; and booksellers, *librarii* or *bibliopolæ* carried on a flourishing trade.

BOOKBINDING is the art of fastening together the sheets of paper composing a book, and inclosing them in cases of pasteboard covered with leather, cloth, or other materials — the object being the preservation of the book, and its protection from injury while in use.

At the time when books were rarities, being either manuscripts produced by patient secluded labor or the productions of the printing-press during the infancy of typography, they were naturally very highly prized; and as much labor and expense were bestowed upon the protection and embellishment of a cherished folio as would suffice at the present day for the building of a house. The wooden cover of a book, with its metal hinges, bosses, guards and clasps, seems, in all but dimensions, fit for a church door; but the great improvement in all the mechanical arts, together with the extension of education to all classes, and the consequent diffusion of knowledge, has led to the multiplication of books, and the gradual but radical changes witnessed during the present century in the art of bookbinding.

For a period of one thousand years — from the end of the fifth to the fifteenth century — books were excessively rare and costly, and comparatively few bindings illustrative of the art during the Dark Ages have been preserved to the present day. From being the task of slaves during the Roman empire, the transcribing of books came to be the duty of monks, who copied and bound the works which were among the chief treasures of religious establishments. Numerous documents exist indicating the attention which was given by all grades of the priestly order to the binding and preservation of their literary treasures. The general aspect of monastic bindings was thick, heavy and solid, and according to modern ideas somewhat clumsy. Books for common use were inclosed in boards of hard wood covered with leather, with the binding protected by metallic bosses, corner plates and clasps. The literary treasures, on the other hand, of kings and ecclesiastical dignitaries, and the sacred volumes of churches and monasteries, were incased in ivory sides, with appropriate subjects artistically carved on them, in silver and sometimes even gold *plaques*, or in the enamels of Limoges, etc.; and these bindings were frequently enriched besides with gems and jewels. Often these precious volumes were, in keeping with ancient customs, further preserved in boxes or cases no less rich and costly than the bindings they were meant to preserve. As the period of the Renaissance approached, silk and velvet came into use for ornamental bindings.

With the invention of printing, and the consequent multiplication of books in a portable shape, came the modern style of bookbinding. The old massive boards, with their bosses, corner plates, and heavy clasps disappeared, and thin sides covered with leather, parchment, and vellum came into use. Bindings in which enamels, precious metals, or gems were employed almost entirely disappeared and were followed by bindings in richly-colored leather or vellum, with elaborate designs blind-tooled or worked in gold or color, and gilt gauffré edges. By the wealthy and powerful families of Italy this style of binding and ornamentation was first encouraged toward the end of the fifteenth century, and skillful artists were employed to design appropriate decorations to be worked out by the bookbinders. Among the most famous early patrons of the bibliopegic art in Italy were Michael and Thomas Maioli, the books of the latter being the models on which were fashioned the bindings of later collectors and of other countries. More rare and artistically valuable still are the works of another Italian collector of the sixteenth century, Demetrio Canevari, commonly called Mecenate, physician of Pope Urban.

After the period of Grolier the taste for magnificent bindings in France grew into a passion, and the sumptuous bindings in which the famous Diana of Poitiers indulged are almost without parallel. The designs for many of her bindings are said to have been prepared by order of her royal lover Henry II., under the superintendence of the celebrated artist, Le Petti Bernard. Her

books are marked with her favorite symbols, the lunar crescent and the bow, and the monogram DC, sometimes with the H of Henry interlaced, and surmounted by the crown. It would be a useless and almost endless task to name the patrons of artistic bindings up to near the period of the revolutionary outbreak, during which long time French binders stood at the head of the craft.

Although during the sixteenth and seventeenth centuries bindings were produced in England which suffer no disgrace by comparison with contemporary masterpieces of French, Italian, and German bibliopegy, it was not till well into the eighteenth century that England took the leading place in the workmanlike forwarding and artistic finishing of books. Silk and velvet long remained the favorite coverings for the more costly bound books in the royal library and down to the time of James I. we find very elaborately worked bindings in these substances. But, at the same time, there are not wanting magnificent examples of work in calf, morocco, and vellum, with blind and gold toolings, and gilt gauffré edges.

The operations of bookbinding are now carried on upon a scale which could not have been dreamt of even at the beginning of the present century, and the millions of volumes which annually issue from the press could not possibly be put into the hands of the reading public in the form and at the price at which they are sold without the aid of machinery.

BOOK-KEEPING. The object of book-keeping is to exhibit a distinct and correct state of one's affairs, and to enable companies, firms, and individuals in trade, or otherwise occupied, to ascertain at any time the nature and amount of their business, the amount of their profits or available income, or, as the case may be, the extent of their losses.

To those engaged in trade or commercial pursuits book-keeping is absolutely necessary, as by it all transactions should be regulated, and their results exhibited. The more simple the system the better; but care must be taken that the plan adopted is sufficiently comprehensive and explanatory to satisfy not only the person keeping the books, but those who may have occasion to refer to them; for, however satisfactory it may be to a trader to follow a system which is intelligible to himself alone, circumstances might arise to render the inspection of others necessary, and from their inability to follow out transactions in the books, suspicions would probably be engendered for which there was no real foundation. Hence the necessity for the adoption of certain recognized and approved systems, which, being plain and easily understood, must prove satisfactory to all concerned.

Book-keeping, when conducted on sound principles, is invaluable; it not only shows the general result of a commercial career, but admits of analysis, by which the success or failure, the value or utter worthlessness of its component parts, or each particular transaction, can be easily ascertained. In a word, on the one hand it promotes order, regularity, fair dealing, and honorable enterprise; on the other, it defeats dishonesty, and preserves the integrity of man when dealing with his fellows.

The questions to which a satisfactory system of book-keeping gives the trader ready and conclusive answers are such as relate — 1. To the extent to which his capital and credit will entitle him to transact business; 2. To the assurance he has that all his obligations are honestly fulfilled; 3. To the ascertainment of the success or failure of his commercial dealings, and the position of his affairs from time to time.

There are three recognized systems of book-keeping, namely, by "single entry," "double entry," and the "mixed method."

I. SINGLE ENTRY.—This system is denoted by its name, transactions being posted singly, or only once in the ledger. Three books are generally kept — the cash book, day book, and ledger, although the first-named is not essential, the cash entries being passed through the day book. Its only use is to check the balance of cash in hand. In the day book are entered daily all the purchases and sales, whether for cash or credit; and all the credit entries are then transferred to accounts opened in the ledger, that is, all goods sold on credit are charged against the customers, and what are purchased are carried to the credit of parties supplying them. In the same way when cash is received from a customer for goods sold on credit, it is posted to his account, and the reverse entry is made when a trader pays for the goods he has bought. Thus it will be seen that only personal accounts are entered in the ledger.

To frame a balance sheet, or state of affairs, on this system, the book-keeper brings down the balances due by customers to him, also his stock of goods as valued, and the cash he may have in hand, on the *left-hand side* of the sheet; while on the *right-hand side* he enters the balances still due by him for the goods supplied, or money lent to him, and the capital, if any, with which he commenced business. The difference between the amounts of the two columns is either profit or loss; if profit, the merchant's capital is increased to that extent, and if loss, then he is so much the poorer.

II. DOUBLE ENTRY.—It is now universally admitted that this system is the best adapted for heavy, responsible, or speculative trades, for foreign trade especially, and for extensive mercantile concerns. As its name implies, it so far differs from the system already described, that every transaction must be recorded doubly in the ledger, that is to say, accounts must be opened in that book, to which all entries in the subsidiary books, after being journalized, are twice carried, to the debit of one account and the credit of another. To illustrate this, let us assume that a merchant speculates in cotton, and purchases so many bales from John Bevan & Co. upon credit; he debits "Cotton account," and credits "John Bevan & Co." He does not pay for it in cash, but gives his bill at three months for the amount; John Bevan & Co. are debited with the bill, and "Bills Payable" are credited. He then sells the whole lot of cotton for cash to Cairns, Brown & Co., debiting "Cash" and crediting "Cotton Account." Lastly, he retires or pays the bill granted to John Bevan & Co., debits "Bills Payable," and credits "Cash."

III. MIXED METHOD.—This system is now extensively adopted by such companies and firms as begrudge the time expended in journalizing, and are of the opinion that double entry is too elaborate, when the same results can be arrived at by a more direct and less laborious plan. There is this identity, however, between the systems, that every transaction must be recorded somewhere, and eventually twice posted, as in double entry, but without the medium of a journal; moreover, the entries are fewer, summations and not specific items being posted, and what would be the daily labor under one system is reserved under this for a longer period.

BOOLE, GEORGE, one of the most original logicians and mathematicians whom England has produced, was born in Lincoln, on November 2, 1815.

To the public Boole was known only as the author of numerous abstruse papers o mathematical topics, and of three or four distinct publications which have become standard works. His earliest published paper was one upon the "Theory of Analytical Transformations," printed in the *Cambridge Mathematical Journal* for

1839, and it led to a friendship between Boole and D. F. Gregory, the editor of that journal, which lasted until the premature death of the latter in 1844. A long list of Boole's memoirs and detached papers, both on logical and mathematical topics, will be found in the *Catalogue of Scientific Memoirs* published by the Royal Society, and in the supplementary volume on *Differential Equations*, edited by Mr. Todhunter. To the *Cambridge Mathematical Journal* and its successor, the *Cambridge and Dublin Mathematical Journal*, Boole contributed in all twenty-two articles. In the third and fourth series of the *Philosophical Magazine* will be found sixteen papers. The Royal Society printed six important memoirs in the *Philosophical Transactions*, and a few other memoirs are to be found in the *Transactions of the Royal Society of Edinburgh* and of the *Royal Irish Academy*, in the *Bulletin de l'Academie de St. Pêtersbourg* for 1862 (under the name) and in *Crelle's Journal*. To these lists should be added a paper on the mathematical basis of logic; published in the *Mechanic's Magazine* for 1848. The works of Boole are thus contained in about fifty scattered articles and a few separate publications. He died December 8, 1864.

BOOM, in a ship, is a general name for the long spars which jut out from certain supports or uprights, to stretch or extend the bottom edge of sails. According to their connections, they receive the names of jib-boom, flying jib-boom, main-boom, square-sail boom, etc. Modern iron-clads are provided with a number of booms to be fitted at intervals along their sides, from which may be suspended a huge net encircling the ship at a sufficient distance from the side to render an explosion from an enemy's torpedo harmless. The term boom is also applied to a strong iron chain or a combination of spars, etc., lashed together with chains and cables, and employed in barring the navigable passage of the mouth of a harbor or river

BOOM is a word frequently used of late in America and Britain and the colonies for a start or rapid development of commercial activity or speculation, as when shares go off, or prices go up "with a boom." The word is assumed to be suggested less by *boom* in the sense of noise than by the rushing progress the noise often accompanies.

BOOM, a town of Belgium, in the province of Antwerp, and twelve miles south of that city, at the junction of the Brussels Canal with the River Rupel. Population of the commune, 10,064.

BOOMERANG, a missile instrument of the Australian aborigines, in the use of which they are very dexterous. It consists of a piece of hard wood, with the curve of a parabola, and is about two feet long, two and a half inches broad, half inch thick, and rounded at the extremities. One side is flat, the other is rounded, and it is brought to a bluntish edge. It is discharged with the hand by one end, the convex edge being forward and the flat side upward. After advancing some distance, and ascending slowly in the air with a quick rotatory motion, it begins to retrograde, and finally falls to the ground behind the thrower.

BOONE, the county seat of Boone county, Iowa, is situated near the Des Moines river, at the intersection of two railroads, and in the center of a coal-producing district. It contains two public halls, five hotels and numerous churches and schools, has considerable manufacturing and mercantile interests, and a population of 6,500.

BOOTH, BARTON, an English tragedian, descended from an ancient family in Lancashire, was born in 1681. He was educated at Westminster school under the celebrated Doctor Busby, and his success in the Latin plays, customarily performed there by the scholars, gave him an inclination for the stage. He was intended for the church; but at seventeen years of age he ran away from school, and after some vicissitudes he obtained employment in a theatrical company in Dublin. His first appearance was hailed with applause; and he continued to improve daily. After two successful campaigns in Ireland he returned to his native country, having first reconciled himself to his friends. Betterton, to whom he had an introduction, received him with great cordiality, and gave him all the assistance in his power. His success at London was complete, and he established his reputation as only second to his great instructor. During the twenty years of his management the theater was in the greatest credit; and his death, which happened on May 10, 1733, contributed not a little to its decline.

BOOTHIA FELIX, a peninsula of British North America. It was discovered by Captain (afterward Sir James) Ross, in 1830, and was named after Sir Felix Booth, who had fitted out the expedition. It forms the western side of the gulf of the same name into which Prince Regent's Inlet leads from Baffin's Bay. From the American shore it is almost separated by lakes and inlets; and a narrow channel known as Bellot Strait intervenes between it and North Somerset Island, which was discovered by Sir E. Parry in 1819. The peninsula is not only interesting for its connection with the Franklin expedition and the Franklin search, but is of scientific importance from the north magnetic pole having been first distinctly localized there by Ross.

BOOTS AND SHOES, see SHOEMAKING, Vol. IX., p. 5391.

BOPP, FRANCIS, glottologist, was born at Mainz on the Rhine, September 14, 1791. In consequence of the political troubles of that time, his parents removed to Aschaffenburg, in Bavaria, where Francis received a liberal education at the Lyceum. It was here that his attention was drawn to the languages and literature of the East by the eloquent lectures of Carl J. Windischmann, who, with Creuzer, Görres, and the brothers Schlegel, was full of enthusiasm for Indian wisdom and philosophy. And further, Fr. Schlegel's book, which was just then exerting a powerful influence on the minds of German philosphers and historians, could not fail to stimulate also Bopp's interest in the sacred language of the Hindus. He was, however, too strictly trained in grammatical and philosophical studies, and too eager for the scientific analysis of language, to allow the clearness of his judgment to be warped by the romantic and speculative predilections of Windischmann and Fr. Schlegel. In 1812 he went to Paris at the expense of the Bavarian Government, with a view to devote himself vigorously to the study of Sanskrit. There he enjoyed the society of such eminent men as Chézy, S. de Sacy, Langlès, and, above all, Al. Hamilton, who had acquired, when in India, a respectable acquaintance with Sanskrit.

The first fruit of his four years' study in Paris appeared at Frankfort-on-the-Main in 1816, under the title *Ueber das Conjugationssystem der Sanskritsprache in Vergleichung mit jenem der Griechischen, Lateinischen, Persischen, und Germanischen Sprache*, and it was accompanied with a preface from the pen of Windischmann, bearing date May 16th of that year. In this first book, Bopp entered at once on the path on which the philological researches of his whole subsequent life were concentrated. It was not that he wished to prove the common parentage of Sanskrit with Persian, Greek, Latin and German, for that had long been established; but his object was to trace the common origin of their grammatical forms, of their inflexions from compositions, a task which had never been attempted. By a historical analysis of those forms, as applied to the verb,

he furnished the first trustworthy materials for a history of the languages compared.

After a short residence at Göttingen, Bopp was, on the recommendation of W. von Humboldt, appointed to the chair of Sanskrit and comparative grammar at Berlin in 1821, and was elected member of the Royal Prussian Academy in the following year, both of which posts he held up to his death, October 23, 1867.

BORA, KATHARINA VON, the wife of Luther, was born of an old family in the district of Meissen, January 29, 1499. At a very early age she entered the Cistercian convent of Nimptschen near Grimma. Luther obtained the services of Leonhard Koppe, a citizen of Torgau, and by him and a few associates nine nuns were liberated from the convent in April, 1523. They were brought to Wittenberg, and Katharina became an inmate of the house of the Burgomaster Reichenbach. Luther, through a friend, Amsdorf, offered her the hand of Dr. Kaspar Glaz. She declined this proposal, but declared herself ready to marry Amsdorf or Luther himself. Her marriage with Luther took place June 13, 1525. She died December 20, 1552, at Torgau.

BORAX, the biborate of sodium ($N_2B_4O_7$), a substance found in commerce under the two different forms of ordinary prismatic borax, which contains ten equivalents of water of crystallization, and octahedral or jeweler's borax, which has only five molecules of water in its composition. The former, which is the variety commonly met with, occurs as a natural product in various parts of the world. In former times crude borax was procured chiefly from Thibet, when it came by way of India under the name of tincal. It also is found in other parts of Central Asia, at Halberstadt in Transylvania, in Canada, and in Peru; and in recent years an important source of the mineral has been discovered near the Clear Lake in California, in a body of water now called the Borax Lake. In very dry seasons the water almost entirely disappears from the basin of the Borax Lake, which is situated in a region containing hot springs and the remains of volcanic action. In 1863, when the lake measured 4,000 feet long, 1,800 feet across at its widest part, and about three feet deep, the water was found to contain 2,401.56 grains of solid matter per gallon, of which 535.08 grains represented crystallized borax. The bed of the lake is occupied with a deposit of borax crystals, which are obtained by sinking caissons, pumping out the water, and digging up the deposit. Californian crude borax is fit for use by assayers and others without undergoing any purification; but that obtained from Thibet contains a greenish encrusting matter of a soapy consistence which has to be separated before the material is fit for use under the name of refined borax.

The supply of borax is, however, more largely derived by artificial means from boracic or boric acid, or from salts in which that acid occurs, than from these natural sources. Boracic acid is found among the ejecta around the craters of some volcanoes, and it is found in jets of vapor which stream forth from fissures in the earth in regions of volcanic disturbance.

In recent years artificial soffioni have been formed by boring through the rock till some of the numerous chasms or chambers, with which the interior is honeycombed, are reached, when immediately all the phenomena of a boracic soffione are established. From some of these artificial soffioni issues water of sufficient richness in acid to be led there direct to the evaporating pans. Similar emanations of volcanic vapors and boracic acid have been discovered in Nevada. Boracic acid is also obtained from boronatrocalcite, a double salt of sodium and calcium, of which extensive deposits exist in the neighborhood of the nitrate of soda beds of Chili and Peru. It is very variable in constitution and condition of purity. Similar deposits are found in California, Nevada, and Nova Scotia, and from the west coast of Africa is received a borate of lime bearing the name of rhodizite. The boronatrocalcite, or borate of lime, as it is called in commerce, is applied in its unrefined condition to many uses for which borax is employed. In 1855 Dr. T. Richardson patented a process for using the picked and washed boronatrocalcite as a substitute for borax in the glass manufacture and preparation of pottery glazes. It is, however, chiefly employed as a source of boracic acid, and there are also several methods of obtaining borax direct from the compound salt.

BORDA, JEAN CHARLES, mathematician and nautical astronomer, was born at Dax on May 4, 1733. He studied at La Flèche, and at an early age obtained a commission in the cavalry. In 1756 he presented a valuable paper to the Academy of Sciences, which elected him a member. He was present at the battle of Hastembeck, and soon afterward joined the naval service. He visited the Azores and the Canary Islands, of which he constructed an admirable map. In 1782 his frigate was taken by a British squadron; he himself was carried to England, but was almost immediately released on parole, and returned to France. He died February 20, 1799.

BORDEAUX, one of the finest and wealthiest commercial cities of France, formerly the capital of Guienne and Bordelais, and now the chief town of the department of Gironde. It is situated 370 miles southeast of Paris, on the left bank of the Garonne, about 60 or 70 miles from its mouth, and in the midst of an extensive plain which comprises the district of Médoc, well known for its red wines. Opposite the town the river makes a semicircular curve, and widens out into an extensive basin which serves as a harbor, and is lined with quays on both sides for a distance of three miles. Vessels of 800 tons can come up to the town, and ships of the greatest ordinary tonnage have depth enough as far as Pauillac, about thirty-five miles from the mouth of the river. The basin is crossed by a magnificent stone bridge of seventeen arches, 1,534 feet long, which was built in 1821, and remained in the hands of a company till 1861 when it was declared free. A short distance further up the river is spanned by a railway bridge.

Bordeaux, or *Burdigala*, was originally the chief town of the Bituriges Vivisci. Under the Roman empire it became a flourishing commercial city, and in the third century it was made the capital of Aquitania Secunda. Ausonius, a writter of the fourth century, who was a native of the place, describes it as four-square and surrounded with walls and lofty towers, and celebrates its importance as one of the greatest educational centers of Gaul. In the evils that resulted from the disintegration of the empire Bordeaux had its full share, and did not recover its prosperity till the beginning of the tenth century. Along with Guienne it belonged to the English kings for nearly three hundred years (1154–1452), and was for a time the seat of the brilliant court of the Black Prince, whose son Richard was born in the city. An extensive commerce was gradually developed between the Bordeaux merchants and their fellow-subjects in England — London, Hull, Exeter, Dartmouth, Bristol, and Chester, being the principal ports with which they traded. During the Reign of Terror the city suffered almost as severely as Lyons and Marseilles, and its commerce was greatly reduced under Napoleon I. Population, 250,000.

BORDENTOWN, a town of Burlington county, N. J., on the Delaware river, six miles southeast of Trenton, and twenty-eight from Philadelphia. It contains

iron foundries, machine shops, and factories of various kinds, and has some ship-building. Population, 5,045.

BORE, a tidal phenomenon at the estuaries of certain rivers, also called *Eagre*. When a river expands gradually toward a very wide mouth, and is subject to high tides, the spring flood-tide drives an immense volume of water from the sea into the river; the water accumulates in the estuary more rapidly than it can flow up into the river; and thus there is gradually formed a kind of watery ridge stretching across the estuary, and rushing up toward the river with great violence and much noise. In some cases this ridge or bore is many feet in height. The most celebrated bores are those of the Ganges, Brahmaputra, and Indus; in the Hoogly branch of the Ganges, the bore travels seventy miles in four hours, and often appears suddenly as a liquid wall over seven feet high. That at Hang-choo-foo is very dangerous; and the Bay of Fundy is remarkable for its tidal phenomena.

BORE is the internal cavity of any kind of firearm. It is in most cases cylindrical; but in the Lancaster gun it is oval, and in the Whitworth hexagonal, both being also spiral; while in all rifled firearms it is furrowed with spiral grooves, and for the same reason — viz., to give that rotation which enables an elongated projectile to be used. In most modern guns and small arms there is a chamber at the bottom of the bore. In breech-loading weapons this chamber is larger in diameter than the bore, in order that the cartridge and projectile may enter it easily. In muzzle-loaders it is generally of smaller diameter, but an enlarged chamber has been tried in some heavy guns in order to give more air space for the expansion of the gases when the cartridge is fired. The diameter of the bore is called the "caliber." Heavy iron guns were formerly cast solid and then bored out, but, as it is essential that the surface of the bore should be extremely hard to prevent its being "scored" by the shot, endeavors were made in America to attain this object by casting them hollow, and cooling the inner surface more rapidly than the rest of the metal. Large guns of modern construction are, however, either made entirely of steel, as in the "Krupp" process, or as in the Woolwich and Armstrong systems, have a steel tube, toughened in oil, for the bore, and strengthened outside by coils of wrought iron shrunk on over it, so that the hardness of the bore is assured.

BOREAS, in Greek mythology, was a personification of the north wind, and to be like it he was represented as rough, powerful, and accustomed to gain his ends by irresistible force.

BORELLI, GIOVANNI ALFONSO, the head of what has been called the iatro-mathematical sect, or that which, misled by the great progress which the application of mathematics had produced in the physical sciences, attempted to secure the same advantage for medicine, by subjecting to calculation the phenomena of the living economy. He was born at Naples, January 28, 1608, taught mathematics for some time at Pisa, and seems afterward to have held the professorship of medicine at Florence. He died of pleurisy on December 31, 1679.

BORGA, or BORGO, a seaport town of the Russian Grand Duchy of Finland, situated in the province of Nyland, at the entrance of the River Borga into the Gulf of Finland, about twenty-five miles northwest of Helsingfors. Population in 1889, about 50,000.

BORGERHOUT, a flourishing township of Belgium, in the arrondissement of Antwerp, and on the road from that city to Turnhout. Population (1889), 13,000.

BORGHESE, a noble Sienese family, one of whom, on being elected pope in 1605, assumed the name of Paul V., after which the family became the most powerful of the Roman nobility by their union with the Aldobrandini. Camillo Filippo Ludovico, Prince Borghese (born 1775), married in 1803, Pauline, sister of the Emperor Napoleon, and widow of General Leclerc. After the fall of Napoleon he fixed his residence at Florence, where he died in 1832.

BORGIA, CÆSAR and LUCRETIA. The history of Cæsar and Lucretia Borgia up to the death of their father has been related under ALEXANDER VI. (See Vol. I., p. 178 *et seq.*) Lucretia Borgia's life, after her marriage to the duke of Ferrara's son, was prosperous and uneventful, or at most only troubled by the not very well attested homage of Cardinal Bembo. She obtained universal respect by her piety and prudence, and her patronage of men of letters, and died in 1520. There is no character in history, not even excepting Mary, Queen of Scots, about whom such differences of opinion exist in the minds of historians.

BORGO SAN DONNINO, a walled town of Italy, in the province of Parma, and capital of a circondario, is situated on the Stirone, a sub-tributary of the Po, about fifteen miles west of Parma on the railway to Milan. Hemp, silk and glass are its principal industries. Population, 10,855.

BORGOGNONE, ANBROGIO. See FOSSANO.

BORGU, or Barba, a large district in the interior of Africa, bounded on the east by the Niger, on the south by Yoruba, on the west by Dahomey, and on the north by Gurma. It is about thirty days' journey in length and eleven in breadth. It has generally a level surface, though crossed by a considerable range of mountains. The soil is mostly fertile, and tolerably cultivated, producing in abundance corn, yams, plantains, and limes. The cattle are numerous and of excellent breed, and there is a copious supply of all the species of game that prevail in Africa.

BORING. The methods and apparatus of boring will be found noticed under the different industries in which it is employed. See ARTESIAN WELLS, BLASTING, COAL, GUNS, etc.

BORISSOGLIEBSK, a town of Russia, in the government of Tamboff, eleven and a half miles southeast of that city, in 51° 22′ N. latitude and 41° 4′ E. longitude, on the left bank of the River Verona. It was founded in 1646 to defend the southern frontiers from the incursions of the Crim Tartars, and in 1696 was surrounded by wooden fortifications by command of Peter I. Population in 1889, 12,254.

BORKU, or BORGU, a country in the interior of Africa, situated between the 17th and 20th parallels of N. latitude, and between 18° and 21° E. longitude, and forming a part of the great Soudan region. It is bounded northward by the Tibesti Mountains, and is in great measure occupied by lesser elevations belonging to the same system; to the south, or rather southwest, lies the Bodele basin, from which it is separated by a narrow stretch of higher ground. The climate is much better than that of the neighboring countries to the south and east; but the eastern trade-winds blow persistently with great violence, being strongest from early morning till about 3 p. m. The northern valleys and Jin are inhabited by a settled population of about 5,000 people, known as the Donosa or Dosa; the others are mainly visited by nomadic tribes. The Uelad Siman, a powerful Arab tribe, claim the lordship of the land, but have to share their authority with another tribe, known as Mgharba, which immigrated from Barca about 1860. They do not inhabit the country of Borku, but give proof of their claim to possession by plundering the valleys every three or four years. In the end of 1851 Dr. Barth and Dr.

Oberweg joined an army despatched by the sultan of Bornu for the conquest of the region east of Lake Chad; but the army was defeated and put to flight, and the travellers were disappointed in their expectation of reaching Borku. Dr. Nachtigal spent some time in the country in the year 1871, and gives an account of his sojourn in the *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, 1873.

BORLASE, WILLIAM, a learned antiquary and naturalist, was born at Pendeen in Cornwall, of an ancient family, February 2d, 1696. He was educated at Exeter College, Oxford, where he took his degree as master of arts. In 1720 he was ordained as priest; he was instituted in 1722 to the rectory of Ludgvan, and in 1732 was presented to the vicarage of St. Just, his native parish. In the parish of Ludgvan are rich copper works, abounding with mineral and metallic fossils, of which he made a collection, and thus was led to study somewhat minutely the natural history of the county. In 1750 he was admitted a fellow of the Royal Society; and in 1753 he published, in folio, at Oxford, his *Antiquities of Cornwall*, a second edition of which was published at London, 1769, with the title of *Antiquities, Historical and Monumental, of the County of Cornwall; consisting of several Essays on the Ancient Inhabitants, Druid Superstition, Customs and Remains of the most remote Antiquity in Britain and the British Isles, exemplified and proved by Monuments now extant in Cornwall and the Scilly Islands; with a Vocabulary of the Cornu-British Language.* His next publication was *Observations on the Ancient and Present State of the Islands of Scilly, and their importance to the trade of Great Britain*, Oxford, 1756, 4to, which had previously been printed in the *Phil. Trans.* In 1758 appeared his *Natural History of Cornwall*, Oxford, folio. He presented to the Ashmolien Museum a variety of fossils and antiquities, which he had described in his works, and for his benefactions received the thanks of the university, and the degree of LL.D. He died August 31, 1772.

BORN, IGNATIUS, BARON VON, an eminent mineralogist and metallurgist, was born of a noble family, at Karlsburg in Transylvania, in 1742. He was educated in a Jesuit college at Vienna, and entered that order, which, however, after sixteen months, he quitted. After studying law at Prague he travelled into Germany, Holland, and France. On his return to Prague he engaged in the study of mineralogy. Austria produces various metals in considerable abundance, and the administration of the revenue arising to Government from this source is conducted by local boards, under the control of the chamber of mines at Vienna. This administration offers a field of some preferment; and Von Born was received into the department of the mines and mint at Prague in 1770. In 1766 he was appointed by Maria Theresa to arrange the imperial museum at Vienna, where he was made councillor of state, and continued to reside until his death. At the time of his death in 1791, he was employed in writing a work entitled *Fasti Leopoldini*, probably relating to the prudent conduct of Leopold II., the successor of Joseph, towards the Hungarians.

BÖRNE, LUDWIG, German political writer and satirist, of Jewish family, was born 18th May 1786, at Frankfurt-on-the-Main, where his father, Jakob Baruch carried on the business of a banker. He studied first at Berlin, where he became acquainted with Schleiermacher and the famous Henrietta Herz, and afterwards at Halle, intending to enter the medical profession. His inclinations for pure literature proved too powerful to allow him to carry out this design, and in 1806 he removed to Heidelberg in order to study financial and political economy. Two years later he took his degree at Giessen, and in 1811 he received an appointment in the bureau of police in his native town. The reconstitution of Frankfurt as a free city after the fall of Napoleon's power in Germany soon deprived him of a situation which was but little suited to his tastes or abilities. He then devoted himself to literature, and for a time edited a newspaper entitled *Staats-Ristretto*, which was quickly suppressed by the Government on account of its liberal tone and the boldness of its criticisms. The same fate attended his next venture, *Die Zeitschwingen*, which appeared for only four months. In 1817 he renounced his Jewish faith and took the name of Börne, by which he is always known. From 1818 to 1821 he edited *Die Wage*, a paper particularly distinguished by its lively political articles, and by its powerful but sarcastic theatrical criticisms. For some years after the suppression of his paper, Börne resided principally in Paris, Hamburg, and Frankfurt. After the July revolution (1830) he hurried to Paris, expecting to find the newly constituted state of society somewhat in accordance with his own philosophic views; but in this hope he was completely disappointed, and the bitterness of his anger lent additional force to the satirical letters he began to publish in his last literary venture, *La Balance*. While advocating his favorite scheme of a closer union between France and Germany, he assailed with unsparing sarcasm and polished wit the German dynasties, whom he looked upon as the great opponents of liberalism. He died at Paris in 1837.

BORNEO, one of the largest islands of the world, is situated about the middle of the East Indian Archipelago, and lies immediately under the equator. It forms a kind of irregular hexagon, and its area is estimated by Engelhardt at 289,000 Eng. square miles. Its coast-line is much less broken than that of most of the neighboring islands; and though there are some extensive bays, such as Maludu in the north and Sarawak in the west, none of them are so deep as greatly to interfere with the regularity of its contour. A large proportion of the seaboard is of alluvial formation; and in various districts the deposition of new land is very perceptibly going on. The whole of the ground, for example, to the west of the Kandang Mountains in the kingdom of Landak has been gained from the sea during the last four centuries, and it is evident that many smaller islands which fringed the coast in former times have been incorporated with the mainland. This process of extension goes on all the more rapidly, because the neighboring sea is very shallow, except on the eastern side.

Of the interior of the island a considerable part has been only partially explored, so that the physical features can hardly be given with sufficient precision and detail. The general character of the country is mountainous, though none of the ranges and few of the individual peaks attain to any great elevation. The centre of the island seems to be occupied by a kind of tableland, with which the principal chains connect themselves more or less directly.

Unlike most of the larger islands of the archipelago, and in remarkable contrast with Java, Borneo seems to possess no active volcanoes. Many of the peaks, however, bear distinct evidence of former activity in regular craters, now in some cases forming lakes of salt water.

The island, which is abundantly supplied with rivers and streams, may be hydrographically divided into five principal versants. Of these the shortest lies along the northwestern slope of the Krimbang and Kini-balu range, and discharges its waters into the Chinese Sea. The most important of its rivers are the Sarawak, the Batang-Lupar, the Seribas, the Rejang, (which is navigable for 140 miles), the Baram (about half a mile wide

at its mouth), the Limbang or Bruni River, the Tewaran, the Bintulu, and the Tampasuk, the last two having their sources in Mount Kini-balu itself.

Among the lakes of Borneo that of Kini-balu, near the mountain of the same name, is regarded as the largest, but many others are of considerable size.

In spite of the equatorial position of the island its climate is nowhere oppressive, and in many places might almost be called temperate. Over such an extensive area there is, of course, great variety in the climatic character of different districts, especially when viewed in relation to health. Some places, as Bidi, for example, are notoriously unhealthy; but from the statistics of the Dutch Government it appears that the European has in general no more to fear in Borneo than in the island of Java. Among the native races the prevailing diseases are principally those that arise from bad food or want of cleanliness. Scrofula is common throughout the country and elephantiasis is frequently met with on the coast. Small-pox, dysentery, and fevers are the usual epidemics; and ophthalmia sometimes attacks whole tribes. About a sixth of the native population in some quarters suffer from a kind of ringworm, called kurab, which is identified with *herpes farinosus*. Consumption is not uncommon.

The mineral wealth of Borneo is great and varied, including diamonds, gold, platina, quicksilver, cinnabar, copper, iron, tin, antimony, petroleum, sulphur, rock-salt, marble and coal. Landak and Pontianak are the best diamond districts, and Sambas, Landak, Montrado and Borneo Proper furnish the greatest quantity of gold.

The fauna of Borneo comprises a large variety of species, many of which are numerically of great importance. Among the Quadrumana, which are very well represented, the most remarkable is the orang-outang, an animal only to be found elsewhere in the Island of Sumatra. The wawah, a kind of gibbon, and the large-eyed *Stenops tardigradus* are also worthy of mention. The larger beasts of prey seem to be altogether wanting, so that little check is put on the natural fecundity of the graminivorous species. A small panther and the *Felis macrocelis* are the largest animals of the cat-kind known; for though the tiger has sometimes been reported to occur in the mountains, its presence has never been verified. The Malay or honey bear is very common. The rhinoceros is found on the north-west coast, and the elephant, introduced by the Chinese or Portugese, in the neighborhood of Cape Unsang. Wild oxen of the Sunda race are not uncommon; and the whole island swarms with droves of wild pigs, which are distinguished by a curious protuberance of hair on each side of the head. These furnish food not only to the Dyaks, who are very fond of the flesh, but also to the crocodiles that abound in the principal rivers. Three or four species of deer are enumerated, one of which, the pelandok of the Malays, is remarkable for its smallness and beauty. Squirrels, porcupines, civet-cats, rats, bats, and lizards are well represented, and snakes of various kinds, from the boa constrictor downwards, are abundant, while the marshy districts swarm with frogs and leeches.

The domestic animals of Borneo are few both in number of species and for the most part in number of individuals. The character of the country has prevented the development of pastoral modes of life. In some districts, as in the neighborhood of Ambong, there are bullocks of the Brahmin breed, about thirteen hands high; the buffalo is sometimes employed in agriculture; and sheep and goats occur. The cat and dog are both domesticated. A few horses, introduced by Europeans, and only possessed by the wealthier classes, are found in Banjermassin and Sarawak.

The flora of Borneo is very rich, the whole surface of the island being clothed in luxuriant vegetation. The king of the forest is the *tappan*, which, rising to a great height with a single branchless stem, is crowned with a splendid dome of foliage. From the wood of this tree the chiefs construct their official seats. The iron-wood, so remarkable for the durability of its timber, is abundant; it is used by the natives for the pillars of their houses, and forms an article of export to China. It is almost rivalled by the *kayu temesu* in hardness. In all about sixty kinds of timber are furnished in more or less profusion.

The population of Borneo consists of a considerable variety of races, of very different origin, and of different degrees of civilization. The most important numerically are the Dyaks, the Malays, the Chinese, and the Buginese; and from their political influence, the Arabs and the Dutch.

The Dyaks, Dayaks, or Dayakkers are generally regarded as the most aboriginal. For themselves they have no general designation; but, broken as they are into numerous tribes, they are distinguished by separate tribal names, many of which seem to be merely the names of the rivers on which their settlements are situated. Though regarded by the Malays as aliens and looked down upon as almost beneath humanity, they belong to the same race. Separation, however, must have taken place at a very early date.

The Dyak is decidedly intelligent; his memory is tenacious, and his powers of observation good. Unacquainted in his natural state with both reading and writing, his aptitude for acquiring these arts is greatly praised by missionaries. In moral character he is far superior to the civilized Malay, being unsuspicious and hospitable, and honest and truthful in a striking degree. The various tribes differ greatly in religious ceremonies and beliefs, and it is hard to give a satisfactory idea of them. They have no temples, priest, or regular recurrence of worship; but the father of each family performs such rites as the exigencies of each day demand. A supreme god seems generally acknowledged, but subordinate deities are supposed to watch over special departments of the world and human affairs.

The Dyaks speak a variety of dialects, most of which are still very slightly known. The tribes on the coast have adopted a great number of Malay words into common use, and it is often hard to ascertain their own proper synonyms.

For an account of the Malays the reader must be referred to a separate article, but the Chinese require more particular notice. They seem to have been the first civilized people who had dealings with Borneo: their own annals speak of tribute paid to the empire by Pha-la on the northeast coast of the island as early as the 7th century, and later documents mention a Chinese colonization in the 15th. The traditions of the Malays and Dyaks support these statements,—the people of Bruni regarding themselves as partly of Chinese descent, and the annals of Sulu recording an extensive Chinese immigration about 1575. Be this as it may, the flourishing condition of Borneo in the 16th and 17th centuries was largely due to trade with China. The Chinese founded in the 18th century an important colony in Bruni; but their numbers were lessened by the bad treatment of the princes. The Malay chiefs of other districts invited them to come and develop the mineral wealth of the country, and before long they were to be found in considerable numbers in Sambas, Montrado, Pontianak, and elsewhere.

In regard to the number of the population of Borneo it is difficult to arrive at anything like a satisfactory estimate. The island districts seem to be very thinly

inhabited; and the Dyaks increase in numbers at a very slow rate, in spite of their being both a healthy and moral people. This is attributed by Mr. Wallace mainly to infecundity on the part of the women brought on by the excessive labor to which they are subjected from early girlhood. The population of the Dutch territory was stated in 1871 at 335,677 natives and 131 Europeans in the western division, and at 847,846 natives and 320 Europeans in the south-eastern, making a total of 1,183,974; but the statements rest on little better than conjecture. If they approximate to the truth, the population of the whole island may be set down at between 1,000,000 and 2,000,000. Earlier estimates carried the total as high as 3,000,000.

Borneo has never, as far as we have information, formed a political unity; and even its physical unity as an island is so little known or considered by its native inhabitants that it possesses in their languages no general designation. As a natural consequence Borneo has no proper history. The island was first discovered by European navigators in the beginning of the 16th century, according to one account by Lorenzo de Gomez, a Portuguese, in 1518, and according to another by Don Jorge de Menezes in 1526. Before long commercial relations were formed with the natives by the Portuguese traders, at first in the city of Bruni itself, and then in various other maritime states. In 1573 their Spanish rivals tried to open a connection with Bruni, but their attempts were without success till the sultan being dethroned appealed to them for assistance, and was restored in 1580. From that time they kept up intercourse with the country, but it was not unfrequently interrupted by war.

BORNHOLM, an island in the Baltic, belonging to Denmark, in the "Stift" of Seeland. It is about 20 miles in length by 14 in breadth, with a generally mountainous surface and steep and rocky shores. Besides a good freestone, which is largely exported for building, it furnishes limestone, blue marble, coal, and clay. Oats, flax, and hemp are cultivated. The population amounts to about 33,000, and is chiefly employed in agriculture, fishing, brewing, distillation, and the manufacture of earthenware. Weaving and clock-making are also carried on to some extent.

BORNU, or BORNOU, a kingdom of Central Africa, situated to the south-west of Lake Chad, and separated from the Niger by the kingdom of Haussa. Its area is estimated at 51,250 square miles, and its population at 5,000,000. The country is for the most part a flat alluvial plain, subject in its north-eastern portions to inundation from the lake and its tributary rivers — the Shari and the Yo. The former of these, which is by far the larger, serves as a boundary towards Baghermi on the east; the latter, rising in Haussa, flows north-east through the whole country. The soil is in general fertile and well watered, yielding large crops even under very imperfect cultivation.

Wild animals, in great numbers, find both food and cover in the extensive districts of wood and marsh. Lions, giraffes, elephants, hyenas, crocodiles, and hippopotami are common; and antelopes, gazelles, ostriches, and various other animals are pursued as game.

The leading people of the country, called Bornuese or Kanuri, present a perfect specimen of the negro form and features, having large mouths, thick lips, and broad noses, but good teeth and high foreheads. The females add to their want of beauty by extensive tattooing; they also stain their faces with indigo, and dye their front teeth black and their canine teeth red. The law allows polygamy, but even the richest have seldom more than two or three wives. The marriage ceremonies last for a whole week, the first three days being spent in feasting on the favorite national dishes, and the others appropriated to certain symbolical rites. The favorite amusement is to watch the wrestling of slaves taken in war from the neighboring nations. Another amusement is a rude game bearing some resemblance to chess, played with beans and holes in the sand. The Mahometan religion is universally professed in Bornu, and with bigotry and violence. The prevailing language of the people is known as the Kanuri. It has no affinity, according to Dr. Barth, with the great Berber family.

The pastoral districts of the country are occupied by the Shuwas, who are undoubtedly of Arabian race, and speak a well-preserved dialect of that language. Of the date of their immigration from the East we have no knowledge; but they were in the country as early as the middle of the 17th century. Their total number is from 200,000 to 250,000, and they are divided into numerous distinct clans. Their villages in general consist of rudely-constructed huts, of an exaggerated conical form. Another tribe, called the La Salas, inhabit a number of low fertile islands in Lake Chad, separated from the continent by channels which those who know the tracts can ford on horseback.

The military force of Bornu consists almost entirely in cavalry, amounting to about 30,000, who are mounted on heavy steeds, which, as well as their riders, are frequently cased in light iron mail. The Shuwas, however, are clad only in a light shirt, and mounted on small unseemly nags, and the Kanembu spearmen are almost naked, and fight with shield and spear.

The towns are of considerable size. They are surrounded by walls 35 or 40 feet in height, and 20 feet in thickness, having at each of the four corners a triple gate, composed of strong planks of wood, with bars of iron. The abodes of the principal inhabitants form an enclosed square, in which are separate houses for each of the wives; the chief's palace consists of turrets connected together by terraces.

The history of Bornu goes back only to the 9th century of our era, and its early portions are very fragmentary and dubious. The first dynasty known is that of the Séfuwa or descendants of Sef, which came to the throne in the person of Dugu Duku, and has its capital at Njimiye in Kanem. Mahometanism was adopted about 1086 by the ruling monarch, Dúnama Ben Humé, and has since continued the religion of the country. From 1194–1220 reigned Selma or Abd-el Jelil, under whom the power of the kingdom was greatly extended. In the following reigns the prosperity of the country began to diminish, and in 1386 the dynasty was expelled from Njimiye, and forced to seek refuge in the western part of its territory by the invasion of the Bulála. Mai Ali Ghajideni rendered his country once more redoubtable and strong. His successor, Edris, completely vanquished the Bulála and subjugated Kanem; and under Mahomet, the next monarch, Bornu reached its highest pitch of greatness. A series of for the most part peaceful reigns succeeded till about the middle of the 18th century, when Ali Omarmi entered upon a violent struggle with the Tuaricks or Imoshagh. Under his son Ahmed (about 1808) the kingdom began to be harassed by the Fulbe or Fellatah, who had already conquered the Haussa country. Expelled from his capital by the invaders, Ahmed was only restored by the assistance of the fakir Mahomet el-Amin el-Kanemi, a mere private individual, who, pretending to a celestial mission, hoisted the green flag of the prophet, and undertook the deliverance of his country. The Fellatahs appear to have been taken by surprise, and were in ten months driven completely out of Bornu. The conqueror, having the army wholly devoted to him, might probably

have, with little difficulty, assumed the sovereign power. More moderate, and perhaps more prudent, he invested the nearest heir of the ancient kings with all the appearance and pomp of sovereignty,—only reserving for himself, under the title of sheikh, all its reality. The court of the sultan was established at New Bornu, or Birni, which was made the capital, the old city having been entirely destroyed during the Fellatah invasion; while the sheikh, in military state, took up his residence at the new city of Kuka. Fairly established he ruled the country with a rod of iron, and at the same time inspired his subjects with a superstitious notion of his sanctity. His zeal was peculiarly directed against moral or religious offences. Kanemi died in 1835, and was succeeded by his son, Sheikh Omar, who altogether abolished the nominal kingship of the Sefuwa. The intercourse of Europeans with Bernu has, during his reign, been for the most part satisfactory as well as frequent.

BOROUGH. Although the idea of self-government by a town is exemplified in the *coloniæ* and *municipia* of Rome, and in their *duumviri*, *decuriones*, and lesser sentae, composed of the curial orders, which along with the *defensor civitatis* appear to have existed in vigor until the reign of Leo the Philosopher, yet as the local power was gradually subordinated to the imperial, and as both in France and Italy it seems almost universally to have disappeared when the territorial jurisdictions, as well as the feudal fiefs, became hereditary, it is impossible to trace an historical connection between these institutions and the modern boroughs. In Spain and Languedoc, perhaps, the forms of ancient independence may have been continuously preserved, but the system of government by *comes* and *scabini* (or assessors), which was pursued in both France and Italy by the successors of Charlemagne, was obviously opposed to the freedom of towns. It is during the 11th and 12th centuries that we begin to read in charters of the *citizens* of Narbonne, the *burgesses* of Carcassonne, the *consuls* of Beziers, the *magistrates* of Rouergues, the *capitols* of Toulouse. It is during the reigns of Louis the Fat, Louis the Lion, and Philip Augustus that charters of *commune* become frequent. These charters, which sometimes bear to be granted on account of the poverty of the towns folk, the enormities of the clergy, or the attacks of the local *Seigneurs*, were probably dictated by the pecuniary needs of the Crown; but they attest the growing power — the *de facto* rights of the industrial population. They distinguish between *Bourgeoiies* and *Communes* proper: the former obtained a confirmation of ancient customs, of exemption from feudal jurisdiction, of personal liberty, but they did not obtain an elective municipal government. In Italy the revival of civic autonomy was much more rapid. Although Frederick Barbarossa reserved to himself in the peace of Constance the right of nominating consuls in the Italian towns, Bishop Otho of Frisingen tells us that the imperial influence did not count for much; and in 1288, at least, we have in the Potestas (Podesta), the Concilium Generale, and Concilium Novem Dominorum of Siena, a type of the independent republican city.

The Saxon *byrig* or *burh* is properly the fortified house of the powerful man. Related forms are *burgus* (Latin of 4th century); *burg* (High German); *baurgs* (Gothic); *borg* (Gaelic); πύργος (Greek); *bor*, *borc*, and *bourg* (French); and *broch*, a pledge. The *burgensis*, or inhabitant of a walled town, was opposed to *villanus*, or inhabitant of the *villa*, or open town. The Gemot, or assembly of the original township, had the power of making *by*-laws (the Danish prefix means "town"), and of electing the *Gerefa* (Reeve), the *Bydel*, and the Tithing-man or Constable, the first of whom represented the assembly in the courts of the hundred and the shire. The *Gemot* also saw to the collection of taxes imposed by the higher courts, the pursuit of criminals, and the search for stolen goods.

BOROUGH-ENGLISH, a custom prevailing in certain ancient boroughs, and in districts attached to them (where the lands are held in socage), and also in certain copyhold manors (chiefly in Surrey and Middlesex), by which in general lands descend to the youngest son, to the exclusion of all the other children, of the person dying seized and intestate.

BOROVICHI, a town of Russia, in the government of Novgorod, situated on both banks of the River Msta. On the site of the present town there existed, from an early date, a settlement famous for the skill of its pilots; and for their encouragement in that occupation the inhabitants were freed from taxation by Peter I.

BOROVSK, a town of Russia, in the government of Kaluga, 54 miles from that city on the old post road to Moscow, is situated on both banks of the Protva, at the confluence of the Tikizh, in 55° 13′ N. lat. and 36° 9′ E. long.

BOROMEAN ISLANDS, a group of four small islands on the western side of Lago Maggiore, in northern Italy, beautifully surrounded by lake and mountain. Naturally mere barren rocks, they were in 1671 converted by Vitaliano Borromeo into pleasure gardens of great beauty, the soil being transported from the neighboring shores of the lake.

BORROMEO, CARLO, saint and cardinal of the Roman Catholic Church, was the son of Ghiberto Borromeo, count of Arona, and of Mary of Medici, and was born at the Castle of Arona, upon the Lago Maggiore, in the Milanese, October 2d, 1538. When he was about twelve years old, Julius Cæsar Borromeo resigned to him an abbacy, the revenue of which he applied wholly in charity to the poor. He studied the civil and canon law at Pavia under the learned Francis Alciat. In 1554 his father died; and, although he had an elder brother, Count Frederick, he was requested by the family to take the management of their domestic affairs After a time, however, he resumed his studies, and in 1559 he took his doctor's degree. In the following year his uncle Cardinal de' Medici was raised to the pontificate, by the name of Pius IV.; and Borromeo was made prothonotary, entrusted with both the public and privy seal of the ecclesiastical state, created cardinal deacon, and soon after raised to the archbishopric of Milan.

On the death of Pius IV., January 7, 1566, the skill and diligence of Borromeo materially contributed to stifle the cabals of the conclave. As soon as tranquility had been re-established he devoted himself wholly to the reformation of his large and important diocese, where the most flagitious irregularities were openly practiced.

In the year 1576 the city and diocese of Milan were visited by the plague, which swept away great numbers. On this occasion he went about giving directions for accommodating the sick and burying the dead, avoiding no danger, and sparing no expense. He also visited all the neighboring parishes where the contagion raged, distributing money, providing accommodation for the sick, and punishing those, especially the clergy, who were remiss in discharging the duties of their calling.

But continual labors and austerities appear to have shortened his life. He was siezed with an intermittent fever, and died at Milan, November 4, 1584.

BORROMINI, FRANCESCO, an Italian architect, born at Bissone in 1599. He was much employed in the middle of the 17th century at Rome. In his style he

affected originality and richness, which corrupted the noble simplicity of the older schools, though his compositions are occasionally imposing.

BORROWSTOUNNESS (usually abbreviated to Bo'NESS), one of the oldest seaports of Scotland, is situated on the Firth of Forth, in Linlithgowshire, about four miles from the county town.

BORY DE SAINT-VINCENT, JEAN BAPTISTE GEORGE-MARIE, a learned and industrious French naturalist, was born at Agen in 1780. While a mere boy he displayed the scientific bent of his genius and attracted attention by two memoirs addressed to the Society of Natural History at Bordeaux. Having been sent as a naturalist of Baudin's expedition to Australia in 1798, he left the vessel at the Mauritius, and spent two years in exploring Bourbon and the other islands of East Africa. Joining the army on his return, he was present at the battles of Ulm and Austerlitz, and in 1808 went to Spain with Marshal Soult. His attachment to the Napoleonic dynasty and dislike to the Bourbons were shown in various ways during 1815, and his name was consequently placed on the list of the proscribed; but after wandering in disguise from one city to another he was allowed quietly to return to Paris in 1820. In 1829 he was placed at the head of a scientific expedition to the Morea, and in 1839 he had charge of the exploration of Algeria. He died in 1846.

BOSA, a city on the western coast of the island of Sardinia, in the province of Cagliari and district of Oristano, in a fine valley on the northern bank of the Terno. Population, 6706.

BOSC, LOUIS AUGUSTINE GUILLAUME, French naturalist, was born at Paris on the 29th January 1759. He was educated at the college of Dijon, and attended the lectures of Durande on botany, which inspired him with a passion for natural history. Under the ministry of Roland he held the post of superintendent of prisons, but the violent outbreaks of 1793 drove him from office, and compelled him to take refuge in flight. For some months he lay concealed in the forest of Montmorency, barely subsisting on roots and vegetables. He was enabled to return to Paris on the fall of Robespierre, and soon after set out for America, resolving to explore the natural riches of that country. The immense materials he gathered were never published in a complete form, but much went to enrich the works of Lacépède, Latreille, and others. After his return, on the establishment of the Directory, he was reinstated in his old office. Of this he was again deprived by the *coup d'état* of 1799, and for a time he was in great destitution. He set resolutely to work, however, and by his copious contributions to scientific literature, contrived to support himself and to lay the foundations of a solid reputation. He was engaged on the Supplement to Rozier's Dictionary, on the new *Dictionnaire d'histoire naturelle*, and on the *Encyclopédie Méthodique*. He edited the *Dictionnaire raisonné et universel d'agriculture*, and was one of the editors of the *Annales de l'agriculture Française*. His increasing fame brought him manifold employments. He was made inspector of the gardens at Versailles, and of the public nurseries belonging to ministry of the Interior. The last years of his life were devoted to an elaborate work on the vine, for which he had amassed an immense quantity of materials. His death, on the 10th July 1828, prevented the prosecution of this work; and his notes which still exist are said to be so unsystematic as to be unfit for publication.

BOSCAN, JUAN, a Spanish poet, celebrated as the introducer of Italian measures into Spanish literature, was born about the close of the 15th century. The exact date is unknown, but it was probably a few years before 1500. He was of patrician birth and appears to have passed some years in military service. He died in 1540 at Perpignan, where he was residing with the duke of Alva. His poems were published in 1543 at Barcelona by his widow. They are divided into four books which mark out distinctly the stages of Boscan's poetical history.

BOSCAWEN, Edward, British admiral, was born August 19th, 1711. He was the third son of Hugh, Lord Viscount Falmouth. He early entered the navy, and in 1740 distinguished himself at the taking of Porto Bello. At the siege of Carthagena, in March 1741, at the head of a party of seamen, he took a battery of fifteen 24-pounders, while exposed to the fire of another fort. On his return to England in the following year he married, and entered parliament as member for Truro. In 1744 he captured the "Medea," a French man-of-war, commanded by M. de Hocquart, the first ship taken in the war. In May 1747 he signalized himself in the engagement off Cape Finisterre, and was wounded in the shoulder by a musket-ball. Hocquart again became his prisoner and the French ships, ten in number, were taken. On the 15th July, he was made rear-admiral and commander-in-chief of the expedition to the East Indies. On the 29th July 1748 he arrived off Fort St. David's, and soon after laid siege to Pondicherry; but the sickness of his men and the approach of the monsoons led to the raising of the siege. Soon afterwards he received news of the peace, and Madras was delivered up to him by the French. In April 1750 he arrived in England, and was the next year made one of the lords of the Admiralty, and chosen an elder brother of the Trinity House. In February 1755 he was appointed vice-admiral, and in April he intercepted the French squadron bound to North America, and took the "Alcide" and "Lys" of sixty-four guns each. Hocquart became his prisoner for the third time, and Boscawen returned to Spithead with his prizes and 1500 prisoners. For this exploit he received the thanks of Parliament. In 1758 he was appointed admiral of the blue and commander-in-chief of the expedition to Cape Breton, when, in conjunction with General Amherst, he took the fortress of Louisbourg, and the island of Cape Breton,—services for which he again received the thanks of the House of Commons. In 1759, being appointed to command in the Mediterranean, he pursued the French fleet, and after a sharp engagement in Lagos Bay, took three large ships and burnt two, returning to Spithead with his prizes and 2000 prisoners. In December 1760 he was appointed general of the marines, with a salary of £3000 per annum, and was also sworn a member of the privy council. He died at his seat near Guildford, January 10, 1761, in the 50th year of his age.

BOSCOVICH, ROGER JOSEPH, a distinguished Italian mathematician and natural philosopher, and one of the earliest of foreign *savants* to adopt the theory of Newton, was born at Ragusa in Dalmatia, May 18th, 1711, according to the usual account, but ten years earlier according to Lalande (*Èloge*, 1792). In his fifteenth year, after passing through the usual elementary studies, he entered the society of Jesus. On completing his novitiate, which was spent at Rome, he studied mathematics and physics at the Collegium Romanum; and so brilliant was his progress in these sciences that in 1740 he obtained the appointment of professor of mathematics in the college. In 1742 he was consulted, with other men of science, by the pope, Benedict XIV., as to the best means of securing the stability of the dome of St. Peter's, in which a crack had been discovered. His suggestion was adopted. Shortly after he engaged to take part in the Portuguese expedition for the survey of Brazil and the measure-

ment of a degree of the meridian; but he yielded to the urgent request of the pope that he would remain in Italy and undertake a similar task there. Accordingly, in conjunction with Christopher Maire, an English Jesuit, he measured an arc of two degrees between Rome and Rimini. The operations were begun towards the close of 1750, and were completed in about two years. A dispute having arisen between the Grand Duke of Tuscany and the republic of Lucca with respect to the drainage of a lake, Boscovich was sent, in 1757, as agent of Lucca to Vienna, and succeeded in bringing about a satisfactory arrangement of the matter. Another occasion for the exercise of his diplomatic ability soon after presented itself. A suspicion having arisen on the part of the British Government that ships of war had been fitted out in the port of Ragusa for the service of France, and that the neutrality of Ragusa had thus been violated, Boscovich was selected to undertake an embassy to London (1760), to vindicate the character of his native place and satisfy the Government. The mission he discharged successfully, with credit to himself and satisfaction to his countrymen.

On leaving England Boscovich travelled in Turkey, but ill health compelled him soon to return to Italy. In 1764 he was called to the chair of mathematics at the University of Pavia, and this post he held, together with the directorship of the observatory of Brera, for six years. He was invited by the Royal Society of London to undertake an expedition to California to observe the transit of Venus in 1769; but this was prevented by the recent decree of the Spanish Government for the expulsion of the Jesuits from its dominions. About 1770 he removed to Milan, where he continued to teach and to hold the directorship of the observatory of Brera; but being deprived of his post by the intrigues of his associates he was about to retire to his native place, when the news reached him (1773) of the suppression of his order in Italy. Uncertainty as to his future lot led him to accept an invitation from the king of France to Paris, where he was naturalized and was appointed director of optics for the marine, an office instituted for him, with a pension of 8000 livres. He remained there ten years, but his position became irksome, and at length intolerable. In 1783 he returned to Italy, and spent two years at Bassano, where he occupied himself with the publication of his *Opera pertinentia ad opticam et astronomiam, &c.*, which appeared in 1785 in five volumes quarto. After a visit of some months to the convent of Vallombrosa, he went to Milan, and resumed his literary labors. But his health was failing, his reputation was on the wane, his works did not sell, and he gradually sank a prey to illness and disappointment. He fell into melancholy, imbecility, and at last madness, with lucid intervals, and died at Milan on the 13th of February 1787.

BOSNA SERAI, SERAIEVO, or in Italian SERAGLIO, a city of European Turkey, and capital of the province of Bosnia, is situated on the Migliazza near its junction with the Bosnia, 246 miles south of Buda.

BOSNIA, the most north-westerly province of Turkey in Europe, comprising Bosnia Proper, a part of Turkish-Croatia, or Craina, the district of Herzegovina, and the ancient Rascia, is bounded on the N. and W. by the Austrian dominions, S. by Montenegro and Albania, and E. by Servia; and has an area of about 24,024 square miles. The whole province, with the exception of the valley of the Save, is more or less mountainous, many of the summits reaching the height of 6000 feet. A large proportion of the surface is valuable forest-land, which furnishes almost inexhaustible stores of timber and fuel. Plums are largely grown in the northern portion and exported as prunes, — Beska on the Save being one of the chief centres of the trade. In Herzegovina the vine, olive, fig, and pomegranate flourish. Maize and wheat are the principal grains in cultivation, but barley, oats, hemp, and even rice are also grown. Abundance of pasture land occurs throughout the province, and cattle, sheep, and goats are reared; the number of the cattle was, however, greatly diminished by the plague in the decade ending with 1870. Large droves of swine are fed in the oak-forests. In mineral deposits the country is especially rich. The whole valley of the Bosnia is said to be one enormous coal-bed; copper is worked in several places, and at Inatch is a very valuable cinnabar mine. The number of the inhabitants has remained about stationary, being estimated at 1,100,000 in 1844, and at 1,279,296 in 1873. Bosnia was at first dependent on the Servian and Croatian kings, but was raised for a time to a separate principality, which reverted about 1339 to the Servian king Stephen. After his death it was again independent, and continued to have its own rulers till the latter half of the 15th century, in spite of the encroachments of the Turks, who at last succeeded in incorporating it in 1503. The Hungarians long disputed this appropriation, but the country was definitely ceded to Turkey at the peace of Carlovitz in 1699, which was confirmed by the treaty of Sistovar in 1791.

BOSPHORUS (or, more correctly, BOSPORUS, Oxford), originally used for a strait, was especially applied to the *Bosporus Cimmerius*, or Strait of Yenikale, and the *Bosporus Thracius*, or Strait of Constantinople. In modern times it has almost become the exclusive designation of the latter strait, which unites the Black Sea with the Sea of Marmora and forms the boundary between Europe and Asia.

BOSSI, GIUSEPPE, an Italian painter and writer on art, was born at the village of Busto Arsizio in the Milanese, in 1776 or 1777. He was educated at the college of Monza; and his early fondness for drawing was fostered by the director of the college, who supplied him with prints after the works of Agostino Carracci for copies. In 1804, in conjunction with Oriani, he drew up the rules of the three academies of art of Bologna, Venice, and Milan, and soon after was rewarded with the decoration of the Iron Crown. On the occasion of the visit of Napoleon I. to Milan in 1805, Bossi exhibited a drawing of the Last Judgment of Michael Angelo, and pictures representing Aurora and Night, Œdipus and Creon, and the Italian Parnassus. By command of Prince Eugene, Viceroy of Italy, Bossi undertook to make a copy of the Last Supper of Leonardo, then almost obliterated, for the purpose of getting it rendered in mosaic. Bossi died at Milan, December 15, 1816. A monument by Canova was erected to his memory in the Ambrosian library, and a bust was placed in the Brera.

BOSSI, GIUSEPPE CARLO AURALIO, BARON DE, an Italian poet and diplomatist, was born at Turin, November 15, 1758. He made his first appearance as a poet at the age of eighteen by the publication of two tragedies, *Rea Silvia* and *I Circassi;* and four years later he took the degree of doctor of laws. In 1781, in consequence of his ode in praise of the edict of toleration promulgated by the Emperor Joseph II., he was banished the kingdom; but having rendered during his exile an important service to his countrymen he was recalled and appointed under-secretary of state for foreign affairs. In 1792, on occasion of the French invasion, he was sent to the court of Prussia to negotiate an alliance, and thence went as ambassador to St. Petersburg. Dismissed by the emperor in consequence of the treaty of alliance between Sardinia and France (1797), he was

named ambassador to Venice, which he reached only in time to witness the fall of the republic. He was next appointed envoy to General Bonaparte in Italy. After the conquest of Sardinia Bossi was a member of the Provisional Government, and one of the three deputies sent to Paris to petition for annexation to France. The Russian invasion of 1799 drove him to take refuge in the Vaudois valleys. He was afterwards a member of the Provisional Government, but retired in 1802. Three years later he was made prefect of the Ain; he was created baron by Napoleon I. in 1810, and was afterwards transferred to the prefecture of La Manche. He died at Paris, January 20, 1823.

BOSSU, RENÉ LE, an eminent French critic, born at Paris, March 16, 1631. He studied at Nanterre, and in 1649 entered among the regular canons of Sainte-Geneviève. After having acted as professor in different religious houses for twelve years, he withdrew into retirement. His first publication was *Parallèle des Principes de la Physique d'Aristote et de celle de René Descartes*, which appeared in 1674, but met with little success.

BOSSUET, JACQUES BÉNIGNE, the celebrated orator and prelate, was born at Dijon, within a short distance of the cathedral, on the 27th September 1627. He was the fifth son of Bénigne Bossuet and Madeleine Mochette. The family of which he came, though of bourgeois rank, had long taken an honorable part in the public and official life of Burgundy. He was destined from infancy for the church, and grew up amid influences eminently favorable to the unfolding of his powers, for, although at six years of age, on his father's appointment to be president in the parliament of Metz, he was left at Dijon, yet his education had been wisely confided to an uncle, Claude Bossuet, a large-hearted man, ardently devoted to literature, whose delight it was to foster his nephew's intellectual gifts. These soon gave token of exceptional brilliancy, and in the Jesuit's College, where he went to school, he distanced all competitors in the facility with which he mastered the Greek and Latin classics, Virgil and Homer being his especial favorites, for whose writings he contracted an unalterable attachment, just as Horace became the life-long companion of his rival Fénélon. It was from a higher source, however, that Bossuet's genius, which was essentially of the Hebrew type, caught its finest inspiration; and one day reading a Bible left open by accident at the prophecies of Isaiah, he was so thrilled by their poetry that thenceforth he became virtually "a man of one book," and in Holy Scripture, read and re-read until learned ultimately almost by heart, he found the field in which his mind could best expatiate and gather light and power. In Bossuet, says Lamartine, the Bible was transfused into a man. With that keen-sighted appreciation of talent which they uniformly display, the Jesuits sought to enlist him in their order, but family influence being against the proposal, in 1642 he was sent to Paris; nor could the circumstances of his arrival there fail profoundly to impress the fervid imagination of the boy, for it chanced to be on the very day on which Richelieu, then near his end, was borne into the city in a splendid movable chamber, at the close of the vengeance-taking campaign, which terminated in the execution of De Thou. Bossuet entered the college of Navarre, the oldest in the University, where, under Nicholas Cornet, the presiding genius of the place, and in the midst of the intellectual quickening imparted to it in common with the whole of learned Europe by the new philosophy of Descartes, he achieved distinction in every department except mathematics, for which he seems to have possessed neither the taste nor the faculty. At sixteen his attainments were the talk of the town. He became the pet of the lettered aristocracy of Paris, and it argues his strength of character that he was unspoiled by their caresses. The applause which greeted the delivery of his thesis for the bachelor's degree encouraged him to perfect his superb oratorical gifts, nor did he count it unlawful then to be a frequent spectator when the *chefs-d'œuvres* of Corneille were played, although, later, he was not sparing in his criticism of the stage. At twenty-four he was appointed archdeacon of Metz. In Lent 1652, after a season of retreat at St. Lazare, he received priest's orders, and immediately quitted the gay capital, and the career already opening to him there, to fulfil the duties awaiting him in the comparative obscurity of the provinces. Six years were spent in unwearied pastoral activity, as well as in exhaustive private study of Scripture and of the Fathers, notably St. Augustine, although even in the less read Patristic writings he was at home, and quickly put his knowledge to use in a work of controversy entitled *Refutation du Catechisme de Paul Ferry*, a Protestant minister of Metz. It is of interest principally because it outlines even at that early date the doctrine afterwards vigorously defended by Bossuet of the limited authority of the popes in matters of faith. The echo of his pulpit eloquence had already begun to reach beyond Lorraine; during a short residence at Metz it fascinated Anne of Austria, the Queen Mother, and for the next ten years (1659–69) he was in perpetual request in the metropolis. Wherever he appeared court and city flocked to listen; the queens went from the palace and the nuns of Port Royal from their seclusion; Condé, Turenne, Madame de Sevigné, and other famous contemporaries mingled with the crowd; while, in 1662, the preacher's triumph reached a climax, when after hearing him for the first time at the Louvre, Louis XIV., in a moment of rarely awakened enthusiasm, despatched a royal message to Bossuet's father—"pour le feliciter d'avoir un tel fils."

In 1669 Bossuet was appointed to the diocese of Condom, and in the year following he became preceptor to the Dauphin; but being unable, in conscience, to retain both offices he resigned the former, and, in consideration of the pecuniary sacrifice involved, obtained the revenues of the Abbey of St. Lucien at Beauvais. Convinced that on the culture of the Dauphin might depend the future welfare of the French people, he threw himself with incredible energy into the novel duties of the preceptorship, and resumed his own education the better to educate his august but indolent pupil.

It was not until the close of 1679 that Bossuet's official duties as preceptor came to an end, but in the interval his industry otherwise did not slacken. He was elected a member of the Academy of France in 1671. About this time, too, he gave to the world the most frequently revised, most bitterly attacked, and most widely translated of all his books, *L'Exposition de la doctrine catholique.* Composed in 1669, and originally circulated in manuscript, it had been credited with effecting in this shape not a few conversions, among others that of Turenne. But Jean Daillé and other Reformers having charged it with toning down the harshness of Roman dogma with the purpose of ensnaring their flocks, Bossuet resolved to publish it. The book created a widespread flutter of excitement, as may be inferred from the terms employed in speaking of it by Jurieu, perhaps the ablest of Bossuet's opponents,—"Everybody is gone mad over the *Exposition;* everywhere one hears of the most disgraceful perversions." It twice received the *imprimatur* of the Pope in despite of the author's undisguised opinions with respect to infallibility.

During the latter years of the preceptorship Bossuet, with a few genial associates, busied himself with *Notes*

and Annotations of the Books of Scripture. Many pleasant hours were spent in these round-table studies, and it is proof of his inexhaustible energy that he did not hesitate, even so late in life, to acquire a knowledge of Hebrew, though there may be a touch of exaggeration in what was said of him by an admirer,—"that he was not less familiar with the language of Moses than with that of Homer."

Appointed in 1681 to the bishopric of Meaux, Bossuet had scarcely been installed when he was summoned to take part in the memorable assembly of the French clergy with which his name will always be associated. This council was convoked by royal edict, at the instance of the clergy themselves, for the purpose of finding a way out of the conflict, yearly growing fiercer, between Louis and Rome. The strife arose about the *regalia*, or claim of the crown to administer the affairs of a vacant see until such time as its new occupant should take the oath of fidelity. But in the course of its discussions the council was agitated by questions far wider than that in which it took its rise, and embracing eventually the whole subject of the extent and limits of Papal authority. Bossuet preached the opening sermon. He gave fearless utterance to his cherished opinions. Referring to the aggressive disposition of the Papacy he declared—"Ocean itself, immense though it is, has its limits, and to break through at its own caprice would be to lay desolate the world." At the same time, seeing the heated state of the public mind, he counselled moderation, occupying a middle place between Ultramontanists and ultra-Gallicans, and was even opposed to any formal declaration of the Gallican position. Being overruled in this chiefly through the influence of Harlay, archbishop of Paris, he next directed his efforts towards issuing the assembly's decision in the most temperate and conciliatory form. He was himself appointed to draw it up, and there resulted the famous four articles which were in substance these:—I. The civil authority is not subject to the ecclesiastical in temporal things; II. As decreed by the Council of Constance, a general council is superior to the Pope; III. The exercise of the apostolic power ought to be tempered by the usage of particular churches; IV. Except with the consent of the church the judgment of the pope is not unalterable in matters of faith. Being virulently attacked, these propositions were defended by Bossuet in his great *Defense de la doctrine du clergé de France*, which, however, was not printed until 1735. He died in 1704.

The best edition of Bossuet's work is that of Lachat in thirty-six vols., Paris (Vives). See also *Life of Bossuet* by Cardinal de Bossuet; *Studies of his Life*, by Floquet; and the *Memoirs* of the Abbé le Dieu. There is a full and admirable English *Life of Bossuet*, by the author of the *Life of St. Francis de Sales*, 1874. For Brougham's estimate of Bossuet as an orator, which is very depreciatory, see his *Works*, iii. 262–269. For a criticism of *L'Histore Universelle* see Flint's *Philosophy of History*.

BOSTON, a parliamentary and municipal borough and seaport town of England, in the county of Lincoln and wapentake of Skirbeck. It is situated in a rich agricultural district on the Witham, six miles from the sea, and thirty miles S.E. of Lincoln on the Great Northern railway. Population (1890), 20,000.

BOSTON, the capital of the State of Massachusetts, in Suffolk County, and the sixth city in commerce, wealth, banking capital, and valuation in the United States of North America. It lies at the bottom of Massachusetts Bay, and is one of many pear-shaped peninsulas formerly attached to the mainland only by narrow marshy necks, which fringed the shores of the bay. The Charles River, once more than double its present width, divides it from the similar promontory of Charlestown (the site of the battle of Bunker Hill), on the other side of which the Mystic River, uniting with the Charles, flows into the harbor.

The Indian name of the peninsula was "Shawmut," meaning "living fountains." When Governor John Winthrop, with his company, came over from England with the king's charter, to establish a government under it in the bay, they reached Charlestown, as a temporary settlement, on June 17, 1630. Looking across the Charles, the Indian Shawmut presented to the eye an elevation nearly in its centre, with three distinct summit peaks, the remnants of the only one of which now remaining constitute the present Beacon Hill, so called from its ancient use as a signal warning station. These triple summits led to the substitution of the name "Trimountaine," or "Tremont," as the English designation of the whole peninsula—a favorite title perpetuated in the name of a central street, a hotel, a theatre, a bank, a lecture hall, &c. A single lonely white man, the Rev. William Blaxton, a clergyman of the English Church, was then living, with house, orchard, and garden on the slope of the central hill, supposed to have come over in 1623, one of several isolated settlers on the promontories and islands of the bay, called "the old planters." He invited Winthrop's company to cross the river and build their cabins on his side, because of the purer and more abundant water-springs. On the records of the company we read, that at a court held in Charlestown, September 17, 1630, "It is ordered that Trimountaine shall be called Boston." This has consequently been the date assumed for the foundation of what is now the present city, and the second centennial of which was commemorated by public civic services, an oration by Josiah Quincy, a former mayor, then president of the Harvard University, and a poem by the banker-poet, Charles Sprague. It is not probable that the peninsula was occupied till a month later. Blaxton, not finding the new-comers congenial associates, sold out his rights to them in 1634, and moved elsewhere. It has often been said, and has been widely accepted, that Boston received its name in compliment to the second minister of its first church, the Rev, John Cotton, formerly vicar of St. Botolph's, borough of Boston, Lincolnshire, England. This was not the case. The Rev. John Wilson, of King's College, Cambridge, and of Sudbury, in Suffolk, England, came in Winthrop's company, and was first pastor of the church. Cotton did not arrive till September 4, 1633, three years after the name Boston had been adopted. Undoubtedly the name was chosen in compliment to the much honored Mr. Isaac Johnson, one of the foremost in the enterprise, who with his wife, the Lady Arbella, daughter of the Earl of Lincoln, came with Winthrop in a vessel bearing her name. Johnson was from the English Boston, as were also his associates, Atherton Hough, who had been mayor of the borough, and Thomas Leverett, "ruling elder" of the church, who had been an alderman.

Some graceful courtesies have been exchanged in recent years between the two cities. The English Boston sent over a copy of her charter, framed in wood from St. Botolph's church, and this now hangs in the city hall of the Massachusetts capital; and some descendants of John Cotton, with members of his American Church, through one of their number, Edward Everett, then American minister at the Court of St. James, united in a generous subscription to restore a chapel in St. Botolph's, and to erect a monumental tablet in it to the teacher.

The sea-girt peninsula seems to have attracted the choice of the colonists as a place of settlement, because

of its facilities for commerce and for defence. Its aboriginal occupants had previously been devastated by a plague, leaving it vacant. Some fifty years afterwards the settlers satisfied the claims of an Indian sachem, representing that his grandfather had been its proprietor. Had these settlers contemplated the enormous outlay of labor, skill, and money, which their posterity would have to expend on the original site to make it habitable and commodious, they might have planted themselves elsewhere. There was neither wood nor meadow on the peninsula; but it might be defended from the Indians and wolves, and as one early visitor vainly imagined, from "moskitoes." The surface was very abrupt, irregular, hilly, and undulating, deeply indented by coves, and surrounded by salt-marshes left oozy by the ebbing tides, and separating the shores from the river channels. The peninsula contained less than 1000 acres, and the narrow neck, which joined it to the main, was often swept by spray and water. The widening of Charles River near its mouth gored deeply into the northern side of the peninsula, almost dividing it, and the waters were soon turned to account for a mill-pond. This was filled up by earth from the hills in 1807, adding more than 50 acres to the territory. Another broad cove on the southern side was filled in 1837, adding 77 acres more. The Back Bay, so called, and all the flats on both sides of the original have since been reclaimed for the various uses of a public garden, and squares, streets, dwellings, churches, schools, hotels, manufactories, &c., constituting, in fact, a new city with many costly and elegant structures, on what was originally the narrowest and most disagreeable, but is now the fairest and widest, portion of the primitive site. But whole forests from the State of Maine, and vast quarries of granite, and hills of country gravel, have been put to service in fringing water margins, constructing the wharves, piers and causeways, redeeming the flats, and furnishing the piling and solid foundations for the stately edifices, private houses, halls, churches, and railroad stations, principally between Charles River and the old Dorchester flats. From the first settlement, however, the ownership and occupancy of land by the citizens were not confined to the soil of the peninsula. The land needed for grazing, farming, and wood, on neighboring promontories and islands was soon placed under the jurisdiction of Boston, for its "inlargement." Portions of territory, thus added, were from time to time severed, and have since been re-annexed. Noddle's Island, now East Boston, was "layd to Boston" in 1637. It then contained 660 acres, with several hundreds more of flats and marsh, since reclaimed. It has a wharf, 1000 feet in length, for the English and Canadian steamers. Dorchester Neck and Point, containing 560 acres, were annexed as South Boston in 1804, and the neighboring Washington Village in 1855. The city of Roxbury, was annexed in 1868; the town of Dorchester in 1870; the city of Charlestown, and the towns of Brighton and West Roxbury, in 1874. The 900 acres of the original peninsula have been doubled on its own area; while the present area of the city's jurisdiction covers 22,472 acres. The whole length of the original peninsula, from Roxbury line to Winnisimmet Ferry, was two miles and a little more than three quarters; its greatest breadth was 1 mile and 139 yards. The reclaimed territory is raised to a uniform level, sufficiently high to secure it against freshets, and is well drained. While the original site still preserves to a large extent its irregularity of surface, and its undulations, some of its former steep eminences have been reduced or wholly removed. The highest eminence in the old territory is about 110 feet above the sea-level. This work of levelling, grading, and reclaiming has been done at vast expense. But greater has been the expense of widening and straightening the narrow and crooked highways, streets, thoroughfares, and lanes of the first settlers, which are traditionally said to have been made by the cattle on their way to and from their pastures. This, next to the water-works, has been the occasion of the most considerable increase of the debt incurred by the city, somewhat relieved by assessments for betterment on abutting proprietors. It is believed that there has been a larger outlay of labor, material, and money, in reducing, levelling, and reclaiming territory, and in straightening and widening thoroughfares in Boston, than has been expended for the same purposes in all the other chief cities of the United States together. The broad watercourses around Boston are now spanned by causeways and bridges,—East Boston only, that the harbor may be open to the navy-yard, being reached by a ferry. The first bridge over Charles River, that to Charlestown, was opened in 1786; the West Boston bridge, to Cambridge, in 1793; the Western Avenue, a solid causeway to Brookline, 7000 feet long, in 1821. Boston has now to maintain sixteen bridges. Most of the railroads also have their bridges. Six of the islands in Boston harbor are the property of the city, and three more of them have been ceded to the United States for fortifications. The harbor islands, including rocks and shoals, are very numerous, rendering the navigation through the two channels very difficult and easily guarded. But the harbor, when reached, is very secure. It is nearly 14 miles long, and 8 miles wide, giving nearly 60 square miles of anchorage. These islands were for the most part heavily wooded when first occupied, and some of them were profitably used for grazing and pasturage. Since they have been stripped of their primitive growth for fuel and building material it has been found impracticable to reclothe them with trees, on account of the roughness of the sea-air. The washing of the soil from the bluffs of many of them, to the great injury of the harbor, has involved large expense in the erection of sea-walls. The first settlers constructed rude defences, frequently repaired and extended, on Castle Island, 2¼ miles from Boston. More formidable works were raised here by an English engineer in 1701–3. The United States government has constructed elaborate fortifications on this site, now called Fort Independence, which, with Forts Winthrop and Warren, on neighboring islands, offer formidable harbor defences. The first lighthouse was erected in the harbor, on Beacon Island, 8¼ miles from the town, near the Great Brewster, in 1716. This was destroyed during the Revolutionary War, re-erected in 1783, ceded to the United States in 1790, refitted in 1856 and 1860, with a tower 98 feet high, fog-horn, bell, &c., and is now called the Outer Light. An inner lighthouse was established on Long Island Head in 1819, refitted in 1855. On the long spit, at the western extremity of the Little Brewster, stands the Bug or Spit Light, erected in 1856.

It is remarkable, considering the leading and conspicuous character which has always attached to Boston from the first English settlement of the country, that it should have remained for nearly two centuries under the simple form and administration of a town government, the same as that of the smallest interior hamlets. Such a government, by all the citizens assembled in "town meeting" to dispose of all their affairs, was, however, found favorable to the development and prosperity of the community. Here was trained a homogeneous population under peculiar institutions. Wealth slowly but steadily increased, through the whale and cod fisheries, the fur-trade, the sale of lumber and pitch, and a commerce largely with the West Indies and elsewhere,—though much impeded by the restrictions of

the English navigation laws. Heavy exactions and drawbacks were found in the Indian and in the French colonial wars. Here began opposition to the measures of the British ministry, for oppressing and taxing the colonies. The Stamp Act, passed in 1765, was repealed in 1766. The Tea Act, passed in 1773, was defied by the emptying of three cargoes of tea into the harbor, December 16 of the same year, by a party in the guise of "Mohawk Indians." The port was closed by a British fleet, June 1, 1774. The British army evacuated Boston March 17, 1776, after having been beleaguered in it nearly a year. The constitution of the state was adopted here in 1780, midway in the war.

Boston received a city charter in 1822. Its Government is composed of a mayor, twelve aldermen, and a common council of seventy-two members, three from each of its twenty-four wards, annually elected by the citizens. There are commissioners for fire, water, health, and various other departments. There is a board of twelve overseers of the poor, with a commodious central building, connected with twelve charitable organizations, with which the board acts in concert.

The buildings of Boston having from the first been largely of wood—the use of which material for that purpose is now under severe restrictions—and closely compacted, the old town suffered from frequent and disastrous conflagrations, several of which were successively described as "The Great Fire." There had been ten of these disasters, severe under the then existing circumstances, before the year 1698. In 1711, the town-house and a meeting house, both of brick, and a hundred dwellings were destroyed. In 1760 a conflagration consumed 349 dwellings, stores, and shops, and rendered more than 1000 people homeless. But these and all subsequent ones were eclipsed in their devastation by the disaster of November 9–10, 1872, in which hundreds of costly warehouses filled with goods, with banks, offices, churches, etc., were destroyed, though all of brick or granite, involving a loss of over $80,000,000. It is an evidence of the energy and resources of the citizens, that in a little more than two years after the catastrophe, the whole "burnt district," with widened and improved thoroughfares, was covered with solid, substantial, and palatial edifices combining all the safeguards, improvements, and conveniences of modern skill.

The park system of Boston, when completed, will be one of the finest in the world. Its chief feature is the famous enclosure, called the Common, formerly Mr. Blaxton's cow-pasture, embracing 48 acres. It is supplemented on its Western side by the Public Garden, a tract of 21 acres. The several parts of the park system are—the Charles River Embankment, on the North side of Beacon street; the Back Bay Park, comprising land and water; the Muddy River Improvement, connecting the Back Bay Park with Jamaica Pond by way of Brookline, Jamaica Park, a driveway wholly around Jamaica Pond; the Arnold Arboretum, and the Franklin Park, which extends to 485 acres lying between Dorchester and Roxbury. A Marine Park is in process of construction at City Point, South Boston, and the Chestnut Hill Reservoir at Brighton may be called another.

The most famous of the public buildings of Boston is Faneuil Hall, "the cradle of liberty." It was built and given to the town for a market-house in 1742 by Peter Faneuil. It was partly destroyed and rebuilt in 1762. In 1805 it was considerably enlarged. It was the place where nearly all the town meetings were held from the time of its erection until the adoption of the city charter. It was here that the citizens deliberated and laid plans which culminated in the Revolution, and it is still used for public and political assemblies and discussions.

The next place in interest is the Old South Church. The parish which formerly worshipped here was organized as the third church in Boston, and the present building is its second edifice. It was erected in 1730. In the revolutionary period it was often used for overflow meetings when Faneuil Hall was crowded. Both of these buildings now contain important pictures. In Faneuil Hall is Healey's great painting representing Daniel Webster addressing the United States Senate on the occasion of his celebrated reply to Hayne, and in the Old South Church is to be found a notable collection of paintings and relics illustrating New England history. The building is also used for historical meetings and for many civic gatherings. The old State House, at the head of State street, was erected in 1748, and was long used for state offices. The legislature met in it, and when Boston became a city in 1822, it was used as the City Hall. It has now been restored to very nearly its original appearance, both within and without, and a large portion of its space is open to the public as an historical gallery of the Bostonian Society. Here are a great many historical paintings of the revolutionary and colonial periods. The present State House, the most conspicuous public building in Boston, was begun in 1793 and completed in 1798. It has been enlarged once by the extension of its rear to Mount Vernon street, and now it is in process of a second enlargement on the other side of the street by a structure equal to its present size, and occupying the site of the disused reservoir which was once located on this spot. The new Court House, on the west side of Pemberton Square, is one of the most imposing structures in the city. The new Public Library building, rapidly approaching completion, is a square structure, occupying an entire block on the South side of Copley Square. The Art Museum is another notable building, and covers a large area. Among historical buildings Old Christ Church and King's Chapel are the quaintest and most interesting.

The water supply was originally obtained from Lake Cochituate, in the town of Natick. Since then supplies have been added from Sudbury River and Mystic Lake. The water works were begun and completed under Mayor Quincy in 1848, and the main system is very extensive. The chief reservoir, outside of the storage basin, at Framingham, is the Chestnut Hill Reservoir, from which the water is brought directly into Boston. The city has obtained in recent years a very thorough sewerage system. Formerly the main sewers emptied into the Charles river and into the harbor; now they all run into a big sewer which takes all the waste matter from the city and discharges it by tunnel to Moon Island, from whence it is carried to a point outside the harbor. The sewer cost $4,000,000.

The public schools bear a high reputation, and are under the care of the School Board, which consists of the Mayor, ex-officio Chairman, and twenty-four members, eight being chosen at large by general popular vote every year for a term of three years. The superintendent of schools and the board of supervisors are under the direction of the school committee, by whom they are chosen. The public schools are the Normal School, the Latin School, the Girls' Latin School, the English High School, the Girls' High and Normal School, the high schools in Roxbury, Dorchester, Charlestown, West Roxbury, Brighton and East Boston, 51 grammar schools, 438 primary schools, and 22 special schools. The Girls' High School was completed in 1870. The new English and Latin High School was first occupied in 1881. The kindergarten system is applied in all the primary schools.

The educational and literary institutions outside of

the public schools are numerous. The first of these is Boston University, founded in 1869 by Isaac Rich, who endowed it with nearly $2,000.000. It has been a very successful institution from the beginning. The Massachusetts Institute of Technology received its charter from the state in 1881. It has an attendance of about 1,000 students. Boston College is carried on under the care of the Jesuits, and is one of the chief Roman Catholic institutions in the state. Chauncey Hall School is the oldest and one of the most noted institutions for preparing boys for college in the city. Art schools are numerous, and the Art Museum is a great incentive to increase their attendance. From four to five thousand students attend these different institutions. Boston has long claimed to be the literary center of America, and its two largest libraries, the Public Library and the Athenaeum, have done much to help to maintain this reputation. The Public Library contains 550,000 volumes. It was fostered by an enterprise initiated by M. Vattemar in securing a gift of books from the city of Paris in 1843. Acts of the legislature, renewed and extended from 1848 to 1857, with free and conditional gifts of money and of books, kept the object steadily in view. In 1852 Mr. Joshua Bates, a native of Massachusetts, but living in London, made a gift to the city of $50,000 for the purpose of a library, and the main hall, in the old as in the new building, bears his name, in commemoration of his gift. The present structure was inaugurated in 1858, and the libraries of Theodore Parker, Edward Everett and George Ticknor have greatly enriched the collection. Here is deposited the famous Prince library, as well as the rich and unique collection known as the Barton library. The new building will be fire-proof and a great ornament to the city. The popular circulation in 1890 was 1,875,411 volumes. This is greatly increased by the use of branch libraries in different parts of the city which are connected with the main library.

There are 231 church organizations, divided denominationally as follows: Protestant—Congregational Trinitarian, 44; Congregational Unitarian, 27; Methodist Episcopal, 32; Independent Methodist, 3; Baptist, 31; Protestant Episcopal, 30; Universalist, 8; various denominations, 17; Presbyterian, 9; Lutheran, 8; Second Advent, 2; Christian, 2; Swedenborgian, 3; Friends, 1; Catholic Apostolic, 1; Roman Catholic, 34; Jewish, 8. The oldest church edifice in the city is Christ Church, in Salem street, built in 1723, and always occupied by the same society. The public, private, charitable, and benevolent institutions of Boston are in number 220. Many of the oldest of them date before the year 1800, and six of them were established in the first seventy years of Boston history. The Massachusetts General Hospital was incorporated in 1811. The City Hospital was chartered in 1864. The Homœopathic Hospital began its work in 1870. The Children's Hospital was incorporated in 1869. The Carney Hospital, a Roman Catholic institution, received its charter in 1865. Boston was the first city in the United States to organize its different charitable societies under the title of the Associated Charities, which works in close harmony with the city government, and has abolished begging in the streets.

The first newspaper printed in America was the Boston *News-Letter*. The date of its earliest issue was April 24, 1704. It ceased to appear with the evacuation of the city by the British. The next paper was the Boston *Gazette*, begun in 1719; and the third was the *New England Courant*, begun in 1721, with which the Franklin brothers, both Benjamin and James, were connected. The first successful daily newspaper was the *Advertiser*, which was started in 1813. Boston now has 2 daily morning, evening and Sunday papers, 2 daily morning and evening papers, 3 daily morning papers, 3 daily evening papers, and nearly 200 periodicals. Its literary and general societies are numerous, and many of them have extensive and valuable libraries, like the Massachusetts Historical, the New England Historic Genealogical, the Natural History, the Horticultural, the Boston, the State, the Law, and the General Theological. There are nine theatres.

The chief railroads of Massachusetts centre in Boston, nine of which have an independent entrance into the city and extensive terminal facilities. At the piers of the New York and New England, the Boston and Albany, and the Fitchburg railroads are large grain-elevators, which are extensively used in loading ocean steamships. Boston is not relatively so strong in its control of the general commerce of the country as it was, but it is still the chief commercial center of New England, and is noted for the large amount of capital which is employed in manufactures within the limits of the city. The largest of these industries are, ready-made clothing, the building of machinery, the iron and steel works, and the printing and publishing of books. The city is now lighted by electricity and gas in about equal proportions, and the street cars are destined to be run almost entirely by electric power.

The city is divided into 24 wards, and the average number of voters in a ward is 3,876. The government is composed of a mayor, 12 aldermen, and a Common Council of 72 members, 3 from each of its 24 wards, annually elected by the citizens. There are commissioners for fire, water, health and various other departments. There is a board of 12 overseers of the poor, connected with 12 charitable organizations, with which the board acts in concert. The population of Boston in 1708 was about 12,000; in 1719, about 18,000; in 1780, about 23,000; in 1800 it was 25,000; in 1850 it was 139,000, and by the addition of Roxbury and Dorchester in 1873, it was 308,873. The population in 1880 was reported as 362,839; in 1890 it was 446,507. In the city report for the year ending May 1, 1891, the funded debt was $55,858,980.06. The total for all expenses was $17,679,888.97. The actual income, including taxes, was $13,576,011.06. The tax vote was $13.30. Some of the larger items are thus stated: Total for schools, $2,121,744.34; salaries for teachers and other officers, $1,424.988.20; police department, $1,061,377.78; fire department, $894,030.97.

BOSWELL, JAMES. the biographer of Johnson, was born at Edinburgh on the 29th October 1740.

Boswell's tastes were always literary; he had contributed some slight things to the current magizines; and in 1762 he published a rather humorous little poem, *The Cub at the Newmarket*. In the following year appeared a collection of *Leeters between the Hon. Andrew Erskine and James Boswell, Esq.*, which the vanity of the youthful authors induced them to think would be received with pleasure and profit by the world. The only prominent characteristic of these epistles is an overstrained attempt at liveliness and wit.

On Monday, 16th May 1763, Boswell then on a second visit to London, had the supreme happiness to make the acquaintance of the object of his almost idolatrous admiration,—Dr. Johnson. Their first interview in the back parlor of Mr. Davies's shop in Russell Street was characteristic of both; the calm strength and ponderous wit of the one, the fluttering folly and childish servility of the other, are portrayed to the life in Boswell's own narrative. Few things are more singular than the intimacy which sprang up between two men so differently constituted. Boswell might indeed congratulate himself that he had something about him that interested most

people at first sight in his favor. He was then about to proceed to Utrecht in order to prosecute his studies; and the great Dr. Johnson actually accompanied him to Harwich and saw him off, with many protestations of affection.

In 1773, though against his father's will, Boswell came to London. He was admitted a member of the Literary Club, and soon after set out with his great friend on the immortal tour of the Hebrides. It was not till many years afterwards that the famous *Journal* was given to the world,—not till after the death of Johnson. Some years after the death of his father in 1782 he had joined the English bar, but he never succeeded in gaining any practice. In 1785 the *Journal of a Tour to the Hebrides* was published, and preparations set on foot for an extended *Life of Johnson*. The collection of materials and careful revision occupied several years, and though Boswell sometimes was despondent, yet on the whole he looked with well-grounded confidence for success. He was absolutely certain that this "mode of biography, which gives not only a *history* of Johnson's *visible* progress through the world, and of his publications, but a view of his mind in his letters and conversations, is the most perfect that can be conceived, and will be more of a life than any work that has ever yet appeared." His expectations were not deceived. The book, which appeared in 1791, was received with the greatest eagerness and delight; and in 1793 a second edition was published. The author's triumph and self-satisfaction were complete; but meantime the evil habits he had contracted during a dissipated life were ruining his health, both of mind and body. He was in later years an habitual drunkard, and the hypochondria, from which he had always suffered at intervals, terribly increased. He died after a short illness on the 19th May 1795, at the age of 55.

BOTANY. The science of Botany includes everything relating to the Vegetable Kingdom, whether in a living or in a fossil state. Its object is not, as some have supposed, merely to name and arrange the vegetable productions of the globe. It embraces a consideration of the external forms of plants — of their anatomical structure, however minute — of the functions which they perform — of their arrangement and classification — of their distribution over the globe at the present and at former epochs — and of the uses to which they are subservient. It examines the plant in its earliest state of development, when it appears as a simple cell, and follows it through all its stages of progress until it attains maturity. It takes a comprehensive view of all the plants which cover the earth, from the minutest lichen or moss, only visible by the aid of the microscope, to the most gigantic productions of the tropics. It marks the relations which subsist between all members of the vegetable world; and traces the mode in which the most despised weeds contribute to the growth of the mighty denizens of the forest.

The plants which adorn the globe more or less in all countries must necessarily have attracted the attention of mankind from the earliest times. The science that treats of them dates back to the days of Solomon, for that wise monarch "spake of trees," from the cedar of Lebanon to the hyssop on the wall. The Chaldeans, Egyptians, and Greeks were the early cultivators of science, and Botany was not neglected, although the study of it was mixed up with crude speculations as to vegetable life, and as to the change of plants into animals. Æsculapius and his priests, the Asclepiades, who studied the art of medicine, had their attention directed to plants in a pharmaceutical point of view. About 300 years before Christ Theophrastus wrote a *History of Plants*, and described about 500 species used for the treatment of diseases. Dioscorides, a Greek writer, who appears to have flourished about the time of Nero, issued a work on Materia Medica. The elder Pliny described about a thousand plants, many of them famous for their medicinal virtues. Asiatic and Arabian writers also took up this subject. Little, however, was done in the science of botany, properly so called, until the 16th century of the Christian era, when the revival of learning dispelled the darkness which had long hung over Europe. Brunfels, a physician of Bern, has been looked upon as the restorer of the science in Europe. He published a *History of Plants*, illustrated by figures, about the beginning of the 16th century.

One of the earliest attempts at a methodical arrangement of plants was made in Florence by Andreas Cæsalpinus, a native of Arezzo, some time professor of botany at Padua, and afterwards physician to Pope Clement VIII. He is called by Linnæus *primus verus systematicus*. In his work *De Plantis*, published at Florence in 1583, he distributed the 1520 plants then known into fifteen classes—the distinguishing characters being taken from the fruit.

John Ray, a native of Essex, did much to advance the science of botany. He was born in 1628, and died in 1705.

About the year 1670 Dr. Robert Morrison of Aberdeen published a systematic arrangement of plants. He divided them into eighteen classes, distinguishing plants according as they were woody or herbaceous, and taking into account the nature of the flowers and fruit. In 1690 Rivinus promulgated a classification founded chiefly on the forms of the flowers. Tournefort about the same time took up the subject of vegetable taxonomy. He was a contemporary of Ray, and was professor of botany at Paris in 1683. He was long at the head of the French school of botany, and published a systematic arrangement in 1694–1700. He described about 8000 species of plants, and distributed them into twenty-two classes, chiefly according to the form of the corolla, distinguishing herbs and under-shrubs on the one hand from trees and shrubs on the other. The system of Tournefort was for a long time adopted on the Continent, but was ultimately displaced by that of Linnæus.

Carl von Linné, or, as he is commonly called, Linnæus, was born on the 23d of May 1707, at the village of Rooshoolt (Râshult), in Smaland, a province of Sweden, where his father, Nicholas Linnæus, was clergyman. He entered as a pupil at the University of Lund, and about the years 1727-28, was received into the house of Stobæus, a physician in that city, where he had abundant opportunities of prosecuting natural history. He afterwards proceeded to Upsal, and had to struggle with great difficulties during his studies there. He aided Celsius in his *Hierobotanicon*, or account of the plants of Scripture, and he became assistant to Rudbeck, professor of botany. He afterwards travelled in Lapland, took his degree in Holland, visited England, and commenced practice in Stockholm, where he lectured on botany and mineralogy. He finally became professor of botany at Upsal, and was one of the most popular lecturers of the day. He died on the 8th of January 1778, in the 71st year of his age. His herbarium is now in the possession of the Linnean Society.

The system of Linnæus is founded on the sexes of plants, and hence it is often denominated the sexual system. It is called an artificial method, because it takes into account only a few marked characters in plants, and does not propose to unite them by natural affinities. It is an index to a department of the book of nature, and as such is useful to the student. It does not aspire to any higher character, and although it cannot be looked

1, Capitulum; 2, Single flower; 3, Dry receptacle; 4, Linear-obovate achene.

Malva sylvestris.
(Common Mallow)

upon as a scientific and natural arrangement, still it has a certain facility of application which commends it to the tyro. In using it, however, let it ever be remembered, that it will not of itself give the student any view of the true relations of plants as regards structure and properties, and that by leading to the discovery of the name of a plant, it is only a stepping-stone to the natural system. Linnæus himself claimed nothing higher for it. He says — "Methodi Naturalis fragmenta studiose inquirenda sunt. Primum et ultimum hoc in botanicis desideratum est. Natura non facit saltus. Plantæ omnes utrinque affinitatem monstrant, uti territorium in mappa geographica." Accordingly, besides his artificial index, he also promulgated fragments of a natural method of arrangement.

A new era dawned on botanical classification when Antoine Laurent de Jussieu appeared. He was born at Lyons in 1748, and was educated at Paris under the care of his uncle, Bernard de Jussieu. At an early age he became botanical demonstrator in the Jardin des Plantes, and was thus led to devote his time to the science of botany. Being called upon to arrange the plants in the garden, he necessarily had to consider the best method of doing so, and adopted a system founded in a certain degree on that of Ray, in which he embraced all the discoveries in organography, adopted the simplicity of the Linnean definitions, and displayed the natural affinities of plants. His *Genera Plantarum*, begun in 1778, and finally published in 1789, indicated an important advance in the principle of classification. Jussieu subsequently became professor of rural botany; he died in 1836 at the age of 88.

The system of Jussieu made its way slowly in Great Britain, and it was not until Robert Brown brought it under notice that it was adopted. It is now the basis of all natural classifications. One of the early supporters of this natural method was Augustin Pyrame de Candolle, who was born in 1778, and who, after attending the lectures of Vaucher at Geneva, devoted himself to botanical pursuits. He subsequently prosecuted his studies at Paris, and lectured on botany at the College of France. He commenced his publications in 1802, and in 1804 he promulgated his *Elementary Principles of Botany*. In 1807 he became professor of botany at Montpellier, and in 1816 he was appointed to the chair of natural history at Geneva, with the charge of the Botanic Garden. In that city he carried on his future botanical labors, and began his *Prodromus Systematis Naturalis Regni Vegetabilis*, which was intended to embrace an arrangement and description of all known plants. He was enabled to complete eight volumes of the work before his death, and it has since been carried on by his son Alphonse de Candolle, with the aid of other eminent botanists. It now embraces descriptions of the genera and species of Dictoyledonous plants. The system followed by De Candolle is a modification of that of Jussieu, and it is adopted more or less at the present day. De Candolle's own herbarium was extremely rich. He had visited and carefully examined many of the most extensive collections, especially those of Paris; and many entire collections, as well as separate families, on which he was specially engaged, were from time to time submitted to his examination by their possessors. He had thus opportunities of comparison greatly beyond what in ordinary circumstances fall to the lot of an individual. His library, too, was stored with almost every important publication that could be required for his undertaking. With such ample materials, aided by his untiring zeal and the persevering energy of his character, he steadily pursued his alloted task, and only ceased to labor at it when he ceased to live. For some years his health declined, and it is to be feared that the severe and incessant attention which he paid to the elaboration of the great family of Compositæ had made a deep inroad upon it. As a relaxation from his labors he undertook in the last years of his life a long journey, and attended the scientific meeting held at Turin; but he did not derive from this the anticipated improvement in his health, which gradually failed until his death on the 9th September 1841. Since De Candolle's time various modifications of his system have been introduced by Endlicher, Lindley, Hooker, and Bentham.

In arranging plants according to a natural method, we require to have a thorough knowledge of structural and morphological botany, and hence we find that the advances made in these departments have materially aided the efforts of systematic botanists.

In all classification it is necessary to define what is meant by species. The usual definition of the term has been that a species (as regards the present epoch of the earth's history) is an assemblage of individuals having characters in common, and coming from an original stock or protoplast, and their seeds producing similar individuals. It was also supposed that variation in species was restrained within certain limits, and that varieties had a tendency to revert to the parent form. The view, however, adopted by many now-a-days is, that the tendency to variation is continuous, and that, after a lapse of long periods of time, and under the influence of varying external conditions, the descendants from a common stock may exhibit the differences which characterize distinct species. These are the views which are advanced by Darwin, and which imply a complete revolution in our idea of species. This theory is thus stated by Bentham: —

1. That although the whole of the numerous offspring of an individual plant resemble their parent in all main points, there are slight *individual* differences.

2. That among the few who survive for further propagation, the great majority, under ordinary circumstances, are those which most resemble their parent, and thus the *Species* is continued without material variation.

3. That there are, however, occasions when certain individuals, with slightly diverging characters, may survive and reproduce races, in which these divergencies are continued even with increased intensity, thus producing *Varieties*.

4. That in the course of an indefinite number of generations circumstances may induce such an increase in this divergency, that some of these new races will no longer readily propagate with each other, and the varieties become *New Species*, more and more marked as the unaltered or less altered races, descendants of the common parent, have become extinct.

5. That these species have in their turn become the parents of groups of species, that is *Genera*, *Orders*, &c., of a higher and higher grade, according to the remoteness of the common parent, and more or less marked, according to the extinction or preservation of unaltered primary, or less altered intermediate, forms.

As there is thus no difference but in degree between a variety and a species, between a species and a genus, between a genus and order, all disputes as to the precise grade to which a group really belongs are vain. It is left in a great measure to the judgment of the systematist, with reference as much to the use to be made of his method as to the actual state of things, how far he should go in dividing and subdividing, and to which of the grades of division and subdivision he shall give the names of Orders, Sub-orders, Tribes, Genera, Subgenera, Sections, Species, Sub-species, Varieties, &c.. with the consequent nomenclature.

The Physiology of plants did not keep pace with the advance in Classification. Grew and Malpighi were the earliest discovers in this department of botany. Hales also contributed to it by his observations on the motion of fluids in plants. The subject of fertilization was one which early excited attention.

The idea of the existence of separate sexes in plants was entertained in early times, long before separate male and female organs had been demonstrated. The production of Dates in Egypt, by bringing two kinds of flowers into contact, proves that in very remote periods some notions were entertained on the subject. Female Date Palms only were cultivated, and wild ones were brought from the desert in order to fertilize them. Herodotus informs us that the Babylonians knew of old that there were male and female Date-trees, and that the female required the concurrence of the male to become fertile. This fact was also known to the Egyptians, the Phœnicians, and other nations of Asia and Africa. The Babylonians suspended male clusters from wild Dates over the females; but they seem to have supposed that the fertility thus produced depended on the presence of small flies among the wild flowers, which, by entering the female flowers, caused them to set and ripen. The process was called palmification. Theophrastus, who succeeded Aristotle in his school in the 114th Olympiad, frequently mentions the sexes of plants, but he does not appear to have determined the organs of reproduction. Pliny, who flourished under Vespasian, speaks particularly of a male and female Palm, but his statements were not founded on any real knowledge of the organs. From Theophrastus down to Cæsalpinus, who died at Rome in 1603, there does not appear to have been any attention paid to the reproductive organs of the plants. Cæsalpinus had his attention directed to the subject, and he speaks of a halitus or emanation from the male plants causing fertility in the female.

Grew seems to have been the first to describe, in a paper on the *Anatomy of Plants*, read before the Royal Society in November 1676, the functions of the stamens and pistils. Up to this period all was vague conjecture. Grew speaks of the *attire*, or the stamens, as being the male parts, and refers to conversations with Sir Thomas Millington, Savilian professor at Oxford, to whom the credit of the sexual theory seems really to belong. Grew says that, "when the attire or apices break or open, the globules or dust falls down on the seedcase or uterus, and touches it with a prolific virtue." Ray adopted Grew's views, and states various arguments to prove their correctness in the preface of his work on European plants, published in 1694. In 1694 Camerarius, professor of botany and medicine at Tübingen, published a letter on the sexes of plants, in which he refers to the stamens and pistils as the organs of reproduction, and states the difficulties he had encountered in determining the organs of Cryptogamic plants. In 1703 Samuel Morland, in a paper read before the Royal Society, stated that the farina (pollen) is a congeries of seminal plants, one of which must be conveyed into every ovum or seed before it can become prolific. In this remarkable statement he seems to anticipate in part the discoveries afterward made as to pollen tubes, and more particularly the peculiar views promulgated by Schleiden. In 1711 Geoffroy, in a memoir presented to the Royal Academy at Paris, supported the views of Grew and others as to the sexes of plants. He states that the germ is never to be seen in the seed till the apices (anthers) shed their dust; and that if the stamina be cut out before the apices open, the seed will either not ripen, or be barren if it ripens. He mentions two experiments made by him to prove this — one by cutting off the staminal flower in Maize, and the other by rearing the female plant of Mercurialis apart from the male. In these instances most of the flowers were abortive, but a few were fertile, which he attributes to the dust of the apices having been wafted by the wind from other plants.

Linnæus was the next botanical author who took up the subject, and by his sexual system he may be said to have opened a new era in the history of botany. He first published his views in 1736, and he thus writes — "Antheras et stigmata constituere sexum platarum, a palmicolis, Milingtono, Grewio, Rayo, Camerario, Godofredo, Morlando, Vaillantio, Blairio, Jussievio, Bradleyo, Royeno, Logano, &c., detectum, descriptum, et pro infallibili assumptum; nec ullum, apertis oculis considerantem cujuscunque plantæ flores, latere potest." He divided plants into sexual and asexual, the former being Phanerogamous or flowering, and the latter Cryptogamous or flowerless. In the latter division of plants he could not detect stamens and pistils, and he did not investigate the mode in which their germs were produced. He was no physiologist, and did not promulgate any views as to the embryogenic process. His followers were chiefly engaged in the arrangement and classification of plants, and while descriptive botany made great advances the physiological department of the science was neglected. His views were not, however, adopted at once by all, for we find Alston stating arguments against them in his *Dissertation on the Sexes of Plants*. Alston's observations were founded on what occurred in certain unisexual plants, such as Mercurialis, Spinach, Hemp, Hop, and Bryony. The conclusions at which he arrives are those of Pon dera, and the pollen is not in all flowering plants necessary for impregnation, for fertile seeds can be produced without its influence. He supports parthenogenesis in some plants. Soon after the promulgation of Linnæus's method of classification, the attention of botanists was directed to the study of Cryptogamic plants, and the valuable work of Hedwig on the reproductive organs of Mosses made its appearance in 1782. He was one of the first to point out the existence of certain cellular bodies in these plants which appeared to perform the functions of reproductive organs, and to them the name of antheridia and pistillidia were given. This opened up a new field of research, and led the way in the study of Cryptogamic reproduction, which has since been much advanced by the labors of numerous botanical inquirers. The interesting observations of Morland, already quoted, seem to have been neglected, and no one attempted to follow in the path which he had pointed out. Botanists were for a long time content to know that the scattering of the pollen from the anther, and its application to the stigma, were necessary for the production of perfect seed, but the stages of the process of fertilization remained unexplored. The matter seemed involved in mystery, and no one attempted to raise the veil which hung over the subject of embryogeny. The general view was, that the embryo originated in the ovule, which was in some obscure manner fertilized by the pollen.

In 1815 Treviranus roused the attention of botanists to the development of the embryo, but although he made valuable researches, he did not add much in the way of new information. In 1823 Amici discovered the existence of pollen tubes, and he was followed by Brongniart and Brown. The latter traced the tubes as far as the nucleus of the ovule. These important discoveries mark a new epoch in embryology, and may be said to be the foundation of the views now entertained by physiologists, which have been materially aided by the subsequent elucidation of the process of cytogenesis, or cell-development, by Schleiden, Schwann, Mohl, and

others. The whole subject has been investigated recently with great assiduity and zeal by physiologists, as regards both Cryptogamous and Phanerogamous plants. The formation of germinal vesicles in the ovule, and the development of the embryo in flowering plants, have been fully considered by Griffith, Schleiden, Mirbel, Spach, Meyen, Schacht, Mohl, Unger, Naudin, Radlkofer, and others; the embryogenic process in Coniferous plants and in the higher Cryptogams by Hofmeister, Henfrey, Suminski, Mettenius, Strasburger, Eichler, Baillon, Cohn, Pringsheim, Millardet; and that of the lower Cryptograms by Thuret, Bornet, Decaisne, and Tulasne. The observations of Darwin as to the fertilzation of Orchids, Primula, Linum, and Lythrum, and the part which insects take in this function, have opened up a new era in Physiological Botany. He has been followed by Hermann Müller. Darwin's experiments in reference to the movements of climbing and twining plants, and of leaves in insectivorous plants, have opened up a wide field of inquiry which he has cultivated with eminent success and with important results. Among the authors who have contributed to the advance of Vegetable Physiology may be named Hoffmann, Sachs, Van Tieghem, Prillieux, Deherain, and Famintzen. We have thus been enabled to come to certain general conclusions on this obscure subject, and future observers have been directed in the proper path of investigation.

In the Physiological department of botany the most important researches have been made by French and German botanists. The laboratories in connection with schools in Germany offer facilities for study which do not exist to the same extent in Britain. Physiological researches demand not only a Botanic Garden with its appendages, but apparatus of various kinds, means of prosecuting histological and chemical investigations physical experiments, and observations by the spectroscope. Our schools require then not only lecture-rooms, but laboratories well fitted up with all needful appliances, and salaried assistants to aid the teachers in their demonstrations and the pupils in their practical work.

The department of Geographical Botany has made rapid advance by means of the various scientific expeditions which have been sent to all quarters of the globe; and the question of the mode in which the floras of islands and of continents have been formed has given rise to important speculations by such eminent botanical travellers as Darwin and Hooker. The latter has published a valuable paper on insular floras. Under this department the connection between climate and vegetation has been carefully studied both by botanists and by meteorologists. Among the contributors to this department of botany the following authors may be noticed — Humboldt, Schouw, Meyen, Berghaus, Martius, Harvey, Hooker.

The subject of Palæontological Botany has been much advanced of late by the researches of botanists and geologists. The use of the microscope in the examination of tissues has aided much in the determination of fossil plants. The more accurate study of Organography has also been the means of correcting errors in diagnosis. The nature of the climate at different epochs of the earth's history has also been determined from the character of the flora. The works of Brongniart, Goeppert, and Schimper have advanced this department of science.

Botany may be divided into the following departments: — 1. *Structural* Botany, having reference to the anatomical structure of the various parts of plants, including Vegetable Histology, or the microscopic examination of tissues; 2. *Morphological* Botany, the study of the form of plants and their organs — (these two departments are often included under the general term of Organography); 3. *Physiological* Botany, by some termed Organology, the study of the life of the entire plant and its organs, or the consideration of the functions of the living plant; 4. *Systematic* Botany, the arrangement and classification of plants; 5. *Geographical* Botany, the consideration of the mode in which plants are distributed over the different regions of the globe; 6. *Palæontological* Botany, the study of the forms and structures of the plants found in a fossil state in the various strata of which the earth is composed.

In the present article we shall confine our attention to the Structure and Morphology of Plants. The limits and classification of the Vegetable Kingdom have been partly considered under BIOLOGY. The Classification of Plants will be taken up *in extenso* under the heading VEGETABLE KINGDOM, and the Distribution of Plants in space and time will be treated of in separate articles.

STRUCTURAL ELEMENTS OF PLANTS.

The elementary structure which is the foundation of all vegetable tissue is the *cell*. In the young succulent bud of a growing stem each cell consists of an outer firm, elastic membrane of cellulose constituting a *cell-wall;* within this, a gelatinous soft mass of *protoplasm*, of which there may be a portion distinctly marked off as a *nucleus;* and, enclosed by the protoplasm, a cell-cavity containing a more or less watery fluid, the *cell-sap*. Such may be taken as the structure of a typical vegetable cell, which is thus a closed vesicle or sac with fluid or semi-fluid contents. Of these elements of the cell the protoplasm is that which is essential for its growth and development. In it are contained all the substances requisite for the formation of the cell-wall and the cell-sap; and the nucleus is merely a differentiated portion of it. From it then all the other parts of the cell are formed, and it is essential to the growth of the cell. Hence it has received the appellation of *primordial cell;* and, indeed, amongst many Algæ it exists for some time as a separate cell without any cell-wall or other part. This must be borne in mind when defining the cell as a sac or vesicle. The growth of the cell is usually, at first, uniform throughout, and it has therefore a more or less rounded form; but, according to the function which it is destined eventually to perform, one or other, or it may be all, of the parts of the cell become modified or specially developed. The cell-wall may be greatly thickened; or it may grow more in one direction than another, so as to be elongated and form protuberances; or perforations may occur; or several similar cells arranged in a longitudinal series may, by obliteration of the interposed septa, unite to form a long tube which is then called a *vessel*. The protoplasm in the process of growth may be completely absorbed; and when this occurs growth ceases and the cell-walls form merely a framework. It may, however, remain a long time, assuming various shapes and often uniting with coloring matters. The cell-sap also may disappear or may remain, containing in solution, or as definite forms in its mass, various assimilative substances, as fat granules, oil globules starch, mineral crystals, &c.

1 *Cells and Vessels—Cellular and Vascular Tissues.*

Cells united together constitute *cellular tissue*. It exists in all plants and abounds in fleshy roots, stems, leaves, and in succulent fruits. It constitutes the pith and outer bark of trees, and is very abundant in the centre of the stem of the Aralia papyrifera, whence Chinese rice-paper is derived by cutting it into thin sheets. By cultivation the Turnip, Carrot, Cabbage, and other esculent vegetables acquire much cellular tissue, and become tender and succulent.

In young cells the cell-wall is a thin membrane consisting of *cellulose*, with some water and a certain amount of incombustible material. It is permeable by water, is slightly extensible and elastic, and is colorless. It dissolves in sulphuric acid, and upon addition of iodine and sulphuric acid assumes a deep blue color. By intus-susception of nutrient material, *i.e.*, the interposition of new molecules between the pre-existing, the cell-wall increases both in surface-extent and in thickness. The resulting cell-wall is not, however, uniform in its structure, but is composed of lamellæ of different refractive power, in which the cellulose is combined alternately with much and with little water. These alternating dense and watery layers,—of which one set is concentric with the cell-wall, whilst two other series are vertical or oblique to the surface of the cell-wall, and cut the concentric ones throughout the whole thickness of the wall,—under a high power of the microscope present a series of mutually intersecting lines and constitute respectively what are termed the *stratification* and *striation* of the cell-well.

The *protoplasm*, which lines the interior of the cell-wall, and which is the essential living portion of the cell, consists of albuminous substance mixed with water and some incombustible materials, and it also contains some organic compounds. It is a homogeneous, soft, gelatinous substance. As we usually find it in cells it has a granular and turbid appearance. This arises from an admixture of formative matters, to which the name *metaplasm* has been applied. It is coagulated by heat, and is soluble in a dilute solution of caustic potash; iodine solution colors it yellow or brown, whilst strong sulphuric acid at first colors it rose-red, subsequently dissolving it.

By the term cell-sap is meant the fluid contained in the vacuoli. It consists in great part of water, in which are dissolved various salts, derived from without, and compounds formed by assimilation in the plant itself.

The term *parenchyma* (areolar, utricular, or vesicular tissue) is a general name for any form of cellular tissue, in which thin-walled cells of a diameter nearly equal in every direction are united to one another by broad surfaces.

Under the term *pleurenchyma* is included tissue composed of such elongated prosenchymatous, flexible, thickened cells, as are found in the bast or phloëm layers of ordinary trees. They also occur in the wood portion. Their walls are thickened regularly, and they constitute when united what is commonly known as the woody or bast fibre.

If the thickening of the cell-wall takes place so that a network, ring, or spiral thickening matter is formed, then the cells are *reticulated*, *annular* or *spiral* as in the leaves of Sphagnum, hairs of Cactaceæ, and seed-coat of Casuarina. In these cells the spiral thickening frequently becomes loosened from the cell-wall as a spiral fibre, and can be unrolled. Such forms occur in the outer covering of the seed of Collomia linearies and of the fruit of Salvia Verbenaca.

If spiral, annular, or reticulated cells are arranged in a longitudinal series, and the septum between adjoining cells gives away, then we have a spiral, annular, or reticulated vessel formed, and to this tissue authors have given the name *trachenchyma*, on account of its resemblance to the tracheæ or air-tubes of animals.

In the process of thickening of the cell-wall, if large spaces of the cell-wall remain thin, and the thickening mass growing in a circular manner projects into the interior of the cell and gradually arches over the thin portion of cell-wall, a dome-shaped cavity is enclosed betwixt the thin cell-wall and the thickening mass. The growing thickening mass gradually contracts the opening into this cavity, but never completely closes it. On front view this presents the appearance of two concentric circles, an outer marking the edge of the original thin portion of the cell-wall, and an inner indicating the under edge of the gradually contracting ring of thickening matter. When this process takes place on opposite sides of the partition wall between two cells, there are then two similar cavities separated by the thin partition wall of the cells, each communicating freely by a small circular aperture with the cell in which it has been formed.

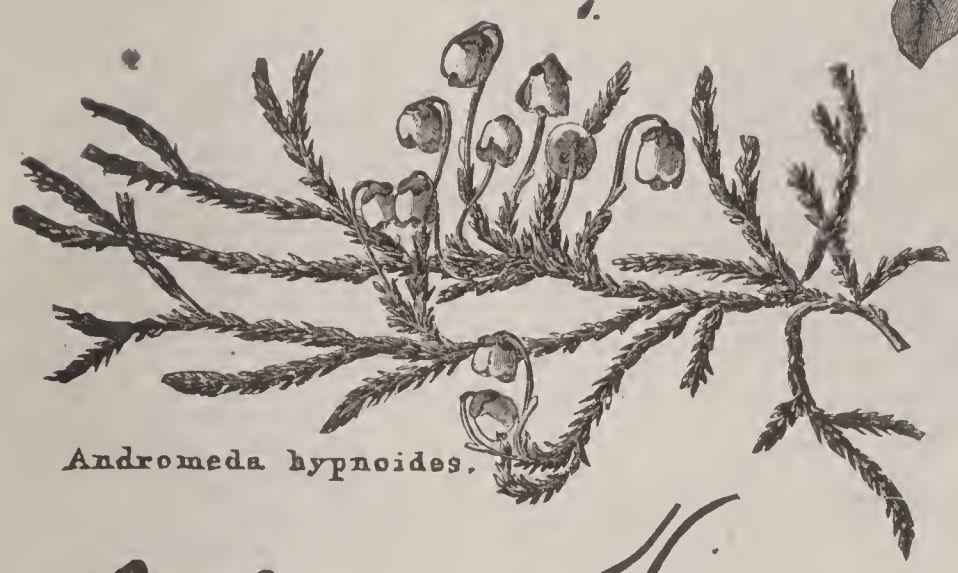
Laticiferous vessels consist of long branching tubes or passages, forming, by their union, an anastomosis or network, like the veins of animals. They are the *milk* vessels and the *proper* vessels of old authors. They receive their name from containing an emulsion called *latex*, of a granular nature, often milky or colored. They are seen in the India-rubber and Gutta-percha plants, the Mudar plant, the Cow-tree, Spurges, Dandelion, Lettuce, Chicory, and Celandine, frequently containing a large quantity of caoutchouc.

We have seen that the cellular tissue is sometimes incomplete, that is, the cells do not touch on every side. The intervening spaces are called *intercellular spaces*, and these may be either circumscribed cavities *lacunæ*, or they may extend for some length through the tissue as *intercellular canals;* but these two structures pass into one another. In the earliest stage of development the tissue is always complete, and these spaces are formed subsequently by a splitting of the partition or common wall of the cells, and they may subsequently be increased in size by an absorption of the investing cells.

Chlorophyll is the green coloring-matter of plants. It occurs in the cells of the superficial parts of plants united with small portions of the protoplasm, which are combined into grains of various forms. Starch-grains are usually abundant in the chlorophyll bodies. Chlorophyll is soluble in alcohol and ether. It consists of four substances, two yellow and two green, which possess distinct optical properties. It gives a black band in the red of the spectrum. Physiogically it is very important. It is developed under the action of light, and undergoes changes according to its state of oxygenation. Hence the varied tints of leaves in autumn. Numerous coloring matters occur in plants, especially in flowers, and all such when not green are included under the general term chromule. Starchy and oily matters and albuminoids occur very abundantly in the cells of plants, where they are stored for the purpose of nutrition. Starch, composed chemically of carbon and the elements of water (hydrogen and oxygen), occurs in the form of fine grains, more or less oval or rounded, which vary in diameter. Each grain contains starch in two forms,—one, receiving the name granulose, is easily soluble, and gives a deep blue color on the addition of iodine; the other form, starch cellulose, is less soluble, and gives a yellow or brown color with iodine; but the former is most abundant in the grain. The individual grains either lie distinct from each other in the cells, as in the Potato, Wheat, and Pea, or they are aggregated so as to form compound grains, as in West Indian Arrowroot, obtained from Maranta arundinacea, and Portland Sago, procured from Arum maculatum. Oily matters occur as drops in the interior of cells, usually associated with starchy substances or with albuminoids. These latter exist as small granules or large rounded masses with definite chemical and optical properties, and are termed aleurone grains. They are frequently associated with a crystalline arrangement of portions of the protoplasm of the cell known as crystalloids. Sugar occurs abundantly in the sap of plants.

3.

1.



4.

Andromeda hypnoides.

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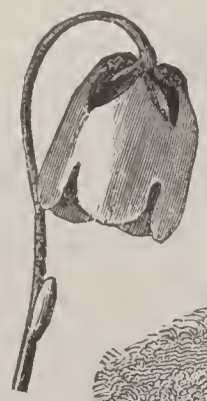


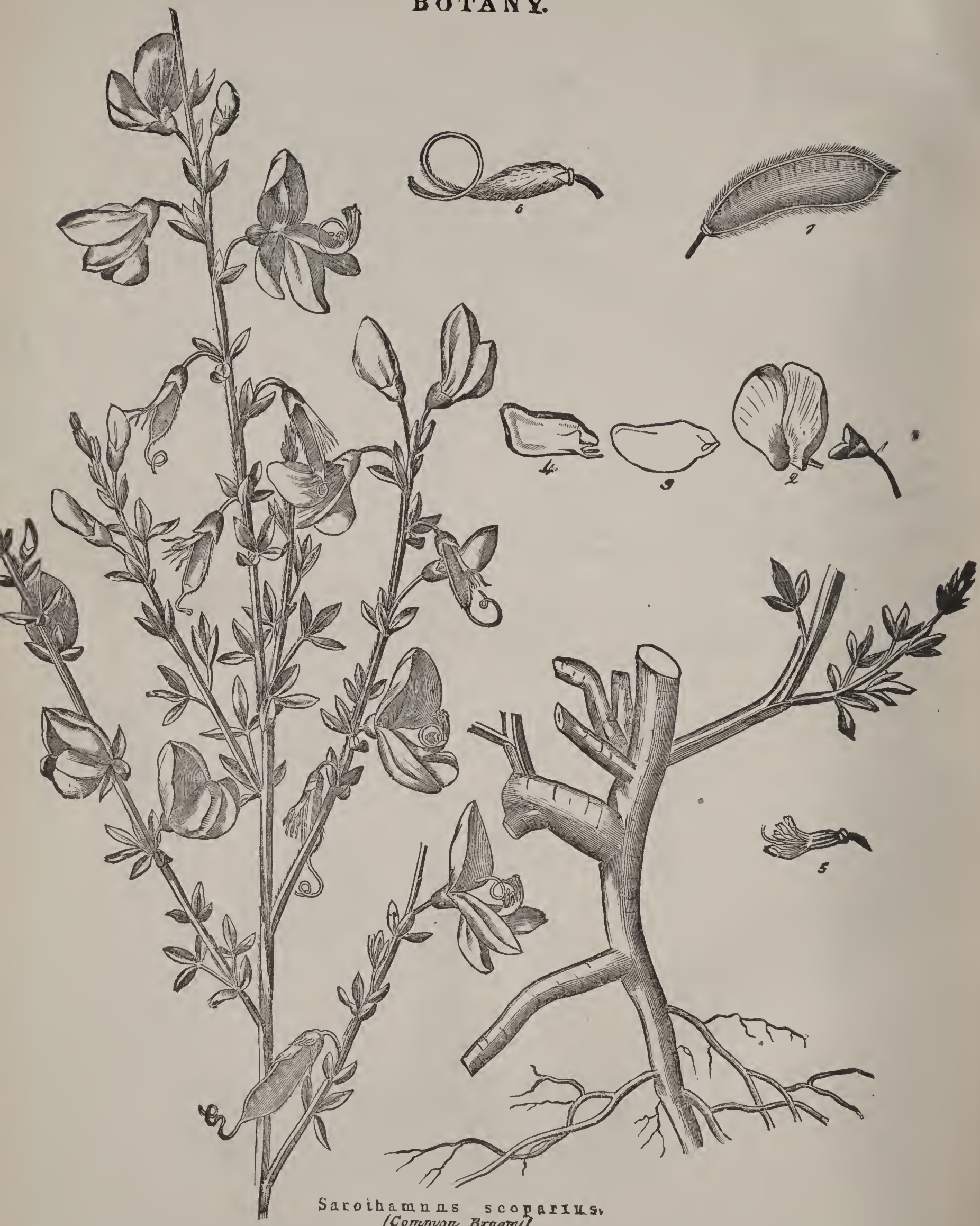
7.

4.

Carica Papaya.

(Papaw Tree.)

1, Plant (reduced); 2, Portion of male flower; 3, Male flower cut open; 4, Stamen; 5, Female flowers; 6, Natural size of plant; 7, Flower; 8, Back view of stamen; 9, Front view of stamen; 10, Pistil; 11, Capsule.



Sarothamnus scoparius.
(Common Broom)

1, Two-lipped calyx; 2, Broadly ovate vexillum; 3, Wing of corolla; 4, Corina: 5, Monadelphous stamen: 6, Hairy ovary; 7, Legume.

When pure and in a solid state this substance is crystalline and soluble in water; but it also occurs in an uncrystallized form.

Gum or mucilage is another substance found in vegetable tissues. When pure it is clear, soluble in water and also in dilute acids, but not soluble in alcohol or ether. It is one of the forms through which vegetable matter passes in being applied to the purposes of plant life. It exists largely in the vegetable juices. From the bark of many trees it is procured in the form of an exudation. Two well-marked kinds of gum are met with,—arabin, soluble in cold water, constituting the chief ingredient of gum-arabic, procured from various species of Acacia; and cerasin, insoluble in cold water, but readily soluble in boiling water, constituting the gummy secretion obtained from the Cherry and Plum. A substance called bassorin, or vegetable jelly, is found in Tragacanth, the roots of some Orchids, as well as in Carrageen (Chondrus crispus), and other sea-weeds. It is allied to gum, but differs in swelling up and becoming gelatinous when mixed with water. Another gum-like substance called pectin exists in the juice of the Apple, Pear, and other pulpy fruits. It is changed by the action of alkalies into pectic acid, which is found in many fruits and such succulent roots as Carrot, Turnip, Beet, &c. Oils, Fats, and Resins occur in cells of plants, or in special canals or glands as products of assimilation. The oils are either fixed or volatile,—the former being divided into drying, fatty, and solid, while the latter are distinguished according as they consist of carbon and hydrogen alone, or of these elements combined with oxygen or with sulphur. Resinous matter occurs in the form either of fluid balsams, or of the various kinds of solid resin and pitch. In the rind of the Orange and Lemon glands of oil occur. Turpentine canals are met with in the wood of Pines; and Vittæ, or oil-canals, in the fruit of Umbelliferous plants, such as the Coriander. In the fleshy covering of the fruit of the Olive there are numerous oil-cells. The fruit of the Guinea-palm yields a solid oil, called palm-oil. The dotted appearance of the leaves of the Orange, Myrtle, Eucalyptus, and St. John's Wort, depends on the presence of numerous cells or cavities containing essential oil.

As allied to these secretions, we may notice caoutchouc, which is found in the milky juice of plants, especially those belonging to the Fig, Spurge, and Dogbane orders. The trees most prolific in this substance are Siphonia elastica, Urceola elastica, and Urostigma elasticum. Guttapercha is the concrete milky juice of the Taban plant (Isonandra Gutta). Wax is also found in the tissues of plants, and it frequently occurs as a secretion on the stems, as in the Wax Palm, and on the surface of fruits, as in the bloom or glaucous secretion of the Plum and the Candleberry Myrtle. Crystals of lime salts occur in the interior of cells, and also in the cell-walls of plants. They consist of lime in combination with carbonic or oxalic acids, and are in many plants very abundant.

A more or less marked division of the tissues into an outer layer bounding an inner mass is visible in all plants. Amongst the lower cellular plants this division is not very distinct; the circumferential cells are perhaps only a little smaller and more compacted than those near the centre. The higher cellular plants, however, exhibit great diversity. In them the cells of the circumference may be arranged in layers so as to constitute a true epidermis, the component cells having a definite relation to one another and to the exterior in the respective families. In all vascular plants an epidermis is found. In many cases, however, it is difficult to recognize it, as in the stems of submerged plants and in most roots. It usually consists of a single thin layer of cells closely compacted, and leaving no interspaces except at definite points (*stomata*), where openings lead into intercellular cavities. The cells composing this layer have their outer wall much thickened, the inner wall remaining thin, and they contain no starch or granular matter, and usually are colorless. In many aquatic plants, however, and in Ferns, chlorophyll is present. The apparent color of the epidermis depends on that of the parenchymatous cells below, from which it can be separated as a colorless layer. Sometimes the cell-sap of the epidermal cells has a red tinge. The outer lamella of the outermost cell-wall of the epidermal cells usually becomes cuticular or corky, and thus is formed an external separable layer or *cuticle* upon the surface of the *epidermis proper*. This layer has different chemical properties from the epidermis, being insoluble in sulphuric acid.

One important character of the epidermis is the presence of *stomata* or breathing-pores. These exist abundantly upon the stems and leaves of plants; they also occur on the parts of the flowers; but they are absent from all root structures, though present on underground axial structures. Each consists of a central pore bounded by two or more cells (guardcells), which contain chlorophyll, starch, and matters distinct from the surrounding epidermal cells.

Stomata are most abundant on the under surface of leaves. Their number varies from 200 to 160,000 or more in a square inch of surface. In the leaves of the White Lily there are 60,000 in a square inch on the under surface, and about 3000 on the upper; on the leaves of the Cherry-Laurel there are 90,000 on the lower surface, and none on the upper.

Upon the epidermis and as outgrowths from it are found certain appendages. These are hairs, scales, prickles, &c., and all have been embraced under the general name *trichome*. Hairs (*pili* or *villi*) are productions each of an epidermal cell, having typically an elongated or conical form, and covered by the cuticle. They are erect or oblique, or they lie parallel to the surface, and are appressed. Sometimes they are formed of a single cell, which is simple and undivided, or forked, or branched; at other times they are composed of many cells, either placed end to end, as in moniliform or necklace-like hairs, or united together laterally, and gradually forming a cone, as in compound or branched hairs. When the branches of a hair proceed from a common centre, it is stellate or radiated as in hairs of the Mallow tribe, in those of Deutzia scabra, and those on the stem of the Rice-paper plant (Fatsia papyrifeia). When stellate hairs are flattened out, so as to form a sort of membranous expansion, a *scale* or *scurf* is produced. In Bromeliaceæ the scurfiness of the leaves is a marked character. To such expansions of the epidermis the name *lepis* is applied, and the surface is said to be *lepidote*.

Hairs occur on various parts of plants,—on the stem, leaves, flowers, seed-vessels, and seeds, and even in the interior of vessels. In the interior of the spathe of some Palms numerous ovate cells, analogous with hairs, occur in clusters, and can, when the spathe is dried, be shaken out in the form of powder. Cotton consists of the hairs surrounding the seeds of Gossypium herbaceum and other species of the genus. These when fresh are elongated tubular cells; when dried their walls collapse and they appear twisted. Hairs are occasionally developed to a great extent on plants exposed to elevated temperatures, as well as on those growing at high altitudes. When they occur on the organs of reproduction they are connected with fer-

tilization, as the hairs on the style of Goldfussia, and the retractile hairs on the style of Campanula.

In connection with the epidermal appendages we may notice glands, although they may occur in any tissue. A gland consists of a single cell or a collection of cells secreting substances different from those contained in the surrounding cells. In the former case the gland is simple, in the latter it is compound. In compound glands it frequently happens that the walls of the inner cells are absorbed, and thus the gland has only a single cavity, as in the glands of the Orange rind; these are termed vesicular. The secretion of the glands may be stored in their interior, as in Orange rind, and in the leaves of Laurus Camphora, or it may be exuded as in Lychnis viscaria, and in the nectaries of Fritillaria imperialis. Hairs serve as ducts through which the secretion of glands is discharged. Such hairs are seen in the Nettle, in Loasa or Chilli Nettle, and in Malpighia, and are commonly called stings (stimuli).

ORGANS OF PLANTS.

Having now considered the elementary structures and tissues found in the Vegetable Kingdom, we proceed to view them in combination to form the plant. The simplest plant is found amongst Algæ, where, as in the Red-snow plant the whole organism consists of a single isolated cell. Other Algæ and all Fungi and Musci are composed of a number of cells united in various ways; whilst in Ferns and their allies and all flowering plants vessels are formed in addition to the cells. The plants in which the tissues are entirely cellular are termed cellular plants; those in which vessels are also found are vascular plants.

That the portions of a plant may be properly maintained two functions have to be performed, namely, nutrition, on the proper performance of which the life of the individual plant depends, and reproduction, by which the perpetuation of the type is provided for. In such a simple form as the Red-snow plant those functions are performed by the single cell. In the plants composed of numerous cells a differentiation takes place by which special cells are set apart for particular functions, and thus certain organs are formed in the plant. In the higher plants those organs become more complicated from the introduction of the vascular element.

The nutritive organs of plants are generally known as the root, the stem, and the leaves. In all vascular plants and the higher cellular plants an axis or stem having roots and bearing leaves is distinguishable, and such plants have been designated Cormophytes or Phyllophytes. In the lower class of cellular plants, as Fungi and Algæ, no such distinction is possible, and there is merely a flattened leafy expansion with dependent filiform processes; this structure has been termed a thallus, and such plants are Thallogens or Thallophytes.

Amongst the higher plants the reproductive organs are, in ordinary language, comprehended under the term flower; and as they are conspicuous, such plants have been denominated Flowering Phanerogamous, or Phænogamous. Amongst all cellular plants and in some vascular plants, as Ferns and Equisetum, there are no flowers, and the reproductive organs are inconspicuous, hence they have been termed Flowerless or Cryptogamous. In all cases the young plant, or embryo, is completely cellular. But as growth proceeds, that differentiation takes places which distinguishes the several classes of plants one from the other.

In all plants the original cell tissue which gives origin to its parts is of a uniform nature, and is termed the primary tissue. When all the cells of this tissue are capable of multiplication and division the tissue is a meristem or generating tissue. If the cells are not so capable, then it is a permanent tissue. The primary tissue at the growing point of any shoot or root is essentially a meristem, and it has been designated the primary meristem, to distinguish it from the secondary meristem, which is applied to a tissue in the older parts of a stem or root which remains or becomes capable of division. The growing point of the apex has been termed the punctum vegetationis, and it not unfrequently forms a conical projection, and is then the vegetative cone. By growth at this punctum vegetationis the shoot or root increases in length, and the mode of addition is in many cases of a definite character. Two chief types of growth are recognized. In one of these a single large cell is always present at the apex, termed the apical cell, which may be regarded as the mother-cell, whence by bipartition in a definite manner the whole meristem below it has arisen, as is well seen in vascular Cryptogams and cellular plants. The other type is seen in Phanerogams, and here no such apical cell is visible, but a number of cells are found at the apex by whose multiplication the subsequent tissues are formed. But in whatever way formed, a primary meristem is the result of all the processes of growth, and by differentiation of its cells the various parts of the shoot or root are formed. The outer layer of the primary meristem, which extends completely over the punctum vegetationis, is termed the dermatogen; it is the primordial epidermis, being continuous with the epidermis of the shoot and afterwards becoming epidermis. Underneath the dermatogen several layers of cells are distinguished, continuous with the cortical portion of the shoot or root; this is the primordial cortex, and constitutes the periblem. Enclosed by this is a central cellular mass, out of which the fibro-vascular bundles and the structures of the central part of the shoot or root are formed; this has been termed the plerome. If the growing axis be a young root there is in addition developed, usually from the dermatogen, a mass of cells at the extremity, constituting a root-cap, or protective covering, to the delicate merismatic cells beneath; no such structure is formed in a stem. Thus a stem is structurally distinct from a root in having no root-cap.

In the plerome the fibro-vascular bundles are formed. Certain cells become elongated and prosenchymatous and united in bundles leaving no intercellular spaces; this mass is termed the procambium of the fibro-vascular bundle. As growth proceeds changes take place in the cells by thickening, and, their contents disappearing, various kinds of cells and vessels are formed. In this way the whole mass of the procambium may be converted into permanent tissue, and then growth ceases; or an inner portion of the bundle remains merismatic, which is called the cambium, and then growth proceeds, the shoot or root increasing in thickness by the cambium forming new cells on both sides. In the former case the bundle is closed, as in Cryptogams and Monocotyledons and some Dicotyledons; in the latter it is open, as in most Dicotyledons and Conifers. In every fibro-vascular bundle a separation into two groups of structures may be distinguished — the wood or xylem layers, and the bast or phloëm layers. As long as the bundle is open and cambium present, these layers are separated by the cambium. Their relative position as regards the axis of the stem or root varies. In some cases the phloëm is nearer the circumference, in other instances the xylem is peripheral, and in rare cases amongst Dicotyledons there are phloëm layers both on the outer and inner sides of the fibro-vascular bundles. In vascular Cryptogams the phloëm layers always surround the xylem portion of the bundle.

In the xylem or wood portion of a fibro-vascular bun-

dle the cells all tend to thicken their walls, and, consequently, numerous kinds of cells and vessels are found, which are usually arranged in a definite manner. On the side furthest removed from the phloëm we find spiral vessels interspersed with wood-cells; outside are reticulated and scalariform vessels and then interspersed with wood cells are large pitted vessels. In the phloëm or bast layers the cells have not such a tendency to thicken, but usually remain thin-walled, forming ordinary parenchymatous cells, or becoming perforated and forming seive cells. In certain layers, however, the cell-walls are thickened so as to become flexible, constituting the bast fibres. Around every fibro-vascular bundle a single layer of cells of the fundamental cellular tissue of the stem is marked off from its surroundings, the cells get filled with starch grains, and this constitutes what has been termed the bundle sheath or starch-bearing layer.

In all plants a provision is made for branching of the various organs, and two principal forms of it may be recognized. In one of these the generating axis elongates at the apex, producing in succession lateral structures. To this form the term *monopodium* has been applied. In the second form there is a cessation of growth at the apex in the direction of previous elongation of the axis, and a continuance in two diverging directions. This is *dichotomous* branching. In their rudimentary state all branchings may be easily referred to one or other of those types; but in the mature system it is frequently difficult to recognize the type, owing to irregular developement of the successive branching.

We now proceed to consider the form and internal structure of the various organs of plants.

ORGANS OF NUTRITION.

Root or descending axis. Speaking generally, the root is that portion of the plant which descends into the soil. In all plants the root is at first entirely cellular. It may remain permanently so, or vessels may be formed in it. The *Radicle*, or young root, is the first portion of the embryo protruded from the seed or spore when germination commences, and resembles very much in structure the young stem. Both are entirely cellular, consisting of a central nucleus of cellular tissue covered by two or more layers of cells. But at the apex of the root a mass of cells is developed, which constitutes what is known as the root-cap or *pileorhiza*. These cells extend for some distance along the sides of the root, forming a sheath, and in some cases, as Lemna, the cap becomes loosened from the root, remaining attached by a few cells at the apex only. and then it is known as the *ampulla*. This root-cap distinguishes structurally the root from the stem, and it serves as a protection to the apical growing-point of the root. The roots of Thallophytes, consisting entirely of cells, do not develop a root-cap.

The root is merely a prolongation downwards of the stem, and the part where they unite is the collum or neck. Afterwards the root is distinguished from the stem by the absence of a provision for the development of leaf-buds. It is not always easy to distinguish between a stem and a root. Many so-called roots bear at their upper part a portion called their crown, whence leaf-buds arise. Underground stems and roots are often confounded. Some plants, as the Moutan Pæony, the Plum-tree, Pyrus japonica, and especially Anemone japonica, have a power of forming buds on what are commonly called their roots. The last-mentioned plant develops these buds on every part of its extensively ramifying root-like prolongations, which may be chopped into numerous pieces, each capable of giving rise to a new plant. Such is also the case with the annulated root of Ipecacuan. Roots are usually subterranean and colorless. Externally, they have a cellular epidermal covering of a delicate texture, sometimes called epiblema, in which no stomata exist. In woody plants fibro-vascular bundles are found in the roots, and there is an internal arrangement of tissues similar to that seen in the stem itself, but spiral vessels are rare in the root. The axis of the root gives off branches which divide into radicles or fibrils, the extremities of which, composed of delicate cellular tissue constituting the punctum vegetationis, have been erroneously called spongioles or spongelets; they are not distinct organs. Hairs are often seen on roots, but no true leaves. These hairs consist of simple elongated cells, which occur singly, and appear to serve the purpose of absorption. Roots increase principally by additions to their extremities, which are constantly renewed, so that the minute fibrils serve only a temporary purpose, and represent deciduous leaves; but in large trees which form thick roots an increase in diameter occurs in the root similar to what is seen in the stem itself. In some plants no roots are formed at all; thus in the Orchidaceous plants Epipogium Gmelini and Corallorhiza innata, and also in Lemna arrhiza, no roots occur. Roots may be given off from any portion of a stem, originating as cellular prolongations from the inner portion of the stem, and coming off at any point of the stem, or at small lenticular points to which the name of lenticels has been given by some. When the stem is more or less horizontal the roots given off from it pass directly into the soil; but if the stem be erect they pass for a certain distance downwards through the air, and are called aerial. The latter are well seen in the Screw-pine (Pandanus), the Banyan (Ficus indica), and many other species of Ficus, where they assist in supporting the stem and branches. In the Mangrove they often form the entire support of the stem, which has decayed at its lower part. In Tree-ferns they form a dense coating around, and completely concealing, the stem; such is also the case in some Dracænas and Palms. In Epiphytes, or plants growing in the air, attached to the trunks of trees, such as Orchids of warm climates, the aerial roots produced do not reach the soil; they continue always aerial and greenish and they possess stomata. Delicate hairs are often seen on these epiphytal roots, as well as a peculiar investment formed by the cells of the epidermis which have lost their succulent contents and are now filled with air. This layer is called velamen radicum, or covering of the roots. The aerial roots of the Ivy are not the nutritive roots of the plant, but are only intended for mechanical support.

Stem or Ascending Axis may be defined as an axis bearing leaves. Structurally it differs from a root in having no development of cells forming a cap over the growing point. Under the term caulome (stem structure) are included all those parts of a plant morphologically equivalent in bearing leaves. The stem generally ascends, seeking air and light, and has therefore been termed the ascending axis. Stems have usually considerable firmness and solidity, but sometimes they are weak, and either lie prostrate on the ground, thus becoming procumbent, or climb on plants and rocks by means of rootlets, like the Ivy, being then called scandent, or twist round other plants in a spiral manner like Woodbine, when they are volubile. Twining plants turn either from right to left, as the French Bean, Convolvulas, Passion-flower, Dodder, Periploca, and Gourd; or from left to right as Honeysuckle, Twining Polygonum, Hop, and Tamus. Bryony tendrils twine from right to left, and left to right, alternately. In warm climates twining plants (lianas) often form thick

woody stems; while in temperate regions they are generally herbaceous.

Names are given to plants, according to the nature and duration of their stems. Herbs, or herbaceous plants, have stems which die down annually. In some of them the whole plant perishes after flowering; in others, the lower part of the stem forming the crown of the root remains, bearing buds from which the stem arises next season. In what are called biennial herbs, the whole plant perishes after two years, while in perennial herbs the crown is capable of producing stems for many years, or new annual products are repeatedly added many times, if not indefinitely, to the old stems. The short permanent stem of herbaceous plants is covered partially or completely by the soil, so as to protect the buds. Plants producing permanent woody stems are called trees and shrubs. The latter are less than five times the height of a man, and produce branches from or near the ground; while the former have conspicuous trunks, which attain at least five times the height of a man. Shrubbery plants of small stature are called under-shrubs or bushes. The limits between these different kinds of stem are not always well defined; and there are some plants occupying an intermediate position between shrubs and trees, to which the name of arborescent shrubs is occasionally given. The stem receives the name of caulis in ordinary herbaceous plants which do not form a woody stem, culm in grasses, truncus in trees, caudex or stock in Palms and in some Cacti, and stipe in Ferns. The term haulm is probably a corruption of culm; it is used by farmers to designate the stem of grasses and the herbaceous stems of plants. The stem is not always conspicuous. Plants with a distinct stem are called caulescent; those in which it is not conspicuous are acaulescent, as the Primrose, Cowslip, Gentian, and Dandelion. A similar term is given in ordinary language to plants whose stems are buried in the soil, such as Cyclamen or Sowbread. Some plants are truly stemless, and consist only of expansions of cellular tissue representing stem and leaf, called a thallus, and hence are denominated Thallogens, or Thallophytes.

Stems have a provision for a symmetrical arrangement of leaves and branches,—nodes, or points whence leaf-buds are produced, being placed at regular intervals. No such provision occurs in roots. The intervals between nodes are called internodes. The stem, although it has a tendency to rise upwards when first developed, in many instances, becomes prostrate, and either lies along the ground partially covered by the soil, or runs completely underneath its surface, giving off roots from one side and buds from the other. Some stems are therefore subterranean, and are distinguished from roots by the provision made for regular leaf-buds.

Buds, as has been stated, are either terminal or lateral. By the production of the former, stems increase in length, while the latter give rise to branches (rami), from which others, called branchlets or twigs (ramuli), arise, and add to the diameter of the stem. The terminal bud, after producing leaves, sometimes dies at the end of one season, and the whole plant, as in annuals, perishes; or part of the axis is persistent, and remains for two or more years, each of the leaves before its decay producing a bud in its axil. This bud continues the growth in spring. In some trees of warm climates, as Cycas, Papaw-tree, Palms, and Tree-ferns, growth by terminal buds is well seen. In these plants the elongation of the stem is generally regular and uniform, so that the age of the plant may be estimated by its height; owing to this mode of growth they do not attain a great diameter. Although provision is made for the regular formation of buds, there are often great irregularities in consequence of many being abortive, or remaining in a dormant state. Such buds are called latent, and are capable of being developed in cases where the terminal bud, or any of the branches, have been injured or destroyed. In some instances, as in Firs, the latent buds follow a regular system of alternation; and in plants with opposite leaves, it frequently happens that the bud in the axil of one of the leaves only is developed, and the different buds so produced are situated alternately on opposite sides of the stem. Occasionally, after a partial development as branches, buds are arrested and form knots or nodules. The embryo-buds or nodules of the Beech, Cedar, and Olive are apparently of this nature.

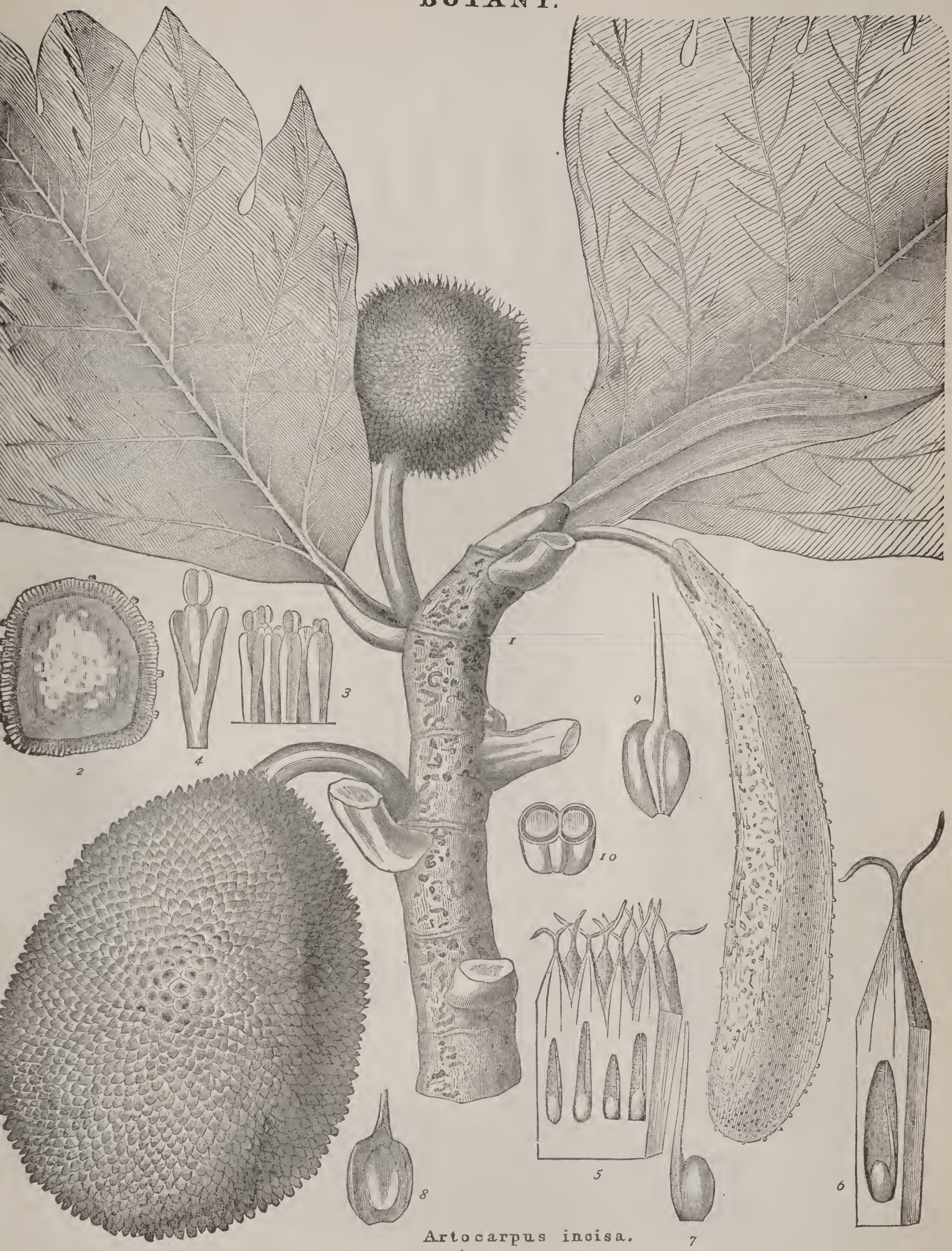
When the terminal bud is injured or arrested in its growth the elongation of the main axis stops, and the lateral branches often acquire increased activity. By continually cutting off the terminal buds, a woody plant is made to assume a bushy appearance, and thus pollard trees are produced. Pruning has the effect of checking the growth of terminal buds, and of causing lateral ones to push forth.

The mode in which branches come off from the stems gives rise to various forms of trees, as pyramidal, spreading, or weeping,—the angles being more or less acute or obtuse. In the Italian Poplar and Cypress the branches are erect, forming acute angles with the upper part of the stem; in the Oak and Cedar they are spreading or patent, forming nearly a right angle; in the Weeping Ash and Elm they come off at an obtuse angle; while in the Weeping Willow and Birch they are pendulous from their flexibility. The comparative length of the upper and under branches also gives rise to differences in the contour of trees, as seen in the conical form of Spruce, and the umbrella-like form of the Italian Pine (*Pinus Pinea*). The branching of some trees is peculiar. In the Amazon district many Myristicaceæ and Monimiaceæ have verticillate branches coming off in fives. This is also seen in the Chili Pine. Some Amazon trees taper downwards, so as to have a form like an inverted cone or pyramid, as in the Mulatto tree (Eukylista Spruceana), one of the Cinchonaceæ.

Branches are sometimes long and slender, and run along the ground, producing buds with roots and leaves at their extremity or apex.

In some instances lateral buds are found without being in the axil of leaves. In this case they are extra-axillary. Such buds are produced after the stem and leaves have been formed, and in certain circumstances they are developed like normal buds. What have been called embryo-buds are woody nodules seen in the bark of the Beech, Elm and other trees. They are partially developed adventitious or abnormal buds, in which the woody matter is pressed upon by the surrounding tissue, and thus acquires a very hard and firm texture. When a section is made, they present woody circles arranged around a central pith, and traversed by medullary rays. The nodules sometimes form knots on the surface of the stem, at other times they appear as large excrescences, and in some cases twigs and leaves are produced by them.

Buds sometimes becomes extra-axillary in consequence of the non-appearance or abortion of one or more leaves, or on account of the adhesion of the young branch to the parent stem. In place of one bud there are occasionally several accessory ones produced in the axil, giving origin to several branches. Such an occurrence is traced to the presence of latent or adventitious buds. By the union of several such buds, branches are produced, having a thickened or flattened appearance, as is seen in the Fir, Ash, and other trees. These fasciated



Artocarpus incisa.

(Bread-fruit Tree)

1, Reduced branch; 2, Transverse section male omentum; 3, Male flowers; 4, Single male flower separated; 5, Female flowers; 6, Single female flowers separated; 7, Ovary; 8, Ovary opened; 9, A variety of ovary with two loculaments; 10, Transverse section of bilocular ovary.

1, Plant (reduced); 2, Male omentum; 3, Upper side of scale on omentum; 4, Under side of scale; 5, 6, 7, Anther; 8, Pollen (magnified)

branches, in some cases, however, are owing to the abnormal development of a single bud.

The typical form of stems is rounded. They are sometimes compressed or flattened laterally, while at other times they are angular; being triangular, with three angles and three flat sides; trigonous, with three convex faces; triquetrous, with three concave sides; quadrangular or square; quinquangular or five-angled; octangular or eight-angled, &c. Various terms are applied to the forms of stems, as cylindrical or terete, jointed or articulated, &c. The arrangement of the fibro-vascular bundles in the mature stem or root is not the same in all plants. But we find that in most plants which have two seed-lobes in the embryo, *i.e.*, Dicotyledons, a characteristic structure is apparent, quite distinct from what is found in the majority of plants in which only one seed-lobe is present in the embryo, *i.e.*, in Monocotyledons; and these, again, have a different structure from that found in Acotyledons, or plants with no seed-lobe in their embryo. The three forms of stem here referred to have been usually distinguished as follows:—(1.) Exogenous stem, in which the fibro-vascular bundles are produced indefinitely in an outward direction, and the stem increases in diameter by the annual formation of a new layer of woody matter on the outside of the preceding layers. This is the form found in most Dicotyledons, and they have hence been called Exogens, or Outward-growers. Ordinary trees, such as the Oak and Ash, furnish instances. (2.) Endogenous stem, in which the fibro-vascular bundles are definite, and are formed towards the centre, which becomes filled up with them in the progress of growth, so that the diameter of the stem increases in a great measure by the new matter pushing out that previously formed. This stem characterizes many Monocotyledons, which have thus been called Endogens, or Inward-growers. Palms supply examples. (3.) Acrogenous stem, in which the bundles of vessels are simultaneously developed, and the additions to the stem take place at the summit by the union of the bases of the leaves. Plants having this kind of stem are called Acrogens, or Summit-growers, and are Acotyledons. Tree-ferns furnish an example. Recent research, however, has shown that these terms cannot always be used as synonymous with Dicotyledon, Monocotyledon, and Acotyledon, as we find amongst Dicotyledons stems where the formation of new fibro-vascular bundles is distinctly endogenous, and again amongst Monocotyledons stems with a provision for exogenous growth, and also amongst Acotyledons examples are not wanting in which a continuous increase in diameter is provided for.

The Pith, or the central part of a Dicotyledonous stem, is composed of cellular tissue.

The Medullary Sheath is the fibro-vascular layer immediately surrounding the pith. It is the inner layer of the fibro-vascular bundle of the first year, and consists chiefly of true spiral vessels, with annular and reticulated vessels, intermixed with long woody fibres, which continue to exercise their functions during the life of the plant, and which extend into the leaves.

The layers of wood are formed outside the medullary sheath in concentric rings in the manner already described. On account of this mode of formation of wood-layers successively outside pre-existing layers the stem increases indefinitely. There are no annular or spiral vessels present; these have been replaced by pitted and punctured vessels along with wood-cells.

In popular language all the green expanded organs borne upon an axis are designated leaves. Investigation however, has shown that many other parts of a plant which externally appear very different from ordinary leaves are, in their essential particulars, very similar to them, and are in fact their morphological equivalents. Thus the scales on the bulb of the Onion, the various parts of the flower, &c., are all leaves. Assuming, then, that the structure ordinarily termed a leaf is the typical form, these latter are designated changed or metamorphosed leaves; and all structures morphologically equivalent with the leaf are included under the general term phyllome (leaf-structure). Leaves are produced as lateral outgrowths of the stem. This character, common to all leaves, distinguishes them from other organs. In the higher plants we can easily recognize the distinction between stem and leaf. Amongst the lower plants, however, it is found that a demarcation into stem and leaf is impossible, but that there is a structure which partakes of the characters of both,—such as a thallome. The leaves always arise from the outer portion of the primary meristem of the plant, and the tissues of the leaf are continuous with those of the stem. Every leaf originates as a simple cellular papilla, which consists of a development from the cortical layers covered by epidermis; and as growth proceeds, the fibro-vascular bundles of the stem are continued outwards, and finally expand and terminate in the leaf. The increase in length of the leaf by growth at the apex is usually of a limited nature. In some Ferns, however, there seems to be a provision for indefinite terminal growth, while, in others this growth is periodically interrupted. It no unfrequently happens, especially amongst Monocotyledons, that after growth at the apex has ceased, it is continued at the base of the leaf, and in this way the length may be much increased. Amongst Dicotyledons this is very rare. In all cases the dimensions of the leaf are enlarged by interstitial growth of its parts.

The simplest leaf is found in some Mosses, where it consists of a single layer of cells. Usually it consists of several layers, and amongst vascular plants is distinguishable into an epidermis and a central parenchyma with fibro-vascular bundles distributed through it.

The *parenchyma* of the leaf is the cellular tissue surrounding the vessels, and enclosed within the epidermis. It has sometimes received the names of *diachyma*, *mesophyllum*, and *diploë*. It is formed of two distinct series of cells, each containing chlorophyll or green-colored granules, but differing in form and arrangement. Below the epidermis of the upper side of the leaf there are one or two layers of oblong blunt cells, placed perpendicularly to the surface, and applied so closely to each other as to leave only small intercellular spaces, except where stomata happen to be present. On the under side of the leaf the cells are irregular, often branched, and are arranged more or less horizontally, leaving cavities between them, which often communicate with stomata. On this account the tissue has received the name of *cavernous*. In leaves having a very firm texture, as those of Coniferæ and Cycadaceæ, the cells of the parenchyma immediately beneath the epidermis are very much thickened and elongated in a direction parallel to the surface of the leaf, so as to be fibre-like. These constitute a hypodermal layer, beneath which the chlorophyll cells of the parenchyma are densely packed together, and are elongated in a direction vertical to the surface of the leaf; this has been termed *palisade* tissue. The form and arrangement of the cells, however, depend much on the nature of the plant, and its exposure to light and air. Sometimes the arrangement of the cells on both sides of the leaf is similar, as occurs in leaves which have their edges presented to the sky. In very succulent plants the cells form a compact mass, and those in the centre are often colorless. In some cases the cellular tissue is deficient at certain points, giving rise to distinct holes in the leaf, as in Monstera Adansonii; such a leaf has been called *pertuse*. In victoria regia perfor-

ations in the leaf seem to be subservient to the purposes of nutrition, by permitting the gases collected beneath the large expanded leaf to escape, and thus allowing its under surface to be brought into immediate contact with the water. The fibro-vascular system in the leaf constitutes the *venation*. The fibro-vascular bundles from the stem bend out into the leaf, and are there arranged in a definite manner. They usually form two layers, which may be separated by maceration. In *skeleton leaves*, or leaves in which the parenchyma is removed, these layers are well seen. In some leaves, as in the Barberry, the vessels forming the veins are hardened, producing spines without any parenchyma. The hardening of the extremeties of the vascular tissue is the cause of the spiny margin of many leaves, such as the Holly, of the sharp-pointed leaves of Madder, and of mucronate leaves, or those having a blunt end with a hard projection in the centre.

Submerged leaves, or leaves which are developed under water, differ in structure from aerial leaves. They have usually no fibro-vascular system, but consist of a congeries of cells, which sometimes become elongated and compressed so as to resemble veins. They have a layer of compact cells on their surface, but no true epidermis, and no stomata. Their internal structure consists of cells, disposed irregularly, and sometimes leaving spaces which are filled with air for the purpose of floating the leaf. When exposed to the air these leaves easily part with their moisture, and become shrivelled and dry. In some instances there is only a network of filamentous-like cells formed, the spaces between which are not filled with parenchyma, giving a peculiar skeleton appearance to the leaf, as in Ouvirandra fenestralis (Lattice plant). Such a leaf has been called fenestrate. A leaf, whether aerial or submerged, generally consists of a flat expanded portion, called the blade, limb, or lamina, of a narrower portion called the petiole or stalk, and sometimes of a portion at the base of the petiole, which forms a sheath or vagina, or is developed in the form of leaflets, called stipules. The sheathing portion is sometimes incorporated with the stem, and is then called tigellary. These portions are not always present. The sheathing or stipulary portion is frequently wanting, and occasionally only one of the other two is developed. When a leaf has a distinct stalk it is called petiolate; when it has none, it is sessile, and if in this case it embraces the stem it is said to be amplexicaul. The part of the leaf next the petiole or the axis is the base, while the opposite extremity is the apex. The surfaces of the leaf are called paginæ, and its edges or margins form the circumscription of the leaf. The leaf is usually flattened and expanded horizontally, *i.e.*, at right angles to the longitudinal axis of the shoot, so that the upper pagina is directed towards the heavens, and the lower pagina towards the earth.

The arrangements of the fibro-vascular system in the lamina constitutes the venation or nervation. In an ordinary leaf, as that of the Elm, there is observed a large central vein running from the base to the apex of the leaf, this is the midrib; it gives off veins laterally, which either end a curvature within the margin (curve-veined), as in Lilac and Belladonna, or go directly to the edge of the leaf (feather-veined), as in Elm and Chestnut. If they are curved, then external veins and marginal veinlets are interspersed through the parenchyma external to the curvature. There are also other veins of less extent (costal veins) given off by the midrib, and these give origin to small veinlets. A leaf with only a single midrib is said to be unicostate. In some cases, as Sycamore and Cinnamon, in place of there being only a single midrib there are several large veins (ribs) of nearly equal size, which diverge from the point where the blade joins the petiole or stem, giving off lateral veins. The leaf in this case is multicostate. When there are three prominent ribs, as in Cinnamon and Cassia, the leaf is tricostate; when five, quinquecostate. When the midrib gives off two ribs a little above the base, the leaf becomes triplicostate; when it gives off five, quintuplicostate. In a leaf having many ribs they may converge towards the apex, as in Cinnamon or they may diverge, as in Sycamore and the Castor-oil plant. Thus the primary veins gives off secondary veins, and these in their turn give off tertiary veins, and so on until a complete network of vessels is produced, and those veins usually project on the under surface of the leaf. To a distribution of veins such as this the name of reticulated or netted venation has been applied. In the leaves of some plants there exists a midrib with large veins running nearly parallel to it from the base to the apex of the lamina, as in Grasses; or with veins diverging from the base of the lamina in more or less parallel lines, as in Fan Palms, or with veins coming off from it throughout its whole course, and running parallel to each other in a straight or curved direction towards the margin of the leaf, as in Plantain and Banana. In these cases the veins are often united by cross veinlets, which do not, however, form an angular network. Such leaves are said to be parallel-veined. The leaves of Monocotyledons have generally this kind of venation, while reticulated venation most usually occurs amongst Dicotyledons. Some plants, which in most points of their structure are Monocotyledonous, yet have reticulated venation. Such have been called Dictyogens. In vascular Acotyledonous plants there is frequently a tendency to fork exhibited by the fibro-vascular bundles in the leaf; and when this is the case we have fork-veined leaves. This is well seen in many Ferns. The distribution of the system of vessels in the leaf is usually easily traced, but in the case of succulent plants, as Hoya, Agave, Stonecrop, and Mesembryanthemum, the veins are obscured, and the leaves are said to be hidden-veined. In the cellular leaves of Mosses a median vein of several layers of cells is often visible, but as there are no fibro-vascular bundles present this is considered a false venation, and they are styled veinless (Avenia).

We now proceed to pass in review the reproductive organs of plants. In Phanerogamous plants, as already mentioned, these organs are conspicuous, and constitute what is known as the flower; in Cryptogamous plants they are inconspicuous. All Dicotyledonous and Monocotyledonous plants are included in the former; Acotyledonous and Thallogenous plants compose the latter. The structures which go to form these organs are not, however, formations of a new type, but are merely modifications of those structures which we have already considered under the nutritive organs. For example, the various parts of the flower in Phanerogams are really phyllomes, the supporting structures of the flower are caulomes, the spore-bearing sac of many Cryptogams is a trichome; and in this way a morphological equivalency may be traced betwixt the two series of organs. Further, the difference betwixt the reproductive organs of Phanerogams and those of Cryptogams is one more of degree of differentiation than of actual morphological difference. In Phanerogams the flowers or floral axes are produced from flower-buds, just as leaf-shoots arise from leaf-buds. These two kinds of buds have a resemblance to each other as regards the arrangement and development of their parts; and it sometimes happens, from injury and other causes, that the part of the axis which, in ordinary cases, would produce a leaf-bud, gives origin to a flower-bud. A

flower-bud has not in ordinary circumstances any power of extension by the development of its central cellular portion. In this respect it differs from a leaf-bud. In some cases, however, of monstrosity, especially seen in the Rose and Geum, the central part is prolonged, and bears leaves or flowers. In such cases the flowers, so far as their functional capabilities are concerned, are usually abortive.

Flower-buds, like leaf-buds, are produced in the axil of leaves, which are called floral leaves, bracts, or hypsophyllary leaves.

The term bract is properly applied to the leaf from which the primary floral axis, whether simple or branched, arises, while the leaves which arise on the axis between the bract and the outer envelope of the flower are bractols or bractlets. Bracts sometimes do not differ from the ordinary leaves, and are then called leafy, as in Veronica hederifolia, Vinca, Anagallis, and Ajuga. Like leaves they are entire or divided. In general as regards their form and appearance, they differ from ordinary leaves, the difference being greater in the upper than in the lower branches of an inflorescence.

They are distinguished by their positions at the base of the flower or flower-stalk. Their phyllotaxis is similar to that of the leaf. When the flower is sessile the bracts are often applied closely to the calyx, and may thus be confounded with it, as in Malvaceæ and species of Dianthus and Eranthis, where they have received the name of epiclyx or calyculus. In some Rosaceous plants an epicalyx is present, due to the formation of stipulary structures by the sepals. In many cases bracts seem to perform the function of protective organs, within or beneath which the young flowers are concealed in their earliest stage of growth.

When bracts become colored, as in Amherstia nobilis, Euphorbia splendens, Erica elegans, and Salvia splendens, they may be mistaken for parts of the corolla. They are sometimes mere scales or threads, and at other times they are abortive, and remain undeveloped, giving rise to the ebracteated inflorescence of Cruciferæ and some Boraginaceæ. Sometimes no flower-buds are produced in their axil, and then they are empty. A series of empty colored bracts terminates the inflorescence of Salvia Hormium. The smaller bracts or bracteoles, which occur among the subdivisions of a branching inflorescence, often produce no flower-buds, and thus anomalies occur in the floral arrangements. Bracts are occasionally persistent, remaining long attached to the base of the peduncles, but more usually they are deciduous, falling off early by an articulation. In some instances they form part of the fruit, becoming incorporated with other organs. Thus, the cones of Firs and the strobili of the Hop are composed of a series of bracts arranged in a spiral manner, and covering fertile flowers; and the scales on the fruit of the Pine-apple are of the same nature. In amenta or catkins the bracts are called squamæ or scales. At the base of the general umbel in Umbelliferous plants, a whorl of bracts often exists, called a general involucre, and at the base of the smaller umbels or umbellules there is a similar leafy whorl called involucel or partial involucre. In some instances, as in Fool's-parsley, there is no general involucre, but simply an involucel; while, in other cases, as in Fennel, neither involucre nor involucel is developed. In Compositæ the name involucre is applied to the leaves, scales, or phyllaries, surrounding the head of flowers.

The arrangement of the flowers on the axis, or the ramification of the floral axis, is called inflorescence or anthotaxis. The primary axis of inflorescence is sometimes called rachis; its branches, whether terminal or lateral, which form the stalks supporting flowers or clusters of flowers, or peduncles, and if small branches are given off by it, they are called pedicels. A flower having a stalk is called pedunculate or pedicellate; one having no stalk is sessile. In describing a branching inflorescence, it is common to speak of the rachis as the primary floral axis, its branches as the secondary floral axes, their divisions as the tertiary floral axes, and so on; thus avoiding any confusion that might arise from the use of the terms rachis, peduncle, and pedicel.

The flower is the *tout ensemble* of those organs which are concerned in reproduction. It is constituted by a portion of the floral axis bearing the sexual organs, usually with certain protective envelopes. The parts borne on the floral axis and composing the flower are all metamorphosed leaves, and, though usually very different in appearance from foliage leaves, their morphological resemblance is frequently shown by their developing as foliage leaves. The axis bearing the parts of the flower is usually very much contracted, no internodes being developed, and it frequently expands into a flattened or hollowed expansion termed the thalamus or tarus; at other times, though rarely, the internodes are developed and it is elongated. Upon this torus the parts of the flower are arranged in a crowded manner, usually forming a series of verticils, the parts of which alternate; but they are sometimes arranged in a spiral manner, especially if the floral axis be elongated. In a typical flower, we recognize four distinct whorls of leaves:—an outer whorl of five parts, the calyx; within it, another whorl of five parts alternating with those of the outer whorl, the corolla; next comes a whorl of parts alternating with the parts of the corolla, the androecium; and in the center is the gynœcium. The flower is supposed to be cut transversely, and the parts of each whorl are distinguished by a different symbol. Of these whorls the two internal, forming the male and female sexual organs, constitute the essential organs of reproduction; the two outer whorls are the protective coverings or floral envelopes. The calyx or outer covering is formed of leaves, called sepals, which are generally of a greenish color. The corolla the next covering, is composed of leaves, called petals, which are often showy, and normally alternate with the sepals. Sometimes, as in many Monocotyledons, the calyx and corolla both display rich coloring, and are apt to be confounded. In such cases the term perianth, or perigone, has been applied to avoid ambiguity. Thus, in the Tulip, Crocus, Lily, Hyacinth, authors speak of the parts of the perianth, in place of calyx and corolla, although in these plants an outer whorl (calyx) may be detected, of three parts, and an inner (corolla), of a similar number, alternating with them. When the parts of the calyx are in appearance like petals they are said to be petaloid, as in Liliaceæ. In some cases the petals have the appearance of sepals, then they are sepaloid, as in Juncaceæ. The term perianth is usually confined to the flowers of Monocotyledons, whatever color they present, whether green, as in Asparagus, or colored, as in Tulip. Some use the term perianth as a general one, and restrict the use of perigone to cases where a pistil only is present. In plants, as Nymphæa alba, where a spiral arrangement of the floral leaves occur, it is not easy to say where the calyx ends and the corolla begins, as these two whorls pass insensibly into each other. When both calyx and corolla are present, the plants are dichlamydeous; occasionally one becomes abortive, and then the flower is monochlamydeous having a calyx only, or apetalous, having no petals. At times both are abortive, and then the flower is achlamydeous, or naked. It is important to remember that if only one perianth-whorl is present it is the calyx. The outermost whorl of the essential organs, collectively termed

the androecium, is composed of a series of leaves distinguished as the staminal leaves or stamens. These are the male sexual organs. In their most differentiated form each consists of a stalk, either filiform or foliaceous, the filament supporting at its summit a lobed saccate mass, the anther, which contains a powdery matter, the pollen, which is discharged therefrom. In many cases, however, the staminal leaf resembles more nearly a cataphyllary leaf, bearing the pollen-sacs scattered over its surface, as in Cycadaceæ. The gynœcium or pistil is the central portion of the flower, and is the female sexual organ. It consists of one or more folded leaves, called carpels, either separate or combined. The parts distinguished in the pistil are the ovary, which is the lower portion enclosing the ovules destined to become seeds, and the stigma, a portion of loose cellular tissue uncovered by epidermis, which is either sessile on the apex of the ovary, as in the Poppy, or is separated from it by a prolonged portion called the style. The androecium and gynœcium are not present in all flowers. When both are present the flower is hermaphrodite. When only one of those organs is present the flower is unisexual or diclinous, and is either male (staminate), or female (pistillate). A flower then normally consists of the four whorls of leaves,— calyx, corolla, androecium, and gynœcium,— and when these are all present the flower is complete. These several whorls of the flower are usually densely crowded upon the thalamus, but in some instances, after spical growth has ceased in the axis, an elongation of portions of the receptacle by intercalary growth occurs, by which changes in the position of the parts may be brought about.

When a flower consists of parts arranged in whorls it is said to be cyclic, and if all the whorls have an equal number of parts and are alternate it is encyclic. In contrast to the cyclic flowers are those, as in Magnoliaceæ, where the parts are in spirals.

A flower is said to be symmetrical when each of its whorls consists of an equal number of parts, or when the parts of any one whorl are multiples of that preceding it. Thus, a symmetrical flower may have five sepals, five petals, five stamens, and five carpels, or the number of any of these may be ten, twenty, or some multiple of five.

The calyx is the external envelope of the flower, and consists of verticillate leaves, called sepals, foliola, or phylla. These calycine leaves are sometimes separate from each other, at other times they are united to a greater or less extent; in the former case, the calyx is dialysepalous or eleutherosepalous, polysepalous or polyphyllous, or aposepalous; in the latter, gamosepalous or gamophyllous, monosepalous or monophyllous, or synsepalous. The divisions of the calyx present usually all the characters of leaves, and in some cases of monstrosity they are converted into the ordinary leaves of the plant. Their structure consists of cellular tissue or parenchyma, traversed by vascular bundles, in the form of ribs and veins, containing spiral vessels, which can be unrolled, delicate woody fibres, and other vessels, the whole being enclosed in an epidermal covering, having stomata and often hairs on its outer surface, which corresponds to the under side of the leaf. In the great divisions of the vegetable kingdom the venation of the calyx is similar to that of the leaves,— parallel in Monocotyledons, reticulated in Dicotyledons. The leaves of the calyx are usually entire, but occasionally they are cut in various ways, as in the Rose, and they are sometimes hooked at the margin, as in Rumex uncatus. It is rare to find the leaves of the calyx stalked. They are usually sessile leaves, in which the vaginal portion is only slightly developed, and frequently the laminar part is alone present. Sepals are generally of a more or less oval, elliptical, or oblong form, with their apices either blunt or acute. In their direction they are erect or reflexed (with their apices downwards), spreading outwards (divergent or patulous), or arched inwards (connivent). They are usually of a greenish color, and are called foliaceous or herbaceous; but sometimes they are colored, as in the Fuchsia, Tropæolum, Globe-flower, and Pomegranate, and are then called petaloid. Whatever be its color, the external envelope of the flower must be considered as the calyx. The nature of the hairs on the calyx gives rise to terms similar to those already mentioned as applied to the surfaces of other parts of plants. The vascular bundles sometimes form a prominent rib, which indicates the middle of the sepal; at other times they form several ribs. The venation is useful as pointing out the number of leaves which constitute a gamosepalous calyx. In a polysepalous calyx the number of the parts is marked by Greek numerals prefixed.

The corolla is the more or less colored inner floral envelope, forming the whorl of leaves between the calyx and the stamens. It is generally the most conspicuous whorl. The gay colors and fragrant odors of flowers are resident in it. It is present in the greater number of Dicotyledons. Petals differ more from leaves than sepals do, and are much more nearly allied to the staminal whorl. In some cases, however, they are transformed into leaves, like the calyx, and occasionally leaf-buds are developed in their axil. They are seldom green, although occasionally that color is met with, as in some Cobæas, Hoya viridiflora, Gonolobus viridiflorus, and Pentatropis spiralis. As a rule they are highly colored, the coloring matter being contained in cells, and differing in its nature from the chlorophyll of the leaves. As regards their structure petals consist of cellular tissue, traversed by true spiral vessels and thin-walled tubes. In delicate flowers, as Convolvulas and Anagallis, these vessels are easily seen under the microscope. Petals do not usually present numerous layers of cells like the leaves, neither is the epidermis always distinct, although in some instances it may be detached, especially from the surface next the calyx. The cuticle of the petals of a Pelargonium, when viewed with a ½ or ¼-inch object glass, shows beautiful hexagons, the boundaries of which are ornamented with several inflected loops in the sides of the cells.

On the outer surface of petals, corresponding to the lower side of leaves, stomata are sometimes found. Petals are generally glabrous or smooth; but, in some instances, hairs are produced on their surface. Petaline hairs, though sparse and scattered, present occasionally the same arrangement as those which occur on the leaves; thus, in Bombaceæ they are stellate. Colored hairs are seen on the petals of Menyanthes, and on the segments of the perianth of the Iris. Although petals are very thin and delicate in their texture, they occasionally become thick and fleshy, as in Stapelia and Rafflesia; or dry, as in Heaths; or hard and stiff, as in Xylopia. A petal often consists of two portions — the lower narrow, resembling the petiole of a leaf, and called the unguis or claw; the upper broader, like the blade of a leaf, and called the lamina or limb. These parts are seen in the petals of the Wallflower. The claw is often wanting, as in the Crowfoot and the Poppy, and the petals are then sessile. Petals having a claw are unguiculate. According to the development of the veins and the growth of cellular tissue, petals present varieties similar to those already noticed in the case of leaves. Thus the margin is either entire or divided into lobes or teeth. These teeth sometimes form a regular fringe around the margin, and the petal becomes fimbriated, as in the Pink; or laciniated as in Lychnis Flos-cuculi; or crested,

as in Polygala. Sometimes the petal becomes pinnatified, as in Schizopetalum. The median vein is occasionally prolonged beyond the summit of the petals in the form of a long process, as in Strophanthus hispidus, where it extends for 7 inches; and at other times it ends in a free point of cuspis, and the petal becomes cuspidate; or the prolonged extremity is folded downward or inflexed, as in Umbelliferæ, so that the apex approaches the base. The limb of the petal may be flat or concave, or hollowed like a boat.

A corolla rarely consists of one petal, and when this occurs, as in Amorpha, it depends on the abortion or non-development of others. Such a corolla is unipetalous, a term quite distinct from monopetalous. A corolla is dipetalous, tripetalous, tetrapetalous, or pentapetalous, according as it has two, three, four or five separate petals. The general name of polypetalous, dialypetalous, eleutheropetalous, or apopetalous, is given to corollas having separate petals, while monopetalous, gamopetalous, or sympetalous is applied to those in which the petals are united. This union generally takes place at the base, and extends more or less toward the apex; in Phyteuma the petals are united at their apices also.

II. ESSENTIAL ORGANS.

These organs are the stamens and pistil, the latter containing the seeds or germs of young plants, and corresponding to the female, while the former produces a powder necessary for fecundation, and is looked upon as performing the part of the male. The presence of both is required in order that perfect seed may be produced. A flower may have a calyx and corolla, but it will be imperfect if the essential organs are not present. The name of hermaphrodite or bisexual is given to flowers in which both these organs are found; that of unisexual or diclinous to those in which only one of these organs appear,— those bearing stamens only, being staminiferous or male; those having the pistil only, pistilliferous or female. But even in plants with hermaphrodite flowers it is rare that self-fertilization takes place, and this is provided against by the structure of the parts or by the period of ripening of the organs. For instance, in Primula and Linum some flowers have long stamens and a pistil with a short style, the others have short stamens and a pistil with a long style. The former occur in what are called thrum-eyed Primroses, the latter in those called pin-eyed. Such plants are called dimorphic. Other plants are trimorphic, as species of Lythrum; and proper fertilization is only effected by combination of parts of equal length. In some plants the stamens are perfected before the pistil; they are called proterandrous, as in Ranunculus repens, Silene maritima, Zea Mays. In other plants the pistil is perfected before the stamens, as in Potentilla argentea, Plantago major, Coix Lachryma, and they are proterogynous plants.

Male Organs in Phanerogams.—The stamens (stamina) arise from the thalamus or torus within the petals, with which they alternate, forming one or more verticils or whorls, which collectively constitute the androecium, or the male organs of the plant. Their normal position is below the inner whorl or the pistil, and when they are so placed upon the thalamus they are hypogynous. Sometimes they become adherent to the petals, or are epipetalous, and the insertion of both is looked upon as similar, so that they are still hypogynous provided they are independent of the calyx and the pistil. Frequently the margins of the thalamus bearing the floral envelopes and stamens elongates, and the gynœcium remains in the centre of the concave receptacle; thus the stamens as it were rise from the calyx, and they surround the ovary, and are perigynous; but when the ovary becomes completely inferior by the growing upwards and inwards of the receptacle, the parts of the flower rising from its summit, the stamens are epigynous. The stamens vary in number, from one to many hundreds. Like the other parts of the flower they are modified leaves, resembling leaves in their structure, development, and arrangement. They consist in cellular and vascular tissues. They appear first in the form of cellular projections, and are arranged in a more or less spiral form. In their general aspect they have a greater resemblance to petals than to the leaves, and there is often seen a gradual transition from petals to stamens, especially in spiral flowers, as Nymphæa alba. When flowers become double by cultivation, the stamens are converted into petals, as in the Pæony, Camellia, Rose, &c. When there is only one whorl the stamens are usually equal in number to the sepals or petals, and are arranged opposite to the former, and alternate with the latter. The flower is then isostemonous. When the stamens are not equal in number to the sepals or petals, the flower is anisostemonous. When there is more than one whorl of stamens, then the parts of each successive whorl alternate with those of the whorl preceding it. The staminal row is more liable to multiplication of parts than the outer whorls. A flower with a single row of stamens is aplostemonous. If the stamens are double the sepals or petals as regards number, the flower is diplostemonous; if more than double, polystemonous. The additional rows of stamens may be developed in the usual centripetal (acropetal) order, as in Rhamnaceæ; or they may be interposed between the pre-existing ones or be placed outside them, *i.e.*, develop centrifugally (basipetally), as in Geranium and Oxalis. When the stamens are neither equal to, nor a multiple of, the floral envelopes, but are less numerous, the flower is miostemonous. When the stamens are fewer than twenty they are said to be definite, and the flower is oligandrous; when above twenty they are indefinite or polyandrous.

The filament, when structurally considered, is found to consist of a thin epidermis, on which occasionally stomata and hairs occur, and a layer of cellular tissue enclosing a bundle of spiral vessels, which traverses its whole length, and terminates at the junction between the filament and the anther.

The anther consists of lobes containing minute powdery matter, called pollen, which, when mature, is discharged by a fissure or opening of some sort. The anther-lobes are considered by some as formed by the two halves of the lamina, their back corresponding to the under surface, and their face to the upper surface, united by the midrib, the pollen being the cellular tissue, and the fissure of the anther taking place at the margin, which, however, is often turned toward the face. In this view, the two cavities which are found to exist in each lobe may correspond with the upper and under layer of cells, separated by a septum equivalent to the fibro-vascular layer of the leaf. Others view the anther as formed by each half of the lamina being folded upon itself, so that the outer surface of both face and back corresponds to the lower side of the leaf, and the septum dividing each cavity into two is formed by the united upper surfaces of the folded half. Again, others hold that the connective represents the lamina of the leaf to which the anther lobes are mere appendages. There is a double covering of the anther — the outer, or exothecium, resembles the epidermis, and often presents stomata and projections of different kinds; the inner, or endothecium, is formed by a layer or layers of cellular tissue, the cells of which have a spiral, annular, or recticulated fibre in their interior. This internal lining varies in thickness, generally be-

coming thinner towards the part where the anther opens, and there disappears entirely. The walls of the cells are frequently absorbed, so that when the anther attains maturity the fibres are alone left, and these by their elasticity assist in discharging the pollen. The anther is developed before the filament, and is always sessile in the first instance, and sometimes continues so. It appears at first as a simple cellular papilla of meristem, upon which an indication of two lobes soon appears. Upon these projections the rudiments of the pollen-sacs are then seen, usually four in number, two on each lobe. In each a differentiation takes place in the layers beneath the epidermis, by which an outer layer of small-celled tissue surrounds an inner portion of large cells. Those central cells are the mother-cells of the pollen, while the small-celled layer of tissue external to them becomes the endothecium, the exothecium being formed by the epidermal layer.

The opening of the anthers to discharge their contents is denominated dehiscence. This takes place either by clefts, by hinges, or by pores. When the anther-lobes are erect, the cleft takes place lengthwise along the line of the suture, constituting longitudinal dehiscence. At other times the slit takes place in a horizontal manner, from the connective to the side, as in Alchemilla arvensis and in Lemna; the dehiscence is then transverse. When the anther-lobes are rendered horizontal by the enlargement of the connective, then what is really longitudinal dehiscence may appear to be transverse. In other cases, when the lobes are united at the base, the fissure in each of them may be continuous, and the two lobes may appear as one. The cleft does not always proceed the whole length of the anther-lobe at once, but often for a time it extends only partially. In other instances the opening is confined to the base or apex, each loculament opening by a single pore, as in Pyrola, Tetratheca juncea, Rhododendron, Vaccinium, and Solanum, where there are two, and Poranthera, where there are four; whilst in the Mistletoe the anther has numerous pores for the discharge of the pollen. Another mode of dehiscence is called hinged.

The anthers dehisce at different periods during the process of flowering; sometimes in the bud, but more commonly when the pistil is fully developed, and the flower is expanded. They either dehisce simultaneously or in succession. In the latter case individual stamens may move in succession towards the pistil and discharge their contents, as in Parnassia palustris, or the outer or the inner stamens may first dehisce, following thus a centripetal or centrifugal order. The anthers are called introrse or anticæ, when they dehisce by the surface next to the centre of the flower; they are extrorse, or posticæ, when they dehisce by the outer surface; when they dehisce by the sides, as in Iris and some grasses, they are laterally dehiscent. Sometimes, from their versatile nature, anthers originally introrse become extrorse, as in the Passionflower and Oxalis.

The usual color of anthers is yellow, but they present a great variety in this respect. They are red in the Peach, dark purple in the Poppy and Tulip, orange in Eschscholtzia, &c. The color and appearance of the anthers often change after they have discharged their functions.

Stamens occasionally become sterile by the degeneration or non-development of the anthers. Such stamens receive the name of staminodia, or rudimentary stamens. In Scrophularia the fifth stamen appears in the form of a scale; and in many Pentstemons it is reduced to a filament with hairs or a shrivelled membrane at the apex. In other cases, as in double flowers, the stamens are converted into petals; this is also probably the case with such plants as Mesembryanthemum, where there is a multiplication of petals in several rows.

The pollen or powdery matter contained in the anther consists of small cells developed in the interior of other cells. These are produced in the large thick-walled mother cells or pollen utricles, formed in the interior of the pollen-sacs of the young anther. These mother-cells are either separated from one another and float in the granular fluid which fills up the cavity of the pollen-sac, or are not so isolated. A division takes place, by which four cells are formed in each, the exact mode of division differing in Dicotyledons and Monocotyledons. These cells are the pollen-cells or grains. They increase in size and acquire a cell-wall, which becomes differentiated into an outer cuticular layer, or extine, and an inner layer, or intine. Then the walls of the mother-cells are absorbed, and the pollen-grains float freely in the fluid of the pollen-sacs, which gradually disappears, and the mature grains form a powdery mass within the anther. They then either remain united in fours, or multiples of four, as in some Acacias, Periploca græca, and Inga anomala, or separate into individual grains, which by degrees become mature pollen.

When mature, the pollen-grain is a cellular body having an external covering, extine, and an internal, intine, Fritzsche states that he has detected, in some cases, other two coverings, which he calls intextine and exintine. They occur between the extine and intine, and are probably formed by foldings of these membranes.

When the pollen-grains are ripe, the anther dehisces and the pollen is shed. In order that fertilization may be effected the pollen must be conveyed to the female organ of reproduction. This process, termed pollination, is promoted in various ways,— the whole form and structure of the flower having relation to the process. In some plants, as Kalmia and Pellitory, the mere elasticity of the filaments is sufficient to effect this; in other plants pollination is effected by the wind, as in Coniferæ, and in such cases enormous quantities of pollen are produced. These plants are anemophilous. But the common agents for pollination are insects. To allure and attract them to visit the flower the odoriferous secretions and gay colors are developed, and the position and complicated structure of the parts of the flower are adapted to the perfect performance of the process. It is rare in hermaphrodite flowers for self-fertilization to occur, and the various forms of dichogamy, dimorphism, and trimorphism are fitted to prevent this.

Male Organs in Cryptogams. Sexual organs have not as yet been demonstrated in all Cryptogamic plants; but in most of them certain structures representing the male organs have been found. These are termed Antheridia or Pollinodia. They are closed sacs of various forms,— rounded, ovate, oblong, clavate, flask-like, &c., — developed from various parts of the plants, and composed either of one or of many cells enclosing a single central cell. In the interior of this organ small cells are formed of varying shape, containing in their interior peculiar bodies, termed antherozoids, spermatozoids, or phytozoa. These are in most cases filamentous spirally coiled cells, frequently with cilia attached, by means of which they move rapidly through the water. In some cases there are no cilia, as in the Algal groupe of Florideæ; and the antherozoids of all Algæ differ from those of other Cryptogams in never being filamentous, but short and more or less rounded. The amount of twisting of the antherozoid varies; in some Rhizocarps there are as many as a dozen coils. Antheridia of this kind have been demonstrated in all vascular Cryptogams, but only in some Thallogens have such structures been seen.

Female Organs in Phanerogams. The pistil or

gynœcium occupies the centre or axis of the flower, and is surrounded by the stamens and floral envelopes when these are present. It constitutes the innermost whorl, and is the female organ of the plant, which after flowering is changed into the fruit, and contains the seeds. It consists essentially of two parts, a basal portion forming a chamber, the ovary or germen, containing ovules or young seeds attached to a part called the placenta, and an upper portion, the stigma, a cellular secreting body, which is either seated on the ovary, and is then called sessile, as in the Tulip and Poppy, or is elevated on a stalk called the style, interposed between the ovary and stigma. The style is not necessary for the perfection of the pistil. Like the other organs, the pistil consists of one or more modified leaves, which in this instance are called carpels. When a pistil consists of a single carpel it is simple or monocarpellary, a state usually depending on the non-development of other carpels. When it is composed of several carpels, more or less united, it is compound or polycarpellary. In the first-mentioned case the terms carpel and pistil are synonymous. Each carpel has its own ovary, style (when present), and stigma, and is formed by a folded leaf, the upper surface of which is turned inwards towards the axis, and the lower outwards, while from its margins are developed one or more buds called ovules. That this is the true nature of the pistil may be seen by examining the flower of the double-flowering Cherry. In it no fruit is produced, and the pistil consists of sessile leaves, the limb of each being green and folded, with a narrow prolongation upwards, as if from the midrib, and ending in a thickened portion. The ovary then represents the limb or lamina of the leaf, and is composed of cellular tissue with fibrovascular bundles, and an epidermal covering. The cellular tissue, or parenchyma, often becomes much developed, as will be seen particularly when fleshy fruits are considered. The outer epidermis corresponds to the lower side of the leaf, exhibiting stomata, and sometimes hairs; the inner surface represents the upper side of the leaf, being usually very delicate and pale, and forming a layer called sometimes epithelium, which does not exhibit stomata. The vascular bundles correspond with the veins of the leaf, and consist of spiral, annular, and other vessels. In Cycas the carpels are ordinary leaves, with ovules upon their margin.

A pistil is usually formed by more than one carpel. The carpels may be arranged like leaves, either at the same or nearly the same height in a verticil, or at different heights in a spiral cycle. When they remain separate and distinct, thus showing at once the composition of the pistil, as in Caltha, Ranunculus, Hellebore, and Spiræa, the term apocarpous is applied. Thus, in Crassula rubens the pistil consists of five verticillate carpels alternating with the stamens. In the Tulip tree and Ranunculus the separate carpels are numerous and are arranged in a spiral cycle upon an elongated axis or receptacle. In the Raspberry the carpels are on a conical receptacle; in the strawberry, on a swollen succulent one; and in the rose, on a hollow one. When the fruit consists of several rows of carpels, the innermost have their margins directed to the centre, while the margins of the outer rows are arranged on the back of the inner ones. When the carpels are united, as in the Pear, Arbutus, and Chickweed, the pistil becomes syncarpous.

The union in a syncarpous pistil is not always complete; it may take place by the ovaries alone, while the styles and stigmata remain free, the pistil being then gamogastrous, and in this case, when the ovaries form apparently a single body, the organ receives the name of compound ovary; or the union may take place by the ovaries and styles, while the stigmata are disunited; or by the stigmata and the summit of the style only. Various intermediate states exist, such as partial union of the ovaries, as in the Rue, where they coalesce at their base; and partial union of the styles, as in Malvaceæ. The union is usually most complete at the base; but in Labiatæ the styles are united throughout their length, and in Apocynaceæ and Asclepiadaceæ the stigmata only. When the union is incomplete, the number of the parts of a compound pistil may be determined by the number of styles and stigmata; when complete the external venation, the grooves on the surface, and the internal divisions of the ovary, indicate the number. The changes which take place in the pistil by adhesion, degeneration, and abortion, are frequently so great as to obscure its composition, and to lead to anomalies.

The pistil is more liable to changes of this kind than any other part of the flower.

The ovary contains the ovules. These are attached to the placenta. This, sometimes called the trophosperm, consists of a mass of cellular tissue, through which the vessels pass to the ovule. The placenta is usually formed on the edges of the carpellary leaf and is then said to be of the marginal type. In many cases, however, the placentas are formations from the axis, and are not connected with the carpellary leaves; they are then said to be axile. Some restrict the term placenta to the point of attachment of a single ovule, and call the union of placentas, bearing several ovules, placentaries or pistillary cords. In marginal placentation the part of the carpel bearing the placenta is the inner or ventral suture, corresponding to the margin of the folded carpellary leaf, while the outer or dorsal suture corresponds to the midrib of the carpellary leaf. As the placenta is formed on each margin of the carpel it is essentially double. This is seen in cases where the margins of the carpel do not unite, but remain separate, and consequently two placentas are formed in place of one. When the pistil is formed by one carpel the inner margins unite in the axis, and form usually a common marginal placenta. This placenta may extend along the whole margin of the ovary as far as the base of the style, or it may be confined to the base or apex only. When the pistil is composed of several separate carpels, or, in other words, is apocarpous, there are generally separate placentas at each of their margins. In a syncarpous pistil, on the other hand, the carpels are so united that the edges of each of the contiguous ones, by their union, form a septum, or dissepiment, and the number of these septa consequently indicates the number of carpels in the compound pistil. It is obvious then that each dissepiment is formed by a double wall or two laminæ; that the presence of a septum implies the presence of more than one carpel; and that, when carpels are placed side by side, true dissepiments must be vertical, and not horizontal. When the dissepiments extend to the center or axis, the ovary is divided into cavities, cells, or loculaments, and it may be bilocular, trilocular, quadrilocular, quinquelocular, or multilocular, according as it is formed by two, three, four, five, or many carpels, each carpel corresponding to a single cell or loculament. In these cases the marginal placentas meet in the axis, and unite so as to form a single central one, and the ovules appear in the central angle of the loculi, as in Canna, Lily. The number of loculaments is equal to that of the dissepiments. When the carpels in a syncarpous pistil do not fold inwards completely so as to meet in the centre, but only partially, so that the dissepiments appear as projections on the walls of the ovary, then the ovary is unilocular, and the placentas are parietal, as in Viola. In these instances the pla-

centas may be formed at the margin of the united contiguous leaves, so as to appear single, or the margins may not be united, each developing a placenta. Frequently the margins of the carpels, which fold in to the centre, split there into two lamellæ, each of which is curved outwards and projects into the loculament, dilating at the end into a placenta. This is well seen in Cucurbitaceæ, Pyrola, &c. From this it will be seen that dissepiments are opposite to placentas formed by the union of the margins of two contiguous carpels, but alternate with those formed by the margins of the same carpel. The carpellary leaves may fold inwards very slightly, or they may be applied in a valvate manner, merely touching at their margins, the placentas then being parietal, and appearing as lines or thickenings along the walls. Cases occur, however, in which the placentas are not connected with the walls of the ovary, and form what is called a free central placenta. This is seen in many of the Caryophyllaceæ and Primulaceæ. In Caryophyllaceæ, however, while the placenta is free in the centre, there are often traces found at the base of the ovary of the remains of septa, as if rupture had taken place, and, in rare instances, ovules are found on the margins of the carpels. But in Primulaceæ, Myrsinaceæ, and Santalaceæ, no vestiges of septa or marginal ovules can be perceived at any period of growth; the placenta is always free, and rises in the centre of the ovary, and the part uncovered by ovules gradually extend in to the style. Free central placentation, therefore, has been accounted for in two ways; either by supposing that the placentas in the early state were formed on the margins of carpellary leaves, and that in the progress of development these leavesseparated from them, leaving the placentas and ovules free in the centre; or by supposing that the placentas are not marginal but axile formations, produced by an elongation of the axis, the ovules being lateral buds, and the carpels verticillate leaves, united together around the axis. The first of these views would apply well to the Caryophyllaceæ, the second to Primulaceæ. The latter case has also been explained, on the marginal hypothesis, by considering the placentas as formed from the carpels by a process of chorisis, and united together in the centre.

The ovary is usually of a more or less spherical or curved form, sometimes smooth and uniform on its surface, at other times hairy and grooved. The grooves usually indicate the divisions between the carpels, and correspond to the dissepiments. The dorsal suture may be marked by a slight projection, or by a superficial groove. When the ovary is situated on the centre of the receptacle, free from the other whorls, so that its base is above the insertion of the stamens, it is termed superior, as in Lychnis, Primula, and Geranium. When the margin of the receptacle is prolonged upwards, carrying with it the floral envelopes and staminal leaves, the basal portion of the ovary being formed by the receptacle, and the carpellary leaves alone closing in the apex, the ovary is inferior, as in Pomegranate, Apple, Pear, Gooseberry, and Fuchsia. In some plants, as many Saxifragaceæ, there are intermediate forms, in which the term half-inferior is applied to the ovary, whilst the floral whorls are half-superior.

The style proceeds from the summit of the carpel, and may be looked upon as a prolongation of it in an upward direction. It is hence called apicilar. It consists not merely of the midrib but of the vascular and cellular tissue of the carpel, and when carefully examined is found to be traversed by a narrow canal, in which there are some loose projecting cells, a continuation of the placenta, constituting what is called conducting tissue, which ends in the stigma. This is particularly abundant when the pistil is ready for fertilization. In some cases, owing to more rapid growth of the dorsal side of the ovary, the style becomes lateral; this may so increase that the style appears to arise from near the base, as in the Strawberry, or from the base, as in Chrysobalanus Icaco, when it is called basilar. In all these cases the style still indicates the organic apex of the ovary, although it may not be the apparent apex.

The stigma is the termination of the conducting tissue of the style, and is usually in direct communication with the placenta. It may, therefore, in most instances, be considered as the placental portion of the carpel, prolonged upwards. In Armeria, and some other plants, this connection with the placenta cannot be traced, The stigma consists of loose cellular tissue, and secretes a viscid matter, which detains the pollen and causes it to protrude tubes. This secreting portion is, strictly speaking, the true stigma, but the name is generally applied to all the divisions of the style on which the stigmatic apparatus is situated.

Transformations of the pistil are of frequent occurrence, and depend generally on abortion of a certain number of carpels, and on adhesions of various kinds. In the apocarpous pistils of Aconite, Nigella, Larkspur, and Pæony, we find on the same plant pistils composed of two, three, four, five, and six carpels. In some of the Brambles, all the carpels except one have been observed to disappear, thus making the fruit resemble that of the Plum. In the case of Leguminous plants there is usually only a single carpel, although the flower is pentamerous; this state has been traced to abortion of carpels, and the view is confirmed by finding plants in the same natural order with more than one carpel. Pistils of a succulent nature, such as those of the Sloe and Bird-cherry, sometimes assume the form of a pod, like that of the Pea. Occasionally stamens are changed into carpels, and at other times the carpels are transformed into stamens, and bear pollen.

The ovule is the body attached to the placenta, and destined to become the seed. Ovules are most usually produced on the margins of the carpellary leaves, but are also formed over the whole surface of the leaf, as in Cupressus. In other instances they rise from the floral axis itself, either as terminal buds, as in Polygonaceæ and Piperaceæ, or as lateral buds, as in Primulaceæ and Compositæ. The ovule is usually contained in an ovary, and all plants in which the ovule is so enclosed are termed angiospermous; but in Coniferæ and Cycadaceæ it is generally considered as having no proper ovarian covering, and is called naked, these orders being denominated gymnospermous. The gymnospermal view is not adopted by all botanists, some maintaining that there is a true ovarian covering.

The ovule appears at first as a small cellular projection from the placenta. The cells multiply until they assume a more or less enlarged ovate form, constituting what has been called the nucleus, or central cellular mass of the ovule. The nucleus may remain naked, and alone from the ovule, as in Balanophoraceæ, Santalaceæ, &c.; but in most plants it becomes surrounded by certain coverings or integuments during its development. These appear first in the form of cellular rings at the base of the nucleus, which gradually spread over its surface.

The position of the ovule relative to the ovary varies. When there is a single ovule, with its axis vertical, it may be attached to the placenta at the base of the ovary (basal placenta), and it is then erect, as in Polygonaceæ and Compositæ; or it may be inserted a little above the base, on a parietal placenta, with its apex upwards, and then is ascending, as in Parietaria. It may hang from an apicilar placenta at the summit of the ovary, its apex being directed downwards, and is inverted or pendulous,

as in Hippuris vulgaris; or from a parietal placenta near the summit, and then is suspended, as in Daphne Mezereum, Polygalaceæ, and Euphorbiaceæ.

The homology of the ovule is by no means the same in all plants. In such cases as Polygonum and Piperaceæ, it represents the termination of the floral axis, and therefore is of the nature of a caulome. Again, in such plants as Primulaceæ and compositæ, it is produced laterally upon the axis, and therefore represents a leaf, the integuments representing the lamina, and the funiculus the petiole,—the nucleus being an outgrowth from them. In some instances of malformation a transformation into these parts actually takes place. In cases where they are produced on the margin of the carpellary leaves (the usual mode), the ovules represent lobes of a leaf, and in some cases of monstrosity, as in Delphinium elatum, they appear as lobes of the carpellary leaf, whilst in Cupressus they are evidently outgrowths of the leaf. Further, the ovules in Orchidaceæ must be considered as mere trichomes, as they have no fibro-vascular bundles, and are developed from superficial cells of the placenta.

When the pistil has reached a certain stage in growth it becomes ready for fertilization. Pollination having been effected, and the pollen-grain having reached the stigma in angiosperms, the summit of the nucleus in gymnosperms, it is detained there, and the viscid secretion from the glands of the stigma in the former case, and the moisture from the ovule in the latter, induce the protrusion of the intine as a pollen-tube through the pores or points of perforation of the grain, many or few tubes being formed according to the number of pores. The pollen-tube or tubes pass down the canal, through the conducting tissue of the style when present, and reach the interior of the ovary in angiosperms, and then pass to the micropyle of the ovule, one pollen-tube going to each ovule. Sometimes the micropyle lies close to the base of the style, and then the pollen-tube enters at once, but frequently it has to pass some distance into the ovary, being guided in its direction by various contrivances, as hairs, grooves, &c.

Female Organs of Phanerogams after Fertilization.—The Fruit.—After fertilization various changes take place in the parts of the flower. Those more immediately concerned in the process, the anther and stigma, rapidly wither and decay, while the filaments and style often remain for some time; the floral envelopes become dry, the petals fall, and the sepals are either deciduous, or remain persistent in an altered form; the ovary becomes enlarged, forming the pericarp; and the ovules are developed as the seeds, containing the embryo-plant. The term fruit is strictly applied to the mature pistil or ovary, with the seeds in its interior. But it often includes other parts of the flower, such as the bracts and floral envelopes. Thus the fruit of the Hazel and Oak consists of the ovary and bracts and calyx combined; that of the Apple, Pear, and Gooseberry, of the ovary and calyx; and that of the Pine-apple, of the ovaries and floral envelopes of several flowers combined. Such fruits are by some distinguished as pseudocarps. In popular language, the fruit includes all those parts which exhibit a striking change as the result of fertilization. In general, the fruit is not ripened unless fertilization has been effected; but cases occur in which the fruit swells, and becomes to all appearance perfect, while no seeds are produced. Thus, there are seedless Oranges, Grapes, and Pine-apples. When the ovules are unfertilized, it is common to find that the ovary withers and does not come to maturity; but in the case of Bananas, Plantains, and Bread-fruit, the non-development of seeds seems to lead to a larger growth, and a greater succulence of fruit.

Fruits may be formed by one flower, or they may be the product of several flowers combined. In the former case they are either apocarpous, of one mature carpel or of several separate free carpels; or syncarpous, of several carpels, more or less completely united. These different kinds of fruits may be indehiscent or dehiscent. When the fruit is composed of the ovaries of several flowers united, it is usual to find the bracts and floral envelopes also joined with them, so as to form one mass; hence such fruits are called multiple, confluent, or anthocarpous. The term simple is perhaps properly applied to fruits which are formed by the ovary of a single flower, whether they are composed of one or several carpels, and whether these carpels are separate or combined. Simple fruits are hence sometimes denominated monogynœcial, as being formed by one gynœcium; while multiple fruits are called polygynœcial, as being formed by many gynœcia.

The Seed.—When the ovule arrives at maturity it constitutes the seed, which is contained in a seed-vessel in the plants called angiospermous; while in gymnospermous plants, such as Coniferæ and Cycadaceæ, it is naked, or, in other words, has no true pericarp. It sometimes happens in angiosperms, that the seed-vessel is ruptured at an early period of growth, so that the seeds become more or less exposed during their development; this occurs in Mignonette, where the capsule opens at the apex, and in Cuphea platycentra, where the placenta bursts through the ovary and floral envelopes, and appears as an erect process bearing the young seeds. After impregnation the ovule is greatly changed, in connection with the formation of the embryo. In the embryo sac of most angiosperms there is a development of cellular tissue, enveloping, when not previously absorbed, the antipodal cells, and more or less filling the embryo sac. In gymnosperms, as already mentioned, the endosperm is formed preparatory to fertilization. The germinal vesicle in angiosperms, the central cell of the corpuscle in cryptogams, enlarges and divides, forming the embryo. The embryo sac enlarges greatly, displacing gradually the nucleus, which may eventually form merely a thin layer around the sac, or it may completely disappear. The integuments also become much altered, and frequently appendages are developed from them.

Female Organs and Reproduction in Cryptogams.—The female organs of reproduction, like the male organs, have not been demonstrated in all Cryptogams. In all vascular Cryptogams, and in Mosses and Hepaticæ, certain usually flask-shaped bodies, which have been termed archegonia or pistillidia, represent the female organs producing cells or spores, which germinate and form new plants. These archegonia have the general structure of a large cell, the central cell or oosphere surrounded by a layer of small cells. From the apex of this oosphere leads a canal, which is bounded by four rows of small cells and constitutes the neck, and in it is a large cell full of soft mucilaginous matter, which has been formed from the central cell, and in the canal cell. Upon the wall of the oosphere, turned towards the neck, a small portion different from the surrounding part is the receptive spot. Fertilization is effected by the antherozoids freed from the antheridium, penetrating the neck of the archegonium, and eventually reaching the receptive spot of the central cell or oosphere; they then enter the oosphere and coalesce with it. The fertilized oosphere is termed an oospore, and it then may escape from the archegonium, and sooner or later germinates; or it germinates within the archegonial cells. These archegonia are, in vascular Cryptogams, produced upon a cellular expansion formed asexually from a spore, and termed the prothallus, which is of varying

size and form. Both archegonia and antheridia may be formed on one prothallus, or only one form of organ may be produced, thus indicating a tendency to diclinism.

In Characeæ the female organ has a peculiar structure, and is termed a nucule. This consists of a large central cell, of which the contents at the apex are clear and hyaline, while the lower part contains much starch and fat. Rising from its base and twisting round it are five long tubes, at the extremity of each of which above the apex of the central cell is a single short cell in Chara, while in Nitella it is divided transversely into two. These five or ten short cells form the crown. They unite together so that their apices project as small teeth. Between the crown and the apex of the central cell, which is termed the apical papilla, a cavity is included, bounded at the sides by the five enveloping tubes, which at this point form the neck of the nucule. The cavity of the neck is constricted in the middle by the projection inwards of the tubes to form a sort of diaphragm, so that the enclosed cavity has a rude hour-glass-like shape, the upper cavity closed above by the crown being connected by a narrow canal with a lower cavity bounded beneath by the apical papilla of the central cell. When fertilization takes place slits are formed betwixt the five tubes of the neck, beneath the crown and above the diaphragm. The antherozoids from the globule enter by them into the upper cavity, pass through the canal into the lower one, and fuse with the apical papilla of the central cell or oosphere. The oospore thus formed becomes detached from the plant, being covered by the thickened inner wall of the tube which invested it. The nucule rises from the base of one of the whorl leaves in Chara, and is therefore above the globule; in Nitella it is produced upon the leafy axis beneath the globule.

In Mosses the archegonia are frequently situated along with the antheridia and paraphyses. They are surrounded by the same whorl of leaves, or perichœtium, when the moss is said to be hermaphrodite, or they occur separately on the same or on different plants, the moss being then monœcious or dioœcious. The term perigone is applied to the whorl of leaves around the antheridia. The basal portion of the archegonia which surrounds the oosphere is termed the epigone. In Hepaticæ the archegonia are situated in the substance of the thallus itself, or they may be in various situations, as in Jungermannia; in Marchantia they are produced upon the under surface of a stalked stellate disk.

In many Thallogens no structure analogous to a female organ has been as yet discovered; in some, however, such structures have been met with. Thus amongst Algæ large cells, termed oogonia, are found, in which usually one, sometimes many (Fucaceæ), oospheres are produced. The antherozoids from the antheridium fertilize these, penetrating the oogonia at a definite point thinner than the surrounding portion; and oosphores are formed. In the Florideæ, a group of Algæ, the organs are different in character. Here the antherozoids are not motile, having no cilia. On discharge from the antheridium, these are washed into a long filiform hollow body, termed the trichogynium. This as supported usually upon a cellular stalk — the trichophore — at the side of the base of which is a small cellular mass. The antherozoids having entered the trichogynium, fertilization is effected, and results in the formation, from the cellular mass at the base of the trichophore, of a large cell, the cystocarp, in which spores are formed. In the Saprolegnieæ the antheridia actually penetrate into the oogonium and discharge their antherozoids. Amongst Fungi it is rare to find sexual organs. In some the casporous fungi, as Eurotium, a sexual process has been observed. The female organ, here termed ascogonium or carpogonium, is of a spiral elongated character, immediately surrounding which are the antheridia, few in number, which open into the apex of the female organ, and discharge their antherozoids. The result is the formation of cellular tissue round the ascogonium, forming what is termed a perithecium, and within the ascogonium large cells (asci) are produced, in which spores or sporidia are subsequently developed. In Lichens no sexual organs have as yet been clearly demonstrated.

Amongst Fungi and Lichens there are certain bodies to be noted, which may be connected with the sexual reproduction, but the function of which is at present unknown.

Another process of reproduction is seen amongst Cryptogams. This is termed conjugation. It differs from the process of fertilization just described in that it consists of a union of the contents of two similar cells, whilst fertilization essentially consists in the mutual influence of dissimilar cells.

Amongst Thallogens especially, though it also occurs in other Cryptogams, the asexual mode of reproduction is very common. But the manner of formation and the nature of the spores is diversified.

Amongst Algæ two modes of a sexual reproduction are seen,—by motile spores and by motionless or resting spores. In the former case the contents of a cell form a new cell which escapes from the mother-cell, and moves about by means of cilia, which are formed either all round it, as in Vaucheria, or as a tuft at one end, as in Œdogonium. These are termed swarm spores, or zoospores, and frequently are of different sizes, being termed respectively microgonidia and macrogonidia. After swimming about for a time they fix themselves, and develop small rhizoids from one extremity, the other growing up into the plant. The motionless spores are seen in the Florideæ, where they are formed in cells, four in each, attached together in a row, or as a tetrahedron, constituting the tetraspore.

Amongst Fungi a sexual reproduction is very common. Swarm spores are rarely formed; but the mode of formation of motionless spores is very various. They may be produced in the interior of distinct sacs called thecæ, asci, or cystidia, when they are denominated endospores or ascospores, and the plants are said to be thecasporous or ascosporous. When they are developed on the exterior of sacs called basidia, they are denominated exospores, and the plants are basidiosporous. When produced in the midst of a gelatinous mass, without any evident differentiation, they are called myxospores, the plants being myxosporous. Both the endospores and the exospores may by division become septate, and form compound spores, each of the secondary spores so formed being termed a merispore. Four or eight basidiospores are usually produced from each basidium. In the asci numerous spores are formed. Other forms of spores seen in Fungi are the conidia. These are stalked spores which arise from a mycelium.

Very little is known of the sexual reproduction of Fungi, and regarding the alternation of sexual and asexual generations in them. But we have abundant instances of alternation amongst the asexual generations, and along with this of that curious phenomenon included under the term heterœcism, which consists in the growth of one generation of a parasitic Fungus upon one host, and the development of another generation upon a different host. By tracing out this phenomenon, many forms, described formerly as distinct species, are now shown to be generations of one and the same Fungus. The asexual spores of Fungi are produced upon certain structures which have been frequently

termed the fructification. For instance, in basidiosporous Fungi the collection of basidia forming the hymenium is usually situated on large receptacles. The structure commonly known as a fungus is a receptacle produced upon a mycelium (my). In its young state it appears as a tubercle upon the mycelium covered by a volva, or wrapper, which it bursts during growth. It consists of a pileus or cap at the extremity of a stalk, the stipe. On the under surface of the pileus are the lamellæ, or gills, of various forms, which constitute the hymenial layer, to which the spores are attached. At first the hymenium is covered by a veil or indusium, which during the growth of the stipe is ruptured, the base remaining on the stipe as the annulus (an) or ring. When, as in the Mushroom, the hymenium is exposed, the fungus is said to be gymnocarpous. In other cases, as in Phalloideæ, it is covered over by a peridium, and the whole mass so enclosed is the gleba, and the fungus is angiocarpous. In ascoporous Fungi, as Sphæria, the asci are usually formed within small roundish receptacles, termed perithecia; and along with the asci are usually numerous abortive filaments or pharaphyses. Sometimes these perithecia are situated upon cushions or branching masses of tissue, the stroma. In the myxosporous Fungi, the plasmodium, or whole protoplasmic mass of the plant, forms receptacles, in each of which is a capillitium, or network of fine filaments, in the interstices of which are numerous spores.

BOTANY BAY, an inlet on the eastern coast of Australia, to the S. of the city of Sydney, in the Cumberland district of New South Wales. It was first visited by Captain Cook in 1770, and received its name from Joseph Banks, the botanist of the expedition, on account of the variety of its flora. When, on the revolt of the New England colonies, the convict establishments in America were no longer available, the attention of the British Government, then under the leadership of Pitt, was turned to Botany Bay; and in 1787 Commodore Phillip was commissioned to form a penal settlement there. Finding, on his arrival, however, that the locality was ill-suited for such a purpose, he removed northwards to the site of the present city of Sydney. The name of Botany Bay seems to have struck the popular fancy, and continued to be used in a general way for any convict establishment in Australia. The transportation of criminals to New South Wales was discontinued in 1840.

BOTHNIA, an ancient province of Sweden, which was divided into East and West by the gulf of the same name.

BOTHNIA, GULF OF, the northern part of the Baltic, so called from the above province. See BALTIC SEA.

BOTHWELL, a village of Scotland, in Lanarkshire, situated near the River Clyde, about 8½ miles S.E. of Glasgow, and a favorite resort of the inhabitants of that city.

BOTHWELL, JAMES HEPBURN, EARL OF, in the peerage of Scotland, only son of Patrick, third earl of Bothwell, was born about 1526. Nothing is known of his life up to the date of his father's death, 1556, when he was served heir to his vast estates. In the end of 1560 he appears to have been one of the lords who went over to France to meet their new queen (Mary). In 1562 occurred the singular and obscure episode of the conspiracy between Bothwell and Arran to carry off the queen. Arran was well known to be deeply enamored of Mary, and Bothwell apparently intended to use this passion as a means of furthering his own designs against Murray. The plot, or the germ of it was discovered; Arran was found to be all but insane, and an indictment was laid against Bothwell, who fled to France and remained there till 1565, when he returned to Scotland. The charge, however, was not forgotten; it was renewed by the earl of Murray, and the day of trial was fixed. But Murray's forces were too numerous to make it safe for Bothwell to make his appearance, and he again fled. He reappeared at court in a short time after the marriage of the queen with Darnley, and began to rise rapidly into favor. He escaped from the palace after the murder of Rizzio, and with great promptitude drew together some forces for the queen's defense. From this time onwards he was in the highest favor with the queen, and all powerful at court. In 1566 he was dangerously wounded when on a judicial tour in Liddesdale. Here the queen paid him a visit, riding all the way from Jedburgh, where she was holding a justice eyre. The fatigues of this ride of forty miles brought on a severe illness, during which her life was despaired of. After her recovery the project of a divorce from Darnley was mooted, but was declined by her, and Bothwell seems then to have resolved on the removal of her husband by any means. On the evening of the 9th of February the famous crime was committed of Darnley's murder. Public opinion, expressing itself in placards and outcries, fastened the guilt upon Bothwell and his associates, but he was too powerful to be dealt with by the law. On the 24th April he played his last move, carrying off Mary to Dunbar Castle, which had been granted him by the Queen. A divorce from his former wife was easily procured, the dispensation in their favor not being produced at the trial, and on the 15th May the royal marriage was completed. Mary had a few days previously pardoned Bothwell for his abduction of her, and had raised him to the rank of duke of Orkney. The fancied security in which they passed the few days after their marriage was soon and rudely dispelled. The great lords collected their forces and seized Edinburgh, Bothwell and the queen escaping with the greatest difficulty to Dunbar. At Carberry Hill the opposing parties met; Mary surrendered to the lords, and Bothwell fled to Dunbar and thence to Orkney. Being closely pursued he took ship, was captured by a Danish cruiser, and confined for a time at Copenhagen. He was removed to Malmö and afterwards to Draxholm Castle, where he died in 1575.

BOTTA, CARLO GIUSEPPE GUGLIELMO, Italian historian, was born in 1766 at San Giorgio, in Piedmont. He studied medicine at the university of Turin, and obtained his doctor's degree when about twenty years of age. Having rendered himself obnoxious to the Government during the political commotions that followed the French Revolution, he was imprisoned for nearly two years; and on his release in 1794 he withdrew to France, only to return to his native country as a physician in the French army, whose progress he followed as far as Venice. Here he joined the expedition to Corfu, from which he did not get back to Italy till 1798. From that year, when he was appointed by Joubert a member of the provisional government at Piedmont, till the fall of the Napoleonic system in 1814, he continued to have considerable political influence; and though towards the close of that period he acted with an independence that proved offensive to Napoleon himself, and on the restoration of the Bourbons adapted his conduct to the circumstances of the time, he was still in sufficient favor with the Bonapartist party to receive from them, during their brief resumption of authority in 1815, the appointment (soon afterwards resigned) of rector of the university of Rouen. By 1824 he had completed a history of Italy from 1789 to 1814 (4 vols.), on which his fame principally rests, for though the continuation of Guicciardini, which he was afterwards encouraged to undertake, is a careful and laborious work, he had not the

erudition necessary for the satisfactory restoration of the past. Botta died at Paris in August 1837, in comparative poverty, but in the enjoyment of an extensive and well-earned reputation.

BOTTA, PAUL EMILE, a distinguished archæologist and traveler, son of the preceding, was born at Turin in 1802. After extensive travels in the New World and in Egypt, he became in 1833 French consul in Alexandria, and thence undertaking a journey to Arabia, published the results in his *Relation d'un Voyage dans l' Yémen* (1841). In 1843 he began digging for monuments of Assyrian antiquity, and the *Journal Asiatique* soon contained accounts of his enterprise and disquisitions on the cuneiform writing, which afterward appeared as a separate publication under the title *Memoires de l'Ecriture Cuneiforme Assyrienne* (1848). In 1848 he published *Inscriptions decouvertes à Khorsabad.* In 1846 Botta was appointed Consul-General at Jerusalem, and in 1857 at Tripoli. He returned to France in 1868, and died April 18, 1870.

BOTTICELLI, SANDRO (for ALESSANDRO), one of the most original and fascinating painters of the school of Florence. Like many Italian artists he is called not after his father but after the master under whom he learned his first lessons in art. He was the youngest son of a citizen named Mariano Filipepi, and was born at Florence in the year 1447. It is related how as a child, though quick at whatever he chose to do, he was restless and wayward, and would not take kindly to "any sort of schooling in reading, writing or arithmetic;" so that his father put him, in despair, to learn the goldsmith's trade with a gossip of his own named Botticello. Thus his first training, like that of Ghirlandaio and many of the best artists of the time, was in jewelry and metal working.

Of all the Florentine school, Botticelli is the richest and most fanciful colorist,— often using gold to enrich the lights on hair, tissues, and foliage, with a very exquisite effect. That may be the consequence of his early employment upon goldsmith's work, as is, more certainly, his minute solicitude in all the accessory details and ornaments of his compositions. The patterned and embroidered dresses, the scarves and headgear of his figures, are often treated with an incomparable invention and delicacy. No artist has ever painted flowers with a more inspired affection, and especially roses, with which he was wont to fill the backgrounds of his pictures. He preferred, it would seem, the circular form for his compositions; and a large number of devotional pieces in this form, by his own hand and that of his scholars, are scattered through the museums and private collections of Europe, and are among the most poetical examples of religious art that Italy has left us. He went even beyond his master Lippo Lippi, and the sculptors Luca della Robbia, Donatello, and Desiderio da Scttignano, in the touching and engaging character of the children who minister, in the form of angels, to his sacred personages. He designed choirs of such or of grown-up angels dancing between earth and heaven, or circles of them ranged in the order of the celestial hierarchies, with a variety of grouping and a graceful fire of movement that was a new thing in his art. One of the best examples of this kind of work is a round numbered 33 in the gallery of the Uffizj at Florence. Another very famous example of his devotional art is a picture of the Coronation of the Virgin executed for Matteo Palmieri, a Florentine man of letters and speculative philosopher, with whom the painter was intimate and who gave suggestions for the design of the picture. It represents the Virgin and Christ surrounded by the celestial hierarchies according so the scheme (with some slight divergencies) of Dionysius the Areopagite,— on the ground beneath, the donor and his wife kneeling at either side of the Virgin's tomb, the Val d'Arno and the city of Florence in the distance. This picture is now the property of the duke of Hamilton. But the grandest of all his altar-pieces is that numbered 47 in the Florence Acadamy, with a group of life sized saints on the ground and a dance of angels above. In the Uffizj is an Adoration of the Magi, in which Botticelli has introduced the portraits of Cosimo, Giuliano, and Giovanni de' Medici. By that house he, like all the artists of his time, was much befriended; and for Lorenzo's villa at Castello he painted the most beautiful of his pictures of classical mythology, the Birth of Venus now at the Uffizj, and the Venus with the Graces now at the Florence Academy.

In 1478 happened the attempt and failure of the conspirators of the Pazzi family and their followers against the house of Medici. It was the custom in Florence to have the likeness of such state offenders painted large upon the outside of the Public Palace, and in this case Botticelli was employed upon the task. It will have been seen afterwards that he was summoned to Rome by Sixtus IV., to decorate the walls of his new chapel in the Vatican. Among the great scenes in fresco painted on those walls by Demenico Ghirlandaio, Cosimo Rosselli, Signorelli, and Perugino, three subjects from the hand of Botticelli hold their place with the noblest. They represent the Life of Moses, the Destruction of Korah, Dathan, and Abiram, and the Temptation of Christ. In 1482, probably after his return from Rome, he received a commission to paint in the Sala dell'Udienca at Florence, together with Domenico Ghirlandaio. Many of the works already mentioned probably fall within the next ten years of Botticelli's manhood. The Boccaccio series belong to 1487. In 1491 he was engaged, together with the brothers Ghirlandaio, upon some mosaic decorations in the cathedral of Florence which have unhappily perished. Soon after this time there came into his life a new influence which greatly changed it. It is well known how the genius of the Dominican Savonarola swept like a storm over the affairs of Italy, and what a revolution, after the passage of the French king through Florence, he brought about in the temper and policy of the republic, —driving out the merchant family who had been its untitled masters for half a century, establishing in place of their rule a new theocracy of which he was himself the oracle and minister, turning the hearts of old and young away from the world and from their lusts. Many of the first artists of the city became his most ardent followers, and among them Botticelli. What the actual effect of his conversion was upon him we have scanty means of judging, but it needs must have put an end to his painting of those old mythologies, over which in earlier days his imagination had been used to throw so singular a charm. Vasari, a devoted servant of the later Medici, and therefore a traducer of the greatest enemy that house had ever had, speaks of Savonarola's influence upon Botticelli as altogether disastrous, saying that he was "obstinate upon that side," "a partisan of the sect of Savonarola in such a fashion that, abandoning painting and having no income to live upon, he fell into the utmost disorder;" and again, how "playing the Piagnone (the name given to the followers of Savonarola), he fell out of the way of painting, and thereby at last found himself old and poor in such a sort that if Lorenzo Medici, as long as he lived, had not supported him, and afterwards his friends and many worthy men who felt an affection for his virtues, he would, we may say, have died of hunger." We have few materials by which we can test the accuracy of this account. We know that in 1496 the young Michael Angelo

sent through his hands a letter addressed to this Lorenzo de' Medici (Lorenzo the younger, that is,—the son of Giuliano); that in 1498 he was living with a brother in the quarter called Sta Lucia of Ognissanti; that in 1503 he was consulted along with other artists as to the best place for Michelangelo's colossal statue of David.

BOTTIGER, KARL AUGUST, a distinguished German archæologist, was born at Reichenbach in 1760. He was educated at the famous school of Pforta, and at the University of Leipsic. In 1784, after having passed a few years as a private tutor in Dresden, he was made rector of the school at Guben, where he remained for six years. He was then transferred to a similar post at Bautzen, and in 1791, through the influence of Herder, obtained the appointment of rector of the gymnasium at Weimar. In that town he entered into a circle of literary men of the highest powers, including Weiland, Schiller, and Goethe, and distinguished himself by the great versatility of his talents. In 1804 he was called to Dresden as superintendent of the studies of the court pages, and received the rank of privy councillor. In 1814 he was made director of studies at the court academy, and inspector of the Museum of Antiquities. He died at Dresden in 1835.

BOTTLE. The first bottles were probably made of the skins of animals. In the *Iliad* the attendants are represented as bearing wine for use in a bottle made of goat's skin. The ancient Egyptians used skins for this purpose, and from the language employed by Herodotus, it appears that a bottle was formed by sewing up the skin and leaving the projection of the leg and foot to serve as a vent. The aperture was closed with a plug or a string. Skin bottles of various forms occur on Egyptian monuments. The Greeks and Romans also were accustomed to use bottles made of skins; and in the southern parts of Europe they are still used for the transport of wine. The Egyptians possessed vases, bottles, etc., of hard stone, alabaster, glass, ivory, bone, porcelain, bronze, silver, and gold, and also, for the use of the people generally, of glazed pottery or common earthenware.

BOTTLE-GOURD (*Lagenaria*, from Lat. *lagena*, a bottle), a sub-genus of Cucurbita (natural order Cucurbitaceæ). The Common Bottle-gourd, or False Calabash (*C. lagenaria* or *L. vulgaris*) is a native of India, but is now common almost everywhere in warm climates. The fruit has a hard rind, and when the pulp is removed and the rind dried, it is used in many countries for holding water, and is generally called a *Calabash*.

BOTTLEHEAD, or BOTTLENOSE (*Hyperoodon*), one of the toothed whales in the same family as the Sperm (*Physeteridæ*). The most striking feature is the abrupt rise of the head from the small snout. Two species are certainly known, both from the North Atlantic, and sometimes found in the North Sea.

BOTTLING and BOTTLING MACHINES. Attention to bottling is of importance not only for the fluids we drink, but also for medical preparations, perfumes, and other liquid bodies, for the reason that a porous cork permitting volatile substances to escape, or air to enter, often leaves the contents of the bottle worthless. To clean bottles they should be left in warm water, containing soda, long enough for any dry films to soften, and then everything adhering to the sides removed with a bottle brush. After several rinsings, they should be filled with clean water before being left to drain. Shaking with vitriol removes petroleum and paraffin oil.

BOTTOMRY, a maritime contract by which a ship (or bottom) is hypothecated in security for money borrowed for expenses incurred in the course of her voyage, under the condition that if she arrive at her destination the ship shall be liable for repayment of the loan, together with such premium thereon as may have been agreed for; but that if the ship be lost, the lender shall have no claim against the borrower either for the sum advanced or for the premium. The freight may be pledged as well as the ship, and, if necessary, the cargo also. In some cases the personal obligation of the ship-master is also included. When money is borrowed on the security of the cargo alone, it is said to be taken up at *respondentia;* but it is now only in rare and exceptional cases that it could be competent to the ship-master to pledge the cargo, except under a general bottomry obligation, along with the ship and freight. In consideration of the risks assumed by the lender, the bottomry premium (sometimes termed maritime interest) is usually high, varying of course with the nature of the risk and the difficulty of procuring funds.

BOTZEN, BOREN or BOLZANO (the ancient *Pons Drusi*), a town of Austria, the capital of the circle of Brixen in Tyrol, is situated at a height of 1,200 feet near the confluence of the Talfer and the Eisack, thirty-two miles north-northeast of Trent. In the ninth century it was the seat of a Bavarian countship and in 1207 was presented to the Prince-Bishop of Trent by the emperor Conrad II. It has since belonged to Tyrol.

BOUCHES-DU-RHONE, a department of France, situated along the south coast, and, as the name imports, at the mouth of the Rhone. It is bounded on the north by Vancluse, from which it is separated by the Durance; on the east by Var, and west by Gard; and its area is estimated at 1,963 square miles. Population, 600,000.

BOUFARIK (the "Hanging Well"), a town of Algeria, in the province of Algiers and arrondissement of Blidah, about twenty-one miles from the city of Algiers near the railway thence to Blidah. It is a thoroughly French town, and only dates from 1835, when General Drouet d'Erlon established an entrenched camp on what was then a mere hillock in the midst of an almost uninhabitable marsh. Population, 3,000.

BOUFLERS, LOUIS FRANÇOIS, DUC DE, commonly called the Chevalier Boufflers, a peer and marshal of France, and a general of distinguished reputation, was born January 10, 1644. Having early entered the army, he was raised in 1669 to the rank of colonel of dragoons. In the conquest of Lorraine he served under Marshal de Créquy. In Holland he served under Turenne, frequently distinguishing himself by his skill and bravery; and when that celebrated leader was killed by a cannon-shot in 1675, he commanded the rear-guard during the retreat of the French army. After performing various military services in Germany, in Flanders, and on the frontiers of Spain, he was created, in 1690, general of the army of the Moselle, and contributed materially to the victory of Fleurus. In 1694 he was appointed governor of French Flanders and of the town of Lille. By a skilful manœuvre he threw himself into Namur in 1695, and obstinately held out for four months during which the besiegers lost 20,000 men In the conference which terminated in the peace of Ryswick he had a principal share. He died at Fontainebleau in 1711.

BOUGAINVILLE, LOUIS ANTOINE DE, the first French circumnavigator, was born at Paris in 1729. He studied law, but soon abandoned the profession, and in 1753 entered the army in the corps of musketeers. At the age of twenty-five he published a treatise on the integral calculus, as a supplement to De l'Hôpital's treatise *Des infiniment petits*. In 1755 he was sent to London as secretary to the French embassy, and was chosen a member of the Royal Society. In 1756 he went to

Canada as captain of dragoons and aide-de-camp to the marquis of Montcalm; and having distinguished himself in the war against England, was rewarded with the rank of colonel and the cross of St. Louis. He afterwards served in the Seven Years' War from 1761 to 1763. After the peace, when the French Government conceived the project of colonizing the Falkland Islands, Bougainville undertook the task at his own expense. But the settlement having excited the jealousy of the Spaniards, the French Government gave it up to them, on condition of their indemnifying Bougainville. He was then appointed to the command of the frigate "La Boudeuse" and the transport "L'Étoile," on a voyage of discovery round the world. He set sail from Nantes in November, 1766, taking with him Commerçon as naturalist, and Verron as astronomer. Having executed his commision of delivering up the Falkland Islands to the Spanish, Bougainville proceeded on his expedition, and touched at Buenos Ayres. Passing through the Straits of Magellan, he anchored at Otaheite, where the English navigator Wallis had touched eight months before. The expedition having crossed the Pacific Ocean, and the men now suffering from scurvy, the ships came to anchor off the Island of Borou, one of the Moluccas, where the governor of the Dutch settlement supplied their wants. It was the beginning of September, and the expedition took advantage of the easterly monsoon, which carried them to Batavia. Thence they proceeded to the Isle of France, where they left Commerçon and Verron. In 1769 the expedition arrived at St. Malo, after a voyage of two years and four months, with the loss of only seven out of upwards of 200 men. In his old age Napoleon I. made him a senator, count of the empire, and member of the Legion of Honour. He died at Paris, August 31, 1814.

BOUGIE, or BOUGIAH, a fortified seaport town of Algeria, in the province of Constantine and arondissement of Sétif, between Cape Carbon and the Wady-Sahell. Population, 3,000.

BOUGIES are rods of metal, or other substances, used for distending contracted mucous canals, as the gullet, bowels, or urethra. For the urethra they are frequently of German silver or pewter, and vary from 1-16 to 1-4 of an inch in diameter. Still larger sizes are used by many surgeons. For the other canals they are usually made of plaited thread, like an ordinary riding-whip, impregnated with a substance called *gum-elastic*, of which the chief constituent is india-rubber. This combination of materials possesses a degree of firmness united with flexibility, and a smoothness of surface suitable for the purpose.

BOUGUER, PIERRE, an eminent French mathematician, was born in 1698. Young Bouguer was bred to mathematics from his infancy, and at an early age was appointed to succeed his father as professor of hydrography. In 1727 he gained the prize given by the Academy of Sciences for his paper "On the best manner of forming and distributing the Masts of Ships;" and two other prizes, one for his dissertation "On the best method of observing the Altitude of Stars at Sea," the other for his paper "On the best method of observing the Variations of the Compass at Sea." He was soon after made professor of hydrography at Havre, and succeeded Marpetuis as associate geometer of the Academy of Sciences. He was afterward promoted in the Academy to the place of pensioned astronomer, and went to reside in Paris. In 1735 Bouguer sailed with Godin and De la Condamine for Peru, in order to measure a degree of the meridian near the equator. Ten years were spent in this operation. He died in 1758.

BOUHOURS, DOMINIQUE, a French critic, was born at Paris in 1628. He entered the Society of the Jesuits at the age of sixteen, and was appointed to read lectures on literature in the college of Clermont at Paris, and on rhetoric at Tours. He afterwards became preceptor to the two sons of the duke of Longueville. The duke died in Bouhours' arms; and the "account of the pious and Christian death" of this great personage was his first publication. He was sent to Dunkirk to the Romanist refugees from England, and in the midst of his missionary occupations published several books. Among these were *Les Entretians d'ariste et d'Eugène*, a work of a critical nature on the French language, printed five times at Paris, twice at Grenoble, and afterwards at Lyons, Brussels, Amsterdam, Leyden, &c. His *Pensées ingenieuses des Anciens et des modernes*, though at once instructive and amusing, exposed him to censure as well as ridicule, on account of some strange misjudgments and omissions. He has classed Boileau with the least esteemed of the Italian satirical versifiers, and has omitted, in his *Thoughts on the Moderns*, all mention of Pascal,—a circumstance which is doubtless to be explained by his being a disciple of St. Ignatius, who, it may be supposed, would willingly forget the author of the *Provincial Letters*. Bouhours died at Paris in 1702.

BOUILLON, GODFREY DE, one of the foremost leaders in the first crusade, was born at Baisy, near Gemappe in Belgium, about 1060. In the contest between Henry IV., emperor of Germany, and Hildebrand, he espoused the imperial cause, and was the first to scale the walls of Rome when the emperor's forces besieged that city in 1084. It is said that while suffering from fever, having heard of the preparations for the first crusade, he vowed, were his health restored, to seek Palestine. Having pawned his lordship of Bouillon to the church of Liége for 1300 marks, he gathered around him 80,000 infantry and 10,000 horsemen, whom he led with rare ability through Germany to the borders of Hungary, where he shamed his brother Baldwin by offering to go in his stead as a hostage to the Hungarians. After capturing Antioch and routing a vast Saracen host at Dorylæum in Phrygia, the crusaders arrived, in 1099, at Jerusalem, which was taken after a siege of five weeks, Godfrey entering the breach among the foremost, but tarnishing his glory by ruthlessly ordering a massacre of the infidels. A Christian kingdom of Jerusalem was then founded, of which Godfrey was unanimously elected sovereign; but he refused to wear a crown of gold where his Lord had worn a crown of thorns, and accepted, instead of the kingly title, the humbler designation of defender and baron of the Holy Sepulchre. During the single year of his rule he repelled the Saracens with admirable courage and skill, routing the Fatimite caliph of Egypt at Ascalon, and with the assistance of others of the pilgrims, drew up from the various feudal statutes of Europe the elaborate system of mediæval jurisprudence known as the *Assizes of Jerusalem*. Godfrey died in 1100, and was buried in the church of the Holy Sepulchre; and so impartial and temperate had been his rule, that Mahometans as well as Christians bewailed his loss.

BOULAINVILLIERS, HENRI DE, Lord of St. Saire, an eminent French writer, descended from a very ancient and noble family, was born at St. Saire in Normandy in 1658. He received his education at the college of Juilli, where he early discovered the uncommon abilities for which he was afterwards distinguished. His historical writings are numerous and important, but deformed by an extravagant admiration of the feudal system, which he regarded as the *chef d'œuvre* of the human mind. He misses no opportunity of regretting those "good old times," when the people were enslaved by a few petty tyrants alike ignorant and barbarous.

His philosophical writings have now lost all their value. His pretended *refutation* of the system of Spinoza is a weak and imperfect exposition of that writer's opinions. He died at Paris in 1722.

BOULDER, the capital of the county of the same name in Colorado, forty miles northwest of Denver. It is situated in the heart of a gold-mining district, some twenty miles from Long's Peak, and is a town of 4,000 inhabitants. Boulder contains two national banks and one other bank, and is the seat of the State University. The exports are chiefly of the precious metals.

BOULDERS, ERRATIC, are large masses of rock found at a distance from the formations to which they belong. The term is generally applied when they are found lying detached on the surface. Large blocks of Scandinavian rocks are scattered over the plains of Denmark, Prussia, and Northern Germany. Some of these have been washed out of the boulder-clay, but the larger number are dotted over the surface of the terminal moraines of the great Northern ice-sheet. The pedestal of the statue of Peter the Great, in St. Petersburg, was hewn out of a large erratic boulder, 1,500 tons in weight, that lay on a marshy plain near that city.

BOULEVARD (Fr. also spelt *boulevart;* apparently a corruption of a Teutonic word—Ger. *bollwerk;* cf. Span. *baluarte*, Ital. *baluardo*, bulwark), the name given in France to a broad street or promenade planted with rows of trees. Originally it was applied to the bulwark portion of a rampart, then to the promenade laid out on a demolished fortification. The boulevards of Paris are the most famous. The *Boulevards des Italiens*, *des Capucines* and *Montmartre* are the most notable. The Thames Embankment is a boulevard in the usual sense of the term. Chicago has a grand system of boulevards in connection with its parks.

BOULOGNE-SUR-MER, a fortified seaport of France, and the chief town of an arrondissement in Pas-de-Calais, is situated on the shore of the English Channel at the mouth of the River Liane (anciently Elna), 157 miles from Paris by railway and twenty-eight from Folkestone, Kent. Population, 40,000.

BOULTON, MATTHEW, manufacturer and practical engineer, was born at Birmingham September 14, 1728. He was called early into active life upon the death of his father in 1745, and soon found ample scope for the exercise of his faculties in improving the manufactures of his native place. His first attempt was a new mode of inlaying steel; and he succeeded in obtaining a considerable demand for the products of his manufactory, which were principally exported to the Continent, and not uncommonly re-imported for domestic use as of foreign manufacture. He died August 17, 1809, after a long illness, in possession of considerable affluence and of universal esteem.

BOUNTY, a term applied to any sum granted by the legislature toward creating or encouraging some kind of undertaking believed to be of national importance. At one time the system of granting such bounties was very prevalent, and it still continues in some countries. See FREE TRADE. Bounty is also the familiar name for the sum of money given to induce men to enter the army or navy. In time of peace, when there is little or no need to augment the forces, the bounty sinks to a minimum; but in cases of exigency, it is raised according to the difficulty and urgency of the circumstances. Bounty, in the United States, is a term for grants of lands to soldiers and sailors, their widows and children, for services in the army and navy. It is also applied to sums of money paid by Government to owners of fishing vessels, by Act of Congress of July 29, 1813, for the encouragement of that industry, and to sums of money appropriated by different State Legislatures for the destruction of wild beasts and destructive birds, when the country was comparatively new and sparsely settled. During the Civil War extravagant sums were paid as bounty by the different States in order to fill their quotas of men. Bounty-jumpers were a class of scoundrels who accepted the bounty and then deserted, sometimes over and over again.

BOURBAKI, CHARLES DENIS SAUTER, French general, born at Pau, April 22, 1816, entered the army in 1836, and fought in the Crimea and Italy. Under Gambetta he organized the Army of the North, and commanded the Army of the Loire. His attempt to break the Prussian line at Belfort, though ably conceived, ended in disastrous failure; in a series of desultory attacks on a much inferior force, January 15–17, 1871, he lost 10,000 men. In the wretched retreat to Switzerland that followed on the 27th, reduced to despair by the ill-success of his plans, he attempted to commit suicide. From 1873 to 1879 he commanded the Fourteenth Army Corps at Lyons, and in 1881 he retired from active service.

BOURBON. The noble family of Bourbon, from which so many European kings have sprung, took its name from the rich district in the centre of France, called the *Bourbonnais*, which in the 10th century was one of the three great baronies of the kingdom. The first of the long line of Bourbons known in history was Adhémar or Aimar, who was invested with the barony towards the close of the 9th century. In 1272 Beatrix, daughter of Agnes of Bourbon and her husband John of Burgundy, married Robert, count of Clermont, sixth son of Louis IX. (St. Louis) of France. The elder branches of the family had become extinct, and their son Louis became duc de Bourbon in 1327. In 1488 the line of his descendants ended with Jean II., who died in that year. The whole estates passed to Jean's brother Pierre, lord of Beaujeu, who was married to Anne, sister of Louis XI. Pierre died in 1503, leaving only a daughter, Suzanne, who, in 1505, married Charles de Montpensier, heir of the Montpensier branch of the Bourbon family. Charles, who took the title of duc de Bourbon on his marriage, was born in 1489, and at an early age was looked upon as one of the finest soldiers and gentlemen in France. His union with Suzanne made him the wealthiest and most powerful French noble; and after his brilliant successes in Italy and France, he became an object of dread to Louis XII., who would not give him the command of the army of Italy. In 1515 Francis I., on his accession, made Bourbon constable of France, and in that capacity he gained new honors, and was for a time in the highest favor with the king. But serious differences soon arose between them, originating, according to common report, in the violent but slighted passion of Louise, duchesse d'Angoulême, the king's mother, for the constable. The grossest insults were heaped upon Bourbon; his official salary and the sums he had borrowed for his war expenses remained unpaid; in the campaign against Charles V. the command of the vanguard was given to the duc d'Alençon; and after the death of Suzanne de Bourbon, an action was raised by the queen dowager, who claimed to be nearest heir. In defiance of Bourbon's marriage-settlement, judgment was given against him, and he was reduced to absolute beggary. Smarting under these wrongs he entered into negotiations with Charles V., and on these coming to the knowledge of Francis at once fled from his native country and joined the emperor. He did good service in the war against his countrymen, and especially distinguished himself at the battle of Pavia, where his ungenerous sovereign Francis was taken prisoner. Bourbon, however, did not find Charles

very ready to fulfil his various promises, and determined to seize a kingdom for himself. With the division under his command he penetrated into Italy, and on the 5th May 1527 appeared before the walls of Rome. In the assault on the following morning he was the first to mount the walls, and fell mortally wounded by a pistol-shot, fired, it is said, by Benvenuto Cellini. His army succeeded in taking and sacking the town. With the constable ended the direct line from Pierre, duc de Bourbon. But the fourth in descent from Pierre's brother, Jacques, Louis, count of Vendôme and Chartres, became the ancestor of the royal house of Bourbon and of the noble families Condé, Conti, and Montpensier. The fourth in direct descent from Louis of Vendome was Antoine de Bourbon, who in 1548 married Jeanne d'Albret, heiress of Navarre, and who became king of Navarre in 1554. Their son became king of France, with the title Henri IV. Henri was succeeded by his son Louis XIII., who left two sons, Louis XIV., and Philippe, duc d'Orleans, head of the Orleans branch. Louis XIV.'s son, the Dauphin, died before his father, and left three sons, one of whom died without issue. Of the others the elder, Louis of Burgundy, died in 1712, and his only surviving son became Louis XV. The younger, Philippe, duke of Anjou, became king of Spain, and founded the Spanish branch of the Bourbon family. Louis XV. was succeeded by his grandson, Louis XVI., who perished on the scaffold. At the restoration the throne of France was occupied by Louis XVIII., brother of Louis XVI., who in turn was succeeded by his brother Charles X. The second son of Charles X., the duc de Berri, left a son, Henri Charles Ferdinand Marie Dieudonné d'Artois, duc de Bordeaux, and count de Chambord, who was a claimant of the French throne, and was designated by his adherents, Henri V. From Louis XIV.'s brother, Philippe, has descended another claimant of the throne. Philippe's son was the Regent Orleans, whose great grandson, Philippe Egalité, perished on the scaffold in 1793. Egalité's son, Louis Philippe, was king of France from 1830 to 1848; his grandson, Louis Philippe (born 1838), is the present Comte de Paris.

BOURBON, an island off the east coast of Africa, now known as Réunion. See RÉUNION.

BOURBON-L'ARCHAMBAULT (the *Aqua-Bormonis* of the Itineraries), a town of France, in the department of the Allier, on the Burge, 19 miles W. of Moulins. It was anciently the capital of the Bourbonnais, and gave its name to the great Bourbon family.

BOURBON VENDÉE, or NAPOLEON VENDÉE, a town of France, capital of the department of La Vendée, now called LA ROCHE SUR YON, which see.

BOURBONNE-LES-BAINS, a town of France, in the department of Haute-Marne, in the arrondissement of Langres, and twenty-one miles east-northeast of that town.

BOURCHIER, JOHN, Lord Berners, born about 1474, was grandson and heir of a lord of the same name, who was descended from Thomas of Woodstock, duke of Gloucester, and had been knight of the Garter and constable of Windsor Castle. He was appointed to conduct Mary, the king's sister, into France on her marriage with Louis XII., and had the extraordinary fortune of continuing in favor with Henry VIII. for the space of eighteen years. He died at Calais in 1532, aged sixty-five.

BOURDALOUE, LOUIS, a celebrated preacher, and one of the greatest orators that France has ever produced, was born at Bourges, August 20, 1632. At the age of sixteen he entered the Society of Jesus, of which he was destined to become one of the greatest ornaments, and there completed his studies. After the revocation of the edict of Nantes he was sent to Languedoc to preach to the Protestants, and confirm the newly-converted in the Catholic faith; and in this delicate mission he managed to reconcile the interests of his ministry with the sacred rights of humanity. He preached at Montpellier in 1686 with the greatest success, Catholics and Protestants being all equally eager to recognize in this eloquent missionary the apostle of truth and virtue. He died in 1704.

BOURG, the chief town of the department of Ain in France, and formerly the capital of the province of Bresse, is situated twenty-seven miles northeast of Lyons, on the banks of the Reyssouze, a tributary of the Saone. Population (1890), 14,360.

BOURGAS, BURGHAZ, or BORGAS, called in the Middle Ages Pyrgos, a seaport town of Turkey in the province of Rumelia, situated on a bay of the Black Sea, to which it gives its name, about 70 miles N.E. of Adrianople. The population is estimated at 5000.

BOURGELAT, CLAUDE, who may be called the father of veterinary science, was born at Lyons in 1712, and died in 1799. He entered the profession of law, but abandoned it in disgust at having gained an unjust suit for a client. Embracing the military profession he served in the cavalry, and thus had ample opportunity of studying the diseases of animals. His works on veterinary subjects are numerous and valuable; perhaps the most important is the *Traité de la conformation extérieure du cheval, de sa beauté et de ses défauts*, 1776.

BOURGES, a city of France, formerly the capital of the province of Berry, and now the chief town of the department of Cher, is situated about 100 miles S. of Paris, at the confluence of the Auron and Yevre. Bourges occupies the site of the Gallic town of *Avaricum*, mentioned by Cæsar as one of the most important of all Gaul. In 52 B.C., during the war of Vercingetorix, it was completely destroyed by the Roman conqueror, but under Augustus it rose again into importance, and was made the capital of Aquitania Prima. In 252 A.D. it became the seat of a bishop, the first occupant of the see being Ursinus. Captured by the Goths in 475, it continued in their possession till about 507. During the English occupation of France in the 15th century it became the residence of Charles VII., who thus acquired the popular title of king of Bourges. In 1463 a university was founded in the city by Louis XI., which continued for centuries to be one of the most famous in France, especially in the department of jurisprudence. On seven different occasions Bourges was the seat of ecclesiastical councils,— the most important being the council of 1438, in which the Pragmatic Sanction of the Gallican Church was established, and that of 1528 in which the Lutheran doctrines were condemned. Population, 30,000.

BOURIGNON, ANTOINETTE, a singular enthusiast of the 17th century, who excited considerable commotion by her religious doctrines, but whose name is now almost forgotten. She was born at Lille in the beginning of 1616; and her appearance as an infant was so deformed that the question of preserving her alive was seriously discussed. She manifested, while still very young, an extraordinary spirit of religious fervor, fostered, apparently, by her loneliness and neglect of her parents. As she grew up this spirit increased in intensity. So few, it seemed to her, lived according to their professed Christian principles that she desired to be carried into the Christian countries. The unhappiness that she observed at home, from the severity of her father to her mother, gave her an invincible repugnance to marriage,— so much so that when it was desired that she should marry at the age of twenty she fled from her

father's house in disguise. Her disguise, however, was soon discovered, and having fallen into the hands of a soldier, she ran worse risks than if she had remained to face her destiny at home. Her autobiography dwells upon these and other similar events of her life, when her virtue underwent violent assault, which she was happily able to resist. She is said to have been "endowed with a wonderful chastity, which remained unassailable by all force or enticement, and which not only preserved her own person pure, but diffused around her an ardor of continence."

It is difficult to give any estimate of A. Bourignon's character and opinions. So far as appears, she was a visionary of the ordinary type, only distinguished by the rare persistency and audacity of her pretensions. Amidst all her enthusiasms she seems to have known how to look after her own interests. She is said never to have given alms to the poor, not even to the hospital which she superintended. She was willing to assist with her hand, but not with her money. Her main idea about religion was that it was a mere internal ecstacy, independent of both church and Bible. She had innumerable visions, from which source she chiefly drew her religious inspiration and knowledge. Among others she saw in vision Antichrist and Adam before the Fall; and she describes the appearance of the former minutely, even to the color of his hair. Her visions and views she gave to the world in numerous treatises and pamphlets.

BOURNE, VINCENT, one of the most able modern writers of Latin verse, was born at Westminster towards the close of the 17th century. In 1710 he became a scholar at Westminster school, and in 1714 entered Trinity College, Cambridge. He graduated in 1717, and obtained a fellowship three years later. Of his after life exceedingly little is known. It is certain that he passed the greater portion of it as usher in Westminster school. He died on 2d December 1747. During his lifetime he published several small collections of his Latin poems, and in 1772 there appeared a very handsome 4to volume containing all Bourne's pieces, but also some that did not belong to him. The Latin poems are remarkable not only for perfect mastery of all linguistic niceties, but for graceful expression and genuine poetic feeling.

BOURNEMOUTH, a watering-place in the south of England, situated on the Hampshire coast about five miles from Christchurch. Population, 8,000.

BOURRIENNE, LOUIS ANTOINE FAUVELET DE, the early friend and biographer of Napoleon, was born at Sens in 1769. His friendship with Napoleon began at the military academy of Brienne, where they were classfellows, but they did not meet for some time after leaving school, as Bourrienne's humble birth precluded him from military service. In 1789, having embraced the career of diplomacy, he was sent as attaché to Vienna, and thence proceeded to Leipsic where he studied for some time. In 1792 he returned to Paris and renewed his close acquaintance with Bonaparte. Towards the close of the same year he was sent as Secretary of Legation to Stuttgart, but the fall of the monarchy a few months later threw him out of office. He was imprisoned for a short time by the Saxon Government as an adherent of the Revolution, and did not return to Paris till 1795. In the following year, after a slight coldness between the friends, Napoleon invited Bourriene to become his private secretary. The offer was accepted, and for six years the two lived on the most intimate and friendly terms. It was during this period that he accompanied Napoleon to Egypt. In 1802 for implication in the disgraceful failure of the army-contractors Coulon caused his dismissal. Three years later, however, he was sent as *charge d' affaires* to Hamburg. There he was accused of peculation, and was in consequence recalled and compelled to pay one million francs into the public treasury. Bourrienne never forgave this; he became one of Napoleon's bitterest enemies, and after the first abdication held office for a short time under Talleyrand. In 1815 he was specially excluded from Napoleon's amnesty and fled to Belgium. After the fall of the emperor he sat for some years in the Chamber of Representatives, but his official salary could not support his extravagance, and in 1828 he took refuge from his creditors in Belgium. There he occupied himself in drawing up the *Mémoires* of Napoleon, which were published in 1829 and 1830. The revolution of 1830 and the discomforts of his private life so preyed upon his mind that his reason became unhinged, and he had to be removed to an asylum near Caen, where he died in 1834.

BOURSAULT, EDMUND, a French dramatist and satirist, was born at Muci-l'Eveque, Burgundy, in 1638. On his first arrival in Paris in 1651 his power of language was limited to Burgundian patois, but he soon gained such reputation as an author, that Louis XIV. directed him to draw up a book for the education of the Dauphin. Two of his dramas, *Esope à la Ville* and *Esope à la Cour* were highly popular, and Corneille declared his tragedy *Germanicus* to be worthy of Racine. His best comedy was *Mercure Galant*, or *Comedie sans Titre*, as it was afterwards named. He accused Molière of impiety, and assailed *L'Ecole des Femmes* in *Le Portrait du Peintre*. Molière retaliated by contemptuously referring to him in *L'Impromptu du Versailles*. His *Satyre des Satyres* was directed against Boileau, whom, however, he afterwards generously offered to assist. In return for this kindness Boileau erased Boursault's name from his satires. Boursault died at Montluçon, where he held the office of collector of taxes, September 15, 1701.

BOUSSA, a town of Africa, situated on an island in the Niger, in 10° 14′ N. lat. and 6° 11′ E. long. The population is estimated at about 12,000. See BORGU.

BOUTERWEK, FREDERICH, a German philosopher and historian of literature, was born in Lower Saxony in 1766. He was educated at Göttingen university, and seems to have contemplated joining the legal profession; but his literary inclinations proved to be too powerful, and he devoted himself entirely to works of poetry and romance. Bouterwek's most important work, *Idee einer allgemeinen Apodiktik*, 2 vols. 1799, is deserving of serious study, both as a critique of Kantianism, and as a substantial contribution to philosophy. In 1802 he was made professor of philosophy at Göttingen, and published some very valuable works, among others *Æsthetik*, 1806; *Lehrbuch der phil. Wissenchaften*, 1813; and *Religion der Vernunft*, 1824. During his later years Bouterwek was entirely devoted to an extensive literary work. To him had been intrusted the section on poetry and eloquence in the great German series of histories of the sciences from the Renaissance downwards. The first volume of the *Geschichte des neuern Poesie und Beredsamkeit* appeared in 1805, the twelfth and last in 1815. It is a work of great research, and has very substantial merits. It is, however, somewhat unequal, the portions on German and Spanish literature being superior to any of the rest. Part of the extended work has been translated into English as a *History of Spanish Literature*. Bouterwek died in 1828.

BOVALI, BOUALI or BOALI, a town of Africa, capital of the kingdom of Loango, situated on the right bank of a river of the same name not far from the coast. The vicinity is fertile but unhealthy. A large trade is carried on in pepper, dye-woods, ivory and slaves. Population estimated at 15,000.

BOVES, a township of Italy, in the province of Cuneo in Piedmont, situated at the foot of the Alps, about four miles from the city of Cuneo. Population, 9,549.

BOVINO (the ancient *Vebinum* or *Vibonium*), a fortified town of Italy, province of Capitanata, eighteen miles south-southwest of Foggia. Population, 7,088.

BOW, the weapon of the archer. See ARCHERY, vol. I, p. 447, and ARMS AND ARMOR, p. 505.

BOW of a ship is the general name for the stem and forepart, or that which cuts the water. The word is often used in the plural, the ship being considered to have starboard and port bows, meeting at the stem. Starboard is applied to the right side, and port to the left side, looking forward.

BOWDICH, THOMAS EDWARD, an English traveler, born at Bristol in 1790, was brought up by his father for commercial life, and in 1814 obtained an appointment on the western coast of Africa. Two years afterward, on his return home, he was sent out by the African Company as their agent to the king of the Ashantees. In 1819 he published a quarto volume giving an account of that remarkable people. He then seems to have spent a considerable time at Paris in the study of the natural sciences. During his stay in Europe he edited several works on Africa, and published an excellent pamphlet on the British settlements on the western coast of Africa. He again visited Africa in 1822, with a firm resolution of devoting himself to the exploration of its interior; but he was attacked by fever on the Gambia, and died January 10, 1824.

BOWDITCH, NATHANIEL, a self-taught American mathematician, born in 1773, of humble parents, at Salem in Massachusetts. He was bred to his father's business as a cooper, and afterward apprenticed to a ship chandler. His taste for mathematics early developed itself; and he acquired Latin that he might study Newton's *Principia*. In 1795 he sailed as supercargo, in which capacity he made four long voyages; and being an excellent navigator, he afterward commanded a vessel, instructing his crews in taking lunar and other observations. He edited three editions of Hamilton Moore's *Navigation*, and in 1802 published a valuable work, *New American Practical Navigator*, founded on the earlier treatise by Moore. In 1804 he became actuary to a Boston insurance company; and in the midst of his active and useful career published a translation of *Mecanique celeste* of Laplace, with annotations —a work which will better prove the great acquirements of this self-taught philosopher than any labored panegyric. He died at Boston in 1838.

BOWDOIN COLLEGE, named in honor of Gov. James Bowdoin (see vol. X, p. 6486) of Massachusetts, was chartered in 1794, and has been the *alma mater* of many distinguished Americans. Notable among its students are Hawthorne, Longfellow, William Pitt Fessenden, John P. Hale, Franklin Pierce, and S. S. Prentiss. The college is located at Brunswick, Me., and has a large staff of professors, some 300 students, and a fine library and museum. It is practically controlled by the Congregational body.

BOWIE-KNIFE, an American hunting dagger, named after its inventor, Rezin P. Bowie, and used with terrible effect in an affray by his brother, Col. Jim Bowie, who, born about 1790, fell at Fort Alamo in the Texan War (1836). The weapon has a curved, double-edged blade, ten to fifteen inches long, and above an inch wide. In earlier days it was occasionally used for duelling.

BOWLES, CAROLINE ANN. See SOUTHEY, CAROLINE.

BOWLES, WILLIAM LISLE, poet and critic, was born at King's Sutton, of which his father was vicar, in 1762. At the age of fourteen he was entered on the foundation at Winchester school, the head-master at the time being Dr. Joseph Wharton. In 1781 he left as captain of the school, and proceeded to Trinity College, Oxford, to a scholarship to which he had been elected. Two years later he gained the chancellor's prize for Latin verse, and soon after left the university, not taking his degree as master till 1792. In 1797 he received the vicarage of Dumbleton in Gloucestershire, and in 1804 was presented to the vicarage of Bremhill in Wiltshire. In 1818 he was made chaplain to the Prince Regent, and in 1828 he was elected residentiary canon of Salisbury. He died at Salisbury in April, 1850.

BOWLING GREEN, a beautiful little town in the State of Kentucky, in Warren County. It is a place of some commercial importance, and has a population of about 5,600.

BOWLS, one of the oldest and most popular of English pastimes, the origin of which can be traced back to the twelfth century. William Fitzstephens, in his *Survey of London*, written during the last quarter of that century, states that in the summer holidays youths took exercise among other pastimes *in jactua lapidum*, "in throwing of stones." There is evidence that it was a royal game, since Stow states that bowling alleys were among the additions made by Henry III. to Whitehall, and the unfortunate Charles I. was an enthusiast of the open-air pastime. During his confinement at Holmby, Northamptonshire, he frequently went over to Lord Vaux's at Harrowden, and Earl Spencer's at Althorp, both of which seats possessed unrivalled bowling greens. He is said to have been engaged at the game when seized by Cornet Joyce. After the suppression of alleys "long bowling," or "Dutch rubbers," was practiced for a short time. It consisted of bowling at nine pins, placed on a square frame thirty yards distant, but does not appear ever to have found much favor in England. The first regular bowling club of which there exists any trace is the Willowbank Club founded in Glasgow at the commencement of the nineteenth century. The game is now chiefly practiced in the northern counties of England and in Scotland, and by the Germans in the United States.

For the outdoor pastime the first requisite is a smooth and level plot of turf, well mown, watered, rolled, and kept in order, hence the comparison, "as smooth as a bowling green." The earliest delineation extant of the game shows two players with a ball each, but no jack or mark to bowl at. It is presumed from this that the first cast his bowl to constitute a mark for the second to play at and knock from its position.

In France, according to Cotgrave, there formerly existed a game termed *carreau*, somewhat similar to bowls, the jack or mark being set up on a square stone at the end of an alley.

In the United States a game of bowls, termed "Ten Pins," is very popular. It is strictly an indoor game, and played in alleys 60x4 feet. Ten wooden pins are set up at the farther end of the alley, in the shape of an equilateral triangle with the apex (termed the "king pin") toward the players. The object is to knock down the greatest number of pins with the fewest balls. These are made of *lignum vitæ*, unlimited in size or weight, but perfect spheres, instead of being biased. A game consists of ten "rolls" of three balls each (if necessary), or thirty in all. The score is kept on a large vertical slate with ten divisions, corresponding to the ten rolls, for each player. The chief point is to try and hit the king pin at the apex of the triangle, as this affords the best chance of knocking

down all the pins. Should a player succeed in doing so with the *first* ball of a roll, he gains a "double spare," his bowling is over for that roll, and he is entitled to add whatever number of pins he knocks down with the first *two* balls of the next roll to the ten already down. Should he gain another double spare, with the first ball of the succeeding roll he has to wait for the first ball of a third roll before the total score for the first roll can be ascertained, and so on in succession.

BOWRING, Sir John, an eminent English linguist, translator, political economist, and miscellaneous writer, was born at Exeter, October 17, 1792. His attainments as a linguist were of remarkable extent. He stated that he knew two hundred languages and could speak one hundred. This, of course, does not mean more than that he had some slight acquaintance with them; but it is certain that he had a pretty good knowledge of forty, and these were languages of various classes. This gives him a place, with Mezzofanti and Von Gabelentz, among the greatest linguists of the world. He died at Claremont, near Exeter, November 23, 1872.

BOWSPRIT is a strong boom or spar projecting over the stemhead or bows of a sailing ship, and also of a steamship when the stem of the latter is of the curved or cut-water description. Its use is to support the jib-boom, a longer and lighter spar, forming a continuation of the bowsprit, which receives the lower ends of the foremast stay-ropes, on which sails are carried.

BOWSTRING is a name specifically used for an old Turkish mode of execution, the offender being strangled by means of a bowstring.

BOXING-DAY, the day after Christmas, and so called in England from being the day on which Christmas boxes or presents are given to servants and others.

BOXWOOD, the wood obtained from the Euphorbiaceous genus *Buxus*, the principal species being the well-known tree or shrub, *B. sempervirens*, the common box, in general use for borders for garden walks, ornamental parterres, etc. The other source of the ordinary boxwood of commerce is *B. balearica*, which yields the variety known as Turkey boxwood. The common box is grown throughout Great Britain, in the southern part of the European continent generally, and it appears to extend through Persia into India, where it is found growing on the slopes of the Western Himalayas. The wood of both species possesses a delicate yellow color; it is very dense in structure and has a fine, uniform grain, which gives it unique value for the purposes of the wood-engraver.

BOYACA, a village in the state of Boyaca, in the later the death of Christope removed his only rival, and he gained almost undisputed possession of the whole Republic of Colombia, situated about twenty miles south of the capital Tunja, and celebrated as the scene of the victory of Bolivar over the Spaniards in 1819.

BOYAR, an order in Old Russia, next to the knjazes or knjeses (ruling princes). They had their own partisans, and gave their services to a prince of their own choice, whom they left again at their pleasure. Peter the Great finally abolished the order by giving them a place among the Russian nobility, but at the same time stripping them of their peculiar privileges. The higher nobility of Roumania are also called Boyars.

BOY-BISHOP. The custom of electing a boy-bishop on St. Nicholas' Day dates from a very early period. It spread over most Catholic countries, and in England seems to have prevailed in almost every parish. Although the election took place on St. Nicholas' Day (December 6), the authority lasted to Holy Innocents' Day (December 28).

BOYCE, Hector. See Boece.

BOYCE, William, an English musical composer of eminence, was born in London in 1710, and died there in 1779. As a chorister in St. Paul's he received his early musical education from King and Dr. Greene, and he afterward studied the theory of music under Dr. Pepusch. In 1736 he was appointed organist of St. Michael's Church, Cornhill, and in the same year he became composer to the chapel royal. In 1749 he received the degree of doctor of music from the University of Cambridge.

BOYCOTTING, the system of combining to hold no relations, social or commercial, with a neighbor, in order to punish him for differences in political opinion, or for alleged unjust acts—a kind of social excommunication. It was first formulated by Mr. Parnell, the Irish leader, at Ennis, on September 19, 1880, and derived its name from one of the first victims, Captain Boycott, a Mayo factor and farmer, who has had for his sufferings the consolation of giving a new word to most European languages. The term "exclusive dealing" has been applied by its apologists to boycotting, which was brought within the law by the Crimes Act of 1887.

BOYD, Zachary, a learned clergyman of the Scottish Church, was born toward the end of the sixteenth century, and died in 1653 or 1654. He was for many years regent in the college of Saumur in France, but returned to his native country in 1621, to escape the persecution of the Protestants. In 1623 he was appointed minister of the Barony church in Glasgow, and held the office of rector of the university.

BOYDELL, John, an engraver, chiefly known by his plates illustrating Shakespeare, was born at Dorrington in 1719. At the age of twenty-one he came to London and was apprenticed for seven years to an engraver. He died in 1804. Some years before his death he had held the position of Lord Mayor of London.

BOYER, Abel, a well-known lexicographer and historian, was born at Castres in France in 1664. Upon the revocation of the Edict of Nantes he first went to Geneva, and then to Franeker, where he finished his studies. Finally he went to England, where he soon acquired such a proficiency in the English language, that he became an author of considerable note, and was employed in writing several periodical and political works. He had for many years the principal management of a newspaper called the *Postboy*, and he likewise published a monthly work entitled *The Political State of Great Britain*. He died in 1729.

BOYER, Alexis, a distinguished French surgeon, was born March 1, 1757, at Uzerches in Limousin. At the age of thirty-seven he obtained the appointment of second surgeon to the Hotel Dieu of Paris, and was elected professor of operative surgery in the Ecole de Santé. This latter appointment he soon exchanged for the chair of clinical surgeon. In 1805 Napoleon nominated him imperial family surgeon, and, after the brilliant campaign of 1806–7, conferred on him the legion of honor, with the title of Baron of the Empire, and a salary of 25,000 francs. On the fall of Napoleon the merits of Boyer secured him the favor of the succeeding sovereigns of France, and he was consulting-surgeon to Louis XVIII., Charles X., and Louis Philippe. In 1825 he succeeded Deschamps as surgeon-in-chief to the Hospital de la Charité, and was chosen a member of the Royal Academy of Sciences of the Institute of France. From the period of his wife's death, which he took much to heart, his health declined, and he died November 23, 1833, at the age of seventy-six.

BOYER, Jean Baptiste, an eminent French physician, born at Marseilles in 1693. He devoted a long life to the special investigation and treatment of contagious epidemics, with a courage and success which

have rarely been surpassed. On the last appearance of the plague in Western Europe in 1720, he was one of the physicians sent from Paris by the Government to succor the inhabitants of his native city, then visited by this great calamity. He died in 1768.

BOYER, JEAN PIERRE, a mulatto general, and for some time the President of Hayti, was born at Port-au-Prince in 1776. He joined the negroes in their war of independence, but after the secession of Toussaint l'Ouverture with his party, was compelled to retire to France. He was well received by Napoleon, and obtained a commission in Leclerc's expedition. After the death of Dessalines, the king of Hayti, Boyer joined Pétion in proclaiming a republic and resisting Christophe, Dessalines' successor. He gallantly and successfully defended Port-au-Prince against the negro troops of Christophe, and on the death of Pétion was named president of the Haytian republic. Two years later the death of Christophe removed his only rival, and he gained almost undisputed possession of the whole island. Absolute power, however, produced its usual effects; Boyer became arbitrary, capricious, and cruel. In 1825 the French compelled the Haytian senate to acknowledge their supremacy, and to guarantee a payment of 150,000,000 francs in return for certain liberties granted. The weight of this enormous debt excited the greatest discontent in Hayti. Boyer was able to carry on his government for some years longer, but in 1842 a violent insurrection overthrew his power, and compelled him to take refuge in Jamaica. He resided there till 1848, when he removed to Paris, where he died in 1850.

BOYLE, CHARLES, earl of Orrery in Ireland, and baron of Marston, in the county of Somerset, the second son of Roger, second earl of Orrery, was born at Chelsea in 1676. He was educated at Christ Church, Oxford, and soon distinguished himself by his learning and abilities. Like the first earl of Orrery, he was an author, soldier and statesman. He translated Plutarch's life of Lysander, and published an edition of the epistles of Phalaris, which engaged him in the famous controversy with Bentley. See ATTERBURY and BENTLEY. He died, after a short illness, August 28, 1731. Among the works of Roger, earl of Orrery, will be found a comedy, entitled *As you find it*, written by Charles Boyle. The orrery, an astronomical instrument, invented, or at least constructed, by Graham, was named after the earl, who used to amuse his leisure hours with mechanical toys.

BOYLE, JOHN, earl of Cork and Orrery, a nobleman distinguished for his literary attainments, was the only son of the subject of last notice, and was born January 2, 1707. He was educated at Christ Church College, Oxford, and was led by indifferent health and many untoward accidents to cultivate in retirement his talents for literature and poetry. He died November 16, 1762. His letters from Italy did not appear until 1774, when they were edited, with his life prefixed, by the Rev. J. Duncombe.

BOYLE, RICHARD, one of the greatest statesmen of the seventeenth century, generally styled the Great Earl of Cork, was the youngest son of Roger Boyle, and was born at Canterbury, October 3, 1566. He studied at Benet College, Cambridge, and afterward became a student in the Middle Temple. Having lost his parents, and being unable to support himself in the prosecution of his studies, he became clerk to Sir Richard Manwood, chief baron of the exchequer; but finding this employment little likely to improve his fortune, he went to Ireland. In consequence of various services and the great ability he displayed, he gradually rose to the highest offices; and in 1616 he was created, by King James I., Lord Boyle, Baron of Youghall, in the county of Cork. Four years later he was created Viscount Dungarvan and earl of Cork, and in 1631 he was appointed lord-treasurer of Ireland, an honor that was made hereditary in his family. He particularly distinguished himself by the noble stand he made when the great rebellion broke out in Ireland in the reign of Charles I., acting with as much bravery and military skill as if he had been trained from his infancy to the profession of arms. Having turned the castle of Lismore, his principal seat, into a fortress, he immediately armed and disciplined his servants and Protestant tenants, and with their assistance, and a small army, raised and maintained at his own expense, which he put under the command of his four sons, he defended the province of Munster, and took several strong castles. During this time he paid his forces regularly; and when all his money was exhausted, he converted his plate into coin. He died on the 15th September 1644.

BOYLE, RICHARD, earl of Burlington and Cork, son of the subject of last notice, was born in 1612. He greatly distinguished himself by his loyalty to Charles I., whom during his troubles he supplied with both money and troops; but at last he was obliged to compound for his estate. He contributed all in his power to the Restoration, and by Charles II. was created earl of Burlington (Bridlington) in 1663. He died in January 1697-8, aged eighty-six.

BOYLE, ROBERT, one of the greatest natural philosophers of his age, and one of the founders of the Royal Society of London, was the seventh son and fourteenth child of Richard Boyle, earl of Cork, and was born at Lismore Castle in the province of Munster, Ireland, January 25, 1627. In his earliest years he learnt to speak Latin and French, and he was only eight years old when he was sent to Eton, his father's friend, Sir Henry Wotton, being then provost of the college. Here he studied about three years, and was next placed as private pupil with the rector of Stalbridge in Dorsetshire, where his father had just taken up his residence. In 1638 after a visit to London he travelled in France accompanied by a French tutor, and studied above a year at Geneva. In the autumn of 1641 he visited Switzerland and Italy, spending the winter of 1641-42 at Florence. Here he studied the works of Galileo, who died near Florence the same winter. On reaching England 1644 he learnt of the death of his father, who had left to him the manor of Stalbridge and estates in Ireland. It was in the following year that he became a member of a society of scientific men, who in consequence of the political agitation of the times used to hold their meetings with as much privacy as possible, first in London and afterwards at Oxford; this became subsequently famous as the Royal Society. In 1646 he settled at Stalbridge, and from that time his whole life was devoted to study, scientific research and experiments, and authorship. After making several visits to his estates in Ireland he took up his abode at Oxford in 1654, and there enjoyed the society of many learned men. He resided at Oxford for fourteen years; and it was during this period that he made important improvements in the air-pump, and by a long series of experiments with it made various discoveries on the properties of air, the propagation of sound, &c., which are recorded in his voluminous writings. Boyle was at the same time an ardent student of theology, and numbered among his friends the eminent Orientalists Pococke, Hyde, and Clark, and Dr. Thomas Barlow, Bodleian librarian and bishop of Lincoln. At the Restoration he was favorably received at court, and was advised to enter the church; but this he declined to do, alleging that it was not his

vocation, and that he believed his writings on religious subjects would have greater weight coming from a layman than from a paid minister of the church.

When the Royal Society was incorporated (1663) Boyle was named a member of the council. He communicated many important memoirs to the *Philosophical Transactions*, and, in 1680, was elected president of the society, but from a scruple about oaths he declined this honor. Boyle was at one time deeply interested in alchemy, and carried on experiments on the transmutation of metals, in which Newton also took much interest. It was through his efforts that the statute of Henry IV., cap. 4, against the multiplying of gold and silver was repealed in 1689. After leaving Oxford in 1668 he settled in London; and here he spent the rest of his days, residing in the house of his sister Lady Ranelagh. He was never married. He was no controversialist, and does not appear to have taken much, if any interest in the great political and religious movements of his day. About 1690 his health began seriously to fail, and he was obliged gradually to withdraw from his public engagements. He discontinued the communication of memoirs of new discoveries to the Royal Society, resigned the post which he had long held of governor of the corporation for propagating the Gospel in New England, and announced by public advertisement his intention no longer to receive visits. The "retired leisure" which he thus secured was devoted to important chemical investigations, the account of which he left "as a kind of hermetic legacy to the studious disciples of that art." His health became worse in 1691. On the 23d of December of this year his sister, Lady Ranelagh, with whom he had lived for more than twenty years, died; and a week later, December 30, Boyle died himself.

BOYLE, Roger, earl of Orrery, fifth son of the great Earl of Cork, was born in April 1621, and was made Baron Broghill when only five years old. He distinguished himself while a student at Dublin College, and afterwards made the tour of France and Italy. Soon after his return he married Margaret Howard, sister to the earl of Suffolk; and passing over to Ireland with his bride he found the country in a state of rebellion, and assisted his father in opposing the insurgents. Upon the execution of the king, he retired to his seat at Marston in Somersetshire; but his spirit could ill brook this state of inactivity, and he therefore resolved to cross the seas, and apply to Charles II. for a commission to raise forces to restore the monarchy and recover his own estate. Under the pretence of visiting Spa for his health, he proceeded as far as London, where he received a letter from Cromwell, then general of the parliamentary forces and a member of the committee of state, intimating his intention to wait upon him. During the interview Cromwell told him that the committee were apprised of his design; and when Broghill assured him that the intelligence was false, Cromwell produced copies of several of his confidential letters, which reduced him to the necessity of asking Cromwell's pardon and requesting his advice in such a conjuncture. Cromwell told him, that though he had hitherto been a stranger to his person, he was not so to his merit and character; and that he had heard how gallantly he had behaved in the Irish wars; and he concluded by offering him a command as general officer, exempt from all oaths and engagements, — adding that he should not be obliged to draw his sword against any but the Irish rebels. Lord Broghill, greatly surprised at so unexpected an offer, requested some time for deliberation. But Cromwell brusquely told him that he must determine instantly, and that he himself was about to return to the committee, who were still sitting, and that if he rejected their offer, they had determined to send him to the Tower. Broghill, finding that his liberty and life were in the utmost danger, pledged his honor that he would faithfully serve against the Irish rebels; and accordingly, by Cromwell's instructions, he passed over into Ireland, where by many important services he fully justified the opinion which had been formed of him.

When Cromwell became Protector, Lord Broghill was made one of his privy council, and admitted to great intimacy and confidence. He continued for some time to assist Richard Cromwell with his counsels, till, seeing that the weak nature of that amiable man would infallibly bring on his fall, he deemed it imprudent still to cling to one whom he could not save, and accordingly retired to his command in Ireland, where affairs shortly after took a turn extremely favorable to the design of the king's restoration. Lord Broghill was not a little instrumental in bringing about that event; and, in consideration of his eminent services, Charles created him earl of Orrery, September 5, 1660. He was soon after made one of the lords justices of Ireland; and his conduct, whilst at the head of affairs in that kingdom, was such as to add greatly to the general esteem in which his character was previously held.

On his return Lord Orrery, by his prudent and skilful measures, rendered abortive the scheme of a descent upon Ireland by the Dutch and French, planned by the duke de Beaufort, admiral of France.

His last voyage to England was for the purpose of obtaining medical advice; but his disease, which was gout, proved mortal, and he expired on the 16th of October, 1679, in the fifty-ninth year of his age.

BOYNE, a river of Ireland, which rising in the Bog of Allen, near Carbery in Kildare, and flowing northeast enters the Irish Sea. It is chiefly famous for the battle of the Boyne, July 1, 1690, in which William III. defeated James II.

BOYSE, or Bois, John, one of the translators of the English Bible, was born in Suffolk in 1560. He received a prebendal stall in Ely cathedral from Bishop Andrews in 1615, but had no other preferment. He died in 1643, leaving behind him an immense mass of MSS.

BOZEMAN, the capital of Gallatin county, Mont., is situated ninety-five miles from Helena, the capital of Montana, on a tributary of the Gallatin river. It is in the heart of a mountain country, in which gold is found. Bozeman contains a national bank, and is a place of considerable trade. The population in 1890 was estimated at over 3,000.

BOZRAH. There are, according to the most usual opinion, two places of this name mentioned in Scripture, one a city of Edom, and the other a city of Moab. About the identification of these cities there has been much discussion, some maintaining that the former occupied the site of the modern village of el-Buseirah, about 25 miles S.E. of the Dead Sea, and that the latter was the city afterward known to the Romans as Bostra and at present as Busrah; while others suppose that the various passages of the Scriptures all refer to one place, and others again that there are two places, but that neither of them is to be identified with Bostra. The first view seems to be the most probable.

BOZZARIS, Marcos, a Greek patriot, was born in Suli towards the close of the 18th century. With the remnant of the Suliotes he crossed in 1803 to the Ionian islands, and in 1820, with some 800 of his countrymen, joined the sultan against Ali Pasha. They soon, however, came over to Ali's party, and fought gallantly against their old enemies the Turks. After the death of

Ali the Suliotes carried on the war with great success, and in 1822 were joined by a body of regular troops under Prince Mavrocordato. At the battle of Petta the Greeks were betrayed and defeated with heavy loss. Bozzaris fell back to Missolonghi, which he successfully defended until the arrival of a Hydriote fleet compelled the besiegers to retire. In the summer of 1823 he learned that a large Turkish force had again been despatched against the town, and resolving to anticipate the attack, he set out secretly with 1200 men. On the 20th of August he came upon the encampment of the Turkish vanguard, and a night attack was crowned with success. The victory of the Suliotes was saddened by the loss of Bozzaris, who fell while leading on his men. The assault on the Turkish camp has been made the subject of a very fine poem by Fitz-Greene Halleck.

BRA, a town of Italy in the province of Cuneo and district of Alba, on the River Stura, 25 miles N.E. of Cuneo. Population (1890), 13,000.

BRABANT, an extensive district in the Netherlands, which formerly constituted a separate duchy, but is now divided between Belgium and Holland. The Belgian portion includes the provinces of Brabant and Antwerp, while the whole of the Dutch portion is still known by its ancient name. Godfrey the Bearded, count of Louvain, who lived in the beginning of the 12th century, was the first to assume the title of count of Brabant, which his great-grandson, Henry I. the Warrior (1190–1235), exchanged for that of duke. The duchy passed in regular succession to Henry II. the Magnanimous (1235–1248), and Henry III. the Debonnair (died 1261); but on the death of the latter the natural heir was supplanted by his younger brother John I. the Victorious, who added the district of Limburg to his possessions by the battle of Woeringen in 1288, in which he killed his competitor Henry of Luxembourg with his own hand. The next duke, John II., is memorable for the privileges he bestowed on his subjects by the statute of the Common Weal and the charter of Cortemberg. His successor, John III. the Triumphant, had to contend against a rebellion of Brussels and Louvain, and an offensive alliance of his neighbors, but managed to make himself not only secure but formidable. His three sons having died before him without issue, he was succeeded by his daughter, who had married Wenceslas of Luxembourg. The count of Flanders laid claim to the duchy, and, after a considerable struggle, was only bought off by the surrender of Antwerp. In 1404 the whole of Brabant was handed over to the countess of Flanders, and in 1406 her son took the title of duke. On his death at the battle of Agincourt, in which he fought on the side of the French, he was succeeded by John IV., whose marriage and divorce created much excitement in his day. In 1430, on the decease of Philip, second son of John IV., the duke of Burgundy, Philip the Good, was also recognized as duke of Brabant; and in 1440 the country passed to the house of Austria by the marriage of Mary of Burgundy his granddaughter to Maximillian the emperor, who transmitted it to Charles V. and thus to the crown of Spain. In 1648 the northern portion of the duchy succeeded in freeing itself from the Spanish tyranny, while southern Brabant continued under the yoke till 1714.

BRABANT, NORTH, the modern Dutch province, has an area of 1,960 square miles, and in 1889 the population was 499,830.

BRABANT, SOUTH, the modern Belgian province, has an area of 1,262 square miles, and in 1889 the population was 1,066,500.

BRACCIOLINI, FRANCESCO, an Italian poet, born at Pistoia, of a noble family, in 1566. On his removing to Florence he was admitted into the academy there, and devoted himself to literature. At Rome he entered the service of Cardinal Maffeo Barberini, with whom he afterward went to France. During Urban's pontificate the poet lived at Rome in considerable reputation, though at the same time he was censured for his sordid avarice. On the death of the pontiff he returned to Pistoia, where he died in 1645.

BRACCIOLINI, POGGIO. See POGGIO.

BRACE, in Carpentry, an oblique piece of wood used to bind together the principal timbers of a roof or other wooden structure. The name is also used of the curved iron tool (holding a bit) used by carpenters for boring.

BRACELET, or ARMLET, a personal ornament, made of different materials, according to the fashion of the age and the rank of the wearer. The word is the French *bracelet*, which Ménage derives from *braceletum*, a diminutive of *bracile*, all formed from the Latin *brachium*, the arm, on which it was usually worn. By the Romans it was called *armilla*, *brachiale*, *occabus;* and in the Middle Ages *boga*, *bauga*, *armispatha*.

Bracelets have at all times been much in use among barbaric nations, and the women frequently wear several on the same arm. The finer kinds are of mother-of-pearl, fine gold or silver; others of less value are made of plated steel, horn, brass, copper, beads, etc.

This species of personal ornament was exceedingly common in Europe in prehistoric times. The bracelets of the Bronze Age were either of gold or bronze, silver being then unknown. In shape they were oval and penannular, with expanding or trumpet-shaped ends, having an opening between them of about half an inch to enable them to be easily slipped over the wrist. Those of gold were generally plain, hammered rods, bent to the requisite shape, but those of bronze were often chased with elegant designs, showing a cultivated taste. Some forms of spiral armlets of bronze, peculiar to Germania and Scandinavia, covered the whole forearm, and were doubtless intended as much for defense against a sword-stroke as for ornament. The Etruscan and early Roman forms of bronze bracelet were for the most part cylindrical, with overlapping ends, or spiral and serpent-shaped. These were also the common forms in the Iron Age of Northern Europe, while silver bracelets of great elegance, formed of plaited and intertwisted strands of silver wire, and plain penannular hoops, round or lozenge-shaped in section and tapering to the extremities, became common toward the close of the pagan period.

BRACHIAL ARTERY is the great arterial trunk supplying the upper extremity between the armpit and the elbow; it is the continuation of the axillary artery. It runs down the front and inner side of the upper arm, giving off several named branches as it proceeds, and at a point about an inch below the bend of the elbow it terminates by dividing into radial and ulnar arteries.

BRACHIOPODA constitute an important and well-defined class of Invertebrates, but the exact position the group should occupy in that division of the animal kingdom is still a matter upon which anatomists have not entirely agreed. For many years the species composing the class were referred to the genus *Anomia* of the Lamelli branchiata, but, as was judiciously observed by Edward Forbes, "a close examination shows that there is no relationship between them, but only a resemblance through formal analogy." Milne-Edwards separated the Mollusca into two great divisions, Mollusca and Molluscoida, and in the last he placed the Brachiopoda, Polyzoa, and Tunicata.

According to Agassiz, the transition between such types as Pedicellina to Membranipora and other incrusting Polyzoa is readily explained from the embryology of Thecidium, and, in fact, all incrusting Polyzoa are only

communities of Brachiopods, the valves of which are continuous and soldered together, the flat valve forming a united floor, while the convex valve does not cover the ventral one, but leaves an opening more or less ornamented for the extension of the lophore. Both Gratiolet and Hancock have expressed the opinion that the Tunicata are in no way related to the Brachiopoda, and that we cannot place these last and the Polyzoa along with the Tunicata in the same division. Gratiolet and some others have considered the Brachiopoda to be allied to the Crustacea, while even the asteridian affinities of the class have been hinted at by King.

No doubt can be entertained, after perusing the admirable memoirs by Morse and Kowalevsky on the embryology of Terebratula, Terebratulina, Argiop, and Thecidium, that the genera composing the class and Amphetrite possess many important features in common, but almost any Invertebrate groups might be annelidilized by overrating certain points of their affinities. Mr. Dall thinks that the general conclusion with reference to the affinities of the Brachiopoda will be something like this. There is much reason for supposing that all the Molluscs and Molluscoids came from the stock out of which the Worms have developed. Indeed, as Huxley has said, they are only isomerous Worms with many special modifications. It is natural, therefore, that the oldest and lowest forms should retain many of the characteristics of the oldest and most simple Worms, especially those which have been modified by a tubular habit. But, on the whole, the modifications are so important that we may continue to consider (if in the specializing tendency of present study we can retain any general divisions of the Invertebrates) that the Molluscoids and Molluscs do form two groups somewhat aside from others, and somewhat more nearly related to each other than to the divisions external to them. Therefore, although it may turn out that the Brachiopoda constitute a class close to the Annelids, it cannot be denied that they possess many molluscan characters that cannot be overlooked, and are, under any circumstances, entitled by their importance and numerous distinctive features to constitute a well-defined and separate class.

The name BRACHIOPOD was proposed for the class by Cuvier in 1805, and by Dumeril in 1809, and has since been very extensively adopted. Blainville in 1824 proposed as a substitute for the Cuvierian name that of Palliobranchiata (pallium, a mantle; branchiæ, gills), on account of the respiratory system being combined with the mantle on which the vascular ramifications are distributed. Prof. King has always adopted the latter name, and perhaps rightly objects to Cuvier's on the ground that it is a misnomer, for the two variously curved and cirrated brachial or labial appendages, improperly designated as arms or feet, were subsequently found not to subserve the function of locomotive organs.

The animal of the Brachiopod is in all cases protected by a shell composed of two distinct valves; these valves are always, except in cases of malformation, equal-sided, but not equivalved. The valves are, consequently, essentially symmetrical, which is not the case with the Lamellibranchiata or Conchifera,—so much so, that certain Brachiopod shells received the name Lampades, or lamp shells, by some early naturalists; but while such may bear a kind of resemblance to an antique Etruscan lamp, by far the larger number in no way resemble one. The shell is likewise most beautiful in its endless shapes and variations. In some species it is thin, semi-transparent, and glassy, in others massive. Generally the shell is from a quarter of an inch to about four inches in size, but in certain species it attains nearly a foot in breadth by something less in length, as is the case with Productus giganteus.

The valves have been distinguished by various names, but those of dorsal and ventral are in most general use. The ventral valve is usually the largest, and in many genera, such as Terebratula and Rhynchonella, has a prominent beak, with a circular or otherwise shaped perforation or foramen at or near its extremity, partly completed by one or two plates, termed a deltidium. Through the foramen passes a bundle of muscular fibres, termed a peduncle, by which the animal is in many species attached to submarine objects during at least a portion of its existence. Other forms show no indication of ever having been attached, while some that had been moored by means of a peduncle during the early portion of their existence have become detached at a more advanced stage of life, the opening becoming gradually cicatrized, as is so often seen in Strophomena rhomboidalis, Orthesina anomala, &c. Lastly, some species have adhered to submarine objects by a larger or smaller portion of their ventral valve, as is the case with many forms of Crania, Thecidium, Davidsonia, &c. Some Cranias are always attached by the whole surface of their lower or ventral valve, which models itself and fills up all the projections or depressions existing either on the rock, shell, or coral to which it adhered. These irregularities are likewise, at times, reproduced on the upper or dorsal valve. Some species of Strophalosia and productus seem also to have been moored during life to the sandy or muddy bottoms on which they lived, by the means of tubular spines of greater or lesser length. The interior of the shell varies very much according to families and genera. On the inner surface of both valves several well-defined muscular vascular and ovarian impressions are observable; they form either indentations of greater or lesser size and depth, or occur as variously shaped projections. In the Trimerellidæ, for example, some of the muscles are attached to a massive or vaulted platform situated in the medio-longitudinal region of the posterior half or umbonal portion of both valves. In addition to these, there exists in the interior of the dorsal valve of some genera a variously modified, thin, calcified, ribbon-shaped lamina or skeleton for the support of the labial or brachial appendages; and so varied, yet constant in shape to certain species is this laminal apophysis, that it has served as one of the chief characters in the creation of both recent and extinct genera. The apopyhsis is more or less developed in some genera than in others. In certain forms, as in Terebratula and Terebratulina, it is short and simple, and attached to a small divided hinge-plate, the two riband-shaped lamina being bent upward in the middle.

The intimate structure of the shell has been minutely investigated by Dr. Carpenter, Prof. King, Dr. Gratiolet, and several others, and been found to be distinct from that of the Lamellibranchiata and Gasterpoda. Dr. Carpenter informs us that there is not in the shell of Brachiopoda that distinction between outer and inner layers, either in structure or mode of growth, which prevails among the ordinary bivalves; that it seems obvious, both from the nature of the shell substance and from the mode in which it is extended, that the whole thickness of the Brachiopod shell corresponds with the outer layer only of the Lamellibranchiata; and that he has occasionally met with a second layer in recent Terebratulæ, within the earlier portion of the shell, but confined to only a part of the surface instead of extending beyond it. In some families composing the Clisenterata it consists, according to Prof. King, of three divisions, the innermost and middle ones, which constitute the entire thickness of the valve, being calcareous with a prismatic or fibrous structure, while the outer divisions would consist of a very thin membrane. The innermost and intermediate divisions are in some families traversed

by minute tubular canals, which pass from one surface to the other, for the most part in a vertical direction, and at tolerably regular intervals, but just before terminating near the outer surface of the epidermis their orifices suddenly become dilated, the lower half of the canals being often considerably smaller in diameter than the upper half. The canals are occupied by cæcal processes proceeding from the mantle or the fleshy covering of the animal. Their function is, according to Dr. Carpenter, brachial or subservient to respiration; but if there exists an outer epidermis, as described by King, which covers their expanded terminations, there would be no communication between the surrounding sea water and the mantle.

The anatomy of the Brachiopoda has been the subject of elaborate investigations by Cuvier, Vogt, Huxley, Hancock, Gratiolet, Woodward, Deslongchamps, King, and others, while of late years much light has been likewise thrown on the embryology and early stages of the groups by Steenstrup, Aacaze-Duthiers, Morse, F. Müller, Oscar Schmidt, M'Crady, Kowalevsky, and others. Some differences in opinion, it is true, have been and still are entertained with respect to the exact function to be attributed to certain parts of the animal, but on all essential questions there is a pretty general agreement.

According to Morse the Brachiopoda are reproduced by eggs, generally kidney-shaped and irregular, which are discharged from the anterior margin of the shell, and drop just beyond the pallial membrane, hanging in clusters from the setæ. Some uncertainty has prevailed as to whether there is a male and female individual. Lacaze-Duthiers and Morse state that the sexes are separate, and describe them as such in Thecidium and Terebratulina, and the French zoologist goes so far as to suggest that a difference is even observable in the shell, but the statement requires verification. Prof. Morse describes the embryo of Terebratulina with great minuteness during its six stages of development. It is divided into two, three, or four lobes clothed with vibratile cilia, and before becoming attached swims or whirls head foremost by means of vibratile cilia which cover the body. The same distinguished American zoologist describes with equal care the formation of the shell from its first stage of development to the adult condition. Lacaze-Duthiers alludes to two and four eye spots in the embryo of Thecidium, and states that the animal appears to be in some measure sensible to light. The mouth conducts by a narrow œsophagus to a simple stomach which is surrounded by a large granulated liver. Owen's "hearts" have been found to be oviducts, while the true heart consists of a pyriform vesicle appended to the dorsal surface of the stomach. The digestive organs and viscera, as well as the muscles, which take up only a small place in the neighborhood of the beak, are separated from the great anterior cavity, and protected by a strong membrane in the centre of which the mouth is situated. The nervous system consists of a principal ganglion of no great size.

Both valves are lined by a delicate membrane termed the pallium or mantle; it secretes the shell, and is generally fringed with horny bristles or setæ. It is composed of an outer and inner layer, between which are situated the blood channels or lacunes; in fact, all the internal parts of the shell are lined by the inner layer of the mantle, with the exception of the spots where the muscles attach themselves to the shell. The outer layer lines closely the inner surface of the valves to which it adheres, and in those species in which the shell is traversed by canals there exist, on the surface of the mantle facing the inner surface of the valves, corresponding short cylindrical membraneous projections or lacunes, which insert themselves into the small tubular orifices that traverse the shell. The cæcal prolongations do not exist in those genera, such as Rhynchonella, where the shell is deprived of tubular perforations. The inner layer is rather thicker than the opposite one, and is covered with vibratile cilia. As stated by Nicholson and other anatomists, the blood channels form a remarkable system of more or less branched tubes, anastomosing with one another, and ending in the cæcal extremities. This, which has been termed by Huxley the arterial system, communicates with the perivisceral cavity by means of two or four organs, which are called pseudo-hearts, and which were at one time supposed to be true hearts. Each pseudo-heart is divided into a narrow, elongated external portion (the so-called "ventricle"), which communicates, as Hancock has proved, by a small apicial aperture with the pallial cavity; and a broad, funnel-shaped so-called "auricle," communicating on the one hand by a constricted neck with the so-called "ventricle," and on the other by a wide patent mouth with a chamber which occupies most of the cavity of the body proper, and sends more or less branched diverticula into the pallial lobes (Huxley). The channels vary in their dispositions and details in different genera, and as they project to some small extent, leave corresponding indentations on the inner surface of the shell, so that their shape and directions can very often be traced on fossil and extinct genera as well as if the animal was still in life; this may be seen in the numerous illustrations appended to Davidson's and other authors' works treating of fossil Brachiopoda. There are usually four principal arterial trunks in each lobe of the mantle; the two central ones run direct to the front, near to which they bifurcate, while the outer ones give off at intervals on the side facing the lateral margin of the valves a series of branches which bifurcate several times. It has been observed by Hancock that the inner lamina of the mantle, and more particularly that portion of it forming the floor of the great pallial sinuses, will undoubtedly assist in purifying the blood. In 1854, in his review of Davidson's great work on British fossil Brachiopoda, Oscar Schmidt called attention to an important anatomical omission, namely, the existence of a vast number of microscopic, flattened, calcareous, denticulated plates or spiculæ on certain parts of the surface of the mantle, and destined, no doubt, to stiffen and protect the portions that contain them; and it was, moreover, observed by Hancock, and afterwards by Deslongchamps, that these calcareous plates are not to be found equally distributed over all the surface of the mantle, but only in those portions in connection with the great lacunes or veins, the labial appendages, and the perivisceral cavity. These spiculæ do not appear to be present in every species, and are totally absent in Lingula, Rhynchonella, and others. Deslongchamps observes that if we examine the genera Kraussina, Terebratula, Terebratulina, Megerlia, and Platydia, we have a series wherein the number and consistence of the calcareous portions increase in a very rapid manner, and that the spicules lie over each other several times, leading the observers by insensible degrees to Thecidium, in which the spiculæ are soldered together, and incrust the mantle to such an extent that it is no longer distinct from the shell itself.

The brachial appendages are a pair of singular organs eminently characteristic of the Brachiopoda; they often are more correctly termed labial appendages on account of each member being a prolongation of the lateral portion of the lips or margin of the mouth. The Lamellibranchs or Conchifera have analogous appendages, but very much less developed. They assume different shapes in different genera, and are supported, or

otherwise, by the more or less complicated skeleton already described. The labial appendages, whatever may be the shape and convolutions they may assume, fill the larger portion of the cavity of the shell in front of the visceral chamber; they are formed of a membraneous tube, fringed on one side with long flexible cirri, and occupy almost the whole of the pallial cavity, but were not capable of being protruded in those families in which they were folded back upon themselves and supported by a calcareous skeleton, as in Waldheimia, Terebratella, Megerlia, &c. Barrett, who has examined the animal of Terebratulina caput serpentis in life, states that it showed more of itself than Waldheimia cranium, which might be supposed from the labial appendages being in the first very slightly supported by a small loop. Barrett observed, likewise, that it protrudes its cirri further, that the cirri on the reflected part of the brachial appendage are shorter than on the first part, and were almost constantly in motion, and often seen to convey small particles to the channel at their base, and that the cirri are bent up when the brachial appendages are retracted, but are generally uncoiled and straightened when the shell is opened, before which the animal has often been observed to protrude a few of its cirri, and move them about to ascertain if any danger threatened. In Rhynchonella, where the elongated spiral labial appendages are slightly supported only at their origin by two short calcareous processes, they can at the will of the animal, according to Owen and Morse, be unrolled and protruded to some distance beyond the margins of the valves, and when forcibly stretched out they are said to be more than four times the length of the shell, and to support some 3000 cirri. We may mention, likewise, that Otto Frederick Müller, having dredged from the Lake of Droeback, in Norway, a number of Terebratulæ (probably belonging to Rhynchonella psittacea), and placed them in a glass of water, he observed that they gracefully extended their spirally coiled brachial appendages. It must, however, remain forever uncertain whether, in the extinct genera Spirifera, Atrypa, and others, in which the spirally coiled fleshy labial appendages were supported throughout their entire length by a calcified skeleton, the animal could protrude them beyond the margin of the valves. In some families — Rhynchonellidæ, Productidæ, and others — these organs are spiral and separate; in many the separation is only at their extremities. There can be very little doubt that these elegant organs, provided as they are with cirri and cilia, are not only instrumental in conveying microscopic organisms to the mouth, which, is situated between the appendages at their origin, but are likewise subservient to the functions of respiration. Hancock observes that to prove that the brachial organs subserve the function of gills, as well as that of sustentation, it is only necessary to refer to the manner in which the blood circles round the labial appendages and is carried to the cirri, but more particularly to its circulating through these latter organs, and returning direct from them to the heart.

As the number and position of the muscles differ materially in the two great divisions into which the Brachiopoda have been grouped, and to some extent also in the different genera of which each division is composed, it may be desirable to treat this subject under two separate heads. Unfortunately almost every anatomist who has written on the muscles of the Brachiopoda has proposed different names for each muscle, and the confusion thence arising is much to be regretted. In the Clistenterata, of which the genus Terebratula may be taken as an example, five or six pairs of muscles are stated by Hancock, Gratiolet, and others, to be connected with the opening and closing of the valves, or with their attachment to or movement upon the peduncle. First of all, the adductors or occlusors consist of two muscles, which, bifurcating near the centre of the shell cavity, produce a large quadruple impression on the internal surface of the small valve, and a single divided one towards the centre of the large or ventral valve. The function of this pair of muscles is the closing of the valves. Gratiolet, who has likewise described with great minuteness the muscles of the Brachiopoda informs us that those which close and open the valves were the only ones known to Pallas, but that he defined their position and functions clearly. The same was done by Blainville and Quenstedt, but the absence of good figures caused much uncertainty to prevail. This deficiency was subsequently supplied by Hancock and Gratiolet's admirable illustrations. Two other pairs have been termed divaricators by Hancock, or cardinal muscles ("muscles diducteurs" of Gratiolet), and have for function the opening of the valves. The divaricators proper are stated by Hancock to arise from the ventral valve, one on each side, a little in advance of and close to the adductors, and after rapidly dimishing in size become attached to the cardinal process, a space or prominence between the sockets in the dorsal valves. The accessory divaricators are, according to the same authority, a pair of small muscles which have their ends attached to the ventral valve, one on each side of the median line, a little behind the united basis of the adductors, and again to the extreme point of the cardinal process. Two pairs of muscles, apparently connected with the peduncle and its limited movements, have been minutely described by Hancock as having one of their extremities attached to this organ. The dorsal adjustors are fixed to the ventral surface of the peduncle, and are again inserted into the hinge-plate in the smaller valve. The ventral adjustors are considered to pass from the inner extremity of the peduncle, and to become attached by one pair of their extremities to the ventral valve, one on each side of and a little behind the expanded base of the divaricators. The function of these muscles, according to the same authority, is not only that of erecting the shell, they serve also to attach the peduncle to the shell, and thus effect the steadying of it upon the peduncle. Gratiolet describes the peduncle with great care, and states it to be composed of two portions — 1st, of a horny sheath formed of concentric epidermic layers, very analogous to that which Vogt has described in Lingula; and 2d, a fibrous stem enveloped by the sheath. This stem, composed of tendonous fibres, is fixed by its free extremity to different submarine objects; the other extremity passes through the foramen, and is ended by a bulbous projection.

Assuming that the reader is acquainted with the geological divisions into which the earth's crust has been grouped, it may be observed that the Brachiopoda, after the Trilobites, occupy the most important place in the Cambrian or Primordial fauna. Thus, in 1871, out of 241 species known to Barrande as composing the animal kingdom of that period, 179 are referable to the Trilobites and other Crustaceans, 28 to the Brachiopoda, while 34 species would be divided between the Annelids, Pteropodes, Gasteropoda, Bryozoa, Cystidians, and Spongida. Subsequently to these researches several additional species of Trilobites and Brachiopoda have been added to the list through the indefatigable exertions of Prof. Linnarsson, Mr. Hicks, and others. The Brachiopoda, along with the groups mentioned by Barrande, are in all probability the earliest representatives of life at present known; for Mr. Hicks has obtained undoubted examples of Lingula or Lingulella (L. primæva) from the very base of the whole Cambrian series

of St. David's in Wales. It is impossible for the present to offer more than an approximate comparison, based on numbers, of the genera and species that have existed during the various geological more or less extended periods; and many years will have to pass away before some master mind will be able to grapple with the accumulated observations of a century or more, and reduce the number of genera and species within reasonable limits, from which something like reliable data may be formed. Lyell has stated that nothing is more remarkable in the Silurian strata generally of all countries than the preponderance of the Brachiopoda over other forms of Mollusca. Their proportional numbers can by no means be explained by supposing them to have inhabited seas of great depth, for the contrast between the Palæozoic and the present state of things has not been essentially altered by the late discoveries made in our deep-sea dredgings. We find the living Brachiopoda so rare as to form about one forty-fourth of the whole bivalve fauna, whereas in the Lower Silurian rocks, and where the Brachiopoda reach their maximum, they are represented by more than twice as many species as the Lamellibranchiate bivalves. There may indeed be said to be a continuous decrease of the proportional number of this lower tribe of Mollusca as we proceed from the older to the newer rocks. Owing to the great number of synonyms it would not be possible at present to offer even an approximate statement with reference to the number of known species. Bigsby states that some 1754 species of Cambrian, Silurian, Devonian, and Carboniferous species of Brachiopoda have been found in America; 1905 in Europe. It is probable that as many as between four or five thousand species of Brachiopoda have been described, and it is noteworthy that the species, so immensely abundant during the Cambrian, Silurian, Devonian, and Carboniferous periods, became much less numerous during the Permian and Triassic, while they again became abundant, although comparatively reduced in number, during the Jurassic and Cretaceous periods. In the Tertiaries they had materially decreased in number, and they are represented at the present time by about 100 species. It has also been clearly ascertained that a certain number of genera and species passed from one system or formation into the one that followed it. Thus, approximately, it may be said that nine genera appeared for the first time in the Cambrian system, fifty-two in the Silurian, twenty-one in the Devonian, seven in the Carboniferous, two in the Permain, three in the Triassic, eleven in the Jurassic, five in the Cretaceous, three in the Tertiary, and nine in the recent periods. But what wonderful changes have been operating during the incalculable number of ages in which the creation and extinction of a large number of genera and thousands of species have taken place, — some few only of the primordial or first created genera, such as Lingula, Discina, and Crania, having fought their way and struggled for existence through the entire sequence of geological time. Many were destined to comparatively ephemeral duration, while others had a greater or lesser prolongation of existence.

The importance of the study of the Brachiopoda must be obvious to all. They are, as already stated, among the first well-known indications of life in this world, and they have continued to be very extensively represented up to the present time. They are also very characteristic fossils by which rocks at great distances, whether in New Zealand of Spitzbergen, in the Himalayas or the Andes, can be identified.

BRACHYLOGUS, a title applied for the first time in the middle of the sixteenth century, to a work which contains a systematic exposition of the Roman law, and which some writers have asigned to the reign of the Emperor Justinian, and others have treated as an apocryphal work of the sixteenth century. The earliest extant edition of this work was published at Lyons in 1549, under the title of *Corpus Legum per modum Institueionum;* and the title *Brachylogus totius Juris Civilis* appears for the first time in an edition published at Lyons in 1553. The origin of the work may be referred with great probability to the twelfth century.

BRACKET, a projection from a wall, used for the purpose of supporting a statue, bust, or the like. The term is also employed in joinery, etc., to designate supports in the form of a bent knee, of shelves, galleries, etc. It is also generally applied to such gas-lights as project from the wall.

BRACTON, HENRY DE, a learned ecclesiastic, who was chief judiciary in the reign of Henry III. He is supposed to have been born at Bretton-Clovelly in Devonshire. There are numerous MSS. extant of Bracton's works, but only two editions of it have been printed, the first in folio in 1569, the second in quarto in 1640. The text of these editions is identical, as well as the paging.

BRADFORD, a parliamentary and municipal borough of England, situated in the northern division of the West Riding of Yorkshire and the wapentake of Moreley, on an affluent of the Aire, 34 miles S.W. of York, 9 miles W. of Leeds, 192 miles from London by rail. Population (1890), 160,000.

During the Saxon period Bradford was included in the parish of Dewsbury; but William the Conqueror, who mentions it in *Domesday Book*, included it in the barony of Pontefract, which he granted to Ilbert de Lacy. The manor of Bradford remained in the hands of the De Lacies until the beginning of the 14th century, when it passed by marriage to the earl of Lancaster, John of Gaunt holding it at the time of his death in 1399. The manor was held by the Crown from that time down to the reign of Charles I., who sold it for a small yearly rent to the corporation of London. Afterwards it passed into the possession of the Marsdens of Hornby Castle, but since 1795 it has been held by the Rawson family, from whom the corporation has recently purchased all manorial rights. In the struggle between Charles I. and the Parliamentarians, Bradford adhered to the cause of the latter, and twice successfully resisted the royal forces that besieged the town.

BRADFORD, an important manufacturing town of McKean county, Penn., sixty-five miles south of Buffalo, N. Y. It is situated at the intersection of four railroads, and does a large business in shipping oil. Bradford, which has a population (1890) of 10,514, contains glass and furniture factories, mills and an oil exchange. There are four hotels, two public halls, several churches and good schools.

BRADFORD, JOHN, was born at Manchester in the early part of the reign of Henry VIII. In 1553 he was made chaplain to Edward VI., and became one of the most popular preachers in the kingdom. Soon after the accession of Mary he was arrested on a charge of sedition and confined in the Tower, where he continued a year and a half. During this time he wrote several epistles which were dispersed in various parts of the kingdom. He was afterwards removed to Southwark, and was at last brought to trial before the court in which Gardiner sat as chief, where he defended his principles to the last, in defiance of all attempts to effect his conversion. He was condemned to the flames, and suffered in Smithfield, July 1, 1555.

BRADLEY, DR. JAMES, one of the most eminent British astronomers, was born at Sherborne in Gloucestershire in March 1692. In 1727 he communicated to the

Royal Society his great paper on aberration, a remarkable combination of exact observation and profound induction. Some years afterwards Bradley began his lectures at the Oxford Museum, and in 1742 he was appointed to succeed Harley as astronomer royal. In 1747 his minute observations led him to the second of his great discoveries, the nutation of the earth's axis. The remainder of Bradley's life was devoted to the Greenwich Observatory. In 1748 he succeeded in getting a small grant for instruments from the public funds, and in 1752 he was rewarded with a pension of £250. He continued his labors till 1761, when his health began to give way. He then retired to the country and died at Chalford, Gloucestershire, in July 1762.

BRADSHAW, HENRY, an English poet, born at Chester about the middle of the 15th century. He died in 1513.

BRADSHAW, JOHN, president of the High Court of Justice which tried Charles I., appears to have been born in 1602 at Marple Hill, near Stockport in Cheshire. In January 1649, when it was found difficult to compose a court of justice for the trial of the king, Bradshaw was proposed as president, and at once elected. His demeanor on this trial is well known, but has been variously judged. He continued to retain the title of Lord President for some time after the trial, and received large rewards from Parliament for his valuable services. On the formation of a council of state Bradshaw was elected a member, and for three years held office as president. After that time the presidents were elected in rotation, and held their appointment for a month. When, on the 20th April 1653, Cromwell, after dismissing the Parliament, came to dissolve the council, Bradshaw is said to have confronted him boldly, and denied his power to dissolve the Parliament. This story rests on the authority of Ludlow, who was not a witness, and who does not say that Bradshaw was president of the council on that occasion. Bradshaw, an ardent republican, ever afterward showed himself an uncompromising adversary of Cromwell. He died on the 22d November 1659, and was buried in Westminster Abbey. His body was disinterred at the Restoration, and exposed on a gibbet along with those of Cromwell and Ireton.

BRADWARDIN, THOMAS, Archbishop of Canterbury, surnamed the Profound Doctor, was born at Hartfield in Sussex towards the close of the 13th century. He died of the plague at Lambeth, in the year 1349, forty days after his consecration.

BRADY, NICHOLAS, D.D., whose name is familiar as the translator, in conjunction with Tate, of a new metrical version of the Psalms, was born at Bandon in the county of Cork in October, 1659. He was a zealous promoter of the Revolution and suffered in consequence. When the troubles broke out in Ireland in 1690, Brady, by his influence, thrice prevented the burning of the town of Bandon, after James II. had given orders for its destruction; and the same year he was employed by the people of Bandon to lay their grievances before the English parliament. He soon afterwards settled in London, where he obtained various preferments. At the time of his death in 1726 he held the livings of Clapham and Richmond.

BRAGA, a city of Portugal, capital of a district in the province of Minho, is situated on an elevated plain near the River Cavado (*Næbis*). Population, 20,000.

BRAGANCA, a town of Portugal, the capital of the province of Tras-os-Montes on the Fervenza, twenty-six miles northwest of Miranda. Population, 4,500.

BRAHAM, JOHN, a celebrated English vocalist, was born in London in 1774, of Jewish parentage, his family name being Abraham. His career in Italy was one of continuous triumph; he appeared in all the principal opera-houses, and was universally recognized as being without a rival even in that land of song. In 1801 he returned to his native country, and appeared once more at Covent Garden in the opera *Chains of the Heart* by Mazzinghi and Reeve. So great was his popularity that an engagement he had made when abroad to return after a year to Vienna was renounced, and he remained henceforward in England. For nearly forty years from this date his powers continued unimpared, and he sang occasionally in public till within a year or two of his death, which occurred on the 17th February 1856.

BRAHE, TYCHO, an illustrious astronomer, descended from a noble family, of Swedish origin, which had settled in Denmark, was born on the 14th December 1546, at Knudstorp, in the county of Schonen. On the death of his father his uncle sent him, in April 1559, to study philosophy and rhetoric at Copenhagen. The great eclipse of the sun, on the 21st of August 1560, happening at the precise time foretold by astronomers, he began to look upon astronomy as something divine; and having purchased the *Ephemerides* of Stadius, he gained some knowledge of the theory of the planets. In 1562 he was sent by his uncle to Leipsic to study law; but astronomy wholly engrossed his thoughts, and he employed all his pocket-money in purchasing books on that science. Having procured a small celestial globe, he used to wait until his tutor went to bed, in order to examine the constellations and learn their names; and when the sky was clear, he spent whole nights in viewing the stars. He returned to Denmark in 1565, but soon left for Wittenberg, whence he was driven by the plague to Rostock. There in the following year his choleric disposition involved him in a duel with a Danish nobleman, in which he had the misfortune to lose part of his nose; but this defect he so skilfully supplied by means of gold, silver, and wax, that it was scarcely perceptible. In 1569 he took up his residence at Augsburg and remained there two years, busily engaged in astronomical and chemical researches. In 1571 he returned to Denmark, and was favored by his maternal uncle Steno Belle with a convenient place at his castle of Herritzvad near Knudstorp for making his observations, and building a laboratory. But his marrying a peasant girl occasioned a violent quarrel between him and his relatives, and the king was obliged to interpose in order to reconcile them. In 1574, by royal command he read some lectures at Copenhagen; and the year following he began his travels through Germany, and proceeded as far as Venice. He then resolved to remove his family, and settle at Basel; but Frederick II., unwilling that Denmark should lose the honor of his residence, bestowed upon him for life the island of Huen in the Sound, for the erection of an observatory and laboratory, and conferred on him a fee in Norway, a pension of two thousand crowns out of the treasury, and the canonry of Roschild, which brought him a thousand more. The first stone of the observatory was laid on the 8th of August 1576. James VI. of Scotland, afterwards James I. of England, on his visit to Denmark to marry the Princess Anne, went to see Tycho Brahe in his retirement at Uranienburg, made him several presents, and wrote some verses in his praise. Soon after the death of King Frederick, the astronomer was deprived of his pension, fee, and canonry. Finding himself unable to defray the expenses of his observatory he went to Copenhagen, whither he carried some of his instruments, and continued his astronomical observations in that city, till, by the order of Christian IV., he was obliged to discontinue them. He then removed his family to Rostock, and afterwards to Holstein in order to

solicit Henry Ranzau to introduce him to the emperor; and accordingly he was received by Rudolph II. at Prague with the most gratifying marks of respect. That prince gave him a magnificent house till he could procure for him one better fitted for astronomical observations, assigned him a pension of three thousand crowns, and promised, upon the first opportunity, a fee for him and his descendants. But he did not long enjoy his good fortune; for on the 24th of October 1601, he died of a strangury, in the 55th year of his age.

BRÁHMA SAMÁJ, the new theistic church in India, owes its origin to Rájá Rám Mohan Rái, one of the leading men whom India has produced in later times. Rám Mohan Rái was born in the district of Bardwán in 1772. He mastered at an early age the Sanskrit, Arabic, and Persian languages. Impressed with the fallacy of the religious ceremonies practised by his countrymen, he impartially investigated the Hindu Shastras, the Koran, and the Bible, repudiated the polytheistic worship of the Shastras as false, and inculcated the reformed principles of monotheism as found in the ancient Upanishads of the Vedas. In 1816 he established a society, consisting only of Hindus, in which texts from the Vedas were recited and theistic hymns chanted. This, however, soon died away on account of the opposition it met from the Hindu community. In 1830 the Rájá organized a Hindu society for prayer-meetings, which may be considered as the foundation of the present Bráhma Samáj. The following extract from the trust-deed of the building dedicated to it will show the religious belief and the purposes of its founder. The building was intended to be "a place of public meeting for all sorts and descriptions of people, without distinction, who shall behave and conduct themselves in an orderly, sober, religious, and devout manner, for the worship and adoration of the eternal, unsearchable, and immutable Being, who is the author and preserver of the universe, but not under and by any other name, designation, or title, peculiarly used for and applied to any particular being or beings by any man or set of men whatsoever; and that no graven image, statue, or sculpture, carving, painting, picture, portrait, or the likeness of anything shall be admitted within the said messuage, building, land, tenements, hereditament, and premises; and that no sacrifice, offering, or oblation of any kind or thing shall ever be permitted therein; and that no animal or living creature shall within or on the said messuage, &c., be deprived of life either for religious purposes or food, and that no eating or drinking (except such as shall be necessary by any accident for the preservation of life), feasting, or rioting be permitted therein or thereon; and that in conducting the said worship or adoration, no object, animate or inanimate, that has been, or is, or shall hereafter become or be recognized as an object of worship by any man or set of men, shall be reviled or slightingly or contemptuously spoken of or alluded to, either in preaching or in the hymns or other mode of worship that may be delivered or used in the said messuage or building; and that no sermon, preaching, discourse, prayer, or hymns be delivered, made, or used in such worship, but such as have a tendency to the contemplation of the Author and Preserver of the universe, or to the promotion of charity, morality, piety, benevolence, virtue, and the strengthening of the bonds of union between men of all religious persuasions and creeds." The new faith at this period held to the Vedas as its basis. Rám Mohan Rái soon after left India for England, and took up his residence in Bristol, where he died in 1835.

The Bráhma creed was definitively formulated as follows. (1.) The book of nature and intuition supplies the basis of religious faith. (2.) Although the Bráhmas do not consider any book written by man the basis of their religion, yet they do accept with respect and pleasure any religious *truth* contained in any book. (3.) The Bráhmas believe that the religious condition of man is progressive, like the other departments of his condition in this world. (4.) They believe that the fundamental doctrines of their religion are also the basis of every true religion. (5.) They believe in the existence of one Supreme God — a God endowed with a distinct personality, moral attributes worthy of His nature, and an intelligence befitting the Governor of the universe, and they worship Him alone. They do not believe in any of His incarnations. (6.) They believe in the immortality and progressive state of the soul, and declare that there is a state of conscious existence succeeding life in this world and supplementary to it as respects the action of the universal moral government. (7.) They believe that repentance is the only way to salvation. They do not recognize any other mode of reconcilement to the offended but loving father. (8.) They pray for *spiritual* welfare, and believe in the *efficacy* of such prayers. (9.) They believe in the providential care of the divine Father. (10.) They avow that love towards Him, and the performances of the works which He loves, constitute His worship. (11.) They recognize the necessity of public worship, but do not believe that communion with the Father depends upon meeting in any fixed place at any fixed time. They maintain that they can adore Him at any time and at any place, provided that the time and the place are calculated to compose and direct the mind towards Him. (12.) They do not believe in pilgrimages, and declare that holiness can only be attained by elevating and purifying the mind. (13.) They put no faith in rites or ceremonies, nor do they believe in penances, as instrumental in obtaining the grace of God. They declare that moral righteousness, the gaining of wisdom, divine contemplation, charity, and the cultivation of devotional feelings are their rites and ceremonies. They further say, Govern and regulate your feelings, discharge your duties to God and to man, aud you will gain everlasting blessedness; purify your heart, cultivate devotional feelings, and you will see Him who is unseen. (14.) Theoretically there is no distinction of caste among the Bráhmas. They declare that we are all the children of God, and therefore must consider ourselves as brothers and sisters.

BRAHMANISM is a term commonly used to denote a system of religious institutions originated and elaborated by the *Brāhmans*, the sacerdotal and, from an early period, the dominant caste of the Hindū community. In like manner, as the language of the Āryan Hindūs has undergone continual processes of modification and dialectic division, so their religious belief has passed through various stages of development broadly distinguished from one another by certain prominent features. The earliest phases of religious thought in India of which a clear idea can now be formed are exhibited in a body of writings, looked upon by later generations in the light of sacred writ, under the collective name of *Veda* ("knowledge") or *Sruti* ("revelation"). The Hindū scriptures consist of four separate collections, or *Sanhitās*, of sacred texts, or *Mantras*, including hymns, incantations, and sacrificial forms of prayer, viz., the *Rich* or *Rigveda*, the *Sāman* or *Sāmaveda*, the *Yajush* or *Yajurveda*, and the *Atharvan* or *Atharvaveda*. Each of these four text-books has attached to it a body of prose writings called *Brāhmanas*, which presuppose the Sanhitās, purporting as they do to explain chiefly the ceremonial application of the texts and the origin and import of the sacrificial rites for which these

were supposed to have been composed. Besides the *Brāhmanas* proper, these theological works, and in a few isolated cases some of the Sanhitās include two kinds of appendages, the *Aranyakas* and *Upanishads*, both of which, and especially the latter, by their language and contents, generally betray a more modern origin than the works to which they are annexed. The subject of the former class of these treatises is on the whole similar to that of the *Brāhmanas*, which they supplement, giving at the same time somewhat more prominence to the mystical sense of the rites of worship. The *Upanishads*, on the other hand, are taken up to a great extent with speculations on the problems of the universe aud the religious aims of man,—subjects often touched upon in the earlier writings, but here dealt with in a more mature and systematic way. Two of the *Sanhitās*, the *Sāman* and the *Yajush*, owing their existence to purely ritual purposes, and being, besides, the one almost entirely, the other partly, composed of verses taken from the *Rigveda* are only of secondary importance for our present inquiry. The hymns of the *Rigveda* constitute the earliest lyrical effusions of the Āryan settlers in India which have been handed down to posterity. They are certainly not all equally old; on the contrary they evidently represent the literary activity of many generations of bards, though their relative age cannot as yet be determined with anything like certainty. The tenth and last book of the collection, however, at any rate has all the characteristics of a later appendage, and in language and spirit many of its hymns approach very nearly to the level of the contents of the *Atharvan*. Of the latter collection about one-sixth is found also in the *Rigveda*, and especially in the tenth book; the larger portion peculiar to it, though including no doubt some older pieces, appears to owe its origin to an age not long anterior to the composition of the *Brāhmanas*.

The state of religious thought among the ancient bards, as reflected in the hymns of the *Rigveda*, is that of a worship of the grand and striking phenomena of nature regarded in the light of personal conscious beings, endowed with a power beyond the control of man, though not insensible to his praises and actions. It is a nature-worship purer than that met with in any other polytheistic form of belief we are acquainted with,—a mythology still comparatively little affected by those systematizing tendencies which, in a less simple and primitive state of thought, lead to the construction of a well-ordered pantheon and a regular organization of divine government. To the mind of the early Vedic worshipper the various departments of the surrounding nature are not as yet clearly defined, and the functions which he assigns to their divine representatives continually flow into one another. Nor has he yet learned to care to determine the relative worth and position of the objects of his adoration; but the temporary influence of the phenomenon to which he addresses his praises bears too strongly upon his mind to allow him for the time to consider the claims of rival powers to which at other times he is wont to look up with equal feelings of awe and reverence. It is this immediateness of impulse under which the human mind in its infancy strives to give utterance to its emotions that imparts to many of its outpourings the ring of monorheistic fervor.

The generic name given to these impersonations, viz., *deva* ("the shining ones"), points to the conclusion, sufficiently justified by the nature of the more prominent objects of Vedic adoration as well as by common natural occurrences, that it was the beautiful phenomena of light which first and most powerfully swayed the Āryan mind. In the primitive worship of the manifold phenomena of nature it is not, of course, so much their physical aspect that impresses the human heart as the moral and intellectual forces which are supposed to move and animate them. The attributes and relations of some of the Vedic deities, in accordance with the nature of the objects they represent, partake in a high degree of this spiritual element; but it is not improbable that in an earlier phase of Āryan worship the religious conceptions were prevaded by it to a still greater and more general extent, and that the Vedic belief, though retaining many of the primitive features, has on the whole assumed a more sensuous and anthropomorphic character. This latter element is especially predominant in the attributes and imagery applied by the Vedic poets to *Indra*, the god of the atmospheric region, the favorite figure in their pantheon. While the represenatives of the prominent departments of nature appear to the Vedic bard as consisting in a state of independence of one another, their relation to the mortal worshipper being the chief subject of his anxiety, a simple method of classification was already resorted to at an early time, consisting in a triple division of the dieties into gods residing in the sky, in the air, and on earth. It is not, however, until a later stage,—the first clear indication being conveyed in a passage of the tenth book of the *Rigveda*, that this attempt at a polytheistic system is followed up by the promotion of one particular god to the dignity of chief guardian for each of these three regions. On the other hand a tendency is clearly traceable in some of the hymns towards identifying gods whose functions present a certain degree of similarity of nature; these attempts would seem to show a certain advance of religious reflection, the first steps from polytheism towards a comprehension of the unity of divine essence. Another feature of the old Vedic worship tended to a similar result. The great problems of the origin and existence of man and universe had early begun to engage the Hindū mind; and in celebrating the praises of the gods the poet wâs frequently led by his religious, and not wholly disinterested, zeal to attribute to them cosmical functions of the very highest order. At a later stage of thought, chiefly exhibited in the tenth book of the *Rigveda* and the *Atharvaveda*, inquiring sages could not but perceive the inconsistency of such concessions of a supremacy among the divine rulers, and tried to solve the problem by conceptions of an independent power, endowed with all the attributes of a supreme deity, the creator of the universe, including the gods of the pantheon. The names under which this monotheistic idea is put forth are mostly of an attributive character, and indeed some of them, such as *Prajāpati* ("lord of creatures"), *Visvakarman* ("all doer"), occur in the earlier hymns as mere epithets of particular gods. But to other minds this theory of a personal creator left many difficulties unsolved. They saw, as the poets of old had seen, that everything around them, that man himself, was directed by some inward agent; and it needed but one step to perceive the essential sameness of these spiritual units, and to recognize their being but so many individual manifestations of one universal principle. Thus a pantheistic conception was arrived at, put forth under various names, such as *Purusha* ("soul"), *Kāma* ("desire"), *Brâhman* (neutr.; nom. sing. *brâhma*) ("devotion, prayer"). Metaphysical and theosophic speculations were thus fast undermining the simple belief in the old gods, until, at the time of the composition of the *Brāhmanas* and *Upanishads*, we find them in complete possession of the minds of the theologians. Whilst the theories crudely suggested in the later hymns are now further matured and elaborated, the tendency towards catholicity of formula favors the combination of

the conflicting monotheistic and pantheistic conceptions; this compromise, which makes *Prajāpati*, the personal creator of the world, the manifestation of the impersonal *Bráhma*, the universal self-existent soul, leads to the composite pantheistic system which forms the characteristic dogma of the Brāhmanical period.

The spirit of Vedic worship is pervaded by a strong belief in the efficacy of invocation and sacrificial offering. The earnest and well-expressed prayer cannot fail to draw the divine power to the worshipper and make it yield to his supplication; and offerings, so far from being mere acts of devotion which give pleasure to the god, represent the very food and drink which render him vigorous and capable of battling with the enemies of his mortal friend. This intrinsic power of invocation found an early expression in the term *bráhma* (neuter) ("religious devotion, prayer, hymn"); and its independent existence as an active moral principle in shaping the destinies of man became recognized in the Vedic pantheon in the conception of a god, *Brihaspati* or *Brāhmanaspati* ("lord of prayer"), the guardian of the pious worshipper. This feature in the Hindū belief could scarcely fail early to engender and foster in the minds of the people feelings of esteem and reverence towards those who possessed the inspired gift of poetical expression, as well as those who had acquired an intimate knowledge of the various forms of ritual worship. The common term used in the Veda for the officiating priest is *brahmán*, originally denoting, it would seem, "one who prays, a worshipper," or "the composer or reciter of a hymn." In some passages the word also signifies a special class of priests who officiated as superintendents during sacrificial ceremonies, the complicated nature of which required the co-operation of several priests. It is probable that in most cases the function of the poet or composer of hymns was combined with that of a minister of worship. In the Vedic hymns two classes of society, the royal (or military) and the priestly classes, were evidently recognized as being raised above the level of the *Vis*, or bulk of Aryan community. These social grades seem to have been in existence even before the separation of the two Asiatic branches of the Indo-European race, the Aryans of Iran and India. It is true that, although the *Athrava*, *Rathaēstāo*, and *Vāstrya* of the *Zend Avesta* correspond in position and occupation to the *Brāhman*, *Rājan*, and *Vis* of the Veda, there is no similarity of names between them; but this fact only shows that the common vocabulary had not yet definitely fixed on any specific names for these classes. Even in the Veda their nomenclature is by no means limited to a single designation for each of them. Moreover, *Atharvan* occurs not infrequently in the hymns as the personification of the priestly profession, as the proto-priest who is supposed to have obtained fire from heaven and to have instituted the rite of sacrifice; and although *ratheshtha* ("standing on a car") is not actually found in connection with the *Rājan* or *Kshatriya*, its synonym *rathin* is in later literature a not unusual epithet of men of the literary caste. At the time of the hymns, and even during the common Indo-Persian period, the sacrificial ceremonial had already become sufficiently complicated to call for the creation of a certain number of distinct priestly offices with special duties attached to them. While this shows clearly that the position and occupation of the priest were those of a profession, the fact that the terms *brāhmana* and *brahmaputra*, both denoting "the son of a brahman," are used in certain hymns as synonyms of Brahman, seems to justify the assumption that the profession had already, to a certain degree, become hereditary at the time when these hymns were composed. There is, however, with the exception of a solitary passage in a hymn of the last book, no trace to be found in the *Rigveda* of that rigid division into four castes separated from one another by unsurmountable barriers, which in later times constitutes the distinctive feature of Hindū society. The idea of caste is expressed by the Sanskrit term *varna*, originally denoting "color," thereby implying differences of complexion between the several classes. The word occurs in the Veda in the latter sense, but it is used there to mark the distinction, not between the three classes of the Aryan community, but between them on the one hand and a dark-colored hostile people on the other. The latter, called Dāsas or Dāsyus, consisted, no doubt, of the indigenous tribes, with whom the Aryans had to carry on a continual struggle for the possession of the land. The partial subjection of these comparatively uncivilized tribes, as the rule of the superior race was gradually spreading eastward, and their submission to a state of serfdom under the name of *Sūdras*, added to the Aryan community an element, totally separated from it by color, by habits, by language, and by occupation. Moreover, the religious belief of these tribes being entirely different from that of the conquering people, the pious Aryas, and especially the class habitually engaged in acts of worship, could hardly fail to apprehend considerable danger to the purity of their own faith from too close and intimate a contact between the two races. What more natural, therefore, than that measures should have been early devised to limit the intercourse between them within as narrow bounds as possible?

The definitive establishment of the Brāhmanical hierarchy marks the beginning of the Brāhmanical period properly so called. Though the origin and gradual rise of some of the leading institutions of this era can, as has been shown, be traced in the earlier writings, the chain of their development presents a break at this juncture which no satisfactory materials enable us to fill up. A considerable portion of the literature of this time has apparently been lost; and several important works, the original composition of which has probably to be assigned to the early days of Brāhmanism, such as the institutes of Manu and the two great epics, the *Mahābhārata* and *Rāmāyana*, in the form in which they have been handed down to us, show manifest traces of a more modern redaction. Yet it is sufficiently clear from internal evidence that Manu's Code of Laws, though it is merely a metrical *rifacimento* of older materials, reproduces on the whole pretty faithfully the state of Hindū society depicted in the sources from which it was compiled. The final overthrow of the Kshatriya power was followed by a period of jealous legislation on the part of the Brāhmans. For the time their chief aim was to improve their newly gained vantage-ground by surrounding everything connected with their order with a halo of sanctity calculated to impress the lay community with feelings of awe. In the Brāhmanas and even in the Perusha Hymn, and the Atharvan, divine origin had already been ascribed to the Vedic Sanhitās, especially to the three older collections. The same privilege was now successfully claimed for the later Vedic literature, so imbued with Brāhmanic aspirations and pretensions; and the authority implied in the designation of *Sruti* or revelation removed henceforth the whole body of sacred writings from the sphere of doubt and crititism. This concession necessarily involved an acknowledgment of the new social order as a divine institution. Its stability was, however, rendered still more secure by the elaboration of a system of conventional precepts, partly forming the basis of Manu's Code, which clearly defined the relative position and the duties of the several castes, and determined the

penalties to be inflicted on any transgressions of the limits assigned to each of them. These laws are conceived with no humane or sentimental scruples on the part of their authors. On the contrary, the offences committed by Brāhmans against other castes are treated with remarkable clemency, whilst the punishments inflicted for trespasses on the rights of higher classes are the more severe and inhuman the lower the offender stands in the social scale. The three first castes, however unequal to each other in privilege and social standing, are yet united by a common bond of sacramental rites (*sanskāras*), traditionally connected from ancient times with certain incidents and stages in the life of the Aryan Hindū, as conception, birth, name-giving, the first taking out of the child to see the sun, the first feeding with boiled rice, the rites of tonsure and hair cutting, the youth's investiture with the sacrificial thread, and his return home on completing his studies, marriage, funeral, &c. The modes of observing these family rites are laid down in a class of writings called *Grihya-sūtras*, or domestic rules. The most important of these observances is the *upanayana*, or rite of conducting the boy to a spiritual teacher. Connected with this act is the investiture with the sacred cord, ordinarily worn over the left shoulder and under the right arm, and varying in material according to the class of the wearer. This ceremony being the preliminary act to the youth's initiation into the study of the Veda, the management of the consecrated fire and the knowledge of the rites of purification, including the *sāvitrī*, a solemn invocation to *savitri*, the sun, which has to be repeated every morning and evening before the rise and after the setting of that luminary, is supposed to constitute the second or spiritual birth of the Arya. It is from their participation in this rite that the three upper classes are called the twice-born. The ceremony is enjoined to take place some time between the eighth and sixteenth year of age in the case of a Brāhman, between the eleventh and twenty-second year of a Kshatriya, and between the twelfth and twenty-fourth year of a Vaisya. He who has not been invested with the mark of his class within this time is for ever excluded from uttering the sacred *sāvitrī* and becomes an outcast, unless he is absolved from his sin by a council of Brāhmans, and after due performance of a purificatory rite resumes the badge of his caste. With one not duly initiated no righteous man is allowed to associate or to enter into connections of affinity. The duty of the Sūdra is to serve the twice-born classes, and above all the Brāhmans. He is excluded from all sacred knowledge, and if he performs sacrificial ceremonies he must do so without using holy mantras. No Brāhman must recite a Vedic text where a man of the servile caste might overhear him, nor must he even teach him the laws of expiating sin. The occupations of the Vaisya are those connected with trade, the cultivation of the land and the breeding of cattle; while those of a Kshatriya consist in ruling and defending the people, administering justice, and the duties of military profession generally. Both share with the Brāhman the privilege of reading the Veda, but only so far as it is taught and explained to them by their spiritual preceptor. To the Brāhman belongs the right of teaching and expounding the sacred texts, and also that of interpreting and determining the law and the rules of caste. Only in exceptional cases, when no teacher of the sacerdotal class is within reach, the twice-born youth, rather than forego spiritual instruction altogether, may reside in the house of a non-Brāhmanical preceptor; but it is specially enjoined that a pupil, who seeks the path to heaven, should not fail, as soon as circumstances permit, to resort to a Brāhman well versed in the Vedas and their appendages.

Notwithstanding the barriers placed between the four castes, the practice of intermarrying appear to have been too prevalent in early times to have admitted of measures of so stringent a nature as to wholly repress it. To marry a woman of a higher caste, and especially of a caste not immediately above one's own, is, however, decidedly prohibited, the offspring resulting from such a union being excluded from the performance of the srāddha or obsequies to the ancestors, and thereby rendered incapable of inheriting any portion of the parents' property. On the other hand, men are at liberty, according to the rules of Manu, to marry a girl of any or each of the castes below their own, provided they have besides a wife belonging to their own class, for only such a one should perform the duties of personal attendance and religious observance devolving upon a married woman. As regards the children born from unequal marriages of this description, they have the rights and duties of the twice-born, if their mother belong to a twice-born caste, otherwise they, like the offspring of the former class of intermarriages, share the lot of the Sūdras, and are excluded from the investiture and the sāvitrī. For this last reason the marriage of a twice-born man with a Sūdra woman is altogether discountenanced by some of the later law books.

The pious Brāhman, longing to attain the *summum bonum* on the dissoluion of his frail body, was enjoined to pass through a succession of four orders or stages of life, viz., those of *brahmachārin*, or religious student; *grihastha* (or *grihamedhin*), or householder; *vananvāsin* (or *vānaprastha*), or anchorite; and *sannyāsin* (or *bhikshu*), or religious mendicant. Theoretically this course of life was open and even recommended to every twice-born man, his distinctive class-occupation being in that case restricted to the second station, or that of married life. Practically, however, those belonging to the Kshatriya and Vaisya castes were, no doubt, contented, with few exceptions, to go through a term of studentship in order to obtain a certain amount of religious instruction before entering into the married state, and plying their professional duties. On the youth having been invested with the sign of his caste, he was to reside for some time in the house of some religious teacher, well read in the Veda, to be instructed in the knowledge of the scriptures and the scientific treatises attached to them, in the social duties of his caste, and in the complicated system of purificatory and sacrificial rites. According to the number of Vedas he intended to study, the duration of this period of instruction was to be, probably in the case of Brāhmanical students chiefly, of from twelve to forty-eight years; during which time the virtues of modesty, duty, temperance, and self-control were to be firmly implanted in the youth's mind by his unremitting observance of the most minute rules of conduct. During all this time the Brāhman student had to subsist entirely on food obtained by begging from house to house; and his behavior towards the preceptor and his family was to be that prompted by respectful attachment and implicit obedience. In the case of girls no investiture takes place, but for them the nuptial ceremony is considered as an equivalent for that rite. On quitting the teacher's abode, the young man returns to his family and takes a wife. To die without leaving legitimate offspring, and especially a son, to perform the periodical rite of obsequies, consisting of offerings of water and cakes, to himself and his ancestors, is considered a great misfortune by the orthodox Hindū. There are three sacred "debts" which a man has to discharge in life, viz., that which is due to the gods, and of which he acquits himself by daily worship and sacrificial rites; that due to the *rishis*, or ancient sages and inspired seers of

the Vedic texts, discharged by the daily study of the scripture; and the "final debt" which he owes to his *manes*, and of which he relieves himself by leaving a son. To these th ee some authorities add a fourth, viz., the debt owing to humankind, which demands his continually practicing kindness and hospitality. Hence the necessity of the man's entering into the married state.

When the householder is advanced in years, "when he perceives his skin become wrinkled and his hair grey, when he sees the son of his son," the time is said to have come for him to enter the third stage of life. He should now disengage himself from all family ties, — except that his wife may accompany him, if she chooses, — and repair to the lonely wood, taking with him his sacred fires and the implements required for the daily and periodical offerings. Clad in a deer's skin, in a single piece of cloth, or in a bark garment, with his hair and nails uncut, the hermit is to subsist exclusively on food growing wild in the forest, such as roots, fruit, green herbs, and wild rice and grain. He must not accept gifts from any one, except of what may be absolutely necessary to maintain him; but with his own little hoard he should, on the contrary, honor, to the best of his ability, those who visit his hermitage. His time must be spent in reading the metaphysical treatises of the Veda, in making oblations, and in undergoing various kinds of privation and austerities, with a view to mortifying his passions and producing in his mind an entire indifference to worldly objects. Having by these means succeeded in overcoming all sensual affections and desires, and in acquiring perfect equanimity towards everything around him, the hermit has fitted himself for the final and most exalted order, that of devotee or religious mendicant.

Mr. Sherring, in his *Hindu Tribes and Castes*, makes the following remarks on the Brāhmanical caste at the present day: — "The Brahman occupies the highest rank among Hindus for at least three reasons. The first is his assumed sanctity. By the people generally he is regarded as a pure, stainless, twice-born being, divine as well as human, worthy of unbounded admiration and worship. He is the priest of the Hindu religion, directing the ceremonies performed at the temples, sacred wells, sacred tanks, sacred rivers, and at all hallowed places throughout the land. He is present to sanction, and give effect to, the great social festivals of his countrymen held at marriages, at births of sons, and at deaths. He casts the horoscope, tells the lucky days, gives spiritual counsel, whispers *mantras* or mysterious words, executes magical incantations and charms, and is at once household god, family priest, and general preceptor and guide in behalf of the many millions of Hindus residing in the vast country lying between the Himalayas and Cape Comorin. The second reason of the Brahman's superiority is that, for many ages, perhaps from the outset of his career, when with other Aryans he first entered the plains of India, he has been intellectually in advance of the rest of the Hindu race. . . . The third reason is a consequent of the second. The Brahman is not only a thinking, but also a reading man. He possesses and, perhaps, reads the holy canon — Vedas, Shastras, and Purānas. He has been the author of Hindu literature. . . . Light of complexion, his forehead ample, his countenance of striking significance, his lips thin, and mouth expressive, his eyes quick and sharp, his fingers long, his carriage noble and almost sublime, the true Brahman, uncontaminated by European influence and manners, with his intense self-consciousness, with the proud conviction of superiority depicted in every muscle of his face, and manifest in every movement of his body, is a wonderful specimen of humanity walking on God's earth. Yet the Brahman has lived his day. His prestige is rapidly on the decline, and is only maintained at its ancient pitch in remote villages and in the fastnesses of superstition in great cities. Here, as of old, it envelops him like a glory."

BRAHMAPUTRA, one of the largest rivers of India, with a total length of 1,800 miles, rises near Lake Mánsarowar in the plateau of Thibet, where it is known by the name of Sánpu, flows eastward for about 1,000 miles, and, skirting round the eastern passes of the Himalayas not far from the Yang-tse-kiang and the great river of Cambodia, enters the plain of British India on the northeastern frontier of Assam. It then runs westward, dividing the province of Assam into two unequal portions, turns southward into Eastern Bengal, and joins the Ganges opposite Goálanda, the terminus of the Eastern Bengal railway. The united stream then flows southwest, joins the Meghná, and after another southern stretch of about 100 miles, empties itself into the Bay of Bengal.

BRAHMS, JOHANNES, composer, was born in Hamburg, Germany, May 7, 1833. Of all modern composers he is held to approach most nearly to Beethoven.

BRAIN. See ANATOMY, PHYSIOLOGY, PSYCHOLOGY, and MENTAL DISEASES.

BRAINERD, the county seat of Crow Wing county, Minn., a railroad and telegraph town of 7,500 people. It possesses good railroad communications and is an important shipping point for grain. It contains a bank, sawmills, hotels, five churches, and several schools.

BRAINERD, DAVID, one of the most zealous and successful of modern Christian missionaries, was born at Haddam, in the state of Connecticut, in 1718, and died October 9, 1747, in the house of his friend President Edwards.

BRAINTREE, the Raines of *Domesday Book*, a market-town of Essex, eleven miles N. by E. of Chelmsford, England. Population, 5,000.

BRAINTREE, a post-village of Norfolk county, Mass., ten miles south of Boston. It contains a bank, an academy, a newspaper office, and manufactures of paper, boots and shoes, and other articles. It has good railroad and telegraph facilities. Population, 4,848.

BRAKE, a town in the Grand Duchy of Oldenburg, on the left bank of the Wesser, about half-way between Bremen and the mouth of the river. Population, 4,000.

BRAKE is an instrument by means of which mechanical energy may be expended in overcoming friction. It is used for several entirely different purposes, the principal of these being (*a*) to limit or decrease the velocity of, or in some cases to bring completely to rest, the body or system of bodies imparting the energy; (*b*) to measure directly the amount of frictional resistance between two bodies; or (*c*) to measure, indirectly, the amount of energy given out by the body or system of bodies producing it.

The first case is the familiar one occurring in the brakes of locomotives, railway carriages, and wheeled vehicles generally, and in those applied to such machines as cranes, winches, &c. Here some systems of bodies,— or for simplicity's sake we may say some body, — originally at rest has been set in motion, and has received acceleration up to a certain velocity, the work which has been done in that acceleration being stored up as "actual energy" in the body itself. Before it can be brought to rest it must part with this energy, expending it in overcoming some external resistance. Very frequently the actual energy is very large in proportion to the usual resistance opposing the motion of the body, so that that motion would continue for a long time, or through a great distance, before the whole energy had been expended and the body brought to rest.

The construction of railway brakes falls to be treated in detail in the article RAILWAYS. In other vehicles the brake belongs generally to one of two classes — it is either a block which can be pressed against a wheel by a suitable arrangement of levers under the control of the driver, or a slipper or "skid" which can be placed under a wheel, and which is attached by a chain or otherwise to the body of the vehicle. The increased resistance is due in the one case to the friction between the block and the wheel, and in the other to that between the skid and the road.

BRAMAH, JOSEPH, a practical engineer and machinist, was born at Stainborough, in Yorkshire, on the 13th of April, 1749. He died in his sixty-sixth year, on the 9th December 1814.

BRAMANTE, or BRAMANTE LAZZARI, one of the most celebrated architects of Italy, famous also as a painter, was born at Casteldurante, in Urbino, in July, 1444. He showed a great taste for drawing, and was at an early age placed under a painter of some distinction, Fra Bartolommeo, called Fra Carnavale. But though he afterwards gained some fame as a painter, his attention was soon absorbed by the sister art, architecture. He died in 1514.

BRAMANTINO. See SUARDI.

BRAMBANAN, a village in Java, notable for extensive and remarkable ruins of Hindu character. The remains embrace six large groups of temples in addition to two buildings intended for residence, perhaps monastic.

BRAN is the material obtained from the outer covering or husk of grain during the process of grinding, and which is separated from the finer flour before the latter is made into bread; 100 parts contain: Water, 14; fibrin, etc., 15; starch, 44; fat, 4; lignose and cellulose, 17; ash, 6. Bran contains a nitrogenous body called cerealin, which is capable of producing a chemical change in the starch, dextrin, etc., of flour. Bread made of flour containing bran is known as brown bread. Bran is used in clearing and brightening goods during the processes of dyeing and calico printing. In medicine bran is employed in warm poultice in abdominal inflammation, spasms, etc., and an infusion is used as an emollient foot-bath.

BRANCHIOPODA, a sub-order of Crustaceans in the order with leaf-like feet (Phyllopods). The name (gill-footed) refers to the fact that many of the numerous (10–40 pairs) appendages bear respiratory appendages.

BRANCO, RIO, a river of Northern Brazil, rising in the Parima Mountains and flowing 400 miles to the Rio Negro.

BRAND is the mark made upon the skins of cattle for the purpose of identification, as in cattle ranches, or a mark made on a cask or box for trade or excise purposes. The name brand is given to the fungoid diseases or blights of grain crops. Branding has been practiced from very early times. The Greeks marked their slaves with the *stigma;* in Rome, runaway slaves (*fugitivi*) and thieves (*fures*) were branded with the letter F; and the slaves who worked in the mines, and convicts condemned to the games or to the mines, were also branded on the forehead for identification. In France down to 1832, galley slaves were marked T F (*travaux forces*). Under the ancient law of England, branding was practiced for various offenses. It was discontinued in England in the reign of George III., and finally done away with in 1829. Army "branding" with the letter D or B C (deserter or bad character) by tattooing was abolished in 1879.

BRANDE, WILLIAM THOMAS, chemist, was born at London in 1788. He died on February 11, 1866. Besides numerous papers, which marked him out as one of the most vigorous and able chemists of the day, Brande was the author of some important works. The *Manual of Chemistry*, 1819, and *Elements of Chemistry*, 1831, were the best works of the time, and soon became popular. He also published a *Dictionary of Materia Medica* in 1839, and a *Dictionary of Science, Literature, and Art* in 1842. The latter is an exceedingly able and valuable work of reference; a new edition of it has recently appeared under the editorship of Mr. G. W. Cox, 1875. Brande was the author of the third of the Dissertations (that on the progress of Chemical philosophy) prefixed to the supplement of the fourth edition of the *Encyclopædia Britannica*.

BRANDENBURG, one of the largest provinces of Prussia, and the division from which that powerful monarchy originally sprung, is bounded on the N. by Mecklenburg and the province of Pomerania, E. by Posen and Silesia, S. by Silesia and the kingdom and province of Saxony, and W. by Anhalt and the provinces of Saxony and Hanover. It has an area of 15,403 square miles, and is divided into the two governments of Potsdam and Frankfort, the capital, Berlin, forming a separate jurisdiction. The province is a sandy plain interspersed with numerous fertile districts and considerable stretches of woodland. Its barrenness was formerly much exaggerated, and it was popularly described as the sandbox of the Holy Roman Empire. Population (1890), 3,500,000.

BRANDENBURG, a town of Prussia, capital of the circle of West Havelland, in the government of Potsdam, and province of Brandenburg. It is situated on the River Havel, and on the Magdeburg and Berlin Railway, 37 miles W.S.W. of Berlin. Pop., 28,000.

BRANDIS, CHRISTIAN AUGUST, a distinguished scholar and historian of Greek Philosophy, was born on 13th February 1790 at Hildesheim. In 1812 he graduated at the university of Copenhagen, and presented as his thesis "Commentationes Eleaticæ," a careful collection of the fragments of Xenophanes, Parmenides, and Melissus. Two years later he attended the university of Göttingen, and in 1815 presented as his inaugural dissertation at Berlin an essay *On the Idea of the History of Philosophy*. In 1816 he had the offer of an extraordinary professorship at Heidelberg, but preferred to accompany Niebuhr to Italy. Six years were spent in examination of the principal libraries, and Brandis began the labors on Aristotle which were to occupy many years of his life. In 1821 he was made professor of philosophy in the newly founded university of Bonn, and in 1823 appeared his edition of the *Metaphysics* of Aristotle. His articles on Socrates (1827, 1829) are particularly deserving of notice. In 1835 appeared the first part of his great work, *Handbuch der Geschichte der Griechisch-röm. Phil.*, and in 1836 the *Scholia in Aristotelem*, forming the 4th volume of the Berlin edition of Aristotle. The following three years were spent in Greece, whither he had gone as instructor to the young king Otho. The remainder of his life was devoted to his history of Greek philosophy, the last part of which was published in 1866, little more than a year before his death, which took place on the 24th July 1867.

BRANDT, SEBASTIAN, German satirist, was born at Strasburg about 1458, and died in 1521.

BRANDY, a spirituous liquor obtained by the distillation of wine, the aroma of which is due to ether and other volatile products. It may be distilled from any wine, but red wines yield a less pure and less aromatic spirit than light colored varieties. In the departments of Charente and Charente Inférieure a variety of grape is cultivated exclusively for the production of brandy, the yield of which constitutes the cognac of commerce.

BRANDYWINE CREEK, a stream rising in Chester county, Penn., flowing with a general southeasterly course into Delaware, and emptying into Christiana Creek at Wilmington. During the War of Independence, a battle was fought on its banks near Westchester, September 11, 1777.

BRANTFORD, a town of the Dominion of Canada, in the province of Ontario, capital of the county of Brant, is situated on the Grand River, about twenty-four miles southwest of Hamilton. It is an important station on the Goodrich & Buffalo line, with extensive engine works and foundries. Brass, iron and tin wares, agricultural implements, window blinds, and pottery are its principal manufactures. It is lighted with gas, and has a good supply of water. As the river is not navigable as far as the town, a canal has been constructed which gives communication with Lake Erie. There are fine county buildings, ten churches, an orphanage, banks and newspaper offices. Pop. in 1890, 11,000.

BRANTOME, PIERRE DE BOURDEILLES, SEIGNEUR DE, French historian and biographer, was born about 1540. He was the third son of the Viscount de Bourdeilles, and at an early age entered the profession of arms. He approved himself a brave soldier, and was brought into contact with most of the great leaders who were seeking fame or fortune in the wars that then distracted the Continent. Soon after the death of Charles IX. he retired from active life, and spent his last years in writing his *Memoirs* of the illustrious men and women whom he had known. He died on July 15, 1614. He left distinct orders that his manuscript works should be printed, and a first edition appeared in 1665-6, not very complete. Of the later editions, the most valuable are one in fifteen volumes, 1740; another in eight volumes, 1787; one in two volumes, 1842, by Buchon; that of the *Bibliothèque Elzevirienne* in three volumes, 1858–9, and Lalanne's edition for the Société de l'Histoire de France, six volumes, 1865, *seq.* Brantôme can hardly be regarded as a historian proper, and his *Memoirs* cannot be accepted as a very trustworthy source of information. But he writes in a quaint conversational way, pouring forth his thoughts, observations, or facts without order or system, and with the greatest frankness and naïveté. His works gave an admirable picture of the court-life of the time.

BRASIDAS, one of the most famous of the Spartan leaders in the early part of the Peloponnesian War, first distinguished himself by the relief of Methone, which was besieged by the Athenians, (431 B.C.) For this service he was publicly commended at Sparta. In 429 he was sent to assist Cnemus, and appears to have taken part in the unsuccessful attack on the Piræeus. Two years later he accompanied the admiral Alcidas to Corcyra, but did not succeed in inducing his superior to make an attack on the city. He was severely wounded in the assault on Pylas (425), and lost his shield, which was picked up and carried in their triumph by the Athenians. When it was resolved by Sparta to carry the war into Thrace, Brasidas was selected as leader. He relieved Megara in 424, and in the same year succeeded in passing through Thessaly and in effecting a junction with Perdiccas of Macedon. He assisted Perdiccas to put down a revolted vassal, Arrhibæus, and then, in an extremely short time, partly by his skilful policy, partly by the rapidity and boldness of his movements, succeeded in gaining possession of Acanthus, Stagira, Amphipolis, and Torone. In the spring of 423 a truce was agreed upon; but Brasidas insisted upon retaining Scione, which had capitulated a day or two after the truce began; this was denied, however, by the Spartan general. The revolt of the Mende gave him another opportunity and he seized that town. Later in the same year he again accompanied Perdiccas against Arrhibæus, and made a most skilful retreat. He received no reinforcements from Sparta, where the leaders seemed jealous of his success, his conciliatory manners, and his dexterous policy. The Athenians, on the other hand, sent out a new armament, retook Mende, and repelled an assault on Potidæa. In 422 Cleon with the fresh Athenian troops besieged Amphipolis. A swift sally, directed by the skilful generalship of the Spartan leader, was crowned with success. The Athenians were routed, and Cleon slain, but Brasidas himself was mortally wounded. He was interred at Amphipolis, the inhabitants making him the founder of their city, and instituting yearly sacrifices and games to his memory.

BRASS, an alloy of copper and zinc, the composition of which will be discussed under the heading COPPER. Although the term brass frequently occurs in Scripture from the era of Job downwards, there is no indication that brass, as known in modern times, was in use previous to the period of the Roman empire. By the Romans a compound was used under the name *oricalchum* or *auricalchum*, which appears to have possessed the composition and properties of brass. With their conquests they carried a knowledge of the arts they cultivated into the countries they subdued, and from these the art of preparing the alloy extended with civilization throughout Europe. The earliest traces of brass in Great Britain are found in the mediæval monumental "brasses," found commonly over the tombs of civil and ecclesiastical dignitaries (see BRASSES). That the alloy was manufactured in England during the reign of Henry VIII., however, is indicated from the passing of an Act of Parliament prohibiting, under severe penalties, the export of brass, a prohibition which was not withdrawn till so recent a date as 1799. During the reign of Queen Elizabeth the manufacture was systematically developed and extended, and a patent for working calamine stone (the principal ore of zinc) and making brass was granted by the queen to William Humfrey and Christopher Schutz, securing to them the exclusive right of manufacturing brass. The patent rights granted to these persons were gradually extended and merged into a company under the name of the "Governors, Assistants, and Societies of the City of London of and for the Mineral and Battery Works," which continued to exercise its functions down to the year 1710. In the year 1721 it was estimated that about 30,000 persons found employment in the brass industries. From a very early date brassfounding was prosecuted in Birmingham, and by degrees it there assumed more important proportions till it has become the most distinguishing industrial feature of the town.

According to the different forms under which brass is to be employed it is fashioned by the various processes of — 1st, casting; 2d, rolling and drawing; 3d, stamping; and 4th, tube-drawing and casting; and 5th, brass-finishing.

Casting.—The first operation necessary in connection with casting is the preparation of patterns of the object to be cast. Castings, of course, vary in all degrees in intricacy and elaboration of details, and the getting up of the more ornamental patterns necessitates the employment of persons of artistic ability to prepare the design, and superior artisans to finish the pattern blocks. Three classes of castings are recognized in the trade — 1st, common castings, made from any plain pattern, an impression of which can be formed and the pattern taken out without breaking the mould; 2d, cored castings, such as plumbers' cocks and other tubular work, where the metal must be poured round a central core; and 3d, false-cored castings, where the pattern is so undercut that the mould must be built up of such a

BRAZIL AND GUAYANA.

Scale of English Miles.

0 25 50 100 200 300 400 500 600 700

Rand, McNally & Co., Engr's, Chicago.

BAHIA. English Miles. 0 2 4 6 8

U.S. OF COLOMBIA

Equator

Continuation of Brazil On Same Scale.

70° Longitude West from Greenwich

50° LONGITUDE WEST 46° FROM GREENWICH.

number of separable sections as the intricacies of the pattern may require.

Sheet Rolling and Wire Drawing.—The raw material of a large proportion of the brass trade consists of sheet-brass, as from it stamped work of all kinds is prepared, and jointed tubing and sheathing are made; and, generally, the processes of rolling must be adopted when sheets of large dimensions or of great thinness are required. For the purpose of rolling the metal is melted and cast in broad flat moulds of cast-iron; and in cases where a large quantity is dealt with, the moulds are hewn out in granite. These moulds are rubbed with oil and powdered with charcoal before being used. The ingots for rolling, termed "strips," are in the cold state passed successively between rolls (pairs of chilled-iron cylinders) of large size which squeeze them out and extend them lengthwise. As often as necessary in the process the sheet is annealed in a muffle or reverberatory furnace, being allowed to cool down after each annealing. The sheet is finished, after "pickling" in acid, by passing it through a pair of highly polished rolls.

Wire Drawing.— Brass wire is consumed in enormous quantities, first and chiefly for pin-making, next for shoe-rivets, then for brush-making, for paper-makers' wire web, and many other purposes. The metal for wire drawing is rolled into long strips of a suitable thickness and cut into "strands" by means of slitting rolls.

Stamping.—A large number of useful articles, as well as many ornamental details, which were formerly produced by the process of casting, are now cheaply and expeditiously made by stamping out of sheets of rolled brass.

Tube-making.—Brass tubes are of three principal kinds:—1st, ordinary soldered; 2d, cased; and 3d, solid tubing.

Brass Finishing.—The operations in brass finishing comprise "dipping," "burnishing," and "lacquering," and in some cases brass-work is finished by "bronzing." After the article to be finished has been cleaned by pickling in acid, it is passed for dipping into an earthenware jar containing a solution of aquafortis (nitric acid).

BRASSES, MONUMENTAL, a species of engraved sepulchral memorials which in the early part of the 13th century began to take the place of the tombs and effigies carved in stone, which formed such conspicuous features in most of the great churches. Made of hard *latten* or sheet brass, let into the pavement, and thus forming no obstruction in the space required for the services of the church, they speedily came into general use.

BRASSEY, THOMAS, an eminent English railway contractor, a man remarkable for his character and abilities, as well as for the vast extent and singular success of his undertakings, was born at Baerton, near Chester, November 7, 1805. He died in 1870.

BRATTLEBOROUGH, a post village of Windham county, Vt., on the Connecticut river, seventy-seven miles from Rutland, and 120 miles west-northwest of Boston. It contains two national and two savings banks, manufactories of carriages, machinery and furniture, and three newspaper offices. It is the seat of the Vermont Asylum for the Insane. Pop. (1890), 6,859.

BRAUNSBEBG, a town of Prussia, capital of a circle in the government of Königsberg, on the Passaye, between three or four miles from its mouth, in the Frische Haff. Population, 10,471.

BRAVURA, Italian. A florid air or song, with many difficult and rapid passages. Also used to describe the style of performance.

BRAWN (muscle, boar's flesh; akin to Ger. *braten*, to roast), a preparation of meat made from pig's head and ox-feet, cut up, boiled, pickled, and pressed.

BRAY, a seaport town and fashionable watering-place of Ireland, 12 miles S.S.E. of Dublin on the railway to Wexford. It is situated on both sides of the River Bray, which separates the two counties of Wicklow and Dublin, the portion in the latter county being known as Little Bray. Population (1890), 7000.

BRAY, SIR REGINALD, architect, was the second son of Sir Richard Bray, one of the privy council of Henry VI. He died in 1503.

BRAY, DR. THOMAS (1656-1730), was born at Marton, in Shropshire, and educated at Oxford. He was the author of *Catechetical Lectures*, *Martyrology, or Papal Usurpation*, *Directorium Missionarium*, and other works.

BRAZIL. In presenting an account of this extensive and important country, the second largest American republic, we shall give, *first*, a condensed view of its physical geography, meteorology, and natural products; *secondly*, a brief historical sketch of the progressive discovery of its coasts and interior, of its gradual settlement, and of the auspices under which its social institutions have developed themselves; and *thirdly*, an account of its existing political and social condition.

Brazil is bounded on the N. by Columbia or New Granada, Venezuela, and the Guianas, British, French, and Dutch; on the E. by the Atlantic; on the S. by the republics of Uruguay and the Argentine Confederation; and on the W. by Paraguay, Bolivia, Peru, and Ecuador. Its greatest length is about 2600 British miles, its greatest breadth about 2500; and it has a seaboard of about 4000 miles.

The original line of demarcation between the Portuguese and Spanish possessions was fixed by two bulls of Pope Alexander VI., the one of the 2d, the other of the 3d of May 1493. The kings of Castile and Portugal afterwards concluded the treaty of Torrizillas, which was approved by the Pope in 1529. The reunion of the two crowns in 1580 suspended all discussions about the boundaries. They, however, recommenced after the revolution and independence of Portugal. The treaty of Utrecht in 1777 regulated many points, but the treaties always referred to rivers, mountains, and other positions passing through deserts, the names of which were not well established. For many years the Government of Brazil has taken great pains to establish amicably with the neighboring states the boundary lines of its territory. In 1851 these were established with the republic of Uruguay, in 1857 with the Argentine Republic, in 1858 with Peru, in 1859 with Venezuela, in 1867 with Bolivia, and in 1872 with Paraguay. The lines determined on have in some cases been already surveyed and marked out on the actual frontier, while a number of commissions from Brazil and each neighboring country are employed in tracing out the other lines agreed upon.

With Uruguay the frontier has been marked out along a line passing from the coast in 33° 41′ S. lat. through the southern part of Lake Mirim and along the River Jaguarão, which falls into it, to its most southerly source stream, thence by a line crossing the head of the Rio Negro to the dividing ridge called the Cuchilla Sta. Anna, and afterwards down the stream of the Cuarein or Quarahim to the River Uruguay.

The Uruguay River, from the mouth of the Quarahim upwards to the confluence of the Pepiry on its right bank in 27° 10′ lat. divides Brazil from the Argentine Republic, the remainder of the mutual frontier of these countries being formed by the Pepiry to its source and the São Antonio from its rise to its union with the Y-Guasú or Curityba, which river marks the boundary to the Paraná.

Between Paraguay and Brazil the frontier runs from

the mouth of the Y-Guasú up the Alto Paraná to the great fall of Guayrá, called Sete Quedas by the Brazilians, and from that westward along the water-parting of the Cordillera of Maracajú southward of the basin of the Igatimi, to the heights of Amambahy, and along these to the source of the Rio-Apa-Estrella, following it down hence to the Paraguay.

With Bolivia the boundary lies along the Rio Paraguay from the mouth of the Apa in 22°, upwards to 20° 11′, where the Bahia Negra joins it; along the Bahia Negra, and thence in a line to the lake of Cáceres, cutting through the midst of this lagoon, and passing onward to lakes Mandioré, Gaiba, and Uberaba, and from the last to the south end of the ridge called Corixa Grande; from this in a direct line to Morro de Buenavista (Boavista), and to the sources of the Rio Verde; along the middle of that stream to its mouth in the Guapore, and along that river and the Mamore to the Beni, where the Madeira begins in 10° 20′ S.; a direct line thence to the source of the Yavari River (found by Chandless in 1867 to be a little south of 7° S. lat.), forms the limit of Brazil with Northern Bolivia and Central Peru. The Yavari continues the boundary between Brazil and Peru down its channel to the confluence with the Amazon at Tabatinga, and the limits commission has been at work for several years in determining the position of this line. Farther on, the boundary of Brazil with Northern Peru has been described as a line passing northward from Tabatinga towards the mouth of the Rio Apaporis in the River Japura, the frontier with Peru terminating on this line where it intersects the Rio Putumayo; and that with Ecuador beginning there. From the mouth of the Apaporis the continuation of the limit with Colombia or New Granada to that with Venezuela follows a line drawn along the water-parting of the range called the Collina do Guaicia or Serra Aracuara, which divides the streams flowing to the Guainia, or Rio Negro, above the Casiquiáre, from those which join it below the anastomosis of that natural canal. This line meets the Rio Negro about 20 miles below the separation of the Casiquiáre. From the Sierra Cucuhy, or Pão d'Azucar, on the opposite or left bank of the Rio Negro, the limit continues eastward over the level ground to the middle of the natural canal called the Maturacá which in times of flood unites the Cababoris tributary of the Rio Negro with the Barria, a sub-tributary of the Casiquiáre channel. Hence the limit is drawn from the Maturacá to the hill of Cupi, the first of the long range of Serras which divide the waters flowing to the Amazon from those tributary to the Orinoco, and those passing through British, Dutch, and French Guiana to the Atlantic. This boundary follows the curve of the water-parting eastward along the Serras named Guahy and Ucuruciro; northward on those of Tapirapecó and Parima; eastward again along the Merevary and Pacaraima heights; southward between the rivers Tacutu and Rupununy, and again generally eastward along the Serras of Acarahy and Tucumuraque to the source of the River Oyapok. This river, from its source to the Atlantic in 4° 22′ N. lat., is the present eastward limit of French Guiana. Several islets in the Atlantic belong to Brazil; among them that of Fernando Noronha, 250 miles from Cape S. Roque, high, and having about 6 square miles of area, is important as a penal settlement of the empire.

The immense territory comprised within the line just described and the Atlantic is upwards of 3,288,000 English square miles in area, or not far short of the extent of Europe.

The great river of the lowlands of Brazil, the Amazon, has been called the Mediterranean of South America, and is the largest stream of the globe in every respect, affording, with its great tributaries, free navigation over not less than 30,000 miles within Brazilian territory (see AMAZON).

The Turyassú, Maranhão, and Paranahyba are the largest of the other rivers of the north-eastern slope. The last named flows for the greater part of its course of 700 miles through level swampy lands, receiving many tributaries from eastward, but few from the west; it is without obstructions, and navigable for a great distance.

The São Francisco occupies a wide enclosed basin of the eastern highland. Rising in the Serra do Espinhaço and the Vertentes of Minas Geraes, it flows north and eastward in a course of 1800 miles.

The great rivers of the southern watershed are the Paranâ and Paraguay. The former has its rise in a broad basin, extending for a width of nearly 700 miles across southern Brazil, enclosed by the coast range of the south, the Serra da Mantiqueira, the Vertentes, and its southward interior branch running down into Paraguay.

The River Paraguay, the upper basin of which lies in a much lower region of the continent, in the south-western interior of Brazil, is far superior to the Paraná in respect of its navigable qualities, and in the grand natural outlet it affords to the southward. Its sources are in several small lakes on the southern slope of the Serra das Vertentes, immediately opposite the head streams of the Tapajos, and it flows thence southward, fed by many lateral streams from the range.

While the Amazon begins to rise in February or March, and is at its highest flood in June, the Paraná is irregular in its risings, but has its greatest volume in December, and the Paraguay again, regularly swelling and falling, is highest in June.

The surface of Brazil in respect to its elevation is divided in the *higher region* of plateaus, ridges, and broad open valleys, occupying the whole of the country south of the parallel of Cape S. Roque and the vast *lowland plain* of the Amazon, extending inland to the base of the Andes of Peru, Equador, and Colombia, and rising again in the extreme north to the ranges which form the boundary with Venezuela and Guiana.

The nucleus of the mountains and plateaus of southern Brazil is not centrally placed, but is formed by the chains named the Serra da Mantiqueira and Serra do Espinhaço, which extend between 18° and 23° south lat., at a varying distance of from 100 to 200 miles from the south-east coast. These are the highest and most important mountains of Brazil, from which the other ranges and plateaus radiate outwards north, west, and south; one of the summits of the Serra da Mantiqueira is the Pico do Itatiaiossú, which is almost certainly the culminating point of Brazil, but the elevation of its peak has been very variously estimated and measured at from 6250 to 8900 and 10,300 feet. Itacolumi, near the town of Ouro Preto, reaching about 5700 feet, and Itambe in the north of the Serra do Espinhaço, 4300 feet, are the other high points of these ranges. The southern coastal range, or the Serra do Mar, begins immediately north of the Bay of Rio de Janeiro, where the Orãgos or Organ Mountains, with sharp peaks, rise to perhaps 7500 feet, and follows the line of the shore southward at varying distances from it to near the 30th parallel. The line of the Serra do Espinhaço is prolonged northward by another maritime chain or plateau edge, more distant from the ocean, forming the eastern barrier of the great valley of the Rio São Francisco, and terminating where the river turns eastward to reach the sea.

A range of high plateaus, probably from 3000 to 4000 feet in general elevation, and named collectively the Serra das Vertentes, or the range of the watersheds, but

bearing a multitude of different names in its local sections and branches, extends westward from the Serra do Espinhaço, nearly at right angles to its direction, traversing the entire country in curving lines inland for upwards of 2000 miles to where the plateaus of Brazil terminate on the great bend, and the cataracts, of the Rio Madeira.

The extremely level character of the great northern lowlands may be judged by this, that the banks of the Amazon where it enters Brazil at Tabatinga, more than 1500 miles in a direct line from the sea, are not more than 250 feet above the ocean level, and a continuous navigation is afforded by its tributaries, the Rio Negro, the Casiquiare, and the Orinoco, to the northern coast of the continent.

The great constituent of all the mountain ranges of the southern highlands of Brazil appears to be gneiss, varying from schistose to coarse-grained and porphyritic, or homogeneous and granitic; and though much of it if seen in a small specimen would be and has been described as granite, the larger masses are always stratified. These rocks are of great thickness in the province of Rio, and the Serra do Mar and Serra da Mantiqueira are wholly composed of them; not only does gniess form the great coast belt from Maranhão to the mouth of the Rio de la Plata, but it sends off a band into Minas Geraes and Goyaz, where the Pyreneos range and a great part of the mountain region are composed of it.

Surface "drift" deposits, ascribed with the greater amount of probability to the agency of the glacial ice, though the hypothesis has been much disputed, occur as a great sheet of pebbles and overlying clay, extending over an immense area of the empire, — over the whole of the provinces south of Rio, over Minas Geraes in the north-eastern coast provinces, and in the valley of the Amazon westward to the confines of Peru, and not only on the hills but over the lower "campos." Deposits of immense boulders of trap and gneiss, evidently the moraines of former local glaciers, were first described by Professor Agassiz, who found them at many points along the coast land.

True coral reefs occur at irregular intervals along the northern Brazilian coast from the Abrolhos islets, which rise on the submerged border of the continent from a less depth than 100 feet, as far as the shores of Maranhão.

No volcanic appearances have been observed in Brazil. Warm springs occur in several provinces; those of Itapi curú in the province of Bahia have temperatures varying from 88° to 106° Fahr., and are saline; the hot springs of pure water at Santa Catharina range from 96° to 113° Fahr., and there are a great number of alkaline springs about the district of Santa Cruz, in the province of Goyaz, ranging up to 119° in temperature.

The metallic and mineral products which occur in the geological formations above described are very various. Diamonds were first discovered in the Serra do Espinhaço, in the vicinity of Diamantina, about 300 miles north of Rio, in 1786. The diamond-producing soil extends along the Serra do Espinhaço as far as the northern borders of the province of Minas, along the valley of the upper Belmonte, and in the interior of the province of Bahia, as well as in the mountains that lie south-west of the sources of the São Francisco.

One of the Brazilian coal basins lies in the province of Santa Catharina, between the plateau and the sea; and along the banks of the Tubarão, beds of bituminous coal of fair quality are exposed, and were first noticed in 1841.

Sulphur exists in a native state in the province of Rio Grande do Norte, and in small quantity in Rio Grande do Sul, as well as at Furquim and Corrego do Ouro, in the district of Minas Novas in Minas Geraes. Saltpetre occurs with salt over a large area of Minas Geraes and Bahia, but is also abundantly formed in the floors of the calcareous caves of the Rio São Francisco valley from the city of Ouro Preto downwards. Saline efflorescence is observed at innumerable localities in the drier portions of the Brazilian plateau; effloresences of nearly pure sulphate of magnesia are also to be found in the valley of the Rio das Velhas in the São Francisco basin, and in the province of Ceará, where chloride of sodium also appears.

Gold in Brazil is found in quartz veins traversing the old metamorphic rocks, such as clay-slate, mica slate or iron schist in drift gravels and clays and in alluvial sands and gravels derived from the wear of these. Most gold is afforded by the clay-slates traversed by auriferous quartz lodes, by the rock called Itacolumite (metamorphic rock of Lower Silurian age), and by certain iron ores known as Itabirite and Jacutinga, the latter described by Burton as a substance composed of micaceous iron schist and friable quartz, mixed with specular iron oxide of manganese and fragments of talc. Over a very large area of the province of Minas Geraes, in the vicinity of Ouro Preto, the country is auriferous, and here are the richest gold mines of Brazil.

The gold of Brazil is alloyed with silver, and this metal is present in many of the galenic formations which are known in almost every province, as well as with the copper in the mines of Rio Grande do Sul. At the hill of Araçoiva, in the municipality of Sorocaba in São Paulo, silver was extracted nearly two centuries ago. Rich mines of mercury occur in the province of Paraná not far from the capital. Copper is abundant in the provinces of Matto Grosso, Goyaz, and Minas, near the capital of Bahia, in Maranhão and Ceará, but chiefly in Rio Grande do Sul, where at Santo Antonio das Lavras, in the municipality of Caçapava, there are the richest copper mines of Brazil, the mineral from which yields 60 per cent. of pure metal.

Manganese exists in abundance in the vicinity of Nazareth, at the head of the estuary of the Jaguaripe, adjoining the bay of Bahia. Galena mines are in operation in many parts of the empire; the chief are those of Iporanga, Sorocaba, Iguapé in the province of São Paulo, and those of the Rio Abaeté and Sete Lagõas, the most productive of all, in the province of Minas. Lead mines also exist along the whole coastal region from Santa Catharina to Maranhão, those of the hill chain of Ibiapaba on the borders of Ceará and Piauhy being important.

Every part of Brazil contains iron, in ore or in other forms, and an almost unlimited quantity appears to exist in the mountains of Minas Geraes. At São João de Ipanéma, in S. Paulo, there are heavy deposits of magnetic iron, which are mined and smelted almost on the spot; and other seams of like character appear in the provinces of Alagõas, Ceará, Rio Grande do Norte, and Parahyba.

A country so extensive as Brazil, and so diversified in its surface, necessarily exhibits a considerable variety of climate. The great northern lowland lying entirely within the tropics has great heat, and its year is divided between the simple wet and dry seasons. The elevation of the central and southern highland of Brazil introduces great variety in the seasons and climates of the intertropical portion of that region; and towards the south beyond the tropic a temperate zone is reached in which four seasons are marked, though not so distinctly as in central Europe. The whole wide plain of the Amazon basin has its rainy season from January or December till May or June, the remaining half of the

year being dry, though intervals of fine weather may occur within the wet period, and of showers in the dry season. The fall during the rainy months is excessive, raising the level of the great river full 40 feet, and much thunder and lightning always accompany the heavy rain.

In temperature the vast Amazon basin is remarkable for the small seasonal variation of heat, accounted for by its equatorial position and immense surface of water and forest; within its limits the thermometer at its highest readings averages 90° and the lowest 75°. At Pará the register kept by Costa Azevedo between 1861 and 1867 gave a mean temperature of 80°, a maximum of 95°, and a minimum of 68°. Observations are very deficient for the greater portion of the empire.

With the exception of the marshy banks of some of the rivers and the lowlands and swamps, where intermittent fevers are very prevalent, the country is generally healthy. On the sea-coast and inland in some of the maritime provinces, epidemics of yellow fever and cholera morbus have been experienced since 1850. The mortality in the most populous towns of Brazil is not, however, above but rather below that of the large cities of Europe.

The broadly-marked features given to the landscape by the vegetations of different characters in Brazil are distinguished by several names. *Mattas* or heavy forests cover the immense northern lowland which is watered by excessive rains, and these occur also in belts of greater or less width over the lower portions of the central and southern region. *Catinga* is the general name applied to the lower growing and open woods of the slopes of the Brazilian highland which lose their leaves in the dry season. These merge into the wide open plains or gently rounded hills and ridges, covered with grass or scattered bushes, which are called the *Campos geraes*. The systematic burning over of these great grass lands, to allow the young crop to appear, has completely destroyed in them all trees and shrubs which cannot bear the scorching, and so has wrought a great alteration in the flora of these regions. The name *Sertão*, meaning originally the interior as distinguished from the maritime country, has come to be applied to dry, hilly and stony districts of the campos only suited for pasture. To the agricultural coast belt of the eastern provinces the name *Beira mar* is given.

Except on the loftiest mountains, and on the wide *sertãos*, the vegetation of Brazil is luxuriant beyond description. In the mountain passes in the neighborhood of the sea-shore, the conjoint effects of heat and moisture produce a superfluity of vegetable life, which man's utmost efforts cannot restrain. Trees split for paling in the neighborhood of Rio Janeiro send forth shoots and branches immediately, and this whether the position of the fragments be that in which they originally grew, or inverted. On the banks of the Amazons the loftiest trees destroy each other by their proximity, and are bound together by rich and multiform lianes. In the province of Maranhão, the roots, grasses, and other plants extending from the shores of the pools, weave themselves in time into a kind of vegetable bridge, along which the passenger treads, unaware that he has left the firm earth, until the jaws of a cayman protrude through the herbage before him. The vegetable productions of Brazil have a strong analogy with those of Guiana. The most common are the *Compositæ*, *Leguminosæ*, *Euphorbiaceæ*, *Rubiaceæ*, *Aroideæ*, and ferns of the most varied forms. The vegetation of the valleys differs from that of the *campos*, as it again does from that which occurs in the *sertãos*. Along the coast, the mangroves are the most numerous and prominent species. The most marked peculiarity of this class of plant is, that the seeds begin to shoot before they drop from the parent plant, and that the drooping branches strike roots into the soil. They are never found inland except where the surface is scarcely elevated above the level of the sea. They flourish from Rio Grande do Sul to Maranhão, converting the land into a morass wherever they are allowed to flourish unmolested. Immediately behind them numerous families of palms raise their graceful heads. The underwood in the neighborhood of Rio Janeiro consists principally of crotons. Every large river of Brazil has its own appropriate form of vegetable life, giving a peculiar character to its banks.

The forests of Brazil contain almost every species of useful and ornamental wood. The cocoa-tree is found in great quantities in the provinces on the sea-shore, and furnishes one of the most important items of internal commerce. A considerable surplus of cocoa is annually exported. One of the most valuable sorts of timber is furnished by the Ibiripitanga or Brazil-wood (*Cæsalpinia brasiliensis*), which yields a fine red dye. The wood itself is very hard and heavy, and takes a beautiful polish. It grew at one time in great abundance along the coast; but being a Government monopoly (thence called *pao da rainho*, Queen's wood), it was cut down in a reckless manner, and is by no means so abundant as it once was. The other trees most worthy of mention are the *jaracandá* or rosewood tree, the trumpet-tree (*Secropia peltata*), the laurel, the soap-tree, the tapia or garlic pear-tree, and the whole family of palms. Of these the Carnauba Palm (*Copernicia cerifera*), which grows in the north-east coastal province, is perhaps the most useful tree of Brazil; every part of it is valuable, and the wax yielded by its leaves is now a considerable article of trade. Not least important is the *Siphonia elastica*, or caoutchouc tree, which during the season is tapped every day, and furnishes in considerable quantities a gum which is poured into moulds; the export of this product from Brazil averages a value of more than £1,000,000 annually. The banana is one of the most useful of all the trees that grow in Brazil, and its fruit is the chief food of the native Indians. The fruits of Brazil are numerous and excellent. The best of these are the pine-apple, the mango, the custard-apple, the guava, and the various kinds of melons and nuts.

In a country of such vast extent as Brazil, embracing as it does every variety of temperature and elevation, the value and importance of the agricultural products cannot fail to be very great. So small, however, is the number of farmers, compared with the extent of the soil, that it is believed that not one acre in 200 is under cultivation. In some provinces, especially those near the sea, the quantity of grain raised is not sufficient to supply the demand, and thus large quantities of wheat are annually imported from the United States. The reason of this is that the soil under tillage is occupied in the production of articles for foreign markets. The chief products of Brazil are coffee, sugar, cotton, manioc or cassava flour, tobacco, rice, maize, fruits, and spices. Of these by far the most important now is coffee, while sugar ranks next in value, and cotton after sugar.

The varieties of animated life in Brazil are more numerous perhaps than in any other region in the world. Of beasts of prey, the most formidable are the jaguar or South American tiger, the ocelot, the tiger-cat, the puma, the guará or red wolf, and the Brazilian fox or wild dog. Large herds of the peccary roam in the forests, in which also is to be found the tapir or *anta*, the largest South American mammal. The *capivara*, or water hog, abundant on the river banks, is the largest known rodent. Diverse species of deer inhabit the campos; representing the Edentata there are several species of armadillos and ant-eaters, and the sloths;

and of the Marsupialia, several species of opossum occurring over the whole of Brazil. The varieties of the monkey tribe that abound in the forests appear to be almost infinite. The largest belong to the genus *Stentor*, including the guaribas or howling monkeys. The *Simia jacchus* has never been seen elsewhere. There are several varieties of bats, of which the *Vespertilio leporinus* and the *V. spectrum* are the largest. No less immense is the variety of birds, from the *ouira*, an eagle far larger than our most powerful birds of prey, to the humming-bird, no larger than a bee. The rhea, a species of ostrich, is found in Brazil. The Brazilian birds are celebrated for the beauty of their plumage. "Red, blue, and green parrots," says Malte-Brun, "frequent the tops of trees. The gallinaceous *jacús*, the *hoccos*, and different kinds of pigeons, haunt the woods. The orioles resort to the orange groves; and the sentinels, stationed at a distance, announce with a screaming noise the approach of man. Chattering manikins mislead the hunter; and the metallic tones of the uraponga resound through the forest like the strokes of a hammer on an anvil. The toucan (*Ramphastos*) is prized for its feathers, which are of a lemon and bright red color, with transverse stripes reaching to the extremities of the wings. The different species of humming birds are more numerous in Brazil than in any other country of America. One sort is called by the people *Guanthe engera* or winged flower." Snakes of every kind abound in the marshy districts, some of which, such as the rattlesnake and the jararaca, are remarkably venomous; while others, such as the boas, attain an enormous size and strength. Of domestic animals, the most important are the horse, the ox, and the sheep. Vast numbers of horses, sprung from the original European stock, roam at large over the extensive plains of the southern provinces. They are generally found in droves of twenty or thirty. Oxen are also allowed to wander half wild. They are hunted down with the *lasso* in great numbers, and are valued chiefly on account of their hides, horns, and tallow, which are exported in immense quantities. The chief cattle-breeding districts of Brazil are the island of Marajo in Pará, Goyaz, Matto Grosso, Piauhy, S. Paulo, Minas, Paraná, and Rio Grande do Sul. Sheep do not thrive in Brazil at all so well as the larger kind of cattle.

Brazil was discovered in 1499 by Vincent Yañez Pinçon, a companion of Columbus. He described the land near Cape St. Augustine, and sailed along the coast as far as the River Amazon, whence he proceeded to the mouth of the Orinoco. He made no settlement, but took possession of the country in the name of the Spanish Government, and carried home, as specimens of its natural productions, some drugs, gems, and Brazil-wood. Next year the Portuguese commander, Pedro Alvarez Cabral, appointed by his monarch to follow the course of Vasco de Gama in the East, was driven, by adverse winds so far from his track, that he reached the Brazilian coast, April 24, and anchored in Porto Seguro (16° S. lat.) on Good Friday. On Easter day an altar was erected, mass celebrated in presence of the natives, the country declared an apanage of Portugal, and a stone cross erected in commemoration of the event. Cabral dispatched a small vessel to Lisbon to announce his discovery, and, without forming any settlement, proceeded to India on the 3d of May. On the arrival of the news in Portugal, Emanuel invited Amerigo Vespucci to enter his service, and dispatched him with three vessel to explore the country. This navigator's first voyage was unsuccessful; but in a second he discovered a safe port, the site of which is not accurately known, to which he gave the name of All-Saints. He remained there five months, and maintained a friendly intercourse with the natives. Some of the party traveled forty leagues into the interior. Vespucci erected a small fort, and leaving twelve men, with guns and provisions, to garrison it, embarked for Portugal, having loaded his two ships with Brazil-wood, monkeys, and parrots.

The first attempt on the part of a Portuguese monarch to introduce an organized government into his dominions was made by João III. He adopted a plan which had been found to succeed well in the Madeira and the Azores,—dividing the country into hereditary captaincies, and granting them to such persons as were willing to undertake their settlement, with unlimited powers of jurisdiction, both civil and criminal. Each captaincy extended along fifty leagues of coast. The boundaries in the interior were undefined. The first settlement made under this new system was that of S. Vincente Piratininga, in the present province of St. Paulo. Martim Affonso de Sousa, having obtained a grant, fitted out a considerable armament, and proceeded to explore the country in person. He began to survey the coast about Rio de Janeiro to which he gave that name, because he discovered it on the first day of January 1531. He proceeded south as far as La Plata, naming the places he surveyed on the way from the days on which the respective discoveries were made. He fixed upon an island, in 24½° S. lat., called by the natives Guaibe, for his settlement. The Goagnazes, or prevailing tribe of Indians in that neighborhood, as soon as they discovered the intentions of the new comers to fix themselves permanently there, collected for the purpose of expelling them. Fortunately, however, a shipwrecked Portuguese, who had lived many years under the protection of the principal chief, was successful in concluding a treaty of perpetual alliance between his countrymen and the natives. Finding the spot chosen for the new town inconvenient, the colonists removed to the adjoining island of S. Vincente, from which the captaincy derived its name. Cattle and the sugar-cane were at an early period introduced from Madeira, and here the other captaincies supplied themselves with both.

No sooner had Brazil passed under the Spanish crown, than English adventurers directed their hostile enterprises against its shores. In 1586 Witherington plundered Bahia; in 1591 Cavendish burned S. Vincente; in 1595 Lancaster took Olinda. These exploits, however, were transient in their effects. In 1612 the French attempted to found a permanent colony in the island of Marajò, where they succeeded in maintaining themselves till 1618. This attempt led to the erection of Maranhão and Pará into a separate *Estado*. But it was on the part of the Dutch that the most skilful and pertinacious efforts were made for securing a footing in Brazil; and they alone of all the rivals of the Portuguese have left traces of their presence in the national spirit and institutions of Brazil.

The success of the Dutch East India Company led to the establishment of a similar one for the West Indies, to which a monopoly of the trade to America and Africa was granted. This body despatched in 1624 a fleet against Bahia. The town yielded almost without a struggle. The fleet soon after sailed, a squadron being detached against Angola, with the intention of taking possession of that colony, in order to secure a supply of slaves. The Portuguese, in the meanwhile, began to collect for the purpose of expelling the permanent intruders, and the hearty co-operation of all the natives against the invaders having been obtained through the descendants of Caramaru, the Dutch were obliged to capitulate in May 1625. The honors bestowed upon the Indian chiefs for their assistance in this

war broke down in a great measure the barrier between the two races; and there is at this day a greater admixture of their blood among the better classes in Bahia than is to be found elsewhere in Brazil.

In 1630 the Dutch attempted again to effect a settlement; and Olinda yielded after a feeble resistance. They were unable, however, to extend their power beyond the limits of the town, until the arrival of Count Maurice of Nassau in 1630. His first step was to introduce a regular government among his countrymen; his second, to send to the African coast one of his officers, who took possession of a Portuguese settlement, and thus secured a supply of slaves. Count Maurice was recalled in 1644. His successors possessed neither his political nor his military talents, and had to contend with more energetic enemies.

In 1640 the revolution which placed the house of Bragança on the throne of Portugal restored Brazil to masters more inclined to promote its interests and assert its possessions than the Spaniards. It was indeed high time that some exertion should be made. The northern provinces had fallen into the power of Holland; the southern, peopled in a great measure by the hardy descendants of the successive colonists who had issued on all sides from the central establishment of S. Paulo, had learned from their habits of unaided and successful enterprise to court independence. They had ascended the waters of the Paraguay to their sources. They had extended their limits southwards till they reached the Spanish settlements on the La Plata. They had reduced to slavery numerous tribes of the natives. They were rich in cattle, and had commenced the discovery of the mines.

Rio and Santos, although both evinced a desire of independence, followed the example of the Paulistas. Bahia, as capital of the Brazilian states, felt that its ascendancy depended upon the union with Portugal. The Government thus left in quiet possession of the rest of Brazil, had time to concentrate its attention upon the Dutch conquests. The crown of Portugal was, however, much too weak to adopt energetic measures. The tyranny of the successors of Nassau, by alienating the minds of the Portuguese and natives, drove them to revolt before any steps were taken in the mother country for the reconquest of its colonies. João Fernandes Vieyra, a native of Maderia, organized the insurrection which broke out in 1645. This insurrection gave birth to one of those wars in which a whole nation, destitute of pecuniary resources, military organization, and skillful leaders, is opposed to a handful of soldiers advantageously posted and well officered. But brute force is unable to contend with scientific valor. Vieyra, who had the sense to see this, repaired to the court of Portugal, and discovering the weakness and poverty of the executive, suggested the establishment of a company similar to that which in Holland had proved so successful. His plan, notwithstanding the opposition of the priests, was approved of, and in 1649 the Brazil Company of Portugal sent out its first fleet. After a most sanguinary war, Vieyra was enabled in 1654 to present the keys of Olinda to the royal commander, and to restore to his monarch the undivided empire of Brazil. After this, except some inroads on the frontiers, the only foreign invasion which Brazil had to suffer was from France. In 1710 a squadron, comanded by Duclerc, disembarked 1000 men, and attacked Rio de Janeiro. After having lost half of his men in a battle, Duclerc and all his surviving companions were made prisoners. The governor treated them cruelly. A new squadron with 6000 troops was entrusted to the famous admiral Duguay Trouin to revenge this injury. They arrived at Rio on the 12th September 1711. After four days of hard fighting the town was taken. The governor retreated to a position out of it, and was only awaiting reinforcements from Minas to retake it; but Duguay Trouin threatening to burn it, he was obliged on the 10th October to sign a capitulation, and pay to the French admiral 610,000 crusados, 500 cases of sugar, and provisions for the return of the fleet to Europe. Duguay Trouin departed to Bahai to obtain fresh spoils; but having lost in a storm two of his best ships, with an important part of the money received, he renounced this plan and returned directly to France.

After this the Portuguese governed undisturbed their colony. The approach of foreign traders was prohibited, while the regalities reserved by the crown drained the country of a great proportion of its wealth.

The Portuguese Government, under the administration of Carvalho, afterwards marquis of Pombal, attempted to extend to Brazil the bold spirit of innovation which directed all his efforts. The proud minister had been resisted in his plans of reform at home by the Jesuits, and, determining to attack the power of the order, first deprived them of all temporal power in the state of Maranhão and Pará. These ordinances soon spread to the whole of Brazil, and a pretext being found in the suspicion of Jesuit influence in some partial revolts of the Indian troops on the Rio Negro, the order was expelled from Brazil under circumstances of great severity in 1760. The Brazilian Company founded by Vieyra, which so materially contributed to preserve its South American possessions to Portugal, had been abolished in 1721 by João V.; but such an instrument being well suited to the bold spirit of Pombal, he established a chartered company again in 1755, to trade exclusively with Maranhão and Pará; and in 1759, in spite of the remonstrances of the British Factory at Lisbon, formed another company for Paraiba and Pernambuco. Pombal's arrangements extended also to the interior of the country, where he extinguished at once the now indefinite and oppressive claims of the original donatories of the captaincies, and strengthened and enforced the regulations of the mining districts. The policy of many of Pombal's measures is more than questionable; but his admission of all races to equal rights in the eye of the law, his abolition of feudal privileges, and the firmer organization of the powers of the land which he introduced, powerfully co-operated towards the development of the capabilities of Brazil. Yet on the death of his king and patron in 1777, when court intrigue forced him from his high station, he who had done so much for his country's institutions was reviled on all hands.

The most important feature in the history of Brazil during the first thirty years following the retirement of Pombal was the conspiracy of Minas in 1789. The successful issue of the recent revolution of the English colonies in North America had filled the minds of some of the more educated youth of that province; and in imitation, a project to throw off the Portuguese yoke was formed,—a cavalry officer, Silva Xavier, nicknamed Tira-dentes (tooth-drawer), being the chief conspirator. But the plot being discovered during their inactivity, the conspirators were banished to Africa, and Tiradentes, the leader, was hanged. Thenceforward affairs went on prosperously; the mining districts continued to be enlarged; the trading companies of the littoral provinces were abolished, but the impulse they had given to agriculture remained.

Removed from all communication with the rest of the world except through the mother country, Brazil remained unaffected by the first years of the great revolutionary war in Europe. Indirectly, however, the fate of this isolated country was affected by the consequences of the French Revolution. Brazil is the only instance

of a colony becoming the seat of the Government of its own mother country, and this was the work of Napoleon. When he resolved upon the invasion and conquest of Portugal, the Prince Regent, afterwards Dom João VI., having no means of resistance, decided to take refuge in Brazil. He created a regency in Lisbon, and departed for Brazil on the 29th November 1807, accompanied by the Queen Donna Maria I., the royal family, all the great officers of state, a large part of the nobility, and numerous retainers. They arrived at Bahia on the 21st January 1808, and were received with enthusiasm. The regent was requested to establish there the seat of his government, but a more secure asylum presented itself in Rio de Janeiro, where the royal fugitives arrived on the 7th of March. Before leaving Bahia Don John took the first step to emancipate Brazil, opening its ports to foreign commerce, and permitting the export of all Brazilian produce under any flag, the royal monopolies of diamonds and Brazil-wood excepted. Once established in Rio de Janeiro, the government of the regent was directed to the creation of an administrative machinery for the dominions that remained to him as they existed in Portugal. Besides the ministry which had come with the regent, the council of state, and the departments of the four ministries of home, finances, war, and marine then existing, there were created in the course of one year a supreme court of justice, a board of patronage and administration of the property of the church and military orders, an inferior court of appeal, the court of exchequer and royal treasury, the royal mint, bank of Brazil, royal printing-office, powder-mills on a large scale, and a supreme military court. The maintenance of the court, and the salaries of so large a number of high officials, entailed the imposition of new taxes to meet these expenses. Notwithstanding this the expenses continued to augment, and the Government had recourse to the reprehensible measure of altering the money standard, and the whole monetary system was soon thrown into the greatest confusion, a state of things from which the country suffers even at the present day. The bank, in addition to its private functions, farmed many of the *regalia*, and was in the practice of advancing large sums to the state, transactions which gave rise to extensive corruption, and terminated some years later in the breaking of the bank.

In the beginning of 1809, in retaliation of the occupation of Portugal, an expedition was sent to Pará to the French colony of Guiana, and after some fighting this part of Guiana was incorporated with Brazil. This conquest was, however, of short duration; for by the treaty of Vienna in 1815, the colony was restored to France. Its occupation contributed to the improvement of agriculture in Brazil; it had been the policy of Portugal up to this time to separate the productions of its colonies, to reserve sugar for Brazil, and spices to the East Indies, and to prohibit the cultivation of these in the African possessions. Now, however, many plants were imported not only from Guiana but from India and Africa, cultivated in the Royal Botanic Garden, and thence distributed. The same principle which dictated the conquest of French Guiana originated attempts to seize the Spanish colonies of Monte Video and Buenos Ayres, Portugal being also at war with Spain. The chiefs of these colonies were invited to place them under the protection of the Portuguese crown, but these at first affecting loyalty to Spain declined the offer, then threw off the mask and declared themselves independent, and the Spanish governor, Elio, was afterwards defeated by Artigas, the leader of the independents.

The inroads made on the frontiers of Rio Grande and São Paulo decided the court of Rio to take possession of Monte Video; a force of 5000 troops was sent thither from Portugal, together with a Brazilian corps; and the irregulars of Artigas, unable to withstand disciplined troops, were forced, after a total defeat, to take refuge beyond the River Uruguay. The Portuguese took possession of the city of Monte Video in January 1817, and the territory of Missiones was afterwards occupied. The importance which Brazil was acquiring decided the regent to give it the title of kingdom, and by decree of the 16th January 1815, the Portuguese sovereignity thenceforward took the title of the United Kingdom of Portugal, Brazil, and Algarves. Thus the old colonial government disappeared even in name. In March 1816 the Queen Donna Maria I. died, and the prince regent became king under the title of Dom João VI.

Although Brazil had now become in fact the head of its own mother country, the government was not in the hands of Brazilians, but of the Portuguese, who had followed the court. The discontent arising among Brazilians from this cause was heightened by a decree assigning a heavy tax on the chief Brazilian custom houses, to be in operation for forty years, for the benefit of the Portuguese noblemen who had suffered during the war with France. The amiable character of the king preserved his own popularity, but the Government was ignorant and profligate, justice was ill administered, negligence and disorder reigned in all its departments. Nor was the discontent less in Portugal on account of its anomalous position. These causes and the fermentation of liberal principles produced by the French Revolution originated a conspiracy in Lisbon in 1817, which was, however, discovered in time to prevent its success. A similar plot and rebellion took place in the province of Pernambuco, where the inhabitants of the important commercial city of Recife were jealous of Rio and the sacrifices they were compelled to make for the support of the luxurious court there. Another conspiracy to establish a republican government was promptly smothered in Bahia, and the outbreak in Pernambuco was put down after a republic had been formed there for ninety days. Still the progress of the republican spirit in Brazil caused Dom João to send to Portugal for bodies of picked troops, which were stationed throughout the provincial capitals. In Portugal the popular discontent produced the revolution of 1820, when representative government was proclaimed—the Spanish constitution of 1812 being provisionally adopted. In Rio, the Portuguese troops with which the king had surrounded himself as a defence against the liberal spirit of the Brazilians, took up arms on the 26th February, 1821, to force him to accept the system proclaimed in Portugal. The prince Dom Pedro, heir to the crown, who now for the first time took part in public affairs, actively exerted himself as a negotiator between the king and the troops, who were joined by bodies of the people. After attempting a compromise the king finally submitted, took the oath, and named a new ministry. The idea of free government filled the people with enthusiasm, and the principles of a representative legislature were freely adopted, the first care being for the election of deputies to the *Cortes* of Lisbon to take part in framing the new constitution. As the king could not abandon Portugal to itself he determined at first to send the prince thither as regent, but Dom Pedro had acquired such popularity by his conduct in the revolution, and had exhibited such a thirst for glory, that the king feared to trust his adventurous spirit in Europe, and decided to go himself. The Brazilian deputies on arriving in Lisbon expressed dissatisfaction with the Cortes for having begun the framing of the constitution before their arrival, for Brazil could not be treated as a secondary part of the monarchy. Sharp discussions and angry

words passed between the Brazilian and Portuguese deputies, the news of which excited great discontent in Brazil. An insulting decree was passed in the Cortes, ordering the prince Dom Pedro to come to Europe, which filled the Brazilians with alarm; they foresaw that without a central authority the country would fall back to its former colonial state subject to Portugal. The Provisional Government of São Paulo, influenced by the brothers Andradas, began a movement of independence by asking the prince to disobey the Cortes and remain in Brazil, and the council of Rio de Janeiro followed with a similar representation, to which the prince assented. The Portuguese troops of the capital at first assumed a coercive attitude, but were forced to give way before the ardor and military preparations of the Brazilians, and submitted to embark for Portugal. These scenes were repeated in Pernambuco, where the Portuguese, after various conflicts, were obliged to leave the country; in Bahia, however, as well as in Maranhão and Pará, the Portuguese prevailed. In Rio the agitation for independence continued. The two brothers Andradas were called to the ministry; and the municipal council conferred upon the prince regent the title of Perpetual Defender of Brazil. With great activity he set off to the central provinces of Minas and São Paulo to suppress disaffected movements and direct the revolution. In São Paulo, on the 7th September 1822, he proclaimed the independence of Brazil. On his return to Rio de Janeiro on the 12th of October he was proclaimed constitutional emperor with great enthusiasm.

The Cortes at Lisbon chose Bahia as a centre for resisting the independence, and large forces were sent thither. But the city was vigorously besieged by the Brazilians by land, and finally the Portuguese were obliged to re-embark on the 2d of July 1823. A Brazilian squadron, under command of Lord Cochrane, attacked the Portuguese vessels, embarrassed with troops, and took several of them. Taylor, another Englishman in Brazilian service, followed the vessels across the Atlantic, and even captured some of the ships in sight of the land of Portugal. The troops in Monte Video also embarked for Portugal, and the Banda Oriental remained a part of Brazil with the title of the *Provincia Cisplatina*. Before the end of 1823 the authority of the new emperor and the independence of Brazil were undisputed throughout the whole country.

Republican movements now began to spread, to suppress which the authorities made use of the Portuguese remaining in the country; and the disposition of the emperor to consider these as his firmest supporters much influenced the course of his Government and his future destiny. The two Andradas, who imagined they could govern the young emperor as a sovereign of their own creation, encountered great opposition in the constitutional assembly, which had been opened in Rio in May 1823, to discuss the project of a new constitution. In July the emperor resolved to dismiss them and form a new ministry, but against this the brothers raised a violent opposition. In November the emperor put an end to the angry debates which ensued in the assembly by dissolving it, exiling the Andradas to France, and convoking a new assembly to deliberate on a proposed constitution more liberal than the former project. The proclamation of a republic in the provinces of Pernambuco and Ceará, with the rebellion of the Cisplatina province, favored by Buenos Ayres and its ultimate loss to Brazil, were the result of the *coup d'état* of November 1823. The Brazilians were universally discontented,—on one side fearing absolutism if they supported the emperor, on the other anarchy if he fell. Knowing the danger of an undefined position, the emperor caused the councils to dispense with their deliberations, and adopt as the constitution of the empire, the project framed by the council of state. Accordingly, on March 25, 1824, the emperor swore to the constitution with great solemnity and public rejoicings. By this stroke of policy he saved himself and Brazil. Negotiations were opened in London between the Brazilian and Portuguese plenipotentiaries, treating for the recognition of the independence of Brazil; and on the 25th of August 1825 a treaty was signed by which the Portuguese king, Dom João VI., assumed the title of Emperor of Brazil, and immediately abdicated in favor of his son, ackowledging Brazil as an independent empire, but the treaty obliged Brazil take upon herself the Portuguese debt, amounting to nearly ten million dollars.

The rebellion of the Banda Oriental was followed by a declaration of war with Buenos Ayres which had supported it, and operations by sea and land were conducted against that republic in a feeble way. Meanwhile the well-deserved popularity of the emperor began to decline. He had given himself up to the influence of the Portuguese; the most popular men who had worked for the independence were banished; and a continual change of ministry showed a disposition on the part of the sovereign to prosecute obstinately measures of which his advisers disapproved. His popularity was regained, however, to some extent, when, on the death of his father, he was unanimously acknowledged king of Portugal, and especially when he abdicated that crown in favor of his daughter, Donna Maria; but his line of policy was not altered, and commercial treaties entered into with European states conceding them favors, which were popularly considered to be injurious to Brazilian trade, met with bitter censure.

During the year 1827 the public debt was consolidated, and a department was created for the application of a sinking fund.

The year 1828 was a calamitous one for Brazil. It began with the defeat of the Brazilian army by the Argentine forces, and this entirely through the incapacity of the commander-in-chief; and misunderstandings, afterwards compensated by humbling money-payments on the part of Brazil, arose with the United States, France, and England, on account of merchant vessels captured by the Brazilian squadron blockading Buenos Ayres. Financial embarrassments increased to an alarming extent; the emperor was compelled by the British Government to make peace with Buenos Ayres and to renounce the Banda Oriental; and to fill the sum of disasters Don Miguel had treacherously usurped the crown of Portugal. It was under these unlucky auspices that the election of new deputies took place in 1829. As was expected the result was the election everywhere of ultra-liberals opposed to the emperor, and in the succeeding year people everywhere exhibited their disaffection. During the session of 1830 the chambers adopted a criminal code in which punishment by death for political offences was abolished. It was openly suggested in the journals to reform the constitution by turning Brazil into independent federal provinces, governed by authorities properly elected, as in the United States. Alarmed at length at the ground gained by this idea in the provinces, the emperor set off to Minas to stir up the former enthusiasm in his favor from recollections of the independence, but was coldly received. On his return to Rio in March 1831 scenes of disorder occurred, and great agitation among the Liberal party. Imagining himself sure of a brilliant destiny in Europe if he lost his Brazilian crown, the emperor attempted to risk a decisive attack against the Liberals, and to form a new ministry composed of men favorable to absolutism. This step caused excited public meetings in the capital, which were joined in by the troops, and depu-

tations went to ask the emperor to dismiss the unpopular ministry. He replied by dissolving the ministry without naming another, and by abdicating the crown in favor of the heir apparent, then only five years of age. Dom Pedro immediately embarked in an English ship, leaving the new emperor Dom Pedro II. and the princesses Januaria, Francisca, and Paula. The subsequent career of this unfortunate prince belongs to the history of Portugal.

A provisional and afterwards a permanent regency, composed of three members, was now formed in Brazil, but scenes of disorder succeeded, and discussions and struggles between the Republican party and the Government, and a reactionary third party in favor of the restoration of Dom Pedro, occupied the succeeding years. In 1834 a reform which was well received consisted in the alteration of the regency, from that of three members elected by the legislative chambers, to one regent chosen by the whole of the electors in the same manner as the deputies; and the councils of the provinces were replaced by legislative provincial assemblies. Virtually this was a republican government like that of the United States, for no difference existed in the mode of election of the regent from that of a president. The ex-minister Feijoó was chosen for this office. With the exception of Pará and Rio Grande the provinces were at peace, but these were in open rebellion; the former was reduced to obedience, but in the latter, though the imperial troops occupied the towns, the country was ravaged by its warlike inhabitants. The regent was now accused of conniving at this rebellion, and the opposition of the Chamber of Deputies became so violent as to necessitate his resignation. Araujo Lima, minister of the home department, who strove to give his government the character of a monarchical reaction against the principles of democracy, was chosen by a large majority in his stead. The experiment of republican government had proved so discreditable, and had so wearied the country of cabals, that men hitherto known for their sympathy with democratic principles became more monarchical than the regent himself; and under this influence a movement to give the regency into the hands of the Princess Donna Januaria, now in her 18th year, was set on foot. It was soon perceived, however, that if the empire could be governed by a princess of eighteen it could be managed better by the emperor himself, who was then fourteen.

A bill was accordingly presented to legislature dispensing with the age of the emperor and declaring his majority, which after a noisy discussion was carried. The majority of the Emperor Dom Pedro II. was proclaimed on the 23d of July, 1840. Several ministries, in which various parties predominated for a time, now governed the country till 1848, during which period the rebellious province of Rio Grande was pacified, more by negotiation than force of arms. In 1848 hostilities were roused with the British Government through the neglect shown by the Brazilians in putting in force a treaty for the abolition of the slave trade, which had been concluded as far back as 1826; on the other hand the governor of Buenos Ayres, General Rosas, was endeavoring to stir up revolution again in Rio Grande. The appearance of yellow fever in 1849, until then unknown in Brazil, was attributed to the importation of slaves. Public opinion declared against the traffic; severe laws were passed against it, and were so firmly enforced that in 1853 not a single disembarkation took place. The ministry of the Visconde de Olinda in 1849 entered into alliances with the governors of Monte Video, Paraguay, and the states of Entre Rios and Corrientes, for the purpose of maintaining the integrity of the republics of Uruguay and Paraguay, which Rosas intended to re-unite to Buenos Ayres, and the troops of Rosas which besieged Monte Video were forced to capitulate. Rosas then declared war formally against Brazil. An army of Correntine, Uruguayan, and Brazilian naval squadron, advanced on Buenos Ayres, completely routed the forces of Rosas, and crushed for ever the power of that dictator. From 1844 Brazil was free from intestine commotions, and had resumed its activity. Public works and education were advanced, and the finances rose to a degree of prosperity previously unknown.

In 1855 the emperor of Brazil sent a squadon of eleven men-of-war and as many transports up the Paraná to adjust several questions pending between the empire and the Republic of Paraguay, the most important of which was that of the right of way by the Paraguay River to the interior Brazilian province of Matto Grosso. This right had been in dispute for several years. The expedition was not permitted to ascend the River Paraguay, and returned completely foiled in its main purpose. Though the main discord resulting between the states on account of this failure was subsequently allayed for a time by a treaty granting to Brazil the right to navigate the river, every obstacle was thrown in the way by the Paraguayan Government, and indignities of all kinds were offered not only to Brazil but to the representatives of the Argentine and the United States. In 1864 the ambitious dictator of Paraguay, Francisco Solano Lopez, without previous declaration of war, captured a Brazilian vessel in the Paraguay, and rapidly followed up this outrage by an armed invasion of the provinces of Matto Grosso and Rio Grande in Brazil, and that of Corrientes in the Argentine Republic. A triple alliance of the invaded states with Uruguay ensued, and the tide of war was soon turned from being an offensive one on the part of Paraguay to a defensive struggle within that republic against the superior number of the allies. So strong was the natural position of Paraguay, however, and so complete the subjection of its inhabitants to the will of the dictator, that it was not until the year 1870, after the republic had been completely drained of its manhood and resources, that the long war was terminated by the capture and death of Lopez with his last handful of men by the pursuing Brazilians.

In the winter of 1889 a sudden and bloodless revolution occurred, and the emperor, Dom Pedro II., abdicated, and a republic was proclaimed. This movement was not entirely unexpected by those familiar with the state of affairs in the empire.

The revolutionary movement was inaugurated on the morning of November 15, 1889, by a demonstration of the troops stationed at the capital. Dom Pedro was at the time at his summer residence, Petropolis, but immediately returned to Rio de Janeiro. Here he was presented with a manifesto by Deodora da Fonseca, and others, as provisional ministers. This proclaimed the abolition of the empire, of the senate, and of the council of state, dissolved the chamber of deputies, and declared the establishment of a republic. The emperor summoned a council and attempted to form a new ministry. These efforts were abruptly ended by a letter from General da Fonseca, who warned Dom Pedro that nothing but the instant departure of himself and the entire imperial family from Brazil would satisfy the people and avert bloodshed. At 2 o'clock the following morning the entire family were carried off under nominal arrest to a steamship lying in the harbor, and thence were transferred direct to Lisbon. The provisional government decreed universal suffrage to all Brazilians who could read and write, and appointed a commission to prepare a draft of a federal constitution.

Later a decree was issued naming September 15, 1890, as the time for holding a general election for delegates to the constituent assembly, and November 15, 1890, as the date for the assembly to meet at Rio de Janeiro. In January, 1890, another decree announced the permanent separation of church and state. In the same month the United States recognized the provisional government.

The latest available statistics for Brazil show that in May, 1889, the foreign debt amounted to about $140,000,000, and the internal debt to about $325,000,000. In addition to this the paper money in circulation amounted to about $103,000,000. The budget for 1889 estimated the expenditures at $95,000,000, including over $11,000,000 of extraordinary expenses, while the anticipated income was under $80,000,000. In 1888 the revenue was $71,000,000, of which one-half was raised by customs duties, and the expenditures amounted to $80,000,000. Almost the last act of the imperial government (September, 1889) was to raise a 4 per cent. loan of 100,000,000 milreis, or $54,560,000, which was negotiated on the London exchange at 90 cents on the dollar. The loan being placed by the Rothchilds, was easily negotiatied, and the bonds commanded a premium of 1½ per cent.

The army of Brazil consists of about 18,000 officers and men on a peace footing. There is a somewhat formidable navy, consisting of 95 steam vessels (9 ironclads) with 254 guns, and manned by 5,300 seamen. There are over 2,000 postoffices and 170 telegraph offices in Brazil, and the telephone is used in Rio de Janeiro and other large towns.

The foreign commerce of Brazil is very extensive. The exports in 1889 aggregated over $120,000,000 in value, and the imports $135,000,000. Coffee, sugar, hides, and India rubber are the great staple exports; flour is largely imported from the United States, and manufactured goods from Europe. Although the United States is by far the largest buyer from Brazil, its sales to that country, except of breadstuffs, are insignificant when compared with those of England, France, and Germany, or even with those of Uruguay and the Argentine Republic.

The total length of railroad lines in operation in Brazil in 1889 was 5,400 miles, and there were nearly 900 miles more under construction. Ten of these railroads are the property of the state, and were built at a cost of over $100,000,000. Sixteen other lines have a capital of over $80,000,000, which was guaranteed by the government.

The population of Brazil is approximately given (1889) at 12,500,000, but the statistics are not very reliable. The last national census taken in 1872 showed almost 10,000,000, besides the wild Indians, roughly estimated at 250,000. Notwithstanding the efforts of the government to encourage immigration the gain from this source has been small, and as the rate of mortality is high it is probable that the annual increase has not exceeded 1½ per cent. Slavery no longer exists in Brazil, immediate and unconditional emancipation having been decreed by the law of May 13, 1888. A gradual emancipation law was adopted in 1871, by which all children born of slave mothers after that year were to be free, but subject to service under the master of the mother until they reached the age of twenty-one. This law also provided a fund for the redemption of slaves by purchase, and under this law 1,540,000 slaves were registered in 1873. From time to time more liberal laws were passed, under which many thousands were freed, and in 1885 all sexagenarians were declared free. Finally, in 1888, as above stated, the whole slave population were freed by decree.

Brazil is not specially a manufacturing country, and its national industries of mining (with smelting of the metals), collecting and polishing precious stones, and salt-making, already referred to, with tanning and hide working, have the widest range. The state has, however, encouraged and in some cases subsidized special manufactures which were of value in developing the resources of the country. Among these seventeen foundries, manufacturing engines and agricultural implements, have supplied a great national want. The home hat factories of Brazil have now all but superseded the imported hats by their products. In almost every city there are manufactories of soap, oil, and candles, which are made, not only of stearine and tallow, but of wax, and in the north from the valuable Carnauba palm. Rum distilling is largely carried on in the sugar districts, and cigars are extensively made, especially at Bahia. Gold and silver smiths and jewel workers are foremost among the delicate handicraftsmen, and excel in their workmanship.

The coastal and fluvial communications of the empire are maintained by eighteen lines of steam-vessels, which receive an annual subsidy from the state (amounting to $1,000.000 in 1889). A North American company, keeping up a regular traffic between the ports of Brazil and the United States, is also aided by Government. Besides these the ocean lines of large vessels from Britain, Germany, and France, touch regularly at the chief points in passing to the La Plata. Almost all the navigable rivers of Brazil have now their regular steam packets.

During 1891 the friction between President Da Fonseca and the Congress by which he had been elected became serious, and finally Congress passed a law looking to his impeachment, which he vetoed. He then dissolved the Congress, and on Nov. 5 proclaimed himself Dictator.

BRAZIL, the capital of Clay county, Ind., is situated sixteen miles from Terre Haute, in the heart of a large coal-producing district. It contains extensive mines of block-coal, which furnish fuel both for export and for a large number of blast furnaces. There are two banks, several hotels, three newspaper offices, graded schools, and manufactories of chairs, boilers, pottery, terra cotta, and other articles. Population (1890), 5,902.

BRAZIL, ISLAND OF, and other imaginary islands in the Atlantic. For a long time before the discovery of America, the fancies of navigators or of cosmographers had scattered over the Atlantic a number of islands, either wholly imaginary, or so detached from the germ of truth which had suggested their existence as to represent no fact in nature. Several such islands are described in the Arabic geography of Edrisi (1153-54 A.D.), and if, passing over more than four hundred years, we take up an atlas of Münster or Mercator we shall find that the northern Atlantic, instead of presenting a vast blank as in our most recent charts, is almost as full of islands and shoals as the heaven is of stars. To our present category belongs the island of St. Brandon, the supposed discovery of an Irish eremite of the 6th century, of whose voyage many wonders are related. Such also were *Antilia* and the *Island of the Seven Cities*, connected with another legend of uncertain date, which described this as the refuge of a body of Christians, who, in flight from the Saracen conquerors of the Peninsula, had, under the guidance of their seven bishops, committed themselves to the wide ocean; such were *Mayda* or *Asmaide*, the *Isla Verde*, or Green Isle (which the natives of the Hebrides still think they see beneath the western sun), but none more famous and recurrent than the *Isle of Brazil*. The name of this island connects itself with the red dye-woods known by that name in the

Middle Ages, a name that possibly also may have been applied to other vegetable dyes, and so may descend from the *Insulæ Purpurariæ* of Pliny. Its first appearance on a map appears to be *(I. de Brazi)* in the Venitian portulano of Andrea di Bianco (1436), where it is found attached to one of the larger islands of the Azores. When this group became better known and was colonized, the island in question got the name of Terceira.

BRAZIL NUTS are the seeds of *Bertholletia excelsa*, a gigantic tree belonging to the natural order *Lecythidaceæ*, which grows in the valleys of the Amazons and generally throughout tropical America. The tree attains an average height of 130 feet, having a smooth cylindrical trunk, with a diameter of fourteen feet at fifty feet from the ground, and branching at a height of about 100 feet.

BRAZIL WOOD is one of several dye woods of commerce which come from the West Indies and South America, belonging to the genera *Cæsalpinia* and *Peltophorum* of the natural order *Leguminosæ*. The species to which the various woods belong have not been well determined, but commercially they are distinguished as Brazil wood, Nicaragua or Peach wood, Pernambuco wood, and Lima wood, each of which has a different commercial value, although the tinctorial principle they yield is similar.

BRAZOS, formerly BRAZOS DE DIOS, a river of Texas, rising in a tableland called the Staked Plain, in the northwest of the State, and running 950 miles southeastward, till it falls into the Gulf of Mexico about forty miles southwest of Galveston.

BRAZZA, the ancient *Brattia*, an island in the Adriatic, off the coast of Dalmatia, in the circle of Spalatro, and eight miles from that city. Population, 15,500.

BREAD. See BAKING.

BREAD-FRUIT. This most important food staple of the tropical islands in the Pacific Ocean is the fruit of *artocarpus incisa*. The tree attains a moderate height, has very large, acutely lobed, glossy leaves, the male flowers in spikes, and the female flowers in a dense head, which by consolidation of their fleshy carpels and receptacles form the fruit. The fruit is globular in shape, about the size of a melon, with a tuberculated or (in some varieties) nearly smooth surface. Many varieties of the tree are cultivated, the fruits of some ripening numerous seeds, which are eaten as chestnuts; but in the best kinds the seeds are aborted, and it is only these that are highly prized as vegetables. The tree is a native of the South Sea Islands, where its fruit occupies the important position that is held by cereals in temperate latitudes. The fruit, which on distinct varieties ripens at different periods, affording a nearly constant supply throughout the year, is gathered for use just before it ripens, when it is found to be gorged with starchy matter, to which its esculent value is due. It may be cooked and prepared for use in a great variety of ways, the common practice in the South Sea Islands being to bake it entire in hot embers, and scoop out the interior, which when properly cooked should have a soft smooth consistence, fibrous only toward the heart, with a taste which has been compared to that of boiled potatoes and sweet milk.

BREAKWATERS differ from piers in their not being necessarily adapted for commercial purposes. They do not, therefore, require to have roadways for the accommodation of traffic, or parapets for keeping water or spray from passing over them. Breakwaters are artificial structures consisting generally of stones or blocks of concrete, built or deposited in deep water. Their object is to tranquilize those portions of the sea which they cover, and which thus become sheltered anchorages. For further information regarding the design of breakwaters and the details of their construction see HARBORS.

BREASTS, or mammary glands, are the organs which secrete milk for the nourishment of the young in the mammalia, and from the presence of which that class of animals takes its name. In the human subject they are two in number, situated on the front of the chest. In children they are small and rudimentary, but about the age of puberty they enlarge. In boys this enlargement, if it occurs, passes off after a few days, and the breasts remain rudimentary during the rest of life; but in girls it leads to the full development of the organ. Over the center of the gland there is a circular patch of skin, thinner and darker than the rest (the *areola*); and from it rises a small conical projection (the *nipple*). On the apex of the nipple the *milk-ducts* (from fifteen to twenty in number) open by separate orifices. Each of these ducts passes outward to one division or *lobe* of the breast, dilating beyond the nipple into a *sinus*, and then branching repeatedly to terminate in the *lobules*, or clusters of small rounded vesicles in which the milk is secreted. The lobules and lobes are bound together by connective tissue, and well packed in fat, which increases sometimes to an enormous extent the apparent size of the organ. In the adult female the breasts swell a little at each monthly period. During pregnancy considerable enlargement takes place, and shortly after the birth of the child the milk begins to be freely secreted.

DISEASES OF THE BREAST are of frequent occurrence in women, probably on account of the great changes in activity and blood-supply to which the organ is subject. During suckling the delicate skin of the nipple often becomes abraded. The ulcers or fissures thus formed are usually very painful, so much so, it may be, as to render nursing impossible, and frequently lead to abscess of the breast. Acute inflammation of a part of the breast or of the adjacent tissues frequently occurs during nursing, rarely at other times.

Chronic inflammation of the whole or a part of the breast sometimes occurs, and may closely resemble a true tumor. It may disappear under the prolonged application of warmth and moisture, or other remedies which favor absorption, or may end in abscess.

The breast may be the seat of almost any of the numerous forms of tumor met with in the body. Far the most common varieties in this situation, however, are *glandular tumors* and *hard cancer*. Glandular tumors (adenocele) vary much in size, form, and consistence, but present in their intimate structure more or less resemblance to the normal structure of the breast, and are not dangerous to life. Their removal may be necessary on account of the pain or inconvenience they cause the patient. Cancer, on the other hand, is all but invariably fatal.

BREASTWORK, in fortification, is a hastily-constructed earthwork of sufficient height to protect men standing on the natural surface of the ground, and firing over it without requiring a "banquette" to stand upon, as would be the case with the more carefully constructed work called a "parapet." The ditch in front, from which the earth is taken to form the breastwork, affords a slight additional obstacle to the attack. The inner surface of a breastwork is revetted (that is, faced with sods, timber, hurdles, etc.), in order that it may stand at a steep slope, thus improving the cover it gives by enabling the defenders to get close up to it.

BRECHIN, a parliamentary burgh of Scotland in the county of Forfar, seven and one-half miles west of Montrose, and connected by a branch line with the Caledonian railway.

BRECON, or BRECKNOCKSHIRE, an inland county in South Wales. Its greatest length from south to north is about fifty-three miles, and its greatest breadth from east to west about forty-six miles. It possesses an area of 719 square miles, or 460,158 acres and is thus the fourth largest county in Wales. It is said to have derived its name from Brychan, a Welsh prince, who flourished in the fifth century. Population (1890), 60,000.

BREDA, a town of Holland, in the province of North Brabant, and capital of a circle, is situated in a marshy plain on the Merck, twenty-four miles southwest of Bois-le-Duc, and thirty north-northeast of Antwerp. Population, 15,000.

BREDA, JAN VAN, a Dutch painter, was the son of Alexander Van Breda, an artist of considerable merit, and was born at Antwerp in 1683. He died at Antwerp in 1750.

BREDOW, GABRIEL GOTTFRIED, a German historian and professor in the University of Breslau, was born at Berlin in 1773. He is best known by his *Manual of Ancient History*, which was translated into English in 1827; *Researches on History, Geography, and Chronology*, and his valuable *Historical Tables*, which come down to 1811.

BREEDS AND BREEDING. The word breeds is usually applied to the varieties of domesticated *animals* only, but since the phenomena presented under cultivation by all classes of organisms are entirely similar in character, and since, moreover, much of our knowledge on the subject has been gained from botany and horticulture, we shall include, under the one term breeds, the varieties of domestic animals and cultivated plants.

Since a breed is a domestic variety, it implies the existence of a group of individuals marked off from their congeners by the possession of certain characters which are transmitted to their offspring. It is this *transmission* of peculiarities which is the essential characteristic of a breed; for any collection of domesticated organisms could be divided into groups of individuals distinguished by certain points, but such groups would not necessarily form breeds. It is evident, then, that the law of heredity which asserts that "like begets like" must hold good, or the existence of breeds would be an impossibility. Again, if it were absolutely true that like begets like, that is, if the offspring were in all cases identical with the parent, it is evident that neither by man's interference, nor by the operation of nature, could a breed or race arise. It seems, then, that were it not in the nature of all organic beings to produce their kind in the manner formulated in the principle of heredity, and were it not for the continuous slight infringement of it expressed by the variability, breeds could not have arisen. It is therefore necessary to examine these two principles as part of the subject under consideration.

Whatever views we may entertain respecting the origin of our domestic animals and plants, there can be no doubt as to the matter of fact that breeders have always proceeded on one principle—*select the best individuals in each generation and pair them.* Now we have found that the qualities of organic beings (forming in a certain sense the material on which the breeder has to work) can be generalized under two principles—heredity and variability. And in the same way the art of breeding is itself capable of a kind of generalization under the principle of selection. There are thus three great principles or laws—heredity, variability, and selection—the last relating to the art of man, the other two to those qualities of organic beings which render the art practicable.

Heredity.—The simplest form of heredity is found among those organisms which produce their kind by division into two parts similar to each other. This process is illustrated by the fission of a Moneron. The next advance in complexity of reproduction occurs when the two portions into which the organism divides are dissimilar to one another; here the process by which both portions ultimately assume the form of the parent is not one of simple nutrition, *i. e.*, of formation of tissue like that already formed. The process by which man propagates some of his cultivated plants is one of artificial reproduction by fission. For instance, a cutting or part of a shoot, or even a leaf (as with Begonia), if placed in suitable soil, will reproduce the original plant in all its minute details. Mr. Darwin remarks: "It is hardly possible, within a moderate compass, to impress on those who have not attended to the subject the full conviction of the force of inheritance, which is slowly acquired by rearing animals, by studying the various treatises which have been published on the various domestic animals, and by conversing with breeders. Certain peculiarities have appeared only once or twice in the history of the world, but have reappeared in children or grandchildren of the individuals so characterized." It is frequently asserted that the male is prepotent over the female in transmitting certain characters. It has been shown, however, that such rules do not hold good except in a very limited extent, and in certain groups only. It frequently happens that a character existing in one of the parents is transmitted more powerfully to the offspring of the sex to which that parent belongs than to the opposite sex. The resemblance between prepotency and sexual limitation becomes clear when we remember that where the offspring are of one sex it may be impossible to distinguish between these forms of heredity. The most interesting point connected with secondary sexual peculiarities in relation to the subject of breeds is, that they are sometime found in domesticated animals whose nearest wild congeners show no limitation of character.

Variability.—When in any case we find the offspring differing from the parent, we set it down at first sight as an instance of variability. But on the discovery being made that the peculiarities characterizing the offspring are derived from a remote ancestor, it can no longer be so considered, and must be attributed to reversion. Many cases of apparent variation are due to this cause. Thus Gärtner declares, and his experience is of the highest value on such a point, that when he crossed distinct species of native plants that had not been cultivated, he never once saw in the offspring any new character; but that, from the odd manner in which the characters derived from the parents were combined, they sometimes appeared as if new. It appears, therefore, that the point at which the line of distinction is drawn between reversion and variation depends in many cases on the state of our knowledge of the subject. In some other points, also, the relations between inheritance and variation are extremely intricate and difficult to unravel. The two principles are often spoken of as opposed to one another.

It may appear a truism to say that every variation must have a distinct cause, but it is a truism very often overlooked. The case of twins, each born with a peculiar crook in the little finger, is instructive, for here the conclusion is irresistible that the same definite, though unknown, cause produced the mal-formation in the two children. This case may also serve to illustrate the extreme obscurity in which the causes of any given variation are hidden, and the great difficulty of investigating them. Some general causes which induce variability may, however, be set down.

There appears to be no doubt that organisms subjected to the unnatural and changeable conditions implied

by domestication are more variable than those living in a state of nature. Thus monstrosities are comparatively frequent among domestic animals and plants. Domestication causes a number of changes in the condition of life; it is therefore of interest to determine which of these are the most important. Contrary to what might have been expected, change of climate is not an important cause of variation. This is repeatedly shown by A. de Candolle in his *Géographie Botanique;* and a change to a more genial climate is certainly not necessary, for the dwarf kidney bean, which is often injured by the spring frosts, and the peach, which requires the protection of a wall, have varied much in England. (See ACCLIMATISATION.)

Some peculiarities in our domestic races are to be attributed to the inherited effects of habit and of disuse. Splints and ring-bones on the legs of horses appear to be certainly hereditary; and veterinary surgeons agree in pronouncing these growths to be the result of travelling on hard roads, and of the horses being shod. The effects of disuse are clearly shown in the skeletal characters of our domestic races. These effects are well marked in tame birds, which are necessarily prevented from exercising their wings in flight. Thus in the domestic duck the crest of the sternum is less prominent, the furculum, coracoids, and scapulæ are all reduced in weight relatively to that of the whole body; the bones of the wing are shorter and lighter, and the bones of the leg longer and heavier in comparison with the same bones in the wild duck. Closely connected with this class of facts is the subject of rudimentary organs. In organisms living in a state of nature the constant pressure of the struggle for existence tends to keep useless structures in a rudimentary condition. But domestication, in removing this pressure, does away at the same time with the principle of economy of growth; and accordingly, we find that organs rudimentary in a state of nature become developed under domestication.

Correlation has probably played an important part in modifying domestic races; for in selecting a given character man has frequently perpetuated many other peculiarities correlated with the first.

Finally may be mentioned the curious phenomena of "analogous variation." This term is applied to those cases in which varieties of one species resemble distinct but allied species. Where this occurs it is probably due to the two forms having originated in a common progenitor, so that modifying causes evolve similar varieties in the two cases because of the similarity of the material which these forces have to act on. Analogous variation is therefore, properly speaking, a branch of the subject of reversion, and once more points out the close connection existing between the latter phenomenon and variability.

Selection.— Selection may be defined as the process by which the procreators of each fresh generation are chosen out of the preceding one. But with reference to the formation of our improved breeds something more than this is meant by the term. The modern development of the art, which has been distinguised by Mr. Darwin as a *methodical selection*, always implies that the breeder has before his mind an ideal form,— a model on which he attempts to mould his strain. To be successful in this respect a man must not only possess in the highest degree the powers of discrimination, enabling him to determine which individuals are tending in the right direction, that is, which most nearly approach his ideal, but he must be able to decide, in the most judicious manner, as to which of his selected individuals ought to be paired together.

Crossing.— An injudicious exaggeration of certain qualities, has taken place in breeding long-woolled sheep. Here the fleece has been almost exclusively attended to and the quality of the carcase allowed to deteriorate. No doubt, an improved breed remedying this evil might have been formed by selection, but this process would have been slow and extremely difficult; and, fortunately, there existed the readier method of forming a cross-breed race combining the desirable characteristics of both varieties.

In some cases the offspring of a first cross between distinct species possess valuable qualities, but owing to their sterility an intermediate *race* cannot be formed. If, however, the combination is valuable the cross may be repeated at will. The breeding of mules is a familiar example of this method. In the same way cross-bred cattle, which though not sterile are yet incapable of transmitting their valuable qualities to their offspring, are bred for the butcher by a repetition of the first cross.

The ancestors of nations at present civilized must have passed through stages in which they resembled the savages of the present day; therefore it may fairly be assumed that customs which are found among lowly developed savages are of great antiquity. Now few races are more barbarous than the Australians, yet even they take pains in the breeding of their dogs, matching the finest together and providing good food for the mother in order that the young may be well nurtured. From a large body of similar evidence there can be no doubt that a degree of selection sufficient for the development of unperceived divergence has been practised from exceedingly ancient times. The results produced by prolonged selection of this kind may be estimated in various ways. For instance, although it is certain that the pointer originally came from Spain, no such breed exists there at the present day. So far as is known no efforts have ever been made to modify the pointer; but every one has wished to possess as good dogs as possible, and by an unconscious consensus of opinion, the desire for improvement has resulted in a slow progressive change in a certain direction. But the amount of divergence produced by long-continued selection may be illustrated more forcibly by general consideration than by special instances. The fact that the progenitors of many cultivated plants and domestic animals cannot with certainty be determined points out the great divergence from the wild parent form that has been effected under domestication.

BREGENTZ, the ancient *Brigantia*, capital of the circle of Vorarlberg, in Tyrol, stands on a hill at the southeast end of the Lake of Constance. Pop., 4,000.

BREHON LAW, the law of Ireland previous to the Conquest, and of some communities of the Irish down to the 17th century (from *breitheam*, genitive *breitheamain*, a judge; root, *breith*, a judgment). Three volumes of these laws, comprising the code called the *Senchus Mor*, alleged to have been revised by St. Patrick, have been published by a Royal Commission appointed in 1852, and other portions in the second series of O'Curry's *Lectures on the Materials of Ancient Irish History*, edited, with a learned introduction, by Dr. W. K. Sullivan in 1873. The antiquated and often obsolete language both of the original text and of the interlined glosses, coupled with the fact that portions of both are cited in complications considered not later than the 10th century, are arguments for their acceptance as fragments of a primitive system unmodified by Anglo-Saxon, Danish or Norman influences. The Roman (or civil) law is hardly traceable to them, except as regards ecclesiastical affairs, and that *sub modo* only. From the first-mentioned cause also, the provisions are often obscure and sometimes unintelligible; but enough appears to indicate the general nature and much of the details of these laws

As compared with the collections known under the generic title *leges barbarorum*, they are remarkable for their copiousness, and furnish a striking example for the length to which moral and metaphysical refinements may be carried under rude social conditions. They present a state of society such as may be conceived to have existed under the older manorial organization, when the land was to a greater extent "folk"-land than "boc"-land, and comprised commons of tillage as well as of pasture. This kind of occupancy entailed annual repartitions of the tillage, recalling the usage of the ancient Germans, and of which, as practiced on a minor scale in Ireland in 1782, Sir Henry Piers has given an account in his description of Westmeath. Traces of such repartitions survived under the name of Rundale in the Highlands of Scotland and in some parts of the West of England till recent times. There is no evidence, however, in the Brehon code, as now published, of merely family occupancy, in which one household living together, or even one village community, enjoyed the land and its produce in common, although such an origin may be theoretically conjectured for the institutions described. The social unit comprised separate families and households numerous enough to occupy a *crich* or *quasi* manor, within which existed a court and complete system of primary social organization. In each of these, mensal lands were set permanently apart for the chief, and means existed by which portions of the common land could, within certain limits, be acquired in severalty by individual owners. The *crich* formed portion of the *tuath*, or *quasi* barony, one or more of which constituted the *mor tuath*, or petty kingdom, equivalent to a county or several counties, governed by a *ri* or *regulus*, who, in theory at least, bore allegiance, through superior *reguli*, to the monarch. The grades of rank were numerous, but the distinctions of wealth which grounded them appear very arbitrary. The upper classes were all "Aires." To be eligible to the *aire* grade, the freeman should possess, besides a certain amount of wealth in cattle, a prescribed assortment of agricultural implements and household goods, the meagerness of which exemplifies the slow progress of the arts of life in early states of society, and he should have a house of given dimensions, ranging from 17 to 27 feet in length, and containing a given number of compartments. The houses were of timber and wattle-work, surrounded by open spaces of prescribed extent for each class. The lower limit for this space was the distance to which the owner seated at his door could throw a missile of given weight; multiples of that distance determined its extent for the higher classes. Tacitus has noticed a like custom of keeping clear spaces round the several dwellings among the early Germans; and this regulation has probably contributed to retard the progress of the early Irish out of pastoral and agricultural into civic habits. There was a serf and slave population, who were designated *ernaans*, as representing the earlier Firbolg and Pictish colonists, who did not enjoy these privileges, except by the process of becoming *fuidhirs* or tenants of the separate lands of the nobles, who called themselves *Gaidel*, or Gael, and claimed a different descent. Besides these tenants, or "feuers," there were dependants called *ceilés*, who stood to the wealthy classes in a relation resembling that of the *clients* of the Roman commonalty to their patrons. Both they and the *fuidhirs* owed suit and homage to their *flaths* or lords, as well as services and rents in kind and in refections. The food-rents, *biadh*, corresponding to the Anglo-Saxon *feorme* (whence "farmer"), were supplied both at the residences of the chiefs and at the tables of their tenants, whence originated the customs of *coyne* and *livery* of later times.

BREISLAK, SCIPIONE, an eminent geologist, was born at Rome in 1748. He early distinguished himself as professor of mathematical and mechanical philosophy in the college of Ragusa; but after residing there for several years he returned to his native city, where he soon became a professor in the Collegio Nazareno, and began to form the fine mineralogical cabinet in that institution. His leisure was dedicated to geological researches in the Papal States. His account of the aluminous district of Tolfa and adjacent hills, published in 1786, gained for him the notice of the King of Naples, who invited him to inspect the mines and similar works in that kingdom, and appointed him professor of mineralogy to the Royal Artillery. The vast works for the refining of sulphur in the volcanic district of Solfatara were erected under his direction. He afterwards made many journeys through the ancient Campania to illustrate its geology, and published in 1798 his *Topografia Fisica della Campania*, which contains the interesting results of much accurate observation. Breislak also published an essay on the physical condition of the seven hills of Rome, which he regarded as the remains of a local volcano,—an opinion which more recent investigations appear to disprove. The political convulsions of Italy in 1799 brought Breislak to Paris, where he remained until 1802, when, being appointed inspector of the saltpetre and powder manufactories near Milan he removed to that city. He died on the 18th of February 1826.

BREMEN, one of the three free cities of the new German empire, is situated on the River Weser, about 50 miles from the sea and 60 S.W. of Hamburg. The city consists of three parts—the old town (*Alt Stadt*) and its suburban extensions (*Vorstadt*) on the right bank of the river, and the new town, dating from the Thirty Years' War, on the left. The river is crossed by three bridges, of which the last was built in 1874–5. The ramparts of the old town have long been converted into beautiful promenades and gardens, but both the old and the new town are still surrounded with moats. The area of the whole city is great in proportion to its population, the houses in general being built to contain only one family. Population (1890), 150,000.

BREMER, FREDRIKA, the most celebrated Swedish novelist, was born near Abo, in Finland, on August 17, 1801. Her father, a descendant of an old German family, was a wealthy iron master and merchant. He left Finland when Fredrika was three years old, and after a year's residence in Stockholm, purchased an estate at Arsta, about twenty miles from the capital. There, with occasional visits to Stockholm and to a neighboring estate, which belonged for a time to her father, Fredrika passed her time till 1820. The education to which she and her sisters were subjected was unusually strict; their parents, especially their father, were harsh and took little or no pains to understand the temperaments of the children. The constant repression, the sense of being misunderstood, and the apparent aimlessness of such an existence told with greatest force upon Fredrika, who was of a quick and eager disposition, fond of praise and conscious of powers which it seemed to her must lay forever unused. She felt as if her life were being wasted; there was nothing on which she could expend her energy; no career was open to a woman. Her health began to give away; and in 1821 the whole family set out for the south of France. They traveled slowly by way of Germany and Switzerland, and returned by Paris and the Netherlands. It was shortly after this time that Miss Bremer became acquainted with Schiller's poetical works, which made a very deep impression on her. Her home life, however, was still unsatisfying, and in her passionate longing for

some work to which she could devote herself, and through which she might do some good in the world, she for a time resolved to join one of the Stockholm hospitals as a nurse. This plan was given up on the entreaty of her sister. Meanwhile, she had found relief for her pent-up feelings in writing, or rather in continuing to write, for she had been an authoress of a sort from the age of eight. In 1828 she determined to attempt publication, and succeeding in finding a publisher. The first volume of her *Sketches of Every Day Life* (1828) at once attracted attention, and the second volume (1831), containing one of her best tales *The H—— Family*, gave decisive evidence that a real novelist had been found in Sweden. The Swedish Academy awarded her their smaller gold medal, and the fortunate authoress became famous. From this time Miss Bremer had found her vocation. Her father had died in 1830, and her life was thereafter regulated in accordance with her own wishes and tastes. In the autumn of 1849 she set out for America, and after spending nearly two years there returned through England. She died December 31, 1865.

BRENHAM, the county seat of Washington county, Texas, is situated 93 miles east of Austin, and 72 miles northwest of Houston, and has good railroad and telegraph facilities. It contains three banks, an opera house, eight churches, several foundries, carriage factories and planing-mills, a seminary and schools. Brenham is a prominent shipping-point for cotton, and has a population (1890) of 5,500.

BREMERHAVEN, a seaport town belonging to the free city of Bremen, on the right bank of the Weser at the mouth of the Geest. Population, 12,000.

BRENNUS, the name given in history to two kings or chiefs of the Celtic Gauls, probably not an appellative, but a title, the Cymric. The first Brennus crossed the Apennines into Italy, at the head of 70,000 of the tribe of Gauls known as Senones, and ravaged Etruria, 391 B.C. Some envoys from Rome, sent to watch their movements, were said to have taken an active part in a skirmish before the walls of Clusium; and the Gauls, failing to obtain the surrender of these men, marched at once for Rome. A Roman army of about 40,000 men was hastily despatched to meet them, and took up a position on the banks of the little river Allia, within twelve miles of the city. Here Brennus attacked and defeated them with great slaughter; and if he had pressed on at once, Rome would have lain at his mercy; for the greater part of the beaten army had placed the Tiber between themselves and the conquerors. But the Gauls lingered on the field of battle, mutilating the dead, and drinking to excess. The Romans gained time to occupy and provision the Capitol, though they had not force sufficient to defend their walls; their women and children were sent off to Veii; and when on the third day the Gauls marched in and took possession, they found the city occupied only by those aged patricians who had held high office in the state. Too old to be of service in the little garrison, and too proud to fly, they had all solemnly devoted themselves to death, and sat each in the porch of his house, in full official robes, awaiting the invaders. For a while these withheld their hands from them, out of awe and reverence; but the ruder passions soon prevailed, and they were all slaughtered. The city was sacked and burnt; but the Capitol itself withstood a siege of more than six months, saved from surprise on one occasion only by the wakefulness of the sacred geese and the courage of Marcus Manlius. (See MANLIUS.) At last the Gauls consented to accept a ransom of a thousand pounds of gold. As it was being weighed out the Roman tribune complained of some unfairness. Brennus at once threw his heavy sword into the scale; and when asked the meaning of the act, replied that it meant "*Væ victis*"—"woe to the vanquished." The Gauls returned home with their plunder, leaving Rome in a condition from which she took long to recover. A later legend, most probably an invention, represents Camillus as having suddenly appeared with an avenging army at the moment when the gold was being weighed, and having defeated and cut to pieces Brennus and all his host (Livy, v. 49).

The second Celtic chief who bears the name of Brennus in history is said to have been one of the leaders of an inroad made by the Gauls from the east of the Adriatic into Thrace and Macedonia, 280 B.C., when they defeated and slew Ptolemy Ceraunus, then king of Macedonia. Whether Brennus took part in this first invasion or not is uncertain; but its success, and the rich spoils brought home, led him to urge his countrymen to a second expedition, when he marched with an army of 150,000 foot and 60,000 horse through Macedonia, defeating such forces as were brought against him, and passing thence into Thessaly, ravaging as he went, until he reached the historic pass of Thermopylæ. To this point the united forces of the Northern Greeks—Athenians, Phocians, Bœotians, and Ætolians—had fallen back; and here the Greeks a second time held their foreign invaders in check for many days, and a second time had their rear turned, owing to the treachery of some of the natives, by the same path which had been discovered to the Persians two hundred years before. Their land force, however, succeeded in getting on board the Athenian fleet, which was lying off the shore to co-operate with them. Brennus and his Gauls marched on to attack Delphi, of whose sacred treasures they had heard much. But the little force which the Delphians and their neighbors had collected—about 4000 men—favored by the strength of their position, made a gallant and successful defence. With or without the help of Apollo, who is said to have come to the aid of his sanctuary, they rolled down rocks upon the close ranks of their enemies as they crowded into the defile, and showered missiles on them from their vantage ground. A thunderstorm, with hail and intense cold, increased their confusion, and when Brennus himself was wounded they took to flight, pursued by the Greeks all the way back to Thermopylæ. Brennus killed himself, "unable to endure the pain of his wounds," says Justin; more probably determined not to return home defeated. Few of the invading force eventually escaped.

BRENTANO, CLEMENS, German dramatist and novelist, was born at Frankfort-on-the-Main in 1777. His sister Elizabeth was the well-known Bettina von Arnim, Goethe's correspondent. He studied at Jena, and afterwards resided in Heidelberg, Vienna, and Berlin, leading a somewhat restless and unsettled life. In 1818 his disgust with all mundane affairs reached such a height that he withdrew from ordinary life and lived in the strictest seclusion at Dülmen. This continued for six years; the latter part of his life he spent in Ratisbon, Frankfort, and Munich. He died at Aschaffenburg 28th July 1842. His first published writings consisted of satires and poetical dramas (*Satiren und Poetische Spiele*, 1800); of his later dramas the best are *Ponce de Léon*, 1804, and *Victoria*, 1817; of his poems the best is *Die Grïndung Prags*, 1816. On the whole his finest work is the short tale, or novelette, *Geschichte von braven Kaspar und dem schönen Annerl*, a very perfect little piece, which has been translated into English. Brentano also assisted Ludwig Achim von Arnim, his brother-in-law, in the collection of the tales and poems forming *Des Knaben Wunderhorn*, 1800-8.

BRENTFORD, a town of England, in the county or Middlesex, eight miles west of London, on a loop line of the South-Western railway. Pop., 18,000.

BRENZ, JOHANN, Reformer, born June 24, 1499. Studied at Heidelberg, became an adherent of Luther, and in 1522 attached himself to the Reformation. He died September 11, 1570.

BRESCIA, or BRESCIANO, a province of Italy, in Lombardy, bounded on the northwest by Bergamo, northeast by Tyrol, east by Verona, from which it is separated by the Lago di Garda, southeast by Mantua, and southwest by Cremona. Its area is rather more than 1,643 square miles. The northern part, or about one-third, is occupied by a chain of mountains which belong to the Rhætian Alps; the remainder forms part of the great plain of Lombardy. Population, 500,000.

BRESCIA, the capital of the above province, is situated between the Mella and the Garza, about 155 miles by rail from Turin. Population (1890), 43,000.

BRESLAU, a city of Prussia, capital of the government of Silesia, is situated mainly on the left, but partly also on the right bank of the Oder, at the influx of the Ohlau, and on the railway from Berlin to Vienna, 190 miles southeast of the former city. Population, 310,000.

BREST, a strongly fortified seaport town of France, capital of an arrondissement in the department of Finistère. It is situated to the north of a magnificent landlocked bay, and occupies the slopes of two hills divided by the River Penfield, the part of the town on the left bank being regarded as Brest proper, while the part on the right is known as Recouvrance, from the chapel of the Virgin, to whom the shipwrecked sailors used to address their prayers for the recovery of their property. The hillsides are in some places so steep that the ascent from the lower to the upper town has to be effected by flights of stairs; and the second or third story of one house is often on a level with the ground story of the next. The roadstead of Brest, which is in some places three miles broad, and has an area of fifteen square leagues, is formed by the promontory of Finistère on the north, and that of Kélernn on the south. It breaks up into numerous smaller bays or arms, formed by the embouchures of streams, the most important being the Anse de Kélernn, the Anse de Poulmie, and the mouths of the Chateaulin, the Dolas, the Lauberlach, and the Landerneau. It is defended on every side by batteries and forts, the first system of which was erected in 1680 under the personal superintendence of Vauban. The only entrance, the Goulet, is about a mile wide; but the Mingant or Mingam rock in the middle compels vessels to pass under the batteries. Population (1890), 70,800.

BREST-LITOVSK (in Polish BRZESC, and in the chronicles BERESTIE and BERESTOFF), a town of Russia, in the government of Grodno, and 131 miles south from the city of that name, at the junction of the navigable river Mukhovetz with the Bug. Pop., 25,000.

BRETAGNE. See BRITTANY.

BRETON, JULES ADOLPHE, born in 1827, was trained as a painter under Félix Devigne at Ghent and at Paris. In 1853 he exhibited "Le Retour des Moissonneurs," and in 1855 his celebrated "Les Glaneuses." He is represented in the Luxembourg by "La Bénédiction des Blés" (1857), "Le Rappel des Glaneuses" (1859), and "Le Soir" (1861).

BRETON DE LOS HERREROS, DON MANUEL, Spanish dramatist, born in 1800 at Quel, and died at Madrid, November 13, 1873. His poems fill five volumes (Madrid, 1850–52), and a selection appeared in Paris in 1875.

BRETSCHNEIDER, KARL GOTTLIEB, an eminent scholar and theologian, of the more moderate school of German rationalism, was born on February 11, 1776, at Gersdorf in Saxony. From his autobiography, which was found among his papers after his death, and was published by his son in 1851, we obtain a very complete picture, not only of the man himself, but of the times in which he lived, and of the influences by which he was surrounded. His father was pastor of the village of Gersdorf, but was translated to Lichtenstein when Bretschneider was only four years of age. He gives an interesting account of his early childhood and school training, of the impression produced upon him by his father's dignified bearing, and of the agricultural pursuits and piscatorial amusements by which the clerical and pedantic labors of the latter were diversified. On the death of his father in 1789 he was sent to Hohenstein to reside with his uncle Tag. It is in keeping with the mental characteristics of the man who afterward became famous for that cool and deliberate exercise of the reason on theological subjects which has led many to place him among the extreme school of rationalist divines, to find him at the early age of fourteen, when he was confirmed by the pastor of Hohenstein, criticizing the religious teaching of his instructor.

The work by which Bretschneider conferred the greatest service upon the science of exegesis was his *Lexicon Manuale Græco-Latinum in libros Novi Testamenti*, which appeared in 1824, and which attained a third edition in 1840. He died at Gotha, January 22, 1848.

BREUGHEL, JAN, a Flemish painter, son of Peeter Breughel, was born at Brussels about the year 1569. He left a large number of pictures, chiefly landscapes, which are executed with great skill. Rubens made use of Breughel's hand in the landscape part of several of his small pictures, such as his Vertumnus and Pomona, the Satyr viewing the Sleeping Nymph, and the Terrestrial Paradise, which by some is regarded as the masterpiece of that great artist. Breughel died in 1642.

BREUGHEL, PEETER, a Flemish painter, was the son of a peasant residing in the village of Breughel, near Breda. He is said to have died about the year 1570 at the age of sixty; other accounts give 1590 as the date of his death. Several other painters of the name Breughel attained to some distinction.

BREVE, a note in music. The name was originally applied to the shortest of the three notes used in early music, but now designates the longest note met with, and it occurs but seldom, except in church music, modern music being divided into bars which usually fall short of it in length.

BREVET (Fr. a writ or warrant) in the army is a promotion of officers by selection to a higher rank irrespective of there being any vacancies in its established numbers. In the United States, brevet rank is often conferred as a mark of recognition for gallant and meritorious services, but does not entitle the holder to the higher rate of pay, nor to corresponding rank, except under special circumstances defined by law. Many brevets were awarded at the close of the Civil War.

BREVIARIUM ALARICANUM, a collection of Roman law, compiled by order of Alaric II., king of the Visigoths, with the advice of his bishops and nobles, in the twenty-second year of his reign (506 A. D.). It comprises sixteen books of the Theodosian code; the Novells of Theodosius II., Valentinianus III., Marcianus, Majorianus, and Severus; the Institutes of Gaius; five books of the *Sententiæ Receptæ* of Julius Paulus; thirteen titles of the Gregorian code, two titles of the Hermogenian code, and a fragment of the first book of the *Responsa Papiani*. It is termed a code (codex) in the certificate of Anianus, the king's referendary, but unlike the code of Justinian, from which the writings of jurists were excluded, it comprises both imperial consti-

tutions (*leges*) and juridical treatises (*jura*). From the circumstance that the Breviarium has prefixed to it a royal rescript (*commonitorium*) directing that copies of it, certified under the hand of Anianus, should be received exclusively as law throughout the kingdom of the Visigoths, the compilation of the code has been attributed to Anianus by many writers, and it is frequently designated the Breviary of Anianus (Breviarium Aniani). The code, however, appears to have been known amongst the Visigoths by the title of "Lex Romana," or "Lex Theodosii," and it was not until the 16th century that the title of "Breviarium" was introduced to distinguish it from a recast of the code which was introduced into Northern Italy in the 9th century for the use of the Romans in Lombardy.

BREVIARY (Lat. *breviarium*), the book which contains the offices for the canonical hours. The word first occurs in the 11th century, and is said to denote that the book was an abridgment of several separate ones which had previously been in use.

In the earliest times most of the stated public devotions of the faithful grouped themselves round the daily celebration of the eucharistic sacrifice; but by degrees other offices were added, in which the recitation of the Psalter formed the principal part. The rise of monasticism gave a great impulse to the movement, as the monks generally used the whole Psalter every week, and many of them every day. Numerous complications were added by degrees, in the shape of antiphons, responses, &c. Metrical hymns seem to date from St. Ambrose in the middle of the 14th century. Select portions of holy Scripture were also read, as well as extracts from works of the Fathers and from lives of the saints.

The canonical hours are eight in number; the night office of matins (divided into three nocturns) and seven day offices,—lauds, prime (at 7 A.M.), terce (at the third hour or 9 A.M.), sext (at the sixth hour, noon), nones (at the ninth hour, 3 P.M.), vespers (at sunset), and compline before retiring to rest.

BREWING is the art of preparing an exhilarating or intoxicating beverage by means of a process of fermentation. In the modern acceptation of the word, brewing is the operation of preparing beer and ales from any farinaceous grain (chiefly from barley), which is first malted and ground, and its fermentable substance extracted by warm water. This infusion is evaporated by boiling, hops having been added to preserve it. The liquor is then fermented.

The art was known and practised by the Egyptians many hundred years before the Christian era, and afterwards by the Greeks, Romans, and ancient Gauls, from whom it has been handed down to us. All countries, whether civilized or savage, have, in every age, prepared an intoxicating drink of some kind. In the second book of Herodotus, written about 450 B.C., we are told that the Egyptians, being without vines, made wine from corn; but as the grape is mentioned so frequently in Scripture and elsewhere as being most abundant there, and no record exists as to the vine having been destroyed, we must conclude that the historian was only partially acquainted with the productions of that most fertile country. Pliny (*Natural History*, xxii. 82) informs us that the Egyptians made wine from corn, and gives it the name of *zythum* which in the Greek would mean drink from barley; and Hellanicus, telling of the introduction of wine at Plinthium, a city of Egypt, states: "Hence the Egyptians are thought to derive their love and use of this liquor, which they thought so neccessary for human bodies, that they invented a wine made from barley." The Greeks, who derived the greater part of their civilization from the Egyptians, obtained from them also the knowledge of artificial fermentation, the art of brewing in fact, and at a very early period. We find it mentioned, for example, in the writings of Archilochus, the Parian poet and satirist, who flourished about 700 B.C., that the Greeks of his day were already acquainted with the art.

Again, we learn from Æschylus (470 B.C.), from Sophocles (420 B.C.), and Theophrastus (300 B.C.), that the Greeks employed barley wine or beer in their daily life as well as in their festive meetings. There is, in fact, little doubt that the discovery of beer and its use as an exhilarating drink were nearly as early as those of the grape itself. Xenophon, in his account of the retreat of the ten thousand Greeks, written 400 years B.C., mentions that the inhabitants of Armenia used a fermented drink made from barley. Diodorus Siculus states that the Galatians prepared a fermented beverage from barley, like the Egyptians. Dioscorides mentions two kinds of beer, but he does not describe them sufficiently to enable us to distinguish them. Both, he says, were made from barley, and similar liquors were made in Spain and Britain from wheat. In the time of Tacitus (whose treatise on the manners and customs of the Germans was written in the 1st century of the Christian era), beer was their usual beverage, and from his description, imperfect as it is, there can be no doubt that they understood the method of converting barley into malt. Pliny mentions its use in Spain under the name of *celia* and *ceria*, and in Gaul under that of *cerevisia* or *cervisia*; he says—"The natives who inhabit the west of Europe have a liquor with which they intoxicate themselves, made from corn and water. The manner of making this liquid is somewhat different in Gaul, Spain, and other countries; and it is called by different names, but its nature and properties are everywhere the same. The people in Spain in particular brew this liquor so well that it will keep good a long time. So exquisite is the cunning of mankind in gratifying their vicious appetites, that they have thus invented a method to make water itself produce intoxication."

The *cevrisia* of Pliny evidently takes its name from Ceres, the goddess of corn. Plautus calls it *Cerealis liquor*, that is, liquor used at the solemn festival of that goddess. The art of malting and use of beer are supposed to have been introduced into Britain by the Romans. That barley was known to the latter is evident from Virgil, who uses it in the plural form, *hordea*, as we do the word oats; and Pliny tells of the *hordearii gladiatores*, a kind of fencers, whose sustenance was barley. Beer and vinegar were the ordinary beverages of the soldiers under Julius Cæsar. The latter was made very strong, and was drunk diluted with water when on the march. Beer being so suitable to the climate, and so easily made by an agricultural people with plenty of corn, it was gladly welcomed, and soon became the national beverage. Previous to this, the usual drinks of the ancient Britons were water, milk, and mead (an intoxicating drink made from honey). After the expulsion of the Romans from Britain, the Saxons subdued the natives and learned from them the art of brewing.

Dr. H. J. Mann tells us that the Kaffre race of South Africa have made for ages, and still make, a fermented drink of beer from the seed of the millet (*Sorghum vulgare*), which is first subjected to a malting process in all essential particulars identical with our own. The seed is first induced to germinate by covering it in a warm place with moistened mats of grass, and the sprouting is then stopped by the application of heat. After simmering for some time in hot water, the malted grain is set aside to ferment in the sun—fragments of a dried succulent plant having been stirred in to play the part of yeast and start the fermentation. The scum which rises

to the surface during fermentation is skimmed away from time to time by ladles made of grass stems spread out and loosely woven together at the bowl. When the fermentation is complete the beer is poured through a mat strainer, shaped and tassled very much like an inverted night-cap, into the store vessel, which is made of thickly and firmly woven grass. The natives of Nubia, Abyssinia, and other parts of Africa also make an intoxicating drink of great power called bousa, from the flour of the teff (*Poa abyssinica*), and from the durrha or millet (*Sorghum vulgare*), much esteemed by the natives, and preferred by many to palm or date wine, the common intoxicating drink in tropical countries. According to Mungo Park, the natives of Africa also make a beverage from the seed of the spiked or eared soft-grass (*Holcus spicatus*). The Russian drink kvass or quass, a thick, sour beverage, not unlike bousa, is made of barley and rye flour, mixed with water and fermented. Formerly, the spruce-fir, birch, maple, and ash trees were tapped and their juice used in England, —the first two, indeed, till within the last fifty years. Koumiss, the drink of the Tatar race, is the fermented milk of their mares. The Chinese beverage, sam-shee, is made from rice. This is not only intoxicating, but, like absinthe, peculiarly mischievous in its permanent effects. In South America a favorite drink is palque, the fermented juice of the American aloe (*Agave americana*). Guarapo is the juice of the sugar-cane, which, when fermented, forms the common drink of the negro races, who also prepare a drink from rice and honey. Where beer has once been introduced, however, it has generally become the national beverage, and is now in universal use in the northern and temperate parts of Europe and Asia.

Beer used formerly to be made in England from wheat; but this beverage was not so well flavored as if prepared from barley-malt, nor did it keep long. It was esteemed in Germany and Denmark, and was called by the Germans *Mumme*, and by the Danes *mom*. The German *Weiss-bier* is made from wheat-malt, with a small portion of barley-malt added.

We are informed by William of Malmesbury that, in the reign of Henry II., the English were greatly addicted to drinking. The monasteries were remarkable for the strength and purity of their ales, brewed from malt prepared by the monks with great care and skill. The waters of Burton-on-Trent began to be famous in the 13th century. The secret of their being so especially adapted for brewing was first discovered by some monks, who held land in the adjacent neighborhood of Wetmore. There is a document still extant, dated 1295, in which it is stated that Matilda, daughter of Nicholas de Shoben, had re-leased to the abbot and convent of Burton-on-Trent certain tenements within and without the town; for which re-lease they granted her, daily for life, two white loaves from the monastery, two gallons of conventual beer, and one penny, besides seven gallons of beer for the men. The abbots of Burton must also have made their own malt, for it was a common covenant in leases of mills belonging to the abbey, that the malt of the lords of the manor, both spiritual and temporal, should be ground free of charge. Mary Queen of Scots, in the midst of her troubles, seems not to have been altogether insensible to the attractions of English beer, for when she was confined in Tutbury Castle, Walsingham her secretary asked, "At what place near Tutbury beer may be provided for her majestie's use?" to which Sir Ralph Sadler, governor of the castle, made reply, "Beer may be had at Burton, three miles off."

The first essay known to us on the subject of brewing is by Basil Valentine. Boerhaave says of this treatise that it is both accurate and elegant. In 1573 H. Knanst published a work in five volumes at Erfurt, with the quaint title, *On the Divine Noble Gift, the Philosophical, highly Dear, and Wondrous Art to Brew Beer*. In the year 1585 Thaddeus Hagecius by Hayck (a Bohemian), published a treatise entitled *De Cerevisia, ejusque conficiendi ratione, natura, viribus, et facultatibus*. This small work of fifty pages gives a very clear and accurate description of the process of brewing. To Mr. Combrune, a London brewer in the early part of the 18th century, we are indebted for the proofs he gave of the value of the thermometer in brewing. In other respects his work entitled *The Theory and Practice of Brewing*, is of no particular value at the present day, though it was very useful at the time in advancing the art, and ran through several editions. Previous to his time brewers had looked upon the thermometer as a scientific toy, and "rule of thumb" was the order of the day. In the year 1784 Mr. Richardson, of Hull, brought out his *Theoretic Hints on Brewing Malt Liquor*, and *Statistical Estimates of the Materails of Brewing, showing the use of the Saccharometer*. These works would be beneficial but for the absurd mystery with which the author invests the whole subject. It was he who first brought publicly to the notice of brewers the value of the saccharometer, an improvement of his own on the hydrometer, or water guage, invented by Martin, the Fleet Street mathematician. Mr. Baverstock purchased one of these in 1768, and in 1770 received a certificate of the value of his instrument from Mr. Thrale, the celebrated brewer in Southwark, who had tested it. It was not, however, till 1785 that Mr. Baverstock published his *Hydrometrical Observations and Experiments in the Breweries;* so that Mr. Richardson has the merit of bringing his improved hydrometer, which he christened saccharometer, first to the notice of the trade. By this instrument the brewer is enabled to ascertain the amount of saccharine or fermentable matter in the wort, and thus to take advantage of a particularly good sample of malt, or to compensate for a bad one, so as to procure an uniform strength. Malt varies in quality according to season, the skill of the maltster, and other circumstances. Samples of barley raised from the same seed, and grown in adjoining fields, will produce malt widely different, although this is not discovered till it has been in the mash tun. The quantity of malt which suffices for a particular "length" to-day may fall far short of affording the same quantity of ale tomorrow, and *vice versa*. In either case the saccharometer is essential, as it enables the brewer to make his ales one standard strength. The instrument is also of great service in regulating the fermentations.

Mr. Richardson's saccharometer was constructed on the principle that 36 gallons (one barrel) of water weighs 360 lb, and that if that quantity of water were converted into wort and again weighed, the difference would show the weight of fermentable matter extracted from the malt. His instrument, therefore, was graduated so as to show one degree for each pound that a barrel of wort weighed more than a barrel of water. He does not, however, allow for the displacement of a certain quantity of water by the saccharine matter dissolved in it; consequently, his instrument is not quite correct. The saccharometer of Dring and Fage and that of Long, which are both on the same principle as Richardson's, are adjusted so as to allow for this inaccuracy; for example, if a gallon of sugar, weighing 16 lb, be added to 35 gallons of water (together making one barrel imperial measure), their instruments show in this infusion, at 60° Fahr., the excess above that of distilled water, which, in this instance, is 6 lb gravity; thus we have a barrel of wort, weighing

366 lb. composed of water 35 gallons, and saccharine matter 16 lb. The Excise make their calculations by Allen and Bate's instruments, which are constructed on the principle of indicating the specific gravity of the wort,—that of distilled water, which is the standard of weight by which all substances have to be compared, being reckoned 1000.

Barley is the seed of several species of *Hordeum*, and belongs to the tribe of grasses, called by botanists *Gramineæ*. It has been cultivated from the earliest times. The species most used for malting purposes are the long-eared or two-rowed barley (*Hordeum distichum*), and the *Hordeum hexastichon*, commonly called bere or bigg. Farmers find by experience that some land is not fit for the growth of this cereal, and maltsters that if it is grown on certain soils it will not make good alt. Light calcareous or friable gravelly dry soil is the best. Rich loamy soil produces an excellent crop, and sandy soil, when well manured, answers; but cold clayey land, even when well drained, will not produce the best malting barley. It is a most precarious crop, requires but little moisture, and a wet season is fatal to it. When it is in full ear rain, or even heavy dew, will break the stalk, and if wet continues for two or three days the ears on the ground begin to grow, get stained, and become quite unfit for malting. It should remain in the stack at least a month to season. If "got up" damp, it is liable to generate excessive heat, in which case the growing power of the germ is destroyed, and the grain rendered useless for malting purposes. Good barley should have a thin, clean, wrinkled husk, closely adhering to a plump well-fed kernel, which, when broken, appears white and sweet, with a germ full, and of a pale yellow color. It is of all cereals the best adapted for malting, containing as it does more starch and far less gluten than other grain, and about 7 per cent. of ready-formed grape sugar. A bushel of barley weighs between 53 lb and 58 lb, depending on climate, soil, and harvest; the same quantity of bere or bigg weighs from 47 lb to 51 lb. It cannot well be too heavy, as it gives a corresponding gravity to the malt, providing it be mellow, thin-skinned, and not steely. The cuticle, or husk, forms nearly $\frac{1}{6}$th of the weight of barley, and between $\frac{1}{4}$th and $\frac{1}{5}$th in bigg. According to Einhoff, 1000 parts of barley meal contain 720 of starch, 100 of water, 68 of fibrous or ligneous matter, 56 of sugar, 50 of mucilage, 36.6 of gluten, 12.3 of vegetable matter, and 2.5 of phosphate of lime. Hermbstädt gives the following percentages as the mean of ten analyses of barley made by him:—

Water	10.48
Husk	11.59
Gluten	4.91
Albumen	0.25
Starch	60.50
Sugar	4.66
Gum	4.50
Oil	0.35
Soluble phosphates, &c.	0.36
Loss	2.30
	100.00

Great care must be taken when buying for malting, for sometimes the grain is doctored by kiln-bleaching or dried at too great a heat. Several samples, too, may be mixed, in which case they will not grow regularly, as heavier barley generally requires to be longer in steep. Corns broken by the drum of the thrashing-machine being set too close spoil a sample; those cut into sections will not germinate, but in warm weather putrefy, as is evident from their blue-grey and mouldy appearance, and offensive smell whilst germinating. A good buyer will, by the use of a skilful hand, estimate very closely the weight per bushel in bulk; his eye will tell him if the grain has been cut before being ripe, in which case there will be a variety in the color of the barley-corns, some being bright, and some a dead greyish yellow. In consequence of being sown in spring, and not undergoing the equalizing tendency of winter, barley is of all grain the most liable to ripen in a patchy manner, and not come to perfection simultaneously. The buyer has also to judge if it has been heated or "mow-burnt" while lying in the field after being cut, or in the stack; this it is apt to do in showery weather, or when the crop of clover, which is generally sown with or soon after the barley, is luxuriant. In this case the grain is apt to sprout, and as the process of malting is as near as can be a natural vegetation, barley once sprouted is useless to the maltster.

Malting.—The word malt has been variously derived from roots that have respectively the meanings of grinding, soaking, and rotting. The last derivation, corresponding to the *humor ex hordeo corruptus* of Tacitus, is the most probable. Malting consists in steeping the grain in water to supply moisture enough to cause it to germinate, and when the growth is sufficiently advanced, stopping it by drying the grain on a kiln. Before explaining the process of malting we must describe the construction of the seed, and see the chemical changes that take place. A grain of barley is composed of several parts—the inner and outer husks, the cotyledon, the corcule (which includes the plumule or future stem and the rostel), the investing membrane, and the scar or eye, through which the seed is nourished during the process. The hard white part is termed, botanically, albumen. This is the cotyledon, and forms the chief part of the seed, supplying the germ with food during the first few days of its existence. With the germ, which begins to exist within an hour of being put in steep, springs also into existence the principle termed diastase.

According to Muspratt, diastase may be obtained by making a paste of malted grain at a temperature of 76°, allowing it to stand for a few minutes, and then pressing out the liquor, which is afterwards filtered and heated in a water bath at 170°. At this temperature a portion of the foreign nitrogenous matter coagulates, which is afterwards separated by filtration. The clear filtrate, which contains tolerably pure diastase, is evaporated at a low temperature to dryness. Diastase is not only soluble itself, but has the power of dissolving starch, and converting it into soluble gum, to which is given the name dextrin, and finally into grape sugar, so called because, on analysis, it closely resembles the sugar which naturally exists in the grape. So powerful is diastase, that one part will convert 2000 parts of starch into grape-sugar. This operation will be noticed below under the head of mashing. It is on account of this wonderful power of diastase to convert starch into saccharine matter, that distillers use one part of malt in mashing to five parts of raw grain. The next part of the seed that comes under notice is the corcule, which is the embryo of the future plant. This germ, feeding on the sugar formed from the starch of the cotyledon by the action of diastase, grows upwards and downwards,—the upward growth being the plumule or "acrospire," the downward the radicle or future root. Acetic acid, which does not exist in raw grain in a free state, is now also formed; this assists the diastase in its action.

The maltster's object is to obtain as much saccharine matter as possible, with the smallest loss of substance, by converting the starch of the barley into sugar, and thus preparing it for the brewery, where it is changed by fermentation into alcohol.

Malting consists of four processes,—steeping, couching, flooring, and kiln-drying.

Steeping is performed in a large cistern of stone, or more usually brick, covered with cement, into which the barley (properly screened, to remove the small useless grains) is shot from the store-chamber above. It is then levelled and covered with water to the depth of 5 or 6 inches, all floating kernels and refuse being skimmed off. This process is necessary for the germination of the seed not only in a chemical but also in a mechanical point of view. The seed is so hard and compact, and the husk so firmly bound to the kernel, that it would be impossible for the tender germ to make its way through it; the steeping imparts vitality to the germ, and also assists it in making its way through the husk. The grain now swells about one-fifth in bulk and one-half in weight from the moisture absorbed; or more precisely, 100 lb of barley would weigh after steeping, 147 lb, and 100 bushels measure would increase to 122. By law it has to be kept at least forty hours under water, and fifty if the grain is to be sprinkled before the twelfth day. This time must depend on the kind of barley used, the soil on which it was grown, the heat of the weather, and the hardness or softness of the water in which it is steeped. More time is required in cold than in hot weather.

Couching.— The couch-frame is formed like the cistern, with the exception that the fourth side may be made of movable planks at least 2 inches in thickness. Into this frame the grain is now thrown with wooden shovels. It must not be compressed in any way, under heavy penalties, and must not exceed 30 inches in depth. After twenty hours the maltster is at liberty to move the grain on to the floors; but, in cold weather, when sufficient heat to forward germination has not generated, it is left two days, and even longer; but if left too long, the grain becomes sour. After sufficient time has elapsed, in order to prevent the heat rising too rapidly, and to equalize it through the whole body of grain, it is thrown forward on to the floors.

Flooring.— Here the grain must be kept level with the edges straight. Germination now progresses; the plumule, or stem begins to grow under the husk from the same end as the root, but instead of piercing the husk, turns round and proceeds under it to the other and of the grain. This would develop into the green leaf were its progress not stopped. Maltsters vary as to the length it is advisable to let the acrospire attain; some like it not much more than half up the back of the grain, others like it ¾ths or even ⅞ths of its length, because it is practically found that a frailibility of the starchy matter takes place *pari passu* with the length of the plumule. Unless the floors are worked with great skill and regularity, however, some are apt to protrude when carried to the latter extent. This shows an exhausted condition within. Maltsters who sell by *weight* work the acrospire no higher than is absolutely necessary; the higher it is worked the less starch and the more sugar is produced, and a corresponding loss in weight ensues. The maltster who sells by *measure*, however, likes to have the acrospire as high as he can, to increase the bulk of his malt. His principal object is to get the grain to work, and to work regularly, to accomplish which, and to check the too rapid growth of the rootlets, the grain must be turned several times daily, the interior being always brought to the surface by the shovels of the workmen. The grain is spread more thinly each time, the depth of it, originally 14 or 15 inches, being thus gradually lessened to 3 or 4. This brings it to the middle of the process; it is then thickened as gradually as it was diminished until it is thrown on the kiln. The grain now emits an agreeable odor, something like apples; and if the hand be thrust into the corn it is found wet enough to damp it; this is called sweating. The "chick" develops into several short bushy rootlets. As the acrospire grows the constituents undergo a great change; the gluten and mucilage almost disappear; the grain becomes white, mealy, and sweet; carbonic acid is produced; air is absorbed, almost as by animals in breathing; and consequently air is necessary to the germination of the grain. It loses during this part of the process from 1½ to 3 per cent. in weight.

Kiln-drying.—The kiln is a chamber of which the floor should be made of woven-wire or sheet-iron, or of perforated tiles. The perforations are necessary to give admission to the hot air, and also to allow the detached rootlets to fall through. The kiln should have a sufficient area to allow the whole of one steeping to be dried at once, at a depth of 8 or 10 inches; by which means the malt is more regular than when dried in two or three lots, as the portion left on the floor will grow, notwithstanding the maltster's efforts to prevent it. The opening at the top of the kiln is covered with a cowl or cupola, which answers the double purpose of excluding rain and allowing the escape of the steam. The furnaces are placed under the floor, nearly in the central line, and the hot air passing through the perforations dries the malt, while the steam is carried off through the vent in the roof. An iron or stone plate, 4 or 5 feet square, called the "disperser," is placed over each fire to disperse the heat and prevent the malt immediately above from taking fire. The heat at first should not exceed 90°; if higher it produces a hardening or vitrefaction of the starchy matter or dextrin, and also heightens the color of the malt; whereas, if the malt be freed from moisture at a low temperature it may afterward be exposed to a high heat without gaining color. The moisture being disposed of, the heat may be gradually raised to from 125° to 135° for India pale ale malt, and to 170° or 180° for ordinary pale malt,—the difference in the kinds of malt being the amount of heat to which they are subjected on the kiln. During the process the fires should never be allowed to go out, as the smell of a green fire imparts an unpleasant flavor. During the last few hours in particular there should be a bright, clear fire for finishing off the malt, otherwise the beer will not get bright. It will thus be seen that the process of kiln-drying is very important.

Malt continues to swell, by absorbing moisture from the atmosphere, for nearly three months, the time varying according to the dampness of the air. Malt in store is said to be mellowing. The increase by measure of malt over dry barley, called the "outcast," is from 3 to 8 per cent.; in bigg the increase scarcely amounts to 1 per cent. During the process of malting barley loses one-fifth of its weight; in other words, 100 lb of barley converted into pale malt weighs of an average 80 lb; but as barley when kiln-dried loses 12 per cent. of moisture, the actual loss is reckoned at only 8 per cent.

Amber malt, when ground, is of a rich amber color, hence its name. This is dried off at a heat of 180°. The fuel used during drying is different. For pale malt, coke or anthracite coal is used, but the color and flavor of amber malt are produced by burning oak or other hard-wood faggots,—the flavor being caused by the pyroligneous acid thrown off during burning. High-colored malts have advantages over pale; more dextrin is produced and more albuminous matter is rendered insoluble; it is, therefore, easier to brew good beer from them.

Brown or porter malt is dried in yet another way.

The floors of malt-kilns used for drying it must be made of thin sheet-iron or stout wire, as the heat must be raised in a few minutes from 100° to a heat nearly approaching combustion, and lowered as rapidly. The process requires great attention, or the malt would take fire. The grain is spread thin, not exceeding 1½ inches in depth; and the whole process is completed in less than two hours. The fuel used consists of faggots of beech, elm, or oak; at first the fire is kept down by being sprinkled with water, but the last half-hour it is allowed to increase, and an intense heat is obtained. This kind of malt weighs about 32 lb per bushel. It is sometimes called "blown malt," from its distended appearance. By this process the gum, sugar, and starch are converted into a kind of caramel, which gives the flavor so much prized in porter. It makes the malt, however, deficient in extractive matter, to the extent of from 20 to 30 per cent.

Pale malt differs in appearance from barley; the grains are plump and generally free from wrinkles, and paler than barley. Instead of the tightly-closed end, the opening through which the rootlets have passed is visible at the base of each grain; when broken the starch should be loose, friable, and cretaceous, and should leave a white mark as of chalk when drawn along a black surface. It should be crisp to the teeth, and have a sweet and empyreumatic flavor, free from the least mould or mustiness of smell or taste. Malt should weigh from 39 lb to 43 lb per bushel. There should be no vitrefied appearance when broken; that would be due to an excess of heat at the beginning of the drying process, or to the barley having been grown in too rich a soil, or to mixed seed being used which did not work regularly. A good test is to take 100 seeds and throw them into water, stirring them well up; good malt, being specifically lighter than water, should float on the surface; if more than 5 per cent. sink it is bad malt. Another test is to take 100 grains of malt and carefully examine the regularity of their acrospire, which should extend ¾ths of the length of the grain for large and ⅞ths for small brewers. If more than 5 per cent. have projected it shows a waste of material, whereas if more than 5 per cent. have the acrospire less than half way up, it is a sign of insufficient germination.

Malt is made duty-free for distillery purposes and exportation; in both cases the maltster has to enter into a bond with two sureties for £1000 that the malt goes to its declared destination. It may also be made free of duty for cattle feeding, an Act giving great facilities being passed in 1864; it was, however, found to be useless, except in small quantities, as a condiment, and the practice of giving it is entirely discontinued.

In America there are no internal taxes on materials used in brewing as such, but there is an import duty on hops and barley — five cents per lb on the former, and 15 cents on the latter per bushel. The barley mostly used comes from Canada, the import duty being equal to about 32 cents on an American barrel of beer. The duty is levied in the form of a stamp-tax on the beer fermented, completed, and in barrel, at the rate of $1 per barrel of 31 gallons, and $2 per barrel of not less than 63 gallons. No restrictions are imposed as to the materials of which it shall be made.

In Bavaria the duty is raised on malt, but not assessed till the malt is brought to the mill to be crushed. It is made without licence or permission, and may be sold without restriction; but traffic in ground malt is strictly forbidden. The case is the same whether the malt is used by brewers or distillers. The consumption of beer and spirits is untaxed, except through the impost on malt.

Americans are now making beer largely from maize meal and maize malt. The experience the writer has had of the use of the latter leads him to doubt its economy; the extract is small, and the fine flavor of the ale impaired. However, a small quantity can be used with advantage where the fermentations are sluggish or inactive,—maize being the most powerful stimulant of this process that we possess. Barley has always been considered, and with good reason, a better, and in favorable seasons a cheaper, grain than any other malting. The reasons for this are, first, that while the husk permits the steep-water to pass through to the starch it effectually precludes the escape of the starch; secondly, the acrospire grows under the husk in barley, and so is protected from injury during malting, whereas in wheat, maize, &c., the acrospire forces its way out with and at the same time end as the rootlets, and therefore runs the risk of being damaged by turning on the floors; these damaged grains become mouldy, and mould being propagated by means of spores, one mouldy grain may send out thousands of these spores among the good grain, and infect the previously healthy ones; and thirdly, barley contains a large ready-made proportion of grape-sugar and starch. It is, therefore, only in bad barley seasons that there will be much demand for malt made from other grain. It is in such cases that the demand for barley malt largely exceeds the supply and substitutes are sought for. The high price, which means a material increase in the cost of manufacture, has naturally made a great inquiry for a cheaper sugar-forming product; and there is no doubt that if the duty on malt were either taken off or laid on the manufactured article, beer, large quantities of other grain dried on a kiln at from 230° to 240° would be used in bad barley seasons. In Germany the grain is steeped before kiln-drying for three or four hours, to remove from the husk the unpleasant flavor it sometimes imparts to ales; the materials used to a considerable extent there, are wheat, oats, rice, maize, and even potato starch. Beer made of rice is of a very pale color, of an extremely pleasant, mild taste, foaming strongly, and yet retaining its carbonic acid. Dr. Graham, in his instructive lectures on the chemistry of brewing, at the Society of Arts in 1874, explained how raw grain might be used to obtain a beer either alcoholic in its nature, as brewed in England, or dextrinous, like the Bavarian beer. Mr. John Prior, of the firm of Truman and Hanbury, in his examination before a committee of the House of Commons, says, "If the malt Acts were not in the way, numerous substitutes for malt might be employed," and that, amongst these, mangelwurzel might be used to any extent; and he goes on to say, "I have tasted as good beer brewed from that alone as any home-brewed beer I have ever tasted in my life."

The only substitute for malt allowed in Great Britain is sugar.

It does not appear that the best judge can, from the taste alone, distinguish between a beer made from malt and one brewed from a mixture of malt and sugar. This is not surprising, when it is borne in mind that brewing from malt consists in subjecting the malt to those conditions which are most favorable to the conversion of the *maximum* quantity of the starch it contains into grape-sugar, by the action of the diastase produced in the grain by the process of malting.

Hops are the catkins or flowers of the *Humulus Lupulus*, a dicœcious plant belonging to the natural order *Urticaceæ*, or the nettle family, and the Linnæan *Diœcia pentandria*. It is the female flowers (which grow on different plants from the male flowers) that yield the hop known to commerce. The plant is mentioned by Pliny under the name of *lupus salictarius*. It was cultivated in the 9th century, for we find that it

822 the millers of Corbey were freed by the abbot from all labors relating to hops; and hop-gardens are mentioned by Ludovicus Germanicus, a few years later. Hops were introduced into England from Flanders about the time of Henry IV. There is a curious edict of Henry VIII., forbidding the mixture of either hops or sulphur with beer; but little attention seems to have been paid to it, for in 1552 hop-plantations were formed. In 1649 the city of London petitioned Parliament against "hoppes" being used, urging that "this wicked weed would spoil the drink, and endanger the lives of the people." It came into common use in Queen Elizabeth's reign.

The hop-clusters are ovoid cones, consisting of scales which are enlarged persistent bracts enclosing the fruit. They are covered with a tenacious yellow, waxy substance, like powder, called lupulin, and technically "condition." Under the microscope this is seen to consist of minute semi-transparent granules, round in shape; it is the most valuable part of the hop, containing most of its active properties. The amount of powder compared with the total weight of the hop varies from 10 to 15 or even 20 per cent. Amongst the leaves and powder of the hop, we find essential oils, resin with associated bitter principles, and tannin. When distilled with water, the powder gives 2 per cent. of its weight in essential oils (there is none in the leaves); one of these distils at 212° Fahr., but the other requires a much higher temperature for its volatilization. Other products are formed from the lupulin — among them valerianic acid, which is the disagreeable characteristic of old hops. The essential oils not only give the aroma, but are of importance, as through their combination the resins and bitter substances become soluble in water. The resin constitutes 50 per cent. of the powder, and is soluble in alcohol. The importance of tannin consists in its power to precipitate albuminous matter; of tannin there is only about 2 per cent. It has been suggested to increase this by using the tannic acid of commerce as a partial substitute for hops; and experiments have been made in Dresden by Dr. Fleck for this purpose. This must, however, be used with caution, as an excess of it would be prejudicial to a successful clarification of the beer.

The plant is very dependent on the season, and has many enemies in the insect world, in particular, the fly or aphis, which infests the crop early in the growth, feeding upon its juices and leaves, giving the latter the appearance of having been riddled with swan shot. The flies come originally from the sloe bushes, and are produced from eggs deposited in the previous autumn. These, as well as fleas, red spiders, lice, &c., may be destroyed by syringing the plants well with soft soap and water. The mould first betrays itself in yellow and drooping leaves, finally in the hop itself, eating it up with mildew, — the presence of a few half-eaten leaves spoiling a sample. The blight coats the leaves with a thick sooty substance; and when this appears the hop dwindles away. The first-blast, as its name implies, sears and scorches the foliage, and withers it up. All these may be seen working mischief at once in the same hop garden.

After picking the hops are dried on a kiln (oast-house, as it is called),— the heat never being allowed to rise above 90°, lest the aroma and volatile oil should be thrown off. A small portion of sulphur is sometimes added to the fire, the appearance of the sample being improved by the sulphurous acid thus formed. This has been generally considered by brewers injurious to the hop, and also to fermentation; but a commission appointed by the Bavarian Government in 1855 (the late Professor Liebig being one of its members), after two years of experiments, arrived at the conclusion that the use of sulphur was beneficial to the hop, and not injurious to fermentation.

The best hops have a yellow, golden color, and an agreeable smell; when rubbed between the hands they leave a yellow, odoriferous, sticky powder on them, without any broken parts of the leaves, and yield to boiling alcohol from 12 to 15 per cent. of soluble yellow matter. A very pale green color indicates that the hops have been gathered before they are fit; whilst a deep brown shade would show they were allowed to hang too long before being gathered, or that they have been over dried on the oast-house floor. A fair test in choosing hops for India pale ale is to make a strong decoction of them with boiling water, putting it into a white bottle, corked and exposed to the sun; if in twenty-four hours the color has become dark they are not fit for the purpose.

Water.— Pure water, protoxide of hydrogen, is obtainable only by art; it is therefore impossible, even were it desirable, to use that in brewing. But good water is an indispensable element in the manufacture of good beer. It should be hard and free from organic matter; this last point cannot be urged too strongly, as this alone frequently causes failure in brewing operations. From Cohn's investigations we find that the germs of putrefaction are so small that no filter of charcoal or other material removes them. It is also doubtful if ordinary boiling destroys these organisms. Soft water gives greater extracts, as it dissolves the albuminous matter in the malt more effectually than hard. With the use of very soft water as much as 100 lb of extract per quarter has been obtained; but here the goodness of the extract was the chief proof of the badness of the water; for it is dangerous to have too much albuminous matter in solution, except in the case of porter or ale that is quickly consumed, albuminous bodies being such powerful agents of change.

We now come to the actual process of brewing, or the art of making the materials we have described into beer. While brewing cannot be considered a difficult or a mysterious art,— good materials, a good method, and strict attention being the secrets of success — there is no process in which rules are of less avail. To obtain complete success, it is necessary that the brewer shall have formed an opinion of his materials from personal observation, and that he should be thoroughly acquainted with the brewery in which they are to be used. It is not too much to say, that the same heats and quantities cannot properly be used in any two breweries. Bearing this difficulty in mind, we shall endeavor to point out where instructions may be safely followed, and where the circumstances of locality, &c., will subject them to certain modifications which cannot be strictly defined in an article like the present.

Brewing consists of eight distinct processes, which may be classed as follows:—

1. Grinding.
2. Mashing.
3. Sparging.
4. Boiling.
5. Cooling.
6. Fermenting.
7. Cleansing.
8. Racking and storing.

Grinding.— This is a very important operation; for, if imperfectly performed, some of the "goodness," or "extract" as it is called, will be left in the grains after mashing, thus entailing a heavy pecuniary loss on the brewer. The malt is crushed rather than ground between plain metal rollers; this is enforced by law, for the purpose of facilitating the examination of the grain as to whether it has been malted or not.

Mashing is the process of infusion, or mixing the malt with water at such a temperature as shall not only extract the saccharine matter existing in the malt, but

shall also change the still unconverted starch into grape-sugar. This is accomplished by the principle called diastase, the power of which we have shown under the head of malting. Many mashing-machines have been invented, and many are in use. In some the malt and the water are simply brought into conjunction, and then mix themselves as they fall into the mash-tun; others, driven by steam, perform the operation of mixing more leisurely, and, in some cases, more effectually. The old-fashioned method of mashing is by means of iron rakes. These rakes are fixed on arms extending from the center of the tun, and are so constructed that when set in motion, no portion of the mash escapes them. When rakes are used a portion of the mashing water is first run into the tun, and part of the malt; the machinery is then started, and, whilst the rakes revolve round the tun, the remainder of the malt and water are added. The heat of the mashing water is a very important point; the particular temperature must depend upon the quantity and quality of the malt, and the situation of and amount of radiation from the mash-tun. Not less than two or more than three barrels of water should be run on to every quarter of malt, and the heat of the water should be such, that, when all has run on, that is, when the malt has combined with the water, the temperature of the mash shall not be lower than 148° or higher than 152°. In some breweries this result will be obtained by mashing at 168°; in others it will be necessary to go as high as 180°. Neither of these heats will do any harm so long as the heat of the mash does not exceed 152°. Most brewers and chemists think that, to ensure the best results, it is necessary for the mash to stand at least two hours.

Sparging. — When about half the wort has run off the mash, the operation of sparging should be commenced,— the object of that process being to wash out the goodness left in the malt after mashing. The sparging-machine is made and fixed as follows: — A bar of iron having an upright pin in the centre is fixed across the mash-tun; on this pin is placed a copper bowl or pan; into this pan are screwed two or three arms, extending to the sides of the tun. These arms are about an inch and a half in diameter, and are perforated their whole length with small holes on their reverse side. The hot water being conveyed into the pan fills the arms, and, running out through the perforated holes, causes the arms to revolve round the tun. By this means an equal and continuous shower of hot water is rained upon every portion of the goods. The heat of the sparging water, like that of the mashing liquor, must be modified by circumstances.

Boiling. — When the wort runs off the mash no time should be lost in getting it into the copper or boiling back. In many modern breweries the mash-tun is placed immediately over the copper, so that the wort runs direct from the former utensil into the latter. Some coppers are built with an ordinary furnace, others are furnished with a coil; in the latter case the worts are boiled by steam passing through the coil from the boiler. Many brewers prefer to boil by steam, as it is a cleaner method, and they are able to regulate the operation to a nicety. Where the steam coil is used the boiling back is generally made of wood. While the wort is running or being pumped into the copper, the hops must be added. Here, again, no positive instructions as to quantity can be given. On this point the brewer must be guided by his customers' tastes, the season of the year, the length of time the beer has to be kept, and the quality of the hop used.

Cooling. — When the wort has boiled the necessary time, it is turned into the hop-back to settle. The hop-back is a utensil made of wood or iron, and fitted with a false bottom of perforated plates; these plates retain the hops in the back, whilst the wort is drawn off into the coolers. The wort should be allowed fifteen or twenty minutes to settle in the back, and when run on the coolers should be thoroughly bright. In many breweries coolers are not used, the wort running direct from the hop-back through the refrigerator into the fermenting tun. When practicable this is an excellent plan, for worts often take harm whilst lying exposed on the coolers. In every brewery of any note the worts are cooled artificially by means of a refrigerator.

Fermentation. — The fermenting tun may be round or square, open or closed, and made of wood or stone. Stone squares are universal in the northern counties of England, but are rarely met with in the southern and midland counties. When beer is fermented in a stone or slate square, it should never be pitched at a lower heat than 66° or 68°; for these utensils are very cold, and therefore liable to check or stop the fermentation. Every fermenting tun should be fitted with an attemperator. The attemperator consists of a series of pipes fixed within the tun, and having its inlet and outlet on the outside. It should be possible to run hot or cold water through these pipes at any hour, so that the temperature of the gyle can be raised or lowered at pleasure. The work performed by that natural process which we call fermentation is the conversion of saccharine matter into alcohol. It playes a most important part in the brewer's art, and deserves his most careful attention. In order to obtain a quick and regular fermentation, the brewer employs yeast, or barm, as it is called in some parts of the country. Great care must be taken that the yeast used shall be perfectly fresh and healthy, for it must never be forgotten, that it is impossible to obtain a good fermentation from bad yeast.

The appearance of a gyle of beer during the earlier stages of a good fermentation is very beautiful. At first the whole surface is covered with a thick white foam, which, within a few hours, curls itself into every imaginable shape and form. This increases in height, until it presents the appearance of a number of jagged rocks of snowy whiteness. With these the artistic beauties of the fermentation disappear, although the fine thick head of yeast which follows delights the eye of the practiced brewer, for it tells him that his fermentation is drawing towards a successful end. But the progress of the fermentation must not be judged by appearance alone. Samples should be taken from the tun at least twice a day, and weighed with the saccharometer. By this means the brewer tells at what speed the sugar is being converted into alcohol; and when he considers the process has gone far enough, he stops it by taking away the yeast, which operation is termed cleansing. At the end of the first twenty-four hours, the gyle should attenuate 1 lb in every three or four hours, whilst the temperature should rise from 1° to 2° during the same space of time.

Cleansing is the act of removing the yeast from the beer, in order to stop the fermentation.

BREWSTER, Sir David, natural philosopher, distinguished especially for his original discoveries in the science of optics and his numerous and varied contributions to scientific literature, was born on the 11th December 1781 at Jedburgh, where his father, a teacher of high reputation, was rector of the grammar school. At the early age of twelve he was sent to the University of Edinburgh, being intended for the clerical profession. Even before this, however, he had shown a strong inclination for physical inquiries, which had been fostered by his intimacy with a "self-taught philosopher, astronomer, and mathematician," as Sir Walter Scott called him, of great local fame — James Veitch of Inchbonny.

Veitch was particularly skilful in making telescopes, and may thus have had some influence in determining the precise direction of his young companion's future researches.

The most important subjects of his inquiries are enumerated by Forbes under the following five heads:—1. The laws of polarization by reflection and refraction, and other quantitative laws of phenomena; 2. The discovery of the polarizing structure induced by heat and pressure; 3. The discovery of crystals with two axes of double refraction, and many of the laws of their phenomena, including the connection of optical structure and crystalline forms; 4. The laws of metallic reflection; 5. Experiments on the absorption of light. In this line of investigation the prime importance belongs to the discovery (1) of the connection between the retractive index and the polarizing angle, (2) of biaxal crystals, and (3) of the production of double refraction by irregular heating. Wheatstone discovered its principle and applied it as early as 1838 to the construction of a cumbrous but effective instrument, in which the binocular pictures were made to combine by means of mirrors. To Brewster is due the merit of suggesting the use of lenses for the purpose of uniting the dissimilar pictures; and, accordingly, the lenticular stereoscope, now in exclusive use, may fairly be said to be his invention. A much more valuable practical result of Brewster's optical researches may be traced in the vast improvement of the lighthouse system during the last half century. It is true that the dioptric apparatus was perfected independently by Fresnel, who had also the satisfaction of being the first to put it into operation, the French Government being in this, as in many other cases, quicker than the English to perceive the value of new scientific discoveries.

Brewster's own discoveries, important though they were, were not his only, perhaps not even his chief, service to science. The extent and variety of his contributions to scientific literature were little short of marvellous. He commenced literary work in 1799 as a regular contributor to the *Edinburgh Magazine*, of which he acted as editor at the age of twenty. In 1807 he entered on a much larger undertaking, which cost him long continued labor, and, especially towards its close, great vexation and anxiety. The chance suggestion of a friend, who knew his varied powers, led to the projection, under his editorship, of the *Edinburgh Encyclopædia*, of which the first part appeared in 1808, and the last not until 1830. The work was, as might have been expected, strongest in the scientific department, and many of its most valuable articles were from the pen of its editor. At a later period he was one of the leading scientific contributors to the *Encyclopædia Britannica* (seventh and eighth editions), the articles Electricity, Hydrodynamics, Magnetism, Microscope, Optics, Stereoscope, Voltaic Electricity, &c., being from his pen. In 1819 Brewster undertook further editorial work by establishing, in conjunction with Jameson, the *Edinburgh Philosophical Journal*, which took the place of the *Edinburgh Magazine*. After a time the title was again changed to the *Edinburgh Journal of Science*, sixteen volumes of which appeared under Brewster's sole editorship, with very many articles from his own pen. To the transactions of various learned societies he contributed from first to last between three and four hundred papers, and few of his contemporaries wrote so much for the various reviews. In the *North British Review* alone seventy-five articles of his appeared. Special mention must be made of the most important of them—his biography of Newton. In 1831 he published a short popular account of the philosopher's life in Murray's *Family Library;* but it was not until 1855 that he was able to issue the much fuller *Memoirs of the Life, Writings, and Discoveries of Sir Isaac Newton*, a work which embodied the results of more than twenty years' patient investigation. Brewster died in 1868.

Brewster's relations as editor brought him into frequent communication with the most eminent scientific men, and he was naturally among the first to recognize the benefit that would accrue from regular intercourse among laborers in the field of science.

In estimating Brewster's place among scientific discoverers the chief thing to be borne in mind is that the bent of his genius was not characteristically mathematical. His method was empirical; he was a painstaking and acurate observer and classifier of facts rather than a theorizer, and the laws which he established, some of them, as has been pointed out, of prime importance, were generally the result of repeated experiment.

BRIAN, a famous king of Ireland, the Brian Boroimhe or Boru ("Brian of the tribute") of the old Irish historians. He succeeded his elder brother as chief of the Dal Cais on the murder of the latter in 976, and after much fighting became Ardrigh na Erenn, chief king of Ireland, and such he remained until his death. He was killed in battle with the Danes, April 23, 1014.

BRIANCON, a very strongly fortified town of France, the capital of an arrondissement in the department of Hautes-Alpes, situated on a hill about 4,300 feet above the level of the sea, near the source of the Durance. Population (1890), 4,000.

BRIANSK, a town of Russia, in the government of Orloff, ninety-eight miles east-northeast of the city of that name, on both banks of the Desna, opposite the mouth of the River Snezheta. Population (1890), 13,620.

BRIAREUS, ÆGÆON, one of the three hundred-armed (*Hekatoneheires*) sons of Uranus and Gaia, his brothers being named Cottus and Gyges. The legends regarding them are various and somewhat contradictory. According to the most widely-spread myth, Briareus and his brothers were called by Zeus to his assistance when the Titans were making war upon Olympus. The gigantic enemies were defeated and consigned to Tartarus, at the gates of which the three brothers were placed. Other accounts make Briareus one of the assailants of Olympus, who, after his defeat, was buried under Mount Ætna. Homer mentions him as assisting Jupiter when the other Olympian deities were plotting against the king of gods and men.

BRIAR-ROOT, a fine hard wood obtained from the roots of a species of very large heath (*Erica arborea*) which grows in the Pyrenees, in Corsica, in Algeria, and in America. It is largely used for tobacco pipes. The name is a corruption of the French *bruyère*, "heath," and has nothing to do with *briar*.

BRIBERY, as a public offence, may be defined as the administration of a bribe or reward, that it may be a motive in the performance of functions for which the proper motive ought to be a conscientious sense of duty. When this is superseded by the sordid impulses created by the bribe, a person is said to be corrupted, and thus corruption is a term sometimes held equivalent to bribery. The offence may be divided into two great classes,—the one characteristic of despotisms, where a person invested with power is induced by payment to use it unjustly; the other, which is an unfortunate characteristic of constitutional governments, where power is obtained by purchasing the suffrages of those who can impart it. The former offence is in every sense the more odious and formidable, and indeed it may be said, that until a country has outgrown it, there is no room for the existence of elective bribery, since the nations among which justice is habitually sold appear to be far below the capacity of possessing constitutional rights.

BRIDGES.

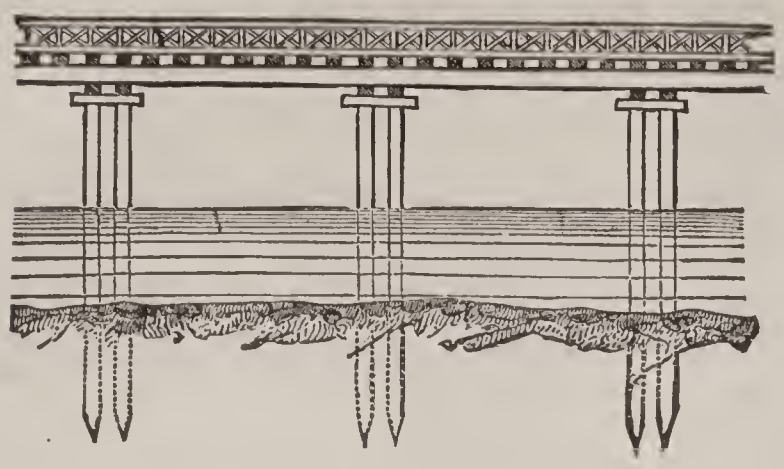


FIG. 1.—Pons Sublicius.

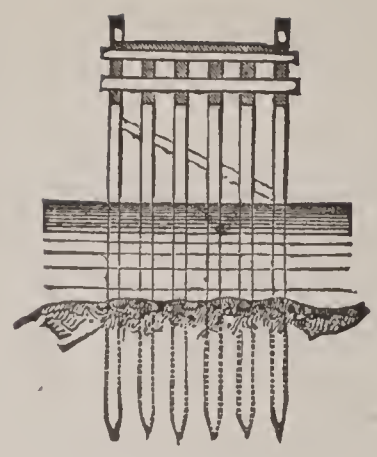
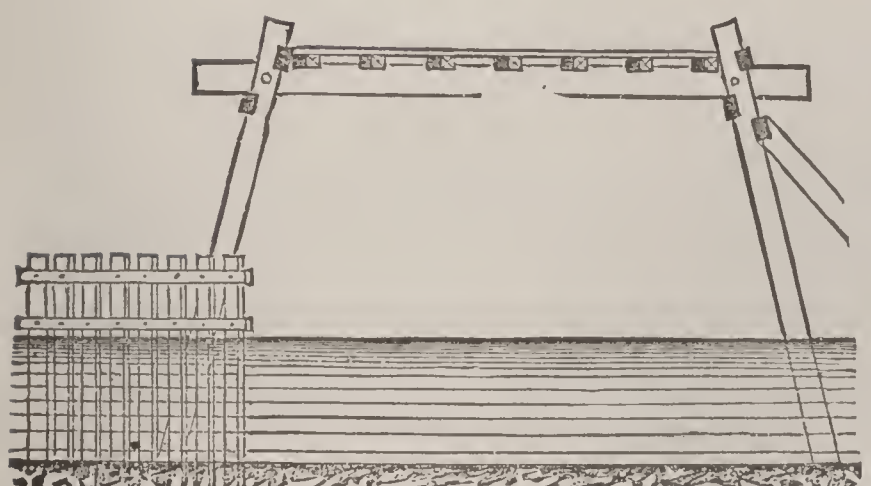
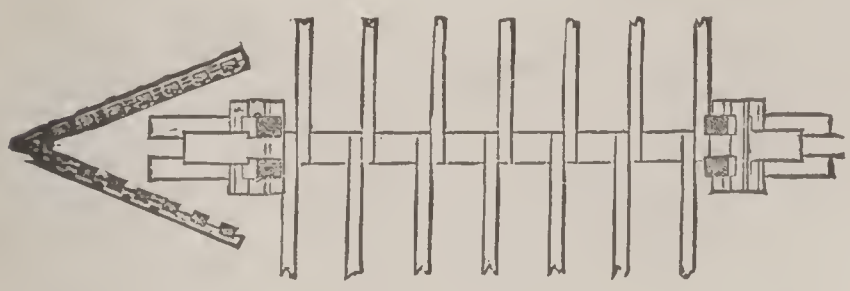


FIG. 1a.
Cross section of Pons Sublicius.



Cross Section at Pier.



Plan at Pier.

FIG. 2.—Bridge thrown across the Rhine by Julius Cæsar.

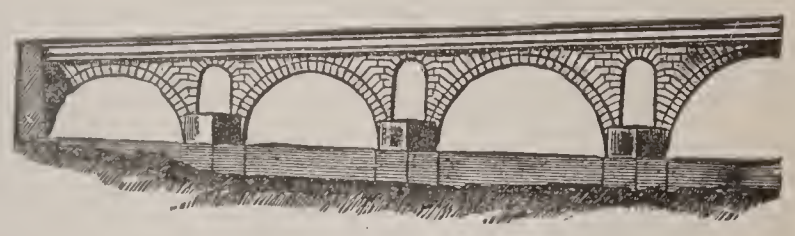


FIG. 3.—Pons Milvius.

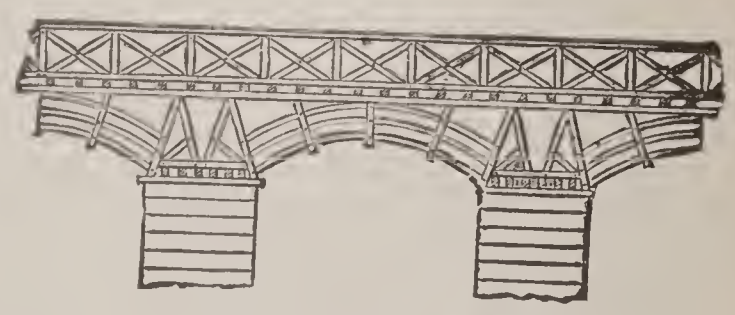
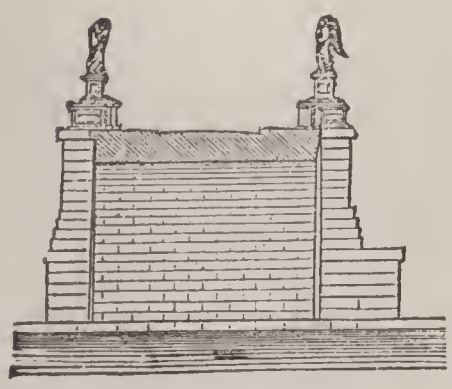
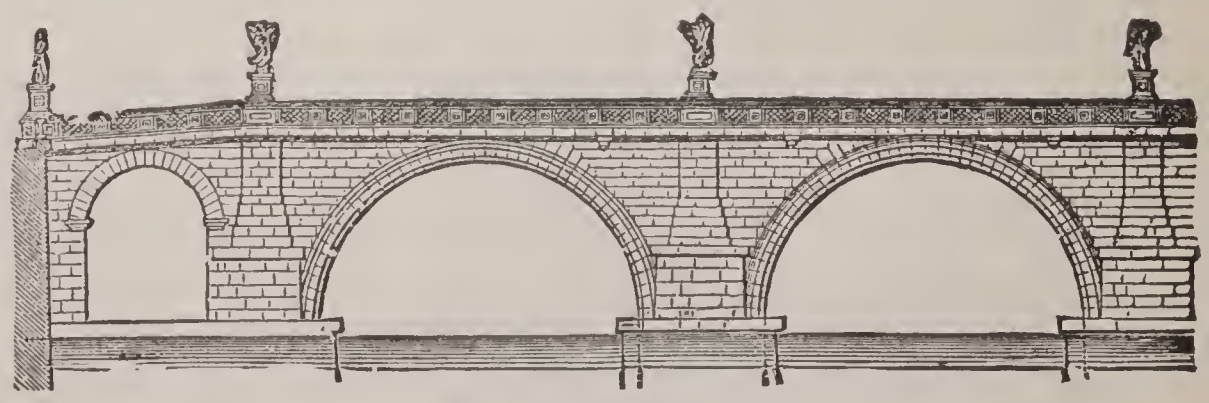


FIG. 5.—Trajan's Bridge.



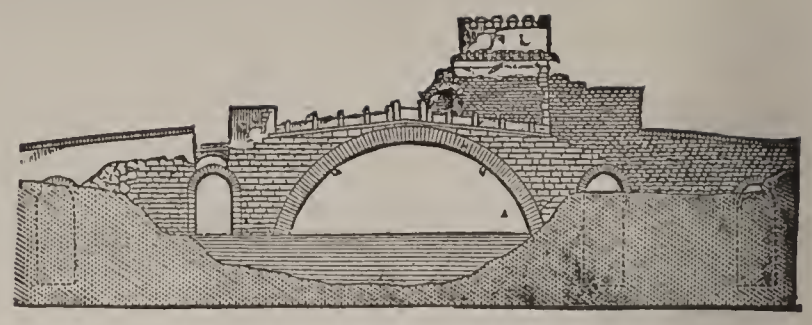
Cross Section.



Elevation.

FIG. 4.—Bridge of S. Angelo.

FIG. 6.—Bridge at St. Chamas.



7.—Ponte Narses.

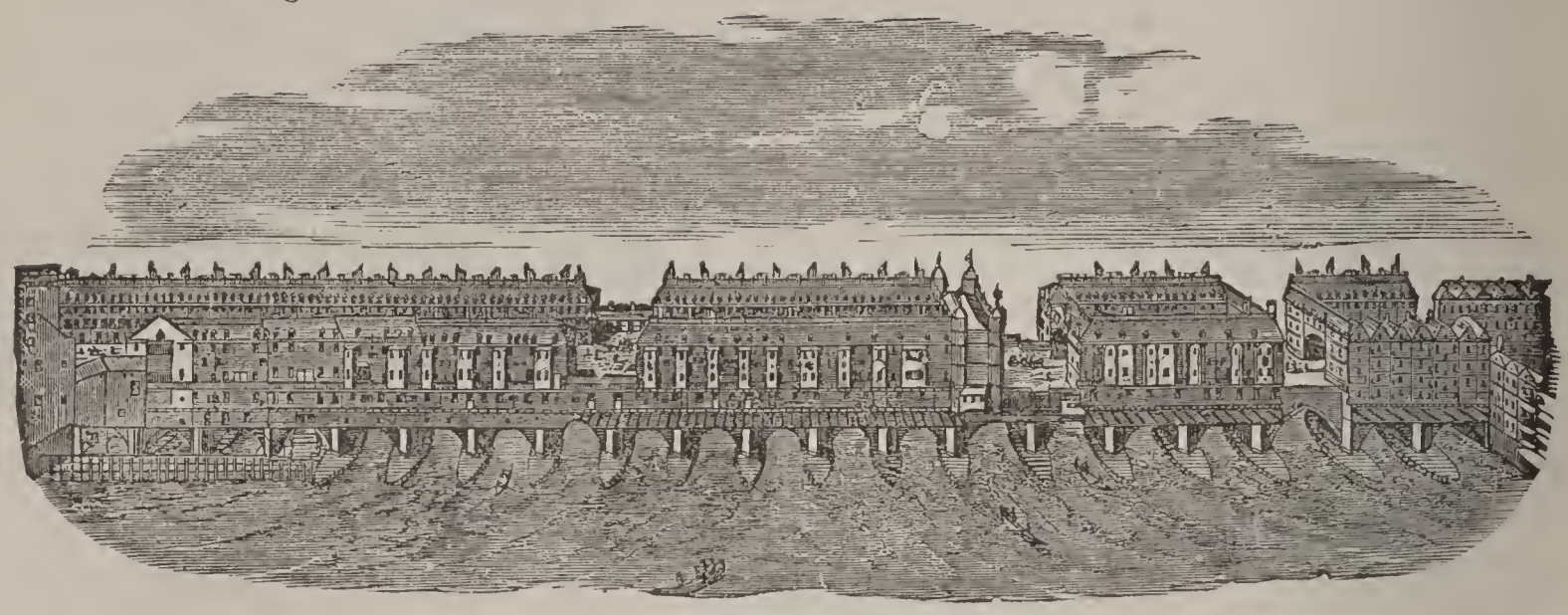


FIG. 8.—Old London Bridge, A D. 1700.

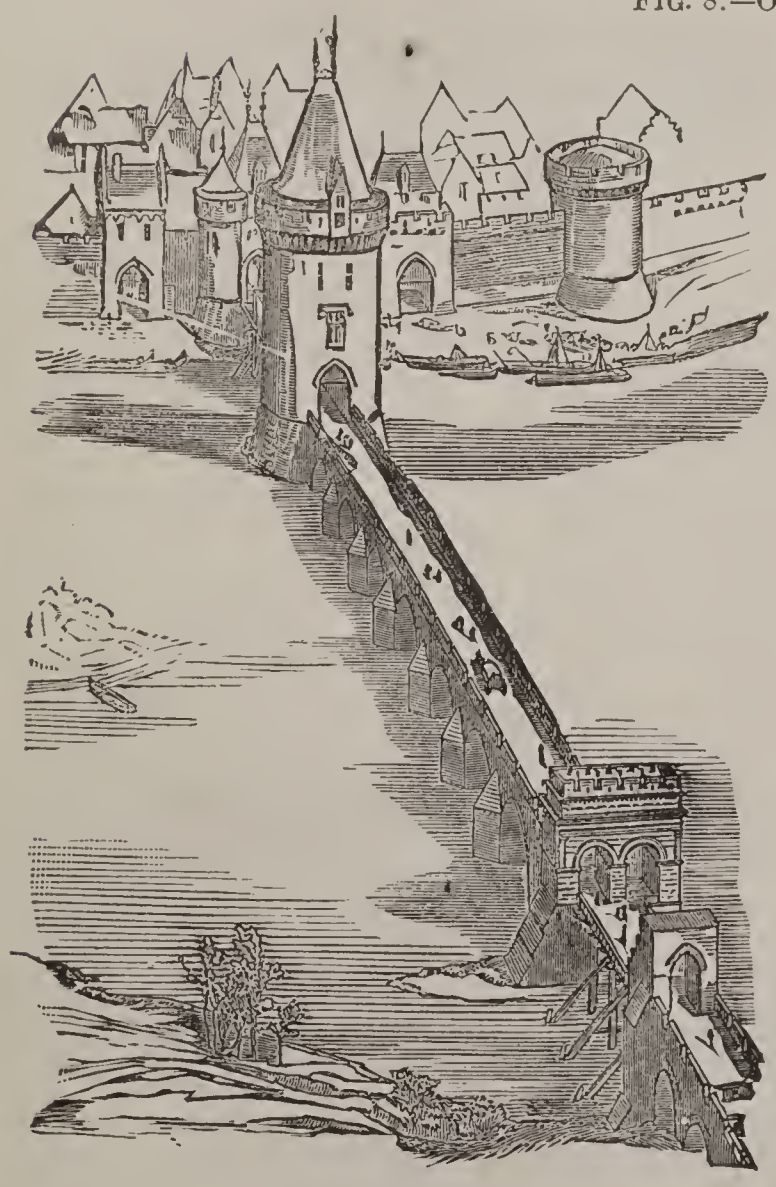


FIG. 10.—Saintes Bridge.

FIG. 9.—Croyland Bridge.

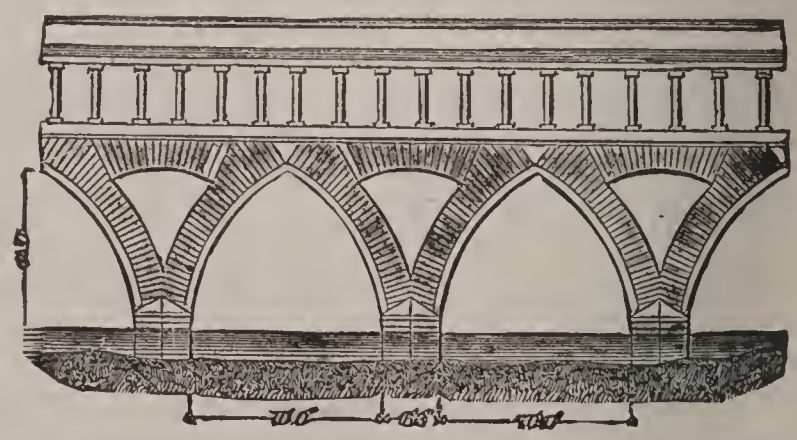


FIG. 11.—Bridge over the Ticino at Pavia.

One of the forms in which administrative corruption is most difficult of eradication is the appointment to office. It is sometimes maintained that the purity which characterizes the administration of justice is here unattainable, because in giving a judgment there is but one form in which it can be justly given, but when an office has to be filled many people may be equally fitted for it, and personal motives must influence a choice. It very rarely happens, however, that direct bribery is supposed to influence such appointments.

BRICK, a kind of artificial stone made of baked clay. The usual form of a brick is a parallelopipedon, about 9 inches long, 4½ inches broad, and 3 inches thick. The art of brickmaking dates from very early times. We read that burnt brick was used in building the tower of Babel. The walls and various other buildings of ancient Babylon were made of burnt brick; several varieties of brick figure in Assyrian art, and most of the Assyrian literature was in the form of minute characters in baked clay (see BABYLON, BABYLONIA). Brickmaking formed the chief occupation of the Israelites during their degrading bondage in Egypt. The bricks were made of clay mixed with chopped straw, and were probably sun-dried. We read (2 Sam. xii. 31) that David made the children of Ammon pass through the brick kiln; and while the meaning of the statement is doubtful, it is thought that the instruments mentioned in the context may have been used in preparation of the clay. Pliny informs us of three different kinds of bricks made by the Greeks. In Italy we have abundant evidences that the Romans used bricks largely; and it was they, probably, who introduced brickmaking into England. By the time of Henry VIII. the art had reached great perfection; and many fine brick buildings (*e. g.*, the older part of Hampton Court) are extant from that period. Previous to the great fire of 1666, many of the London houses consisted chiefly of timber framework, filled in with lath and plaster; but after the fire, brick was used almost exclusively in building. Much of the brickwork remaining from that time is finely carved with the chisel. From the latter part of last century (1784) till 1850, bricks in England were subject to taxation. In Holland, where stone is scarce, bricks have been in use from a very early period, both for domestic and public buildings.

The quality of bricks depends primarily on the choice of earth. There are three principal classes of brick-earths:—(1.) Pure clays, consisting chiefly of alumina and silica, in various proportions, and with a small percentage of other salts, iron, lime, magnesia, &c.; (2.) Loams or sandy clays; (3.) Marls, or earths with a considerable proportion of lime. A paste of pure clay alone (made with water), while it may be easily moulded, will shrink and crack in drying and firing, in proportion to the excess of alumina over silica; but this can be remedied by mixture with a milder earth or with sand. Loams, again, are often so loose that they require the addition of lime as a flux. The London brickmakers add lime and ashes, or *breezè*, to their loams and marls, both as a flux and to prevent shrinking; such admixtures also, as will be seen, affect color. Brick-earths are very various in composition. The proportion of ingredients in a good earth will be something like the following:—silica, three-fifths; alumina, one-fifth; iron, lime, magnesia, manganese, soda, and potash forming the other one-fifth. The clays of which fire-bricks for furnaces are made are almost entirely free from lime, magnesia, and like substances, which act as fluxes; they are found throughout the coal measures, immediately beneath the coal.

The color of bricks is determined by the proportion of hydrated oxide of iron and other ingredients they contain, also by the degree of heat in burning. Where iron is present without lime or such substances, a moderate red heat makes the bricks red, the intensity varying with the proportion of iron; with more intense heat, the bricks, if slightly fusible, may be vitrified externally, and become greenish blue. The presence of lime changes the red color produced by iron to a cream brown; magnesia also arrests the development of red.

BRIDAINE, JACQUES, a celebrated French preacher and home-missionary, was born in 1701 at Chuslan in the department of Gard. He was the author of a collection of *Cantiques Spirituels*, which has been frequently reprinted, and of five volumes of sermons, printed at Avignon in 1725. In the neighborhood of this town he died in 1767.

BRIDGENORTH, a parliamentary and municipal borough and market town of England, in the county of Shropshire, on both sides of the Severn, 18 miles S.E. by E. of Shrewsbury. Population, 8,000.

BRIDGEPORT, a city and port of entry of Connecticut, at the mouth of the Pequannock, which empties itself into an inlet of Long Island Sound. It is fifty-three miles southwest of Hartford, and fifty-seven northeast of New York. Bridgeport is connected by railways both with the interior and with several important towns on the seaboard. It has a safe harbor for small vessels, a considerable coasting trade, several fine public parks, and a system of street railways. The city is modern and well built, and the streets are shaded by trees. The elevation, called Golden Hill, commanding fine views of the Sound and shore, is covered with good residences, many of the inhabitants belonging to New York. Its manufactures are extensive, particularly of carriages, harness, machinery, metallic cartridges, and sewing machines. Population (1890), 48,866.

BRIDGEPORT, a town of Belmont county, Ohio, is situated on the Ohio river, opposite Wheeling, W. Va., at the intersection of two important railroads. It contains a national bank, glass and nail factories, foundries, and other industrial establishments, and has a population of 5,000.

BRIDGES. *Definitions and General Considerations.*—Bridges are structures designed to carry roads across streams, gullies, or roads. A viaduct may be distinguished from a bridge, inasmuch as the object of the former is to carry a road at a considerable elevation above the surrounding country, by means of structures, similar indeed to bridges, but in which the object of the open spans is to save expense rather than to cross some obstacle which could not be passed by a level road or embankment. The aqueduct is a structure similar to the viaduct, but employed to convey or support water. A culvert may be distinguished from a bridge as an opening, the primary object of which is to let water flow past a road or other obstacle, the object being similar to that of a large drain. A large culvert might be called a small bridge, and a bridge having long approaches with many spans might be called a viaduct. The present articles will treat only of Bridges.

Every bridge may be divided into two parts, the *substructure* and the *superstructure*. The substructure of a bridge consists of foundations, abutments, and piers. The end supports of the bridge are the abutments, and the intermediate supporters are called piers. Piers and abutments rest on foundations in the ground. A bridge of one span has no piers. The superstructure of a bridge consists of the roadway and the beam, arch, or chain used to carry the roadway from support to support.

In designing a bridge to cross a stream care must be taken to insure that the openings are suitable for the maximum floods.

The *load* which the superstructure of a bridge has to carry in addition to its own mass may be estimated as follows:

1. For a *public road;* one hundredweight per square foot will represent the weight of a very dense crowd.

2. For a *railway;* the maximum passing load on each line of rails may be taken as the weight of a train composed exclusively of locomotives. The bridge must be fit to bear this load distributed in all possible ways along the line. For spans above 60 feet on the usual 4 feet 8½ inches gauge this load may generally be taken as equivalent to 1 ton for each foot of length of each line of way, or, in engineering language, "one ton per foot run."

Classification.—Bridges are classed, according to the design of their superstructure, as *girders*, *arches*, and *suspension bridges*.

Beams or *Girders* may be of various materials—wrought iron, cast-iron, and wood being chiefly employed.

Arches may be of masonry, or they may be of wrought or cast-iron or steel, in which case the compressed sector of a ring is usually a continuous and stiff structure.

Suspension bridges are made of wire ropes or of separate links of wrought iron or steel pinned together so as to form a chain. The metal beam, arch, or suspension bridge may be a continuous structure or an open frame; we shall also find that in some designs the several simple types are combined so as almost to defy classification.

In America the exigencies of railroad traffic and construction have caused the erection of many modified forms of bridges, such as the cantilever drawbridge, or the girder drawbridge, or the compound arch-girder drawbridge. In some instances the cantilever bridge, where the distance across is not great, swings from one abutment, with a motion similar to a door or gate; but where the distance is longer, a section only of the bridge is swung around to allow the passage of vessels. In most instances, however, the draw is a compound of arch and girder, and swings on a central pivot.

A very simple form of suspension bridge has long been used in Peru and Thibet. Two ropes are hung side by side across the gorge to be passed, a rude platform is laid on the ropes, and the dip of these is sufficiently small to allow the bridge to be crossed by men or beasts passing down from the one side to the center and up to the opposite bank. The modern suspension bridge consists of two or more *chains*, from which a level *platform* is hung by suspension *rods*. The chains may in some cases be secured directly to the sides of the chasm to be crossed, but the configuration of the ground seldom allows this to be done. The chains, therefore, usually pass over *piers*, and are led down on either side to an *anchorage* at a considerable distance from the piers.

Herodotus mentions a bridge erected by Nitocris over the Euphrates at Babylon. It appears to have consisted of stone piers connected by planking, which was removed at night. The river was diverted to allow the piers to be built.

The first bridge constructed at Rome was called the *Pons Sublicius*, or wooden bridge (*sublica* meaning a stake or pile). It is said to have been built by Ancus Martius, and rebuilt by the chief priests, who from this circumstance were called "Pontifices." This was the bridge defended by Horatius Cocles.

(Fig. 2) also taken from the work of Colonel Emy, is intended to represent the design of the bridge thrown across the Rhine in ten days by Julius Cæsar.

The *Pons Milvius* (fig. 3), now Ponte Molle, was built a mile and a half from Rome by the Censor Ælius Scaurus, about 100 B. C. Some part of the first bridge is supposed to remain, although it has been altered from time to time. The arches vary in their opening from 51 feet to 79 feet 9 inches; the waterway between the piers is 413 feet 3 inches; the breadth of the bridge, 28 feet 9 inches; these dimensions are given on the authority of Cresy (*Encyclopædia of Civil Engineering*). The following bridges also cross the Tiber at Rome:—The *Pons Palatinus*, which stood on the site of the present Ponte Rotto; the *Pons Fabricius* and *Pons Cestius*, which still remain; the *Pons Janiculanus*, which occupied the site of the modern Ponte Sisto; the *Pons Vaticanus*, which has disappeared; and the *Pons Ælius*, built by Hadrian (13 A.D.), now the bridge of St. Angelo. This bridge (fig. 4) was repaired by Popes Nicholas III. and Clement IX. The largest arch has a span of 62 feet 4 inches, and the width of the bridge is 50 feet 9 inches.

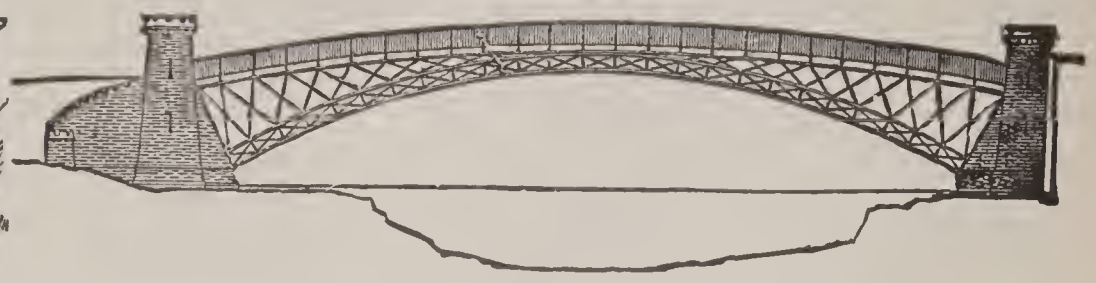
The bridge erected by Trajan (4 A.D.) across the Danube, just below the rapids of the Iron Gate, has been the subject of much controversy. The drawing (fig. 5) was originally taken from a bas-relief on the Trajan column at Rome. A description of the bridge is given by the ancient historian Dion Cassius, who states that the bridge had twenty piers of hewn stone, 150 feet high, and 60 feet wide, with openings between them of 170 feet, spanned by arches. Doubt has been thrown on the accuracy of this description, because the design shown in fig. 5 is obviously unsuited to a span of 170 feet; nevertheless thirteen piers are still visible out of the twenty, according to Murray's *Handbook*. The writer has not been able to find any accurate measurement of the width between these piers, but as the *Handbook* speaks of the length of the bridge as perhaps 3900 feet, and as the Conte Marsigli, writing from personal observation, in a letter to Montfaucon, gives the total length as probably 3010 feet, there can be no doubt that the spans were very considerable, and that the representation of the design in the bas-relief is almost wholly conventional. The one point as to which it gives clear information, not supplied elsewhere, is that the superstructure was of wood. The piers seem to have been founded by sinking caissons. Murray's *Handbook* gives the depth of the river as 18 feet. Apollodorus of Damascus was the architect of this remarkable bridge. The bridge at Rimini, built during the reign of Augustus, was especially admired by Palladio. The bridge at Narni, on the road from Loretto to Rome, also built by Augustus (Montfaucon), and the bridge of Alcantara over the Tagus, built in the reign of the Emperor Trajan, are often cited as remarkable works.

The Romans frequently adorned their bridges with a triumphal arch. A small example of this kind of bridge at St. Chamas, in France, is shown in fig. 6. The span of the arch is 42 feet, and the voussoirs are 3 feet 5 inches deep. Fig. 7 shows the bridge of Narses, built in the 6th century, and which carried the Via Salaria across the Anio or Teverone. This bridge was blown up during the panic caused by the approach of Garibaldi to Rome in 1867. We see here, perhaps, one of the earliest examples of the castle built to protect the bridge against an enemy or to enforce payment of a toll, —the bridge and castle of mediæval romance.

In the year 1178 a famous bridge was begun over the Rhone at Avignon by Saint Benezet, the head of one of certain religious confraternities, which undertook the building or repair of bridges during the Middle Ages, and were called Fratres Pontis or Hospitalarii Pontifices. The bridge was finished in 1188. Four arches still remain, and are remarkable in having an elliptical outline with the radius of curvature smaller at the crown than at the haunch, a form which accords more truly

BRIDGES.

FIG. 12.—Bridge of Brioude.



Cast-Iron Bridge at Craigellachie.

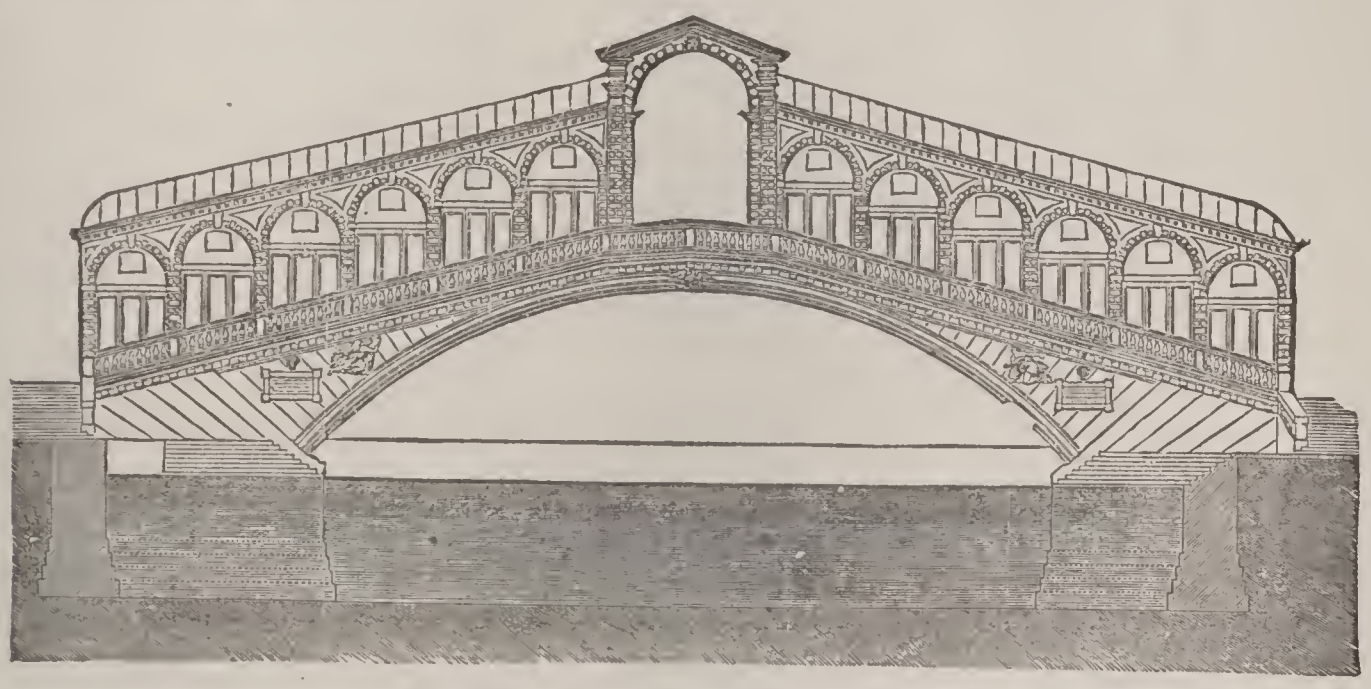


FIG. 13.—Bridge of the Rialto, Venice.

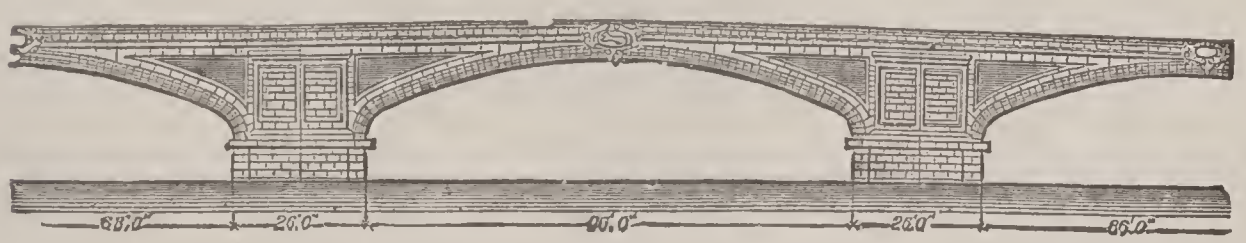
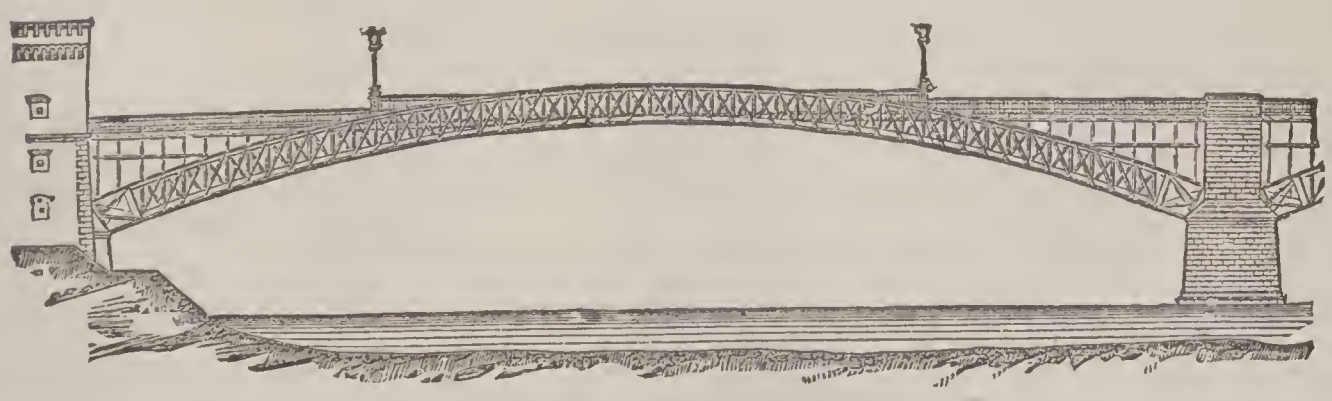


FIG. 14.—Ponte della Trinitá, Florence.

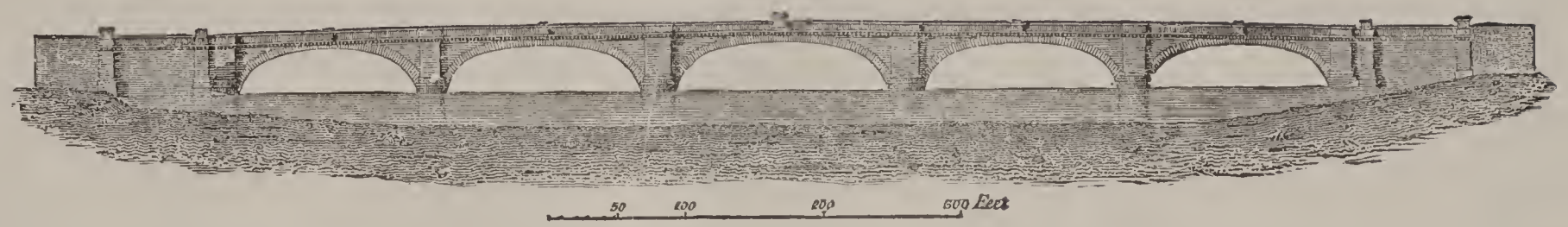


Arch of Bridge at Coblentz.

BRIDGES.

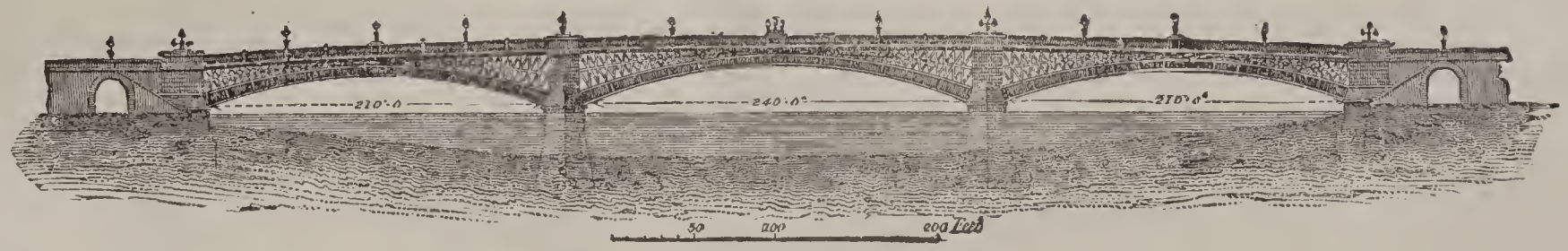
LONDON OLD BRIDGE.

LONDON NEW BRIDGE.

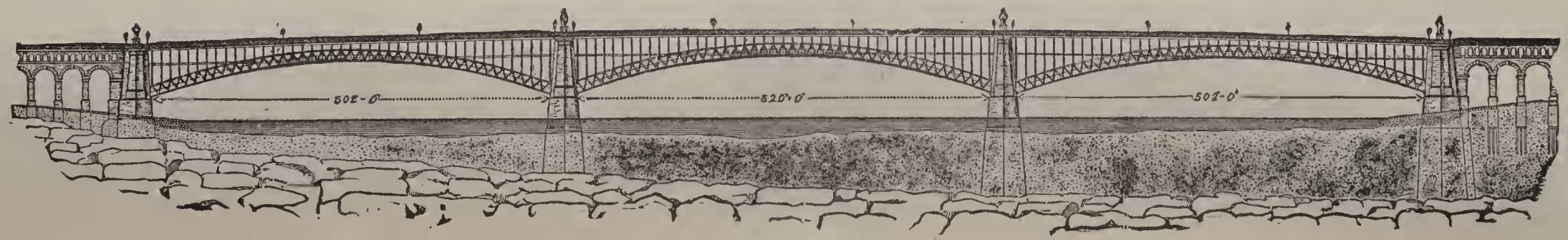


WATERLOO BRIDGE.

SOUTHWARK BRIDGE



ILLINOIS & St. LOUIS BRIDGE



with the linear equilibrated arch than the modern flat ellipse with the largest radius at the crown.

A religious confraternity, founded in the first instance by a certain Mary, the maiden daughter of a ferryman, is said to have built a timber bridge near the site of the present London Bridge, but it seems quite uncertain when the first bridge over the Thames was built. There is little doubt, however, that it was of timber, and had frequently to be reconstructed.

Heavy repairs were frequently necessary, and the timber houses built on the bridge were often burned down; yet the main structure appears to have remained unaltered until the beginning of this century. It does not seem improbable that Peter of Colechurch and Saint Benezet may have been in communication with one another, both being heads of religious bodies engaged in similar works at the same time. Their letters to one another would interest engineers. A French brother Isembert, from Saintes, succeeded Peter as engineer for London Bridge.

Stow describes the partial rebuilding of the timber houses in 1645:—

"The building was of timber, very substantial and beautiful, for the houses were three stories high, besides the cellars, which were within and between the piers, and over the houses were stately platforms leaded with rails and ballasters about them, very commodious and pleasant for walking and enjoying so fine a prospect up and down the river, and some had pretty little gardens with arbors."

The passage between the houses was made 20 feet; previously it had been but 14 feet, and in some parts 12 feet. These beautiful houses were burned in 1666, when they were replaced by a still finer pile of buildings, with a uniform roadway of 20 feet in width. Fig. 8 shows the bridge as it appeared in 1700.

The piers varied in thickness from 25 to 34 feet, and were raised on strong elm piles, covered with thick planks bolted together. The openings in the arches varied from 10 feet to 32 feet 9 inches. The whole waterway was 336 feet 9 inches, two-thirds of the stream being occupied by piers.

Fig. 10 shows the old bridge at Saintes as M. Viollet-le-Duc considers that it appeared towards the end of the 14th century. The following description is abridged from his *Dictionnaire raisonnée d'Architecture*:—

"The first gate appeared on the right shore of the river, on the side of the Faubourg des Dames; next came the Roman arch, the upper part of which was crenelated during the Middle Ages; next on the side of the town stood a tower of oval plan, through which the road lay; the town gates with flanking towers closed the end of the bridge. From the first gate to the Roman arch the bridge was of wood, as was also the case between the great towers and the town gates, so that by the removal of this part of the roadway all communication could be cut off between the town and the tower as well as between the bridge and the Faubourg; moreover, the parapets were crenelated, so that the garrison of the town could at will stop all navigation."

Clearly it was quite as important in those days to be able to arrest as to facilitate communication between the two sides of the river.

The covered bridge over the Ticino at Pavia (fig. 11) was erected, under Gian Galeazzo Visconti, about the end of the 14th century. This bridge, which still exists, has seven pointed brick arches, each 70 feet in span and 64 feet in height; the depth of the arch ring at the crown is 5 feet 6 inches.

Fig. 12 shows the old bridge of Brioude across the Allier in France. Montfaucon and Sêguin speak of this as a Roman work, but Gauthey gives the date 1454 for its construction, and names Grenier and Estone as builders without giving his authority. The design of the bridge appears to favor the date given by Gauthey. The span was 183.73 English feet, the arch was a segment of a circle and the height 60 feet, while the width of the bridge was only 16 feet. The bridge fell in 1822.

The bridge of the Rialto at Venice (Fig. 13) was begun in 1588, Antonio da Ponte being the architect. The span of the arch is 91 feet, the height above the water level 24 feet 6 inches, and the width of the footway 72 feet. Erroneous statements are often met with that this bridge was built from a design by Michael Angelo; the mistake has arisen from the misinterpretation of a passage in the works of Vasari. Rondelet, in his *Essai Historique sur le Pont du Rialto*, gives a full account of the rival designs submitted to the senate by Antonio da Ponte and Palladio.

Fig. 14 shows the singularly beautiful "Ponte della Trinità," erected at Florence (1566) from the designs of Ammanati.

The bridge erected by Telford at Craigellachie, over the Spey, in the beginning of this century, shows a great advance in the conception of what was the safest form in which to apply cast-iron to an arch.

London Bridge and Waterloo.— London new bridge is as fine an example of the modern stone arch bridge as can be found. The shape of the arches, the variation in their span, the slight curvature of the roadway, and the simple yet bold architectural details, are combined so as to produce a singularly beautiful structure. It is now insufficiently wide for the traffic it has to convey, but all who value beauty must earnestly desire that it may not be disfigured by having overhanging footpaths fitted to it as has been frequently proposed. London can well afford to pay for new bridges, but can by no means afford to part with a single object of real beauty.

Waterloo Bridge is another fine structure of the same character.

The Tower bridge, a bascule bridge, constructed in 1889–90, across the Thames, at the Tower of London, is designed on such a scale as to be the largest bridge in the world of the bascule class. It is a compound suspension and bascule bridge of three spans, of which the center opening is fitted with a bascule or drawbridge, which may be lifted at pleasure. The bascule is carried by two massive Gothic towers, from which the chains and links are suspended, and in which provision is made for the machinery required for opening and closing the middle span. Elevators at both sides, as well as internal staircases, are provided for the use of foot-passengers. The elevators communicate immediately with the upper footway connecting the towers, so that the foot-traffic is never interrupted. The leaves of the drawbridge, when open, will be flush with the towers, allowing the largest shipping to pass through. When the bridge is closed, there will be sufficient height at high-water for the ordinary traffic of the river to pass under. The bridge is being built of gray granite for the lower portions, hard red brick for the upper portions of the towers. The opening of a passage for vessels, and the closing of the bridge, will be accomplished in the course of four or five minutes. Of the three spans, the clear center opening for shipping is 200 feet, the side spans are each 270 feet, and the total length between abutments is 800 feet. The headway of the center span when closed is 29½ above Thames high-water, and that of the side spans is 27 feet. The height of the foot-bridge across the center span is 135 feet above high-water. The approach-roads and the foot-bridge are 60 feet wide. The parliament-

ary estimate cost of the bridge, including land, is £750,000, or about £940 per lineal foot. The late Sir Horace Jones was the architect, and Mr. J. Wolfe Barry is the engineer.

Introduction of Suspension Bridges.—It will be observed that from the earliest ages in which we have records of the construction of permanent bridges until very lately, the stone or brick arch has been the structure principally relied on. Timber bridges more or less permanent have also been employed for great spans, as in the noble bridges erected by the brothers Grubenmann (1757); and after the construction of the bridge at Coalbrookdale (1777) cast-iron was not unfrequently employed in England. The theory of the metal arch was, however, very imperfectly understood, and the great metal arch of Southwark bridge (completed 1819, largest span 240 feet), is little more than a heavy and wasteful imitation of a stone ring. By the use of timber or cast-iron instead of stone, the opening which a bridge could span was, however, somewhat increased. An immense stride in this direction was made when suspension bridges were introduced. A bridge of this kind over the Tees, 70 feet in length, was built in 1741 for the use of miners. Similar bridges are also said to have been used by Mr. Finley in America, but the introduction of the modern suspension bridge practically dates from about 1820. (Galashiels bridge, 112 feet in length, was constructed in 1816, also a bridge of similar dimensions at Peebles over the Tweed). In 1819 Telford began the construction of the Menai suspension bridge, in which the span of the catenary is 570 feet and the dip 43 feet. The success of this structure led to the construction of many other large suspension bridges, as at Fribourg (span 870 feet), Hammersmith (span 422 feet), Pesth (span 666 feet). This form of bridge was not, however, found suitable for railway traffic; and on the introduction of railways engineers were for many years dependent on stone, brick, or cast-iron arches.

The design by Robert Stephenson of a bridge to carry the Chester and Holyhead Railway across the Menai Straits led to a complete revolution in engineering practice. Mr. Stephenson's first conception was that of a tube partly carried by chains. This would have practically been a suspension bridge stiffened by a girder.

The Britannia Bridge which carries the Chester and Holyhead Railway over the Menai Straits consists of two independent continuous wrought iron tubular beams, 1511 feet in length, and weighing 4680 tons each, independent of the cast-iron frames inserted at their bearings on the towers. They are 15 feet wide, and vary in depth from 23 feet at the ends to 30 feet at the centre. They rest on two abutments and three towers of masonry at a height of 100 feet above high water. The roadway is laid along the bottom, viz., one line of rails in each tube. The centre or Britannia tower, which is altogether 230 feet high, is built on a rock in the middle of the Straits. The bridge has thus four spans, viz., two spans of 460 feet over the water, and two spans of 230 feet over the land. On each side the weight of a single span of 470 feet is 1587 tons, and a span of 242 feet 630 tons. These tubes repose solidly on the centre tower, but repose on roller beds on the land towers and abutments.

The *Niagara Suspension Bridge* crosses the Niagara River at a height of 245 feet above the water by a single span of 821 feet 4 inches, and forms the connecting link between the American States and Canada.

The superstructure may be best described as a hollow rectangular box, 18 feet deep and 24 feet wide, on the top of which the railway is laid, while the bottom, which is 25 feet wide, forms the roadway for public traffic — both these floors are constructed of timber beams; and each connecting side consists of a row of double posts or uprights of timber, each pair being 6 feet apart; between them wrought iron diagonal bars are made to pass, extending each way to the fourth pair of posts at an angle of 45 degrees. The upper or railway floor is suspended from two wire cables at intervals of 5 feet, and the lower floor is suspended at similar intervals from two other wire cables which have a deflection of 10 feet more than the upper ones; these cables, four in number, are each 10 inches in diameter, and composed of seven strands, each containing 520 wires, making a total of 3640 wires. One strand forms the axis round which the other six are twisted. Sixty wires are equal to 1 square inch of solid section; therefore the total area of each cable is 60.4 square inches, or the total sectional area of iron supporting the structure is 241.6 square inches.

Each cable rests upon a separate saddle, there being two on the top of each of the four towers. The saddles are placed on ten cast-iron rollers, 5 inches diameter and 25½ inches long, which bear upon cast-iron plates 8 feet square and 2½ inches thick, strengthened by three parallel flanges which form two compartments for the reception of the saddles.

The ends of the cables are attached to cast-iron shoes, in each of which is inserted a wrought iron pin which forms the connection with the anchor chains. These anchor chains are each embedded in a solid shaft of masonry 7 feet by 3 feet, enlarged at the bottom to form a chamber 8 feet square cut in the rock. The shafts are sunk to a depth of 25 feet on the New York side, and 35 feet on the Canada side.

Each anchor chain is composed of nine links, the eight lower links being 7 feet long, and the ninth or uppermost 10 feet long. The lowest link consists of seven wrought iron bars, 7 inches by 1.4 inches each, and amounting collectively to an area of 69 square inches. They are secured to a cast-iron anchor plate, by a pin 3½ inches in diameter. From the fourth link the chain curves, and the section is gradually increased to an area of 93 square inches. There are two towers at each end of the bridge, based upon a mass of masonry 60 feet by 20 feet, which is pierced by an arch 19 feet wide, forming the entrance to the lower roadway. The towers are 60 feet high, 15 feet square at the base, and 8 feet square at the top.

Above the floors are 64 diagonal stays, extending from the saddles to the suspenders, amongst which they are equally distributed; they are formed of wire-rope 1⅜ inches diameter. There are also 56 stays attached at their upper extremities to the soffit of the bridge, and at their other ends well anchored to the rocks below. The superstructure is thus tied down as well as suspended, and all undulations directly resisted.

The bridge was commenced in September 1852, and opened for traffic in March 1855. The total cost was $400,000.

The use of two chains of different versed sines is certainly a defect in this design.

There are several other suspension bridges in the United States of great span, *e.g.*, Cincinnati 1057 feet; Brooklyn 1600 feet.

The Brooklyn Suspension bridge across the East River, between New York and Brooklyn, opened in 1883, is built of steel. It has a central span of 1,595½ feet, and two land spans of 930 feet each, making, with the approaches, a total length of 5,989 feet, or about one mile and one furlong. The anchorage at each end is a solid cubical structure of stone, measuring 119 feet one way by 132 feet the other, rising to a height of 90 feet above high-water mark, weighing 60,000 tons each.

The towers are 276 feet high. The weight of the whole structure suspended between the towers is nearly 7,000 tons. The stress of suspension is borne by four cables, of 5,000 steel wires each, 15¾ inches in diameter. The foundations of the towers were laid by means of caissons and compressed air, at a level of about 80 feet below high-water mark. The roadway presents five parallel avenues, of an average width of 16 feet each. The two outmost avenues, 19 feet wide, are devoted to vehicles; the central avenue, 15½ feet wide, for foot-passengers; and on the two intermediate avenues are laid tramways for car traffic. See NEW YORK.

Fig. 16 shows one of the wrought iron arches of a bridge over the Rhine at Coblentz. The bridge consists of three spans of about 315 feet each.

The St. Louis and Illinois bridge over the Mississippi is the first example of a metal arch yet erected.

The Mississippi at St. Louis is confined to a single channel 1600 feet wide and 8 feet deep at extreme low water by an embankment or levee on the Illinois side, which is carried up to the level of extreme high water, at which time the width is augmented to 2200 feet. Both shores are revetted below the low water, some with rubble stones, and protected by the wharf pavements above that line. The extreme range between high and low water is 41 feet. Owing to the narrow gorge through which the whole volume of the Mississippi flows the variations in the bed of the river are very great. Captain James B. Eads, M. Inst. C. E., the distinguished engineer who designed the bridge and superintended its construction, informed the author that a rise of 13 feet less than high water mark caused a scour of 18 feet, and that in the freshet of 1870 the scour reached a depth of 51 feet below low water mark alongside the east pier. These facts induced him to believe it possible that the scour, at times of extraordinary high flood, might extend even to the rock itself. He therefore determined to establish the piers and abutments on the rock; and this was done by means of caissons provided with air chambers and locks at depths for the east pier and east abutment reaching 136 feet below high water mark, or 110 feet from the surface of the water where the foundation work was actually performed. This feat is unprecedented in the annals of engineering.

The piers and abutments are composed of coursed rubble masonry up to low-water mark. Above this level they are faced with grey granite from the State of Maine, which cost $10 per cubic yard *in situ*.

The bridge has three spans, each formed with ribbed arches made of cast steel, a novelty in bridge building. The centre span is 520 feet and the side ones 502 feet in the clear.

The rise of the centre arch is 47½ feet, that of the side ones 46 feet each. These are by far the largest arched spans in the world. Each span is composed of four double ribs of steel (well braced together at their relative distances from each other), and the tubes forming them are jointed butt to butt. They are clasped together by wrought iron couplings (which proved to be much better than steel), furnished with parallel grooves corresponding with similar grooves in the tubes. Steel pins, varying from 4½ inches to 7 inches in diameter, pass through the centre of the couplings and the ends of the tubes at every joint.

The arches carry a double railroad track, and above the track there is a roadway 54 feet wide for carriages and foot passengers.

Cantilever Bridges.—The Forth Bridge.—The principle of the Cantilever bridge has, from time immemorial, been applied primitively in Japan and India, and China also. A cantilever is, as Mr. Baker says, a bracket. It is a structure overhung from a fixed base. The bridge in course of construction across the river Forth, on the North British railway system, will be, when completed, the largest and most magnificent bridge in the world. The engineers are Sir John Fowler, K.C.M.G., and Mr. Benjamin Baker. The site of the bridge is at Queensferry. At this place, the estuary of the Forth is divided by the island of Inchgarvie into two channels, whose depth, as much as 200 feet, precluded the construction of intermediate piers. Hence, two large spans 1,700 feet each were adopted. Between these, the central pier is founded on the island, midway across, and is known as Inchgarvie pier. There are two other main piers, shore-piers, known respectively as the Fife pier, and the Queensferry pier. On these three piers, respectively, three double lattice-work cantilevers, like scalebeams, 1,360 feet, or a quarter of a mile, in length, are poised in line, reaching toward each other, and connected at their extremities by ordinary girders 350 feet long, by which the two main spans are completed. The bridge consists of two main spans of 1,700 feet, or nearly one-third of a mile each; two of 675 feet each, being the shore-ends of the outer cantilevers; and fifteen spans of 168 feet each. The total length of the viaduct, including piers, is 8,296 feet, or a little over one and one-half miles, of which almost exactly one mile is covered by the great cantilevers. The clear headway under the center of the bridge is 152 feet at high water, and the highest part of the bridge is 361 feet above the same level. Each of the three main piers consists of a group of four cylindrical columns of masonry 36 feet high, each 49 feet in diameter at the top, and 55 feet at the bottom; founded on rock or on bowlder-clay. To make assurance doubly sure, the superstructure is bolted down to each column with forty-eight steel bolts two and one half inches in diameter, and 24 feet long.

BRIDGET, ST. one of the patron saints of Ireland.

BRIDGET, ST. of Sweden, was born about the year 1302. She was descended from a family of royal blood, and at the age of sixteen was married to Alpho, prince of Nericia. The husband and wife were equally devoted to works of piety, and undertook together a pilgrimage to shrine of St. Jago de Compostella. On their return both embraced the monastic life, and after the death of Alpho, his wife founded a new kind of monastery for monks and nuns. She then went on a pilgrimage to Rome, where she founded a house for Swedish pilgrims and students, and composed her *Revelationes*. After another pilgrimage to Jerusalem, she died at Rome in 1373.

BRIDGETON, a city and port of entry of New Jersey, is situated in Cumberland county, on both banks of Cohansey creek, which is navigable up to this point—a distance of thirty-eight miles south of Philadelphia. There are two schools of high grade, and numerous educational establishments of lower class, a dozen churches, a public library, four newspapers, and numerous manufactories, whose products cover the range from iron to canned fruits. It has a large trade with the surrounding region. Population (1890), 11,424.

BRIDGETOWN, the principal town in the British colony of Barbadoes. Pop. 20,000.

BRIDGEWATER, a muncipal borough and seaport in Somersetshire, on the Great Western Railway, 29 miles S.S.W. of Bristol.

BRIDGEWATER, FRANCIS EGERTON, THIRD DUKE OF, "the Father of British Inland Navigation," was born in 1736, and died in March, 1803.

BRIDGEWATER, THE REV. FRANCIS HENRY, EIGHTH EARL OF, was born in 1758 and died on the 11th February 1829.

BRIDLINGTON, BRELLINGTON, or BURLINGTON,

a market town of England, in the East Riding of Yorkshire, on the North-Eastern railway, twenty-three miles from Scarborough.

BRIDPORT, a parliamentary and municipal borough and market-town of England, in the county of Dorset, eighteen miles by rail northwest from Dorchester between two branches of the River Brit, from which it takes its name. Population, 6,500.

BRIEF, in the practice of the English bar, is the name given to the written instructions on which barristers advocate causes in courts of justice. It is called a brief because it is, or ought to be, an abbreviated statement of the pleadings, proofs and affidavits at law, or of the bill, answer, and other proceedings in equity, with a concise narrative of the facts and merits of the plaintiff's case, or the defendant's defense.

BRIEG, the capital of a circle in the Prussian province of Silesia and government of Breslau, is situated on the left bank of the Oder, and on the Breslau and Oppeln railway, twenty-seven miles southeast of the former town. Population (1890), 16,000.

BRIEL, BIELLE, or BRIL, a fortified seaport town of Holland, in the province of South Holland, and capital of an arrondissement, stands on the north side of the island of Voorne, near the mouth of the Maese, fourteen miles west of Rotterdam. Population, 4,200.

BRIENNE-LE-CHATEAU, a town of 1,800 inhabitants in the French department of Aube. At the military school here (suppressed in 1790) the great Napoleon spent five years.

BRIENZ, a Swiss town, beautifully situated at the foot of the Bernese Alps. Population (1880), 2,753.—The lake of Brienz, which is eight and three-fourths miles long and one-and-one-half in breadth, is an expansion of the River Aar, and is believed to have been at one time united with Lake Thun.

BRIG, BRIGANTINE. A brig is a square-rigged vessel with two masts. A brigantine, or hermaphrodite brig, is a two-masted vessel, with the mainmast of a schooner and the foremast of a brig. A brig's mainsail is the lowest square-sail on the mainmast, whereas, the mainsail of a brigantine is a fore-and-aft sail like that of a schooner.

BRIGADE, a tactical body, composed of two or more regiments of cavalry or infantry, under the command of a general officer of the lowest grade. The term *brigade* is also applied to from four to eight batteries of artillery working together, and to the small detachments (eight or nine men) of engineers employed in excavating saps in siege operations. Two or more brigades constitute a division, two or more divisions a corps d'armée, two or more corps d'armée an army.

BRIGADE-MAJOR, a third-class staff-officer, appointed by the brigadier to assist him in the management of his brigade.

BRIGADIER, a general officer of the lowest grade, next in rank above a colonel, who is intrusted with the command of a brigade.

BRIGANDS (Ital. *brigante*, from *briga*, an intrigue or quarrel), a name originally given to the mercenaries who held Paris during King John's imprisonment (1358), and who made themselves notorious for their ill-behavior. It was applied by Froissart to a kind of irregular foot-soldiery, and from them was transferred to simple robbers; it is now used especially of such of these as live in bands in secret mountain or forest retreats. In this sense the pest has been common to most countries, by whatever name the robbers may have been known. It has ever flourished under weak or corrupt governments, and patriotism at times has swelled its ranks, always largely recruited from those disposed readily to join in any political movement, and has transformed them into guerrilla companies, who have carried on a bitter warfare against the invader.

BRIGGS, HENRY, one of the greatest mathematicians of the sixteenth century, was born in 1556 at Warley Wood near Halifax, in Yorkshire. Briggs died January 26, 1630, in the seventy-fourth year of his age. Dr. Smith, in his *Lives of the Gresham Professors*, characterizes him as a man of great probity, a contemnor of riches, and contented with his own station, preferring a studious retirement of all the splendid circumstances of life.

BRIGHTON, a parliamentary borough, and one of the most fashionable watering-places of England, is situated on the coast of Sussex between Beachy Head and Selsea Bill. By railway it is fifty miles from London and twenty-eight from Chichester. Its sea frontage of handsome mansions and hotels extends upward of three miles from Kemp Town in the east to what was formerly the suburban village of Cliftonville in the Parish of Hove, while its depth inland at the center is rather more than a mile. In general appearance the style of the town strikingly resembles that of London, and many of the streets and squares seem as if they had been transported as they stand from the "West End." As far indeed as its character is not affected by its natural situation, it is nothing more or less than a vigorous off-shoot supported by the sap of the greater city, a fact which is popularly recognized by the designation of London-super-Mare. Resident population, 120,000.

BRIGHT'S DISEASE, a term in medicine applied to a class of diseases of the kidneys which have as their most prominent symptom the presence of albumen in the urine, and frequently also the co-existence of dropsy. These associated symptoms in connection with kidney disease were first described in 1827 by Dr. Richard Bright. Since that period the subject has been investigated by many able physicians, and it is now well established that the symptoms above named, instead of being as was formerly supposed the result of one form of disease of the kidneys, may be dependent on various morbid conditions of those organs. Hence the term Bright's disease, which is retained in medical nomenclature in honor of Dr. Bright, must be understood as having a generic application.

BRIGNOLES, the capital of an arrondissement in the department of Var, in France, is situated in a fertile and pleasant valley on the right bank of the Calami, twenty-two miles north-northeast of Toulon. Population, 5,000.

BRILL, PAUL, Flemish painter, born at Antwerp in 1554. The success of his elder brother Matthew in the Vatican induced him to repair to Rome. He died at Rome in 1626.

BRILLAT-SAVARIN, ANTHELME, French gastronomist, born at Belley, April 1, 1755, was a deputy in 1789, and Mayor of Belley in 1793; he resided for a time in Switzerland and afterward in America, and from 1796 until his death, February 2, 1826, he was a member of the Court of Cassation. Shortly before this event, appeared his *Physiologie du Gout* (1825), an elegant and witty compendium of the art of dining, to which he brought the experience of half a century.

BRILLIANT is a popular name given to the diamond when cut in a particular way.

BRIMSTONE (a stone that burns; from Anglo-Saxon *Byrnan*, to burn, and stone) is the commercial name for sulphur, in sticks or rolls.

BRINDISI (the ancient *Brundisium* or *Brundusium*) a seaport town of Southern Italy, in the Province of Lecce, is situated on a small promontory in a bay of the Adriatic Sea, 346 miles southeast of An-

cona. Since the establishment of the Overland Route to India, Brindisi has greatly increased, and as the terminus of the Mont Cenis and other railway routes it has became a great point of departure for passengers for the East. It is about sixty hours from London by rail, and the weekly steamers to Alexandria make the passage in three days. About 1,000 vessels annually enter the port, of upward of 600,000 tons' burden. Population (1881), 14,508.

BRINDLEY, JAMES, a celebrated engineer, was born in Derbyshire, England, in 1716, and died in 1772.

BRINVILLIERS, MARIE MADELEINE MARQUISE DE, poisoner, was the daughter of Dreux d'Aubray, Lieutenant of Paris, in 1651, while still young was married to the Marquis de Brinvilliers. A gay and careless spendthrift, he allowed her to do very much as she pleased, and even introduced to her a handsome young officer, the Seigneur de Sainte Croix, who inspired her with a violent passion. Her father caused Sainte Croix to be arrested and imprisoned in the Bastille, where he learned from an Italian the properties of arsenic. On his release he imparted his fatal knowledge to his mistress, who resolved to destroy her father, and, to test the efficacy of the poison, tried its effects on patients in the Hôtel Dieu. Having satisfied herself, she commenced operations on her parent, kissing and poisoning him continually for eight months, until her diabolical patience was exhausted, and she was at last induced to administer a very violent dose. He died, and no one suspected his daughter, who, aided by Sainte Croix and a domestic, Jean Amelin or Chaussée, next poisoned her two brothers and her sisters, her object being to find means of supporting her extravagant style of living with her paramour. She made several attempts to poison her husband, but Sainte Croix is said to have given him antidotes, dreading that he should be compelled to marry the widow. Sainte Croix died suddenly in 1672—his glass mask having fallen off while he was engaged in preparing a poison—and left documents inculpating the marchioness. She escaped to England, afterward traveled into Germany, and next took refuge in a convent at Liège. From this, however, she was decoyed by an officer of justice disguised as an abbé, and conveyed to Paris. Among her papers was found a general confession of her crimes, whose truth she acknowledged after having been put to the torture, and on July 16, 1676, she was beheaded and burned at Paris. Scribe made her the subject of a comic opera, and Albert Smith of a romance (1856).

BRIOUDE, a town in France in the department of Haute Loire, capital of an arrondissement, is situated on the left bank of the Allier, thirty-nine miles northwest of Puy.

BRIQUETTE is the name, originally French (small brick), given to a comparatively new form of fuel, made mostly from waste coal-dust, and used not merely for household purposes, but in various industries. A briquette is simply an admixture of coal-dust with pitch, molded under pressure and heat, the pitch or some similar substance being introduced to form the cementing material.

BRISBANE, the capital of Queensland, a seaport and chief seat of trade in the colony, is situated about 500 miles north of Sidney, in Moreton district. It stands about twenty-five miles from the mouth of a river of its own name, which falls into Moreton Bay, and it is divided into the four divisions of North Brisbane, South Brisbane, Kangaroo Point, and Fortitude Valley. Population (1886), 32,571, or, with suburbs, 51,683. Brisbane was settled as a penal station in 1825 by Sir T. Brisbane, Governor of New South Wales, when a batch of desperate and incorrigible characters were landed at Eagle Farm, near the present town of Brisbane. The era of progress began in 1842, when the colony was opened to free settlers. At first an appanage of New South Wales, the Moreton district was erected into an independent colony in 1859, when the city was incorporated, and the prosperity of the town and district became more steady and rapid. The Brisbane river rises in the Burnett Range, and receives the Bremer and other rivers before its entrance into Moreton Bay, below the town of Brisbane.

BRISBANE, SIR THOMAS MAKDOUGALL, a distinguished soldier and astronomer, was born in 1773 at Brisbane in Ayrshire. He received the degree of D.C.L. from Oxford, and was elected president of the Royal Society of Edinburgh after the death of Sir Walter Scott. Sir Thomas died January 31, 1860.

BRISSON, MATHURIN JACQUES, a French zoologist and natural philosopher, was born at Fontenay-le-Comte, April 3, 1723, and died in 1806.

BRISSOT, JEAN PIERRE, who assumed the name *De Warville*, a celebrated Girondist, was born of humble parents at Chartres in January, 1754. He received a good education, and entered the office of a lawyer at Paris. His first works, *Theorie des Lois criminelles* (1781) and *Bibliothèque philosophique du Legislateur* (1782) were on the philosophy of law, and showed how thoroughly Brissot was imbued with the ethical precepts of Rousseau. He paid a visit to the United States, and returned just at the outbreak of the Revolution. Into this great movement Brissot threw himself heart and soul. He edited the *Patriote Français*, and, being a well-informed, capable man, soon began to take a prominent part in affairs. In the National Assembly he leagued himself with the party, well known in history as the Girondists, but then frequently called the *Brissotins*. Of this party he was in many respects the ruling spirit. Vergniaud certainly was far superior to him in oratory, but Brissot was quick, eager, impetuous, and a man of wide knowledge. But he was at the same time timid and vacillating, and not qualified to struggle against the fierce energies roused by the events of the Revolution. His party fell before the "Mountain"; sentence of arrest was passed against the leading members of it on June 2, 1793. Brissot, persuaded by his friends, attempted to escape in disguise, but was arrested at Moulins. His demeanor at the trial was quiet and dignified; and on October 31, 1793, he died bravely with his comrades.

BRISTLES, the strong hairs growing on the back of the hog and wild boar, and extensively used in the manufacture of brushes, and also by shoemakers and saddlers. The quality of bristles depends on the length, stiffness, color and straightness—white being the most valuable. The best bristles are produced by hogs that inhabit cold countries. The Russian hog is a long, spare animal, and the thinner the hog, the longer and stiffer the bristles.

BRISTOL, England, a mercantile city six miles from the mouth of the Avon, and at its junction with the Frome, is located partly in Gloucestershire and partly in Somerset. South of the river is St. Mary Redcliff, justly declared by Queen Elizabeth to be the "fairest and most famous parish church in England." Of the church rebuilt, "from the cross aisles downward," by William Canynges, Sr., merchant (*circa* 1376); only the south transept and south wall of nave remain; the rest was wrecked by the fall of the spire, and was built by Canynges' grandson and namesake (*circa* 1470). It is vaulted throughout, and is a magnificent specimen of perpendicular architecture. The truncated spire was completed, 280 feet from ground and 170 feet from top of tower, in 1872. In the muni-

ment room is the chest in which Chatterton (1752–70) pretended to have found the Rowley poems. Among the ancient houses of the town are Canynges' house, Redcliff Street, Spicer's (or Back) Hall, and St. Peter's Hospital. Bristol first appears in history on a coin (*circa* 1000). In 1497 John Cabot sailed from the port, and was the first to discover North America; his son, Sebastian, declared that he was born in Bristol, and sailed thence on his voyage of 1498. Bristol men colonized Newfoundland, engaged in several early attempts to colonize Maine, and established a large trade with the West Indies and American colonies. The city was taken by Prince Rupert, in 1643, and by Fairfax in 1645. Colston, the philanthropist (1636–1721), founded many charities, and his "day" is annually kept in Bristol. Southey (1774–1843) was a native of Bristol, and he and Coleridge were much there in their younger days. Burke was returned for the city in 1774, and declined the poll in 1780. The first steamship for the transatlantic voyage, the *Great Western*, was built in the port in 1838. The principal imports are grain, provisions, oils, hides, tallow, sugar, and petroleum; the exports, coal, salt, tin-plates, cotton, piece-goods, chemical products, manufactured oils, and sundries. The tonnage of vessels entering the port during 1886 was returned as 1,285,090; in 1847 it was 546,753 tons. Bristol is on the Great Western and Midland railways. Population within municipal boundaries (1887), 223,695. Clifton is mentioned in *Domesday*, but has little history till it appears as a "beautiful village" in 1760; it is now a large and handsome suburb of Bristol, of which it forms part for municipal and parliamentary purposes. It stands above St. Vincent's Rocks, which rise majestically from the Avon. The river is spanned 245 feet above high water by a suspension bridge.

BRISTOL, a manufacturing town of Hartford county, Conn., is on the Hartford, Providence & Fishkill railroad, eighteen miles southwest of Hartford and fifteen miles northeast of Waterbury. Its principal industries are foundries and machine shops and manufactories of clocks and water-wheels. The 1890 census stated the population at 7,374.

BRISTOL, the largest town of Bucks county, Penn., is situated on the Delaware river, at the terminus of the Delaware canal, twenty miles above Philadelphia. It is a station on the Pennsylvania railroad, and in 1890 contained a population of 6,537. Its manufactories embrace machine shops and foundries, rolling mills, worsted mills, and flour mills, and felt, furniture and hosiery are manufactured to a considerable extent. Bristol is well represented in banks, newspapers, churches, schools, etc.

BRISTOL, a town of Rhode Island, the capital of Bristol county, is situated on a peninsula, between Narragansett Bay and Mt. Hope Bay, sixteen miles southeast of Providence by rail. It is a port of entry and has shipyards, refineries, and various manufactories, the principal of the last being cotton and rubber goods. The town contains several churches and schools, and has good railroad and telegraph communications. Its population in 1890 was 5,475.

BRISTOL CHANNEL, an inlet of the Atlantic Ocean, in the southwest of England, between South Wales on the north, and Devon and Somerset shires on the south, or it may be regarded as an extension of the estuary of the River Severn. It is about eighty miles long, and five to forty-three miles broad, the depth ranging from five to forty fathoms. It is the largest inlet or estuary in Britain, having a very irregular coast line of 220 miles. The tides in it rise to an extraordinary height.

BRITANNIA. The history of Britain begins with the invasion of Julius Cæsar, 55 B.C. Cæsar is the first Roman writer who mentions Britain; before him we have only a few short notices in Greek writers, who appear to have known but little about the country. The earliest notice of Britain is in Herodotus (450 B.C.,) who mentions the *Tin Islands*, only to confess his ignorance about them. By the Tin Islands are probably to be understood only the Scilly Isles and Cornwall, which are said to have been known to Phœnician traders some centuries before the Christian era.

The earliest inhabitants of Britain concerning whom we have any certain knowledge are the Celts, who formed the vanguard in the great westward migration of the Indo-European or Aryan nations; but it seems certain, from the evidence of remains found in the country, that the Celts were preceded in their occupation of it by a non-Aryan race.

The Celtic family is divided into two branches — the Gaelic and the Cymric. To the former belong the Irish and the Highlanders of Scotland, to the latter the Welsh and the inhabitants of Britanny, and to these may be added the ancient Gauls, the remains of whose language seem to prove without doubt that they belong to the Cymric and not to the Gaelic branch.

Politically, Britain consisted of a number of independent tribes united in a federation of the loosest kind, in which the lead was taken by the tribe which happened at any time to be the most powerful.

The Britons appear to have kept up a tolerably close intercourse with the Continent. They are first mentioned by Cæsar as sending aid to the Veneti (a Gaulish tribe whose name is preserved in that of the present town of Vannes) in their revolt against the Roman power. This was in 56 B.C.; and in the following year Cæsar resolved on an invasion of Britain, partly influenced, no doubt, by the desire of taking vengeance for the help afforded by the Britons to his enemies, the Veneti. C. Volusenus having been previously sent to examine the British coast, Cæsar himself set sail from Portus Itius (probably Wissant, between Boulogne and Calais) on the night of August 26, 55 B.C., taking with him two legions. The opposite coast was reached early on the morning of the following day, and after a sharp struggle a landing was effected apparently somewhere near Deal. Slight resistance was now offered by the Britons, to whom peace was granted on easy terms, and the Romans hastened back to Gaul.

Early in the following summer Cæsar again started from Portus Itius, this time with a force of five legions and a corresponding body of 2,000 cavalry, and landed on the coast of Britain at the same place as in the previous year. Leaving a small force to protect the ships he advanced twelve miles inland to the River Stour before meeting with the enemy. Cassivellaunus, chief of the country to the north of the Thames, had been chosen by the Britons as their general-in-chief, and under his command they for a time presented a fierce resistance to the invaders, but they were unable to withstand the steady onset of the Romans, and Cæsar soon reached and took by storm Cassivellaunus' capital. The site of this city is now unknown, but it has been conjectured with some probability to have been Verulamium (St. Albans). Cassivellaunus now sued for peace, and after receiving hostages and fixing the amount of the tribute Cæsar left the country before the end of the summer. No garrison was left behind to secure the Roman conquests, which were thus practically relinquished. For nearly a hundred years after this date the history of Britain is almost a blank. The Emperor Claudius, on his accession to the empire in 41 A.D., determined to carry out Augustus' intention of exacting the British tribute; accordingly (43 A.D.) Aulus Plau-

tius was sent to Britain with a force of four legions, and having landed without opposition, he advanced to the northern side of the Thames, and there awaited the emperor's arrival. Plautius was soon joined by Claudius, who at once led his army against the Britons, over whom he gained a complete victory, immediately after which he returned to Rome, leaving Plautius to secure his conquests.

The war was now carried on in the west between the Roman general Vespasian, who afterward became emperor, and the Silurian chief Caractacus (Caradoc). After a struggle of nine years Caractacus at length, in 51 A. D., met with a decisive defeat at the hand of P. Ostorius Scapula. Having fled for refuge to Cartismandua, queen of the Brigantes (a tribe occupying the district between the Tyne and the Humber), he was taken to be led in triumph through the streets of Rome.

Ten years after this Boadicea, queen of the Iceni, a tribe occupying the present counties of Norfolk and Suffolk, took advantage of the absence in Mona (Anglesey) of the Roman prefect, Suetonius Paulinus, to excite her people to revolt. The Roman colony of Camulodunum (Colchester) was taken and sacked, and the rebellion soon seemed seriously to threaten the Roman power. Suetonius, however, hastened up from the west, and in a single battle, fought near London, inflicted a decisive defeat on the Britons, following up his victory by a massacre in which 80,000 Britons are said to have perished. Boadicea poisoned herself to avoid falling into the hands of the Romans. The spirit of insurrection was now completely crushed; a milder policy was adopted by the successors of Suetonius, and Roman civilization began rapidly to spread over the country.

The next event of importance was the arrival of Agricola as governor of Britain in the year 78. Agricola's first task was to complete the subjection of the Ordovices (North Wales), and this having been speedily accomplished, he adopted, with great success, a policy of conciliation. He encouraged education and building, and succeeded in introducing Roman dress and manners among the Britons. This, says Tacitus, they in their ignorance called civilization, though it was but a part of their slavery. In 79 Agricola attacked the Brigantes, and reduced the country between the Humber and the Tyne. During five years he continued to advance farther north, and in 84 he defeated a Caledonian chieftain, named Galgacus, in a great battle, the site of which it is impossible to fix, but it was probably not far from the eastern coast of Scotland at some place north of the Tay. Agricola was now recalled to Rome, and no attempt was made to maintain the conquest north of the line of forts which he had built between the Forth and the Clyde.

The remainder of the period of the Roman occupation was for the most part uneventful. In 120 the Emperor Hadrian visited the country, and built a rampart between the Tyne and the Solway Firth, in order to check the inroads of the northern tribes. In 139 a wall, called the wall of Antonine, in honor of the emperor Antoninus Pius, was built by the prefect Lollius Urbicus along the line of Agricola's forts between the Forth and the Clyde. In 207 the Emperor Severus came to Britain in order to lead in person an expedition against the Caledonian tribes. He advanced far into Caledonia, driving the enemy before him but never meeting them in a pitched battle. No substantial advantage was gained in this desultory war, which cost the lives of 50,000 Roman soldiers. Severus built a new wall along the line of Hadrian's rampart, and died in York in 211.

The Roman empire was now in a state of decay, and its weakness offered great temptations to distant officials to seize the supreme power for themselves. About 287 the title of emperor was assumed by a man of low birth named Carausius, a native of Menapia (the district between the Scheldt and the Meuse), who had been appointed to the command of the fleet stationed in the English Channel for the purpose of protecting the coasts of Britain and Gaul from the Frisian pirates, and whose conduct in that position had been such as to draw from the emperor Maximian an order for his death. After a successful reign of seven years, in the course of which his independence was acknowledged by Maximian, Carausius was assassinated by his chief officer Allectus, who in his turn usurped the imperial title during three years, at the end of which Britain was regained for Rome by Constantius Chlorus (296). Constantius afterward led an expedition into Caledonia, and died at York in 306.

Soon after this date the Picts and Scots began to be heard of as invading the Roman province from the north.

In 367 the Picts and Scots overran the whole country as far south as London. Theodosius, father of the emperor of that name, was sent against them, and in two campaigns succeeded in driving them back beyond the wall of Antonine. The district thus regained between the walls of Hadrian and of Antonine was named Valentia, in honor of the reigning emperor Valentinian. This, however, was only a momentary check, and the new province was soon lost.

In 383 the title of emperor was assumed by Maximus, a native of Spain, who had served under Theodosius in the Pictish wars. Maximus took a large army of Romans and Britons into Gaul and was recognized by Theodosius and Valentinian as sole emperor over Britain, Gaul and Spain. Five years later he invaded Italy, but was taken and beheaded at Aquileia in 388. The army never returned to Britain, which was thus left weaker than ever. In 396 a single legion was sent by Stilicho, and the Picts were once more driven back. In 407 three successive emperors—Marcus, Gratian, and Constantine—were set up in Britain, the last of whom followed the example set by Maximus, and carried the army into Gaul, leaving Britain again helpless against the northern invaders. In 410 the Roman occupation of Britain was formally terminated by a letter addressed by the emperor Honorius to the cities of Britain, in which he told them that they must henceforth be their own defenders.

Britain first became a Roman province in the reign of the emperor Claudius, 43 A. D. It was governed by a single prefect until the reign of Severus, who divided the province into two parts, called Britannia Superior and Britannia Inferior, each governed by a prefect. In the division of the empire into four prefectures in the reign of Diocletian, Britain formed part of the prefecture of Gaul, and was governed by an officer called the *vicarius*, residing at York.

BRITANNIA METAL. The composition of Britannia metal varies. Much of it is 90 tin, 8 antimony, and 2 copper. Another formula is 81 tin, 16 antimony, 1 copper and 2 zinc. But most of the alloys passing under this name have between 80 and 90 per cent. of tin with varying proportions of antimony and copper. Britannia metal forms a good ground or basis for electroplating with silver. Britannia metal spoons and ladles, made by casting, stamping and burnishing, have been nearly driven out of the market by German silver; but the former metal is more largely used than ever for hot-water jugs, coffee-pots, sugar-basins, soup-tureens, gravy-dishes, vegetable and side dishes, dram bottles, drinking cups, wine coolers, soap-boxes, liquor-frames, cruets, waiters, trays, etc.; and as a basis for electroplate. Sheffield and Birmingham are the chief seats of the manufacture. After electroplating came into general

use in the decade 1840-50, the trade in Britannia metal wares became double what it was previously.

BRITANNICUS, son of the emperor Claudius, and of his third wife Messalina, was born probably 42 A. D., though the exact date can not be determined. He was originally called Claudius Tiberius Germanicus, and received the name Britannicus on account of the conquest made in Britain about the time of his birth.

BRITISH COLUMBIA. See COLUMBIA, BRITISH.

BRITISH MUSEUM. The British Museum, an important national institution in London, originated in a bequest of Sir Hans Sloane, in accordance with which his extensive collection of objects of natural history, works of art, books and manuscripts, was offered in 1753 to the government for the sum of $100,000, or two-fifths of its original cost. The institution was opened in 1759. The present building was not completed till 1847. Its principal front faces Great Russell street, and presents a columnar façade, 370 feet in length. The library building cost $750,000. The reading room is circular, and will accommodate over 300 readers. It is constructed principally of iron, with brick arches between the main ribs. The dome is 106 feet in height, and its diameter 140 feet. It has three miles lineal of bookcases eight feet high. In addition, the reading room has accommodation for 60,000 volumes. The Natural History building stands on the site occupied by the International Exhibition of 1862. The whole cost of the new museum very nearly reached the sum of $2,000,000. This elegant terra-cotta edifice is situated at Kensington, in the Cromwell road. There are eleven departments: Printed Books (with the sub-department of Maps), Manuscripts, Prints and Drawings, Oriental Antiquities, Greek and Roman Antiquities, Coins and Medals, British and Mediæval Antiquities and Ethnography, Zoölogy, Botany, Geology, and Mineralogy. The library at present contains about 1,500,000 printed volumes. There are over 50,000 published and 20,000 manuscript maps in the Museum. The manuscripts are contained in several rooms in the southeast angle of the building. Among the most valuable treasures here are the *Codex Alexandrinus*, a manuscript of the Bible written in uncial Greek, before the close of the fifth century, and the *Basilicon Doron* of James I., in his own handwriting. In 1887 the department contained upward of 50,000 volumes, 47,000 charters and rolls, nearly 10,000 detached seals and casts of seals, and upward of 100 ancient Greek, Coptic, and Latin papyri. Among the drawings are fine examples of Raphael, Michael Angelo, Leonardo da Vinci, Albert Dürer, and Claude; among the water-colors, of David Cox, Girtin, and W. Müller. The collection of etchings by Rembrandt and of engravings by Hogarth are unrivaled. The Egyptian monuments date from a period as remote as 2,000 years before the Christian era, and come down to the Mohammedan invasion of Egypt (640 A.D.). The key to the hieroglyphics was furnished by the celebrated Rosetta Stone, which is placed in the center of the gallery. The Elgin Gallery containes the sculptures from Athens and Attica, the greater portion of which were obtained by the Earl of Elgin, and purchased from him by Parliament in 1816 for $175,000. In 1856 the trustees united the Natural History departments under Professor Owen, who was then appointed Superintendent of Natural History. In the spring of 1881 the new building erected at South Kensington for the reception of the zoölogical, mineralogical, geological, and botanical departments, was opened to the public.

BRITTANY (Fr. *Bretagne*), the great northwestern peninsula of France, extending in triangular form into the sea, its base resting on Normandy, Maine, Anjou, and Poitou, its sides washed by the Channel and the Atlantic Ocean. In earlier times it formed, with the name of Duchy, one of the provinces of France; now it forms the five departments of Finistère, Côtes-du-Nord, Morbihan, Ille-et-Vilaine, and Loire-Inférieure, with a total area of 13,130 square miles, and a population (1889) of 3,136,400. In ancient times, Brittany, under the name of *Armorica*, was the center of the confederated Armorican tribes, who were of Celtic origin. Later it was known as *Provincia Lugdunensis Tertia*. Already entirely liberated in the fourth century, it became divided into several allied republican states, which afterward passed into petty monarchies. Brittany became subject to the Franks in the reign of Charlemagne, and was handed over by Charles the Simple to the Northmen in the tenth century. The duchy of Brittany was incorporated with France in 1532 by Francis I., to whom it had come by marriage. During the Revolution Brittany accordingly became the arena of a long and bloody struggle against dominant republicanism, its Chouans almost rivaling the Vendéans in the heroic stubbornness of their opposition. Abelard, Duguesclin, the Connétable de Richemont, Jacques Cartier, Michel Columb, Dom Lobineau, Duclos, Surcouf, Broussais, Laënnec, Jules Dupré, Duguay-Trouin, Kératry, Maupertuis, Chateaubriand, Lemennais, Jules Simon, and Renan, were Bretons. The Breton (*Brezonek, Brezonuk;* Fr. *Bas Breton*), the ancient language of Brittany, still called sometimes Armorican, is one of those small Celtic tongues which are languages down to the present time. It is at the present day spoken chiefly in the department of Finistère and the western parts of Côtes-du-Nord, and in Morbihan, and is still the ordinary language of about 1,322,000 persons, of whom 679,700 know no other.

BRITTON, the title of the earliest summary of the law of England in the French tongue, which purports to have been written by command of King Edward I.

BRITTON, JOHN, a topographical and antiquarian writer, was born at Kingston-St. Michael, near Chippenham, July 7, 1771, and died in 1857.

BRIVES-LA-GAILLARDE, a town of France, capital of an arrondissement in the department of Corrèze, situated in a beautiful and fertile plain twenty miles from Tulle. It is surrounded with elm-planted boulevards. Population (1890), 9,000.

BRIXEN, a town of Austria in Tyrol, situated in the Pusterthal at the confluence of the Eisack and Rientz, 104 miles from Vienna. Population, 4,500.

BRIXHAM, a seaport town of England, in the county of Devon, about 200 miles from London, with a station about two miles distant on the South Devon railway. Population (1890), 7,000.

BROACH, or BHARUCH, a district of British India under jurisdiction of the government of Bombay, extending from 21° 22′ to 22° 11′ N. lat. and from 72° 30′ to 73° 10′ E. long. It is bounded on the N. by the River Máhi, on the E. and S. by the territory of the Gaikwar, and on the W. by the Gulf of Cambay. Consisting chiefly of the alluvial plain at the mouth of the River Nerbudda, the land is rich and highly cultivated, and though it is without forests it is not wanting in trees. The district is well supplied with rivers, having in addition to the Nerbudda, the Mahi in the north and the Kíni in the south. Population (1890), 360,000.

BROACH, the principal place of the district of the same name, situated on an elevated mound, supposed to be artificial, on the northern bank of the Nerbudda, about 30 miles above its mouth. Population, 38,000.

BROADSTAIRS, a town of England, in the county of Kent, about a mile and a half to the south of the North Foreland, and three miles from Margate, on the London, Chatham, and Dover Railway. Pop. 3,000.

BROCCHI, Giovanni Battista, a celebrated Italian mineralogist and geologist, was born at Bassano, in February 1772. He studied at the university of Pisa, where his attention was especially turned to mineralogy and botany. In 1802 he was appointed professor of botany in the new Lyceum of Brescia; but he more particularly devoted himself to geological researches in the numerous excursions he made into the adjacent districts.

In the year 1823 Brocchi sailed for Egypt, and engaged with his usual ardour in exploring the geology of that country and its mineral resources, every facility being granted by Mehemet Ali, who in 1825 appointed Brocchi one of a commission to examine and organize his conquest of Sennaar, but the naturalist, unfortunately for science, fell a victim to the climate at Khartum, in September 1826.

BROCKHAUS, Friedrich Arnold, an eminent German publisher, was born in Dortmund, on the 4th May 1772. He was educated at the gymnasium of his native place, and from 1788 to 1793 served an apprenticeship in a mercantile house at Düsseldorf. The work distinctly associated with his name, and with the publishing house which has been carried on by his sons, is the *Conversations-Lexicon*, in many ways the completest and best encyclopædia of its kind, which has now reached its twelfth edition. Brockhaus died in 1823.

BROCKLESBY, Richard, a physician of considerable reputation, was born in Somersetshire, 11th August 1722. Dr. Brocklesby died suddenly 11th December 1797.

BROCKPORT, a town of Monroe county, N. Y., 17 miles from Rochester, with a population of 5,000. It is the seat of the State Normal School, contains one national and one other bank, seven churches and three newspaper offices. Its manufactures include reapers, mowers, pumps, and other articles.

BROCKTON, formerly known as North Bridgewater, a manufacturing town of Plymouth county, Mass., 20 miles south of Boston. It contains two national banks and one savings bank, nine churches and several schools. Brockton is the largest town in Plymouth county, and has extensive manufactures of boots and shoes and other goods, and a population (1890) of 27,294.

BROCKVILLE, a town of Ontario, Canada, on the left bank of the St. Lawrence, 125 miles southwest of Montreal. It is a railroad center and a port of call for the St. Lawrence steamers, and has a population (1890) of 8,500. It was named after Sir Isaac Brock (*q.v.*), who was killed in the battle of Queenstown in 1812.

BRODERIP, William John, a distinguished writer on natural history, was born in Bristol, probably in 1787. He was educated at the school conducted by the Rev. Samuel Seyer, and proceeded to Oriel College, Oxford, where he began the study of law. He was called to the bar in 1817, and took part for several years in editing the law reports. In 1822 he was appointed by Sir Robert Peel, one of the metropolitan police magistrates, a post which he occupied for thirty-four years. All his leisure time was devoted to the favorite study of his earlier days — natural history. He was a member of most of the scientific societies, contributed numerous papers to their Transactions, and did much to further the study of zoology in England. He acted for many years as vice-president of the Zoological Society.

BRODIE, Sir Benjamin Collins, Bart., a distinguished physiologist and surgeon, was born in 1783 at Winterslow, county of Wilts, and died at Broome Park, for over thirty years. In 1810 he was elected a fellow of the Royal Society, and in the following year communicated a series of papers "On the Influence of the Brain on the Action of the Heart, and on the Generation of Animal Heat." In 1812 he also communicated a paper "On the Mode in which Death is produced by certain Poisons." For these researches he received the Copley medal of the Royal Society in 1811. In 1813 he delivered the Croonian lecture, "On the Effect of the Nerves on the Heart and on the Involuntary Muscles," and in 1814 he contributed another paper "On the Influence of the Nerves of the Eighth Pair on the Secretions of the Stomach." In 1816 he performed many experiments on animals, to ascertain the influence of bile on the food during its passage through the bowels.

At this period of his career Brodie rapidly glided into a large and lucrative practice, and more especially he quickly gave evidence of superior powers as an operator, having knowledge, coolness, and readiness of resource. From time to time he wrote upon surgical questions, contributing numerous papers to the *Transactions of the Royal Medical and Chirurgical Society*, and to the medical journals. Probably his most important work is that entitled *Pathological and Surgical Observations on the Diseases of the Joints*, in which he attempts to trace the commencements of disease in the different tissues which form a joint, and to give an exact value to the symptom of pain as evidence of organic disease.

Brodie received many honors during his career. He was the medical adviser of three successive sovereigns, and in 1834 he was elevated to the rank of a baronet. It is generally believed that he might have been created a peer had he desired the honor. He became a corresponding member of the French Institute in 1844, D.C.L. of Oxford in 1855, and president of the Royal Society in 1858; and he was the first president of the Medical Council under the Act for the Education and Registration of the Medical Profession. He died at Broome Park, October 21, 1862.

BRODY, a town of Austria, in the circle of Zloczow, in Galacia, near the Russian frontier. Pop. 20,000.

BROGLIE, Achille Leonce Victor Charles, Duc de, peer of France, was born in Paris November 28, 1785, and died January 25, 1870. The family from which this eminent statesman descended was of Piedmontese origin, but it won its honors in the service of France. The first Marshal de Broglie (1639–1727) served with distinction under Louis XIV.; his son, known as the Chevalier de Broglie (1671–1745), was raised to the highest grade in the French peerage for his gallant military service at Guastalla and at Prague in 1742, but he refused the rank of marshal of France, which was offered to him by the regent, on the ground that his father, who was still alive, deserved it more than he did. The next in descent was the second marshal (1718–1804), who commanded the French armies in the Seven Years' War, for which he was created a prince of the empire, and though subsequently disgraced and exiled by the intrigues of the Condés, he was recalled in 1789 by Louis XVI. to the office of commander-in-chief. To stem the tide of the Revolution was impossible. The marshal speedily fell from power, emigrated to Germany, refused the solicitation of Napoleon to return to France, and died at Münster in 1804.

The son of this veteran followed an opposite course and met with a more untimely end. He adopted the liberal opinions of the time. He followed Lafayette and Rochambeau to America. He sat in the Constitutent Assembly, constantly voting on the Liberal side. He served as chief of the staff to the Republican army on the Rhine; but, like many other champions of the Rev-

olution, he was denounced, arrested, dragged to Paris, and executed on the 27th June 1794. The parting injunction he left to his son, Victor de Broglie, the subject of this notice, then a boy nine years old, was ever to remain faithful to the cause of liberty, even though it were ungrateful and unjust. His father murdered, his mother imprisoned, his property confiscated and plundered, the young de Broglie first appears in life in wooden shoes and a red cap of liberty, begging an assignat from the younger Robespierre. Yet he adhered to the cause from which his father had died; he maintained through life the principles of 1789. He seemed to have forgotten his own rank, until he was reminded of it at the Restoration by a writ of summons to the Chamber of Peers, and in early life he served, not unwillingly, as one of the officers of the council of state of the emperor Napoleon I.

In 1815, before he had completed his 30th year, the Duc de Broglie was summoned by Louis XVIII. to the Chamber of Peers. The first incident in his parliamentary life was the trial of Marshal Ney, and on this occasion he had the courage to speak and vote alone for the acquittal of the prisoner, on the ground that he was not guilty of deliberate treason; no other peer of France supported his protest on that occasion. During the Restoration he continued to take an active part in the defence of liberal opinions and measures. He refused to take office in the cabinet of M. de Serre. He opposed the reactionary policy of the court. He supported the short-lived administration of M. de Martignac, and he acted with the party known as the *doctrinaires*, of which M. Royer-Collard was the founder, and M. Guizot the ablest representative. Meanwhile, in 1816, he had married the daughter of Madame de Stael, a union of unbroken domestic happiness; and he had pledged himself to that sacred cause of Negro emancipation, in which he was the worthy rival and ally of Clarkson, Buxton, Wilberforce, and Brougham. The revolution of July 1830 imposed fresh duties on the Duc de Broglie. Though reluctant to take office from his cold, retiring, and unambitious temperament, he consented to hold the ministry of public worship in the first cabinet of Louis Philippe's reign, and in 1832, after the death of Casimir Périer, he was prevailed upon to take the more important department of foreign affairs. In this function he strengthened the alliance of France with England; he negotiated the Quadruple alliance; he contributed to the settlement of the Belgian and Greek questions; and he labored with success to preserve the peace of Europe. He was out of office from March 1834 to March 1835, but he returned to power at the latter date, and this time as the head of the cabinet. He was riding by the side of the king when Fieschi's "infernal machine" was fired on the royal cortege, and a bullet passed through the collar of his coat. In 1836 the Government was beaten on the question of the reduction of the five per cents., and M. de Broglie retired permanently from official life. He shared the indignity of the *coup d'etat* of December 2, 1851, and remained for the remainder of his life one of the bitterest enemies of the imperial régime. The last twenty years of his life were devoted chiefly to philosophical and literary pursuits. His literary works, though few of them have been published, were rewarded by a seat in the French Academy, and he was also a member of another branch of the French Insitute, the Academy of Moral and Political Science. In the labors of these learned bodies he took an active and assiduous part; and on his death, which took place at the advanced age of eighty-five, just before the lamentable events of 1870, he was followed to the grave by representatives of all that is most illustrious in the political and literary society of France. He was succeeded in the honors of his house by Albert de Broglie, his oldest son, also distinguished by his literary works, and who has since 1871 played no inconsiderable part in the political affairs of his country as a leading member of the National Assembly, and for some time head of the cabinet of Marshal Macmahon.

BROGUE (Irish and Gaelic *brog*), a light shoe formed of one piece of hide or half-tanned leather gathered around the ankle which was formerly much in use among the native Irish and the Scottish Highlanders, and of which there were different varieties. The term brogue is also used to signify the peculiar pronunciation of English that distinguishes natives of Ireland.

BROILING is a convenient and expeditious mode of cooking meat by exposing it to the direct action of fire, usually by means of a gridiron. The albumen of the outside being coagulated, the meat is cooked in its own juices and rendered extremely nutritious.

BROKE, Sir Philip Bowes Vere, English Rear Admiral, born September 9, 1776. In the *Shannon* he fought the memorable duel with the *Chesapeake*, off Boston, June 1, 1813. He died in London, January 2, 1841.

BROKER, a word derived variously from the French, *broier*, to grind, and *brocarder*, to cavil or higgle, and the Saxon *broc*, misfortune.

A broker is an agent or intermediate person appointed for transacting special business on account of another, but differing somewhat from an ordinary factor in functions and responsibility. Of this class there are various descriptions, exercising employment without the smallest analogy, though all are brought under the general name of brokers: of those the principal are—exchange brokers, whose province is to ascertain the rates and relation of exchange between countries; stock-brokers, who negotiate transactions in the public funds; insurance brokers, who effect insurances on lives or property; and pawnbrokers, who advance money on goods, on the condition of being allowed to sell the goods if the sum advanced is not repaid with interest within a limited time. See Agent and Insurance.

BROMBERG, a town of Prussia, capital of a government in the province of Posen, is situated seventy miles north of the city of that name on the River Brahe, which is there crossed by a fine new railroad bridge.

BROME, Alexander, a minor English poet, was born in 1620, and died in 1666.

BROME, Richard, a dramatic writer in the reign of Charles I., and a contemporary of Dekker, Ford Shirley, and others, dicd in 1652.

BROMIC ACID, $HBrO_3$, is the best known compound of bromine and oxygen. It is prepared pure by acting on bromine (Br.) with bromate of silver, $AgBrO_3$. It is a very unstable acid, and forms a series of salts called Bromates.

BROMINE, one of the halogen group of non-metallic chemical elements, which comprises three other members,—chlorine, iodine, and florine. The whole group has many properties in common, the most marked being their behavior toward hydrogen, uniting with it atom for atom, forming gaseous condensible acid compounds, which are all produced by similar reactions, and which yield in combination with metal crystals of uniform structure. Bromine was discovered in 1826 by Balard, who extracted it from the water of the Mediterranean during his researches in connection with the sea-water. Its combining equivalent or atomic weight is eighty. Bromine is an element of great chemical activity, and of the highest interest in scientific chemistry on account of its combinations, and especially on account of the products of its substitution for hydrogen in organic compounds.

Although very widely disseminated, since it is found in ocean water, bromine is nowhere an abundant element. It is a constituent of some silver ores from Mexico and South America; it is very generally found in strong saline springs, as well as associated with deposits of salt; and it is present in many marine plants. The waters of the Atlantic, according to Von Bibra, contain 24 grains per gallon; while Herepath's analysis gives Dead Sea water a strength of 121.5 grains per gallon. It is only from the waters of certain saline springs in America that bromine is prepared as a direct product. At several places in western Pennsylvania and West Virginia the manufacture is carried on extensively. In Europe bromine is only obtained as a secondary product of the preparation of potash and other alkaline salts, its chief source being the mother-liquors of the kelp manufacture, brine springs, and especially the Stassfurth saline deposits, near Magdeburg, Prussia.

BROMLEY, a market-town of England, in the county of Kent, 10 miles S.E. of London.

BROMSGROVE, a market-town of England, in the county of Worcester, 13 miles S. by W. of Birmingham, with a station on the Birmingham and Worcester railway. Population, 8,000.

BRONCHITIS, inflammation of the mucous membrane of the bronchial tubes. Well known as one of the most common diseases of the climate of Great Britain, bronchitis exists in either an *acute* or a *chronic* form.

Acute bronchitis, like other inflammatory affections of the chest, generally arises as the result of exposure to cold, particularly if accompanied with damp, or of sudden change from a heated to a cool atmosphere. The symptoms vary according to the severity of the attack, and more especially according to the extent to which the inflammatory action spreads in the bronchial tubes. The disease usually manifests itself at first in the form of a catarrh, or common cold; but the accompanying feverishness and general constitutional disturbance proclaim the attack to be something more severe, and symptoms denoting the onset of bronchitis soon present themselves. A short, painful, dry cough, accompanied with rapid and wheezing respiration, a feeling of rawness and pain in the throat and behind the breast bone, and of oppression or tightness throughout the chest, mark the early stages of the disease. In some cases, from the first, symptoms of the form of Asthma known as the *bronchitic* are superadded, and greatly aggravate the patient's suffering. See ASTHMA.

Chronic bronchitis, may arise as the result of repeated attacks of the acute form, or it may exist altogether independently. It occurs more frequently among persons advanced in life than among the young, although no age is exempt from it.

The usual history of this form of bronchitis is that of a cough recurring during the colder seasons of the year, and in its earlier stages, departing entirely in summer, so that it is frequently called "winter cough." In many persons subject to it, however, attacks are apt to be excited at any time by very slight causes, such as changes in the weather; and in advanced cases of the disease the cough is seldom altogether absent.

The symptoms and auscultatory signs of chronic bronchitis are on the whole similar to those pertaining to the acute form, except that the febrile disturbance and pain are much less marked. The cough is usually more troublesome in the morning than during the day. There is usually free and copious expectoration, and occasionally this is so abundant as to constitute what is termed *bronchorrhœa*.

The treatment to be adopted in chronic bronchitis depends upon the severity of the case, the age of the patient, and the presence or absence of complications. Attention to the general health is a matter of prime importance in all cases of the disease, more particularly among persons whose avocations entail exposure, and tonics with cod-liver oil will be found highly advantageous. The use of a respirator in very cold or damp weather is a valuable means of protection. In those aggravated forms of chronic bronchitis, where the slightest exposure to cold air brings on fresh attacks, it may become necessary, where circumstances permit, to enjoin confinement to a warm room or removal to a more genial climate during the winter months.

BRONDSTED, PETER OLUF, archæologist, was the son of a Danish clergyman, and was born at Horsens in Jutland on 17th November 1781. He received his academical education at the university of Copenhagen; and in 1802 he visited Paris in company with his friend Koes. After remaining there two years, they went together to Italy. Both were zealously attached to the study of antiquities; and congeniality of tastes and pursuits induced them both, in 1810, to join Baron Stackleberg, Von Haller, and Linckh of Stuttgard, in an expedition to Greece, where they examined with attention the interesting remains of ancient art, and engaged with ardor in excavations among the ruins, which were carried on, especially by Brönsted and Stackleberg, with very interesting results.

He returned to Copenhagen in 1832, when he immediately received the appointment of director of the royal museum of antiquities, and the professorship of archæology and philology. His merits were ten years afterwards further rewarded with the honorable office of rector of the university; but an unlucky fall from his horse caused the death of this eminent man on the 26th June 1842. His principal work was the *Travels and Archæological Researches in Greece*.

BRONGNIART, ALEXANDRE, a distinguished French mineralogist, was the son of the eminent architect who designed the Bourse and other public buildings of Paris, and was born in that city in 1770. At an early age he joined the army of the Pyrenees; but having committed some slight political offence, he was thrown into prison, and detained there for some time. On his release he was appointed professor of natural history in the Collége des Quatre Nations, and soon after succeeded Haüy as professor in the school of mines. In 1800 he was made director of the Sévres porcelain factory, in which he revived the almost forgotten art of painting on glass. He did not confine himself entirely to mineralogy, for it is to him that we owe the division of Reptiles into the four orders of Saurians, Batrachians, Chelonians, and Ophidians. In 1816 he was elected into the Academy; and in the following year he visited the Alps of Switzerland and Italy, and afterwards Sweden and Norway. The result of his researches he published from time to time in the *Journal des Mines* and *Dictionnaire des Sciences Naturelles*. He died at Paris, October 7, 1847.

BRONTE, a city of Sicily in the intendency of Catania. Population, 14,589.

BRONTE, CHARLOTTE, modern English novelist, was born on the 21st April 1816. Her father, the Rev. Patrick Bronte, was a native of county Down, Ireland; her mother, Maria Branwell, was of Cornish family. In 1820 he was presented to the living of Haworth, and removed in that year to the parsonage, a bleak and solitary house, standing close by the churchyard and backed by a wide expanse of moorland. Mrs. Bronte died soon after their removal, and the little family of young children were left to educate and train themselves. They saw little of their father, whose health was bad, and who seems to have been eccentric

in his modes of thinking and acting. By the time Charlotte Bronte was thirteen years of age, it had become her constant habit, and one of her few pleasures, to weave imaginary tales, idealizing her favorite historical heroes. Nor was she alone in this curious occupation; all the family took part in the composition of juvenile stories and magazine articles.

Meanwhile, the three living sisters, who found refuge in their habits of composition, had made their first literary venture. During their separation, while Charlotte was in Brussels, and Anne in a situation as governess, they had been quietly pursuing their favorite occupation; and in 1845 they made the discovery of each other's poetical efforts. After some correspondence with publishers they resolved to print a small volume of poems, assuming the *noms de plume* of Currer, Ellis, and Acton Bell. The book appeared in the spring of 1846, was barely noticed by the reviews, and attracted no public attention. The authors, however, were encouraged to make a further trial, and each began to prepare a prose tale. Charlotte's was *The Professor;* Emily's, *Wuthering Heights;* Anne's, *Agnes Grey*. *The Professor* was refused on all hands; the other two were accepted, but their publication was delayed for some time. Nothing daunted by her want of success, Charlotte devoted herself heart and soul to a new tale, *Jane Eyre*, which she completed in August 1847. The MS. was accepted by Messrs. Smith and Elder; the book appeared with the name of Currer Bell on the title page in October 1847, and at once achieved a decided success. Few works of an unknown author have been received with such sudden and general acclamation. Numerous were the conjectures as to Currer Bell, but the secret was well kept. Even the publishers were unaware of the truth, till the disclosure had to be made to them in consequence of the publication of *Wuthering Heights* and *Agnes Grey*, and of the announcement of *The Tenant of Wildfell Hall*. The public, however, remained in the dark till after the appearance of the second work by the unknown, when a shrewd Yorkshireman, who knew Haworth, divined the secret and published his discovery.

Shirley, this second work, fully sustained the author's high reputation. Yet it was written under melancholy circumstances. The death of Patrick Bronte, in September 1848, was followed by the deaths of Emily and Anne in quick succession. Emily died on the 19th December 1848; Anne on the 28th May 1849. *Shirley* was published in October 1849. The disclosure of Miss Bronte's name as the writer at once introduced her to the great literary society of London. She met all the most prominent men of letters of the time; yet, though she was in the world, she was not of it. Her previous life and her peculiarly sensitive and retiring disposition made notoriety and attention painful to her, and she gladly escaped to the quiet of Haworth parsonage. Slowly, and with long interruptions from failing health, her last work proceeded to completion. *Villette* was published in 1853, and was hailed with universal delight.

In June 1854 Miss Bronte was married to her father's curate, the Rev. Mr. Nicholls, and for a brief period she tasted the strange new happiness of domestic life. But the seeds of decay were in her constitution; the same malady that had carried off her sisters, worked its way with fatal facility in her enfeebled frame. She died on the 31st March 1855. After her death *The Professor*, her first luckless tale, was published from her MSS. She had what Goethe calls the true secret of poetic genius.

BRONZE, an alloy formed wholly or chiefly of copper and tin, in variable proportions. It has been used from a very early period. Archæologists distinguish a *bronze age* in prehistoric times in Western Europe (intermediate between those of stone and iron), characterized by a general use of the alloy for cutting instruments and other objects. The "brass" of the Bible was probably of the nature of bronze. The use of bronze in early times is noticed more particularly below.

The addition of tin to copper gives rise to a product more fusible than copper, and thus better suited for casting. The alloy is also harder and less malleable. The proportions in which copper and tin are combined to make bronze vary according to the object for which the alloy is designed. With about 7 parts copper to 1 part tin, bronze is very hard, brittle, and sonorous. Soft bronze, again, which bears drifting, rolling, and drawing, is generally composed of 16 copper to 1 tin; while a flexible tenacious alloy good for nails and bolts, is made of 20 copper to 1 tin. In preparing bronze for statues, bas-reliefs, &c., the qualities chiefly looked at are fusibility and hardness, also readiness to acquire a fine patina on exposure, though it appears this may be acquired by bronzes differing widely in composition. A common statue bronze is formed of copper 80, tin 20. Bell-metal, for large bells, is generally made with about 3 parts copper to 1 part tin; for house bells, 4 copper to 1 tin. The bronze of bells (as of various other objects) sometimes contains a little zinc, lead, &c., in addition to the primary ingredients. The Chinese *tam tams* or *gongs*, are made of bronze forged by the hammer; they contain about 20 per cent. tin, the rest copper only.

A few years ago some very beautiful Chinese and Japanese bronzes were exhibited in Paris, remarkable chiefly for the dead black color of their patina. From analyses by M. Morin it appeared that they contained a large proportion of lead, the average composition being copper 80 parts, lead 10, tin 4, zinc 2, and the remaining four parts consisting of iron, nickle, arsenic, silver, and gold. According to M. Christofle, lead is not essential for production of a fine black patina; and it renders the alloy brittle. Bronze can be covered with a black, red, brown, or green patina, as desired, by suitable oxidation or sulphurization.

Some important researches on bronze for field-guns have lately been made by Colonel Uchatius of Vienna; and the *steel bronze* he produces is said to be quite equal to steel in hardness, homogeneousness, resistance, and other qualities; while it is less effected by atmospheric agency, and less costly. He casts the bronze (which contains 8 per cent. tin, the rest copper) in a cast-iron ingot mould, with a core of wrought-copper 50 mm. in diameter. Then after boring out the hollow ingot to a diameter of 80 mm. he forces through it a series of six conical pistons of hardened steel, slightly larger in diameter than the bore. The interior is then excessively hard and ready for rifling. The hardness, elasticity, and solidity diminish from within outwards. These new bronze guns have been found to bear several hundred discharges successively without the slightest apparent deformation or other injury.

The alloy known as *aluminium bronze* is one endowed with great strength, malleability, and ductility. It is formed of 10 parts aluminium and 90 of copper.

In the melting of ordinary bronze, reverberatory furnaces have long been used, as rapid fusion is desirable in order to prevent loss of tin, zinc, or lead by oxidation. Bellfounders often use dome-topped furnaces, as their alloy does not require so intense a heat for fusion; but there is some waste of material with these. The copper is melted first, and covered with small charcoal or coke; and the tin is rapidly thrust down to the bottom of the melted mass. After stirring, the alloy is poured into the moulds, in which the cooling

should be as rapid as possible. Sometimes pressure is applied during cooling, in order to make the cast free from pores.

In the old method of bronze-casting, known as the *cire perdue*, wax is first used for the thickness of the statue (between core and mould, which are of baked clay), and is melted and run off before the metal is poured in,—the core and mould being held apart by stays of iron wires. In the present day large works are never cast in one piece, but in several, which are afterwards united by heating and application of fused metal. A model is made in plaster, and a piece mould of Caen sand, about 1½ or two inches thick, made round it, the sizes of the pieces being determined by the shape and character of the portions they occupy. These pieces are backed with plaster of Paris to about a foot in thickness, with indentations cut in their horizontal thickness, into which the succeeding portion of the mould fits. The mould is then taken to pieces, dried, and rebuilt in the casting-pit. It is then filled with core-composition in a liquid state, and when this is sufficiently hardened, again taken to pieces. The core thus obtained is thoroughly dried, and reduced in size by scraping away as much of the material as would represent the thickness of the metal to be cast. This done, the mould is again built up over the core, and the pit filled, &c., as in the other process. The statue is completed after its removal from the mould by cutting off the jets, removing roughnesses where they occur, and giving greater sharpness to the details when necessary.

Statues and various ornamental objects may also be manufactured by the process of electro-deposition from a metallic solution; and some excellent results have been obtained in this way by Oudry, Christofle, Elkington, and others. While the method offers some advantages in regard to cheapness, lightness, &c., of the products, the bronzes thus produced are not so hard and durable as those got by casting, and are thus less suited for exposure.

Bronzing is the process by which a bronze-like surface is produced on objects made of metal, plaster, wood, or other material.

BROOCH, or BROACH, (from the French *broche*), an awl or bodkin. A spit is sometimes called a *broach*, and hence the phrase "to broach a barrel." The term is now used to denote a clasp or fastener for the dress provided with a pin, having a hinge or spring at one end, and a catch and loop at the other. Brooches were universally used among the more civilized nations of antiquity. They were made of many materials, and in innumerable varieties of ornamental design, the forms varying according to the period of their manufacture, or the taste and culture of the people using them. They are unknown in the Swiss Lake settlements of the Bronze Age, though pins and bracelets are abundant. Brooches of the Bronze Age are extremely rare in Britain, although they occur in considerable numbers and of elegant forms in North Germany and Scandinavia. The simplest is similar to that which has been reproduced in modern times as the "patent safety-pin," but having the ends prolonged into flat spirals and the clasp flattened and engraved with ornamental designs. Another characteristic form was produced by winding a long wire into a flat double-spiral, of which one end formed the pin and the other the catch. A third form consisted of two round ornamented plates connected by a bow-shaped centre piece. In the early Iron Age the brooches of Central Europe exhibit an immense variety of forms, which are for the most part bow-shaped or harp-shaped, with spring pins, akin to the types found in the Etruscan cemeteries of Certosa and Villanova recently explored. In mediæval times the form of the brooch was usually a simple, flat circular disc, with open centre, the pin being equal in length to the diameter of the brooch. They were often inscribed with religious and talismanic *formulæ*. The Highland brooches were commonly of this form, but the disc was broader, and the central opening smaller in proportion to the size of the brooch. They were ornamented in the style so common on Highland powder-horns, with engraved patterns of interlacing work and foliage, arranged in geometrical spaces, and sometimes mingled with figures of animals.

BROOKE, FRANCES, a clever novelist and dramatic writer, whose maiden name was Moore, was born in the earlier part of the 18th century. She died in January 1789, two days after her husband.

BROOKE, HENRY, novelist and poet, was born at Rantavan, county Cavan, in 1708. At an early age he entered Dublin University, where he was noticed by Swift, who predicted great things of him. About 1724 he proceeded to London, where he managed to gain the affection and esteem of Pope. His first literary venture appears to have been the poem *Universal Beauty* (1730), in which there is exceedingly little that can be admired or even tolerated. A much more successful venture was the drama *Gustavus Vasa*. Brooke died in 1783. An edition of the *Fool of Quality* was published in 1859 by the Rev. Charles Kingsley, in whose extravagantly eulogistic preface will be found all the information we have with regard to the author's life and character.

BROOKE, SIR JAMES, Rajah of Sarawak, in the island of Borneo, and Governor of Labuan, was born at Coombe Grove near Bath, April 29, 1803. It is sometimes erroneously stated that he was born in Bengal, a mistake arising from the fact that his father, a member of the Civil Service of the East India Company, had long lived there. His mother was a woman of superior understanding, and to her care he owed his careful early training. He received the ordinary school education, entered the service of the East India Company, and was sent out to India about 1825. On the outbreak of the Burmese war, he was despatched with his regiment to the valley of the Brahmaputra; and, being dangerously wounded in an engagement near Rungpore, was compelled to return home (1826). After his recovery he travelled on the Continent before going to India, and circumstances led him soon after to leave the service of the Company. In 1830 he made a voyage to China, and during his passage among the islands of the Indian Archipelago, so rich in natural beauty, magnificence, and fertility, but occupied by a population of savage tribes, continually at war with each other, and carrying on a system of piracy on a vast scale and with relentless ferocity, he conceived the great design of rescuing them from barbarism and bringing them within the pale of civilization. In October 1847 Rajah Brooke returned to England, where he was well received by the Government; and the Corporation of London conferred on him the freedom of the city. The Island of Labuan, with its dependencies, having been acquired by purchase from the sultan of Borneo, was erected into a British colony, and Rajah Brooke was appointed Governor and commander-in-chief. He was also named consul-general in Borneo. These appointments had been made before his arrival in England. The university of Oxford conferred upon him the honorary degree of D.C.L., and in 1848 he was created K.C.B. He soon after returned to Sarawak, and was carried thither by a British man-of-war. In the summer of 1849 he led an expedition against the Seribas and Sakuran Dyaks, who still persisted in their piratical practices and refused to submit to British authority. Their defeat and wholesale slaughter was a matter of

course. At the time of this engagement Sir James Brooke was lying ill with dysentery. He visited twice the capital of the sultan of Sala, and concluded a treaty with him, which had for one of its objects the expulsion of the sea-gypsies and other tribes from his dominions. In 1851 grave charges with respect to the operations in Borneo were brought against Sir James Brooke in the House of Commons by Joseph Hume and other members, especially as to the "head-money" received. To meet these accusations he went to England, and after trial was acquitted. He died in 1868.

BROOKES, JOSHUA, English anatomist, was born in 1761. At a very early age he devoted himself to medical science, and attended the lectures of the most eminent surgeons in London and Paris.

BROOKLINE, a large village of Norfolk county, Mass., is situated on the estuary of the Charles river, four miles southwest of Boston. It has good railroad service and is connected with Boston by street railroad. Brookline is practically a residential suburb of Boston, and contains numerous villas and residences. It has one bank, a fine town hall and a manufactory of astronomical instruments. Brookline has developed very rapidly within the last decade, and is a beautiful place of 12,103 inhabitants.

BROOKLYN, the fourth city of the United States and the capital of King's county, New York, is situated on the western end of Long Island, immediately opposite the city of New York, from which it is separated by the East river, an arm of the sea, about three-quarters of a mile in breadth. The city now includes not only Brooklyn proper, but also by a recent act of the legislature, all the county towns of the western part of the island, so that it now covers a larger area than any other city in the United States. From Hunter's Point to Bay Ridge it has a river frontage of nearly nine miles. The ground on which the city is built exhibits considerable inequalities of surface, and thus increases the picturesqueness of its appearance, while the practical disadvantages of such a site have been overcome by skillful engineering. The streets, with the exception of Fulton street, the principal thoroughfare, are generally straight, have a width of from 60 to 100 feet, and cross each other at right angles. Though Brooklyn in some measure serves as a suburb of residence to New York, and many of its inhabitants carry on their business in the larger city, its own industrial and commercial activity is very great. It has flour-mills, sugar-refineries, lager-beer breweries, distilleries, tobacco factories, and chemical works; and manufactures steel, brass, and copper wares, engines, machinery, and printing-presses. The grain trade is of enormous extent, the warehouses being capable of holding about 12,000,000 bushels; and sugar, coffee, oil, hides, and wool are also largely imported. Most of the river frontage is lined with basins, wharves, and docks, the most important being the Atlantic dock (constructed about 1846) with an area of 40 acres, the Erie basin of 60 acres, the Brooklyn basin of 40 acres, the Wallabout basin and the United States navy yard. This last occupies a total area of 144 acres, and has extensive wharfage, and a dry dock, built of granite, at a cost of upward of $2,113,000. The city is supplied with water by an elaborate system of reservoirs. Brooklyn contained January 1, 1890, five national banks, thirteen savings banks and several trust companies. It has eight daily and numerous weekly papers. There is a high school and training school, seventy grammar and primary schools, employing 1,800 teachers, and costing $1,800,000 in 1889. Brooklyn is known as the "City of Churches," and is said to include nearly 300 church edifices. Among the public buildings, the chief are the court-house, costing $543,000; the hall of records, $330,000; the municipal building costing $200,000, and the academy of music, which seats 2,000 persons. The postoffice is a fine and commodious building, and there are numerous public and private charitable institutions.

The traffic of the city is facilitated by tramway lines; and its connection with New York, which has hitherto been dependent on steamboat ferries, is rendered more convenient by a large bridge. This bridge, which crosses the East river near its western extremity, is 85 feet wide and has a river span of 1,596 and a total length of 5,989 feet. The total cost exceeded $13,000,000. The population of Brooklyn in 1890 was 806,343.

BROOKLYN, a town of Alameda county, Cal., is situated on the eastern shore of the Bay of San Francisco, nine miles east of the city of San Francisco. It contains tanneries, carriage factories, and terra-cotta works, has five churches and a newspaper office. It has recently been incorporated with the city of OAKLAND, (*q.v.*).

BROOKS, CHARLES SHIRLEY, an English novelist and dramatic and miscellaneous writer, was born in 1815. Brooks was for many years on the staff of the *Illustrated London News*, contributing the weekly article on the politics of the day, and the two series entitled "Nothing in the Papers," and "By the Way," besides occasional pieces. In 1854 he joined the staff of *Punch*. He died in London, February 23, 1874.

BROOM, a name given to a number of species of shrubs of the closely-allied genera Cytisus, Genista, and Spartium, of the natural order Leguminosæ, sub-order Papilionaceæ—all of them having long slender branches, along which are produced axillary flowers. Common broom, *Cytisus* (*Sarothamnus*) *scoparius*, is a well-known native of Europe and Northern Asia, ranging also as far as the Canaries and the Azores. The lower leaves have three oblong leaflets, the upper ones are simple; the branches are angular and of a very dark green, very tough, and much in use for making besoms, as also in Belgium, etc., for baskets. They have also been used for tanning and dyeing, and their fiber has been woven into a coarse, strong cloth, and even made into paper. In South Germany it is sometimes planted on sandy wastes for the sake of its fibers, while its ashes are also valuable additions to the soil on account of their high percentage of potash.

BROOM-CORN (*Sorghum Vulgare*), a plant cultivated in North America for the manufacture of brooms and whisks, which are made of the tops of the culms and the branches of the panicle.

BROOME, WILLIAM, the coadjutor of Pope in translating the *Odyssey*, was born at Haslington in Cheshire, in 1689. He was educated upon the foundation at Eton, and was captain of the school a whole year, without any vacancy occurring by which he might have obtained a scholarship at King's College. Being by this delay superannuated, he was sent to St. John's College by the contributions of his friends, and obtained a small exhibition there. His fondness for metrical composition was then such that his companions familiarly called him "Poet." He appeared early in the world as a translator of the *Iliad* into prose; in conjunction with Ozell and Oldisworth, the translation being superior, in Toland's opinion, to that of Pope. Broome was introduced to Pope, who was then visiting Sir John Cotton at Madingley, near Cambridge, and gained much of his esteem. Broome died in 1745.

BROSELEY, formerly BUDWARDESLEY, a market town on the Severn, in the county of Shropshire, 14 miles from London. Population (1890), 5,000.

BROSSES, CHARLES DE, first president of the par

liament of Burgundy, was born at Dijon in 1709. He studied law with a view to the magistracy, but the bent of his mind was toward literature and the sciences. At the solicitation of his friend Buffon, De Brosses undertook his *Histoire des Navigations aux Terres Australes*, which was published in 1756, in two volumes 4to, with maps. It was in this work that M. de Brosses first laid down the geographical divisions of Australasia and Polynesia, which were afterward adopted by Pinkerton and succeeding geographers. In 1765 appeared his *Traite de la Formation Mecanique dez Langues*, a work distinguished by much research, and containing an admirable exposition of the purely empirical theory of the origin of language. Full recognition of its merits will be found in Dr. Tylor's work, *Primitive Culture*. M. de Brosses had been occupied, during a great part of his life on a translation of Sallust, and in attempting to supply the lost chapters of that celebrated historian's works. At length in 1777, he published *L'Histoire du Septième Siècle de la Republique Romaine*, three volumes 4to, to which is prefixed a learned life of Sallust, reprinted at the commencement of the translation of that historian by De Lamalle. He died in 1777.

BROTH is an infusion or decoction of vegetable and animal substances in water. It is customary to use more or less meat with bone and certain vegetables. These are mixed together in cold water, heat applied, and the materials allowed to simmer for some hours. The meats yield up certain ingredients, while others are retained in the residual flesh.

BROTHERHOODS, RELIGIOUS, were societies instituted for pious and benevolent purposes, and were numerous in the Middle Ages. Where the rules of monastic life appeared too narrow and severe, the Romish Church favored a freer form of consecrated life without vows other than those of devotion to good works or penitential exercises, but in many other respects, as in living together and the like, resembling the spiritual orders. Such brotherhoods were, in earlier times, those of Mary, of the Scapular, and of the Rosary; in later times, that of the Sacred and Immaculate Heart of Mary for the conversion of sinners, that of Francis Xavier or the Mission Brotherhood, and that of Christian Learning *(Frères ignorantins)* for the education of the people. In modern times certain trade and labor organizations are also known as Brotherhoods.

BROTHERS, LAY, an inferior class of monks, not in holy orders, but bound by monastic rules, and employed as servants in monasteries.

BROTHERS, RICHARD, the originator of the Anglo-Israelite movement, was born in Newfoundland in 1757, and in 1772 entered the British navy, which he quitted with a lieutenant's half-pay in 1789. In 1793 he announced himself as the apostle of a new religion, "The Nephew of the Almighty, and Prince of the Hebrews, appointed to lead them to the land of Canaan;" and in 1794 published a book, *A Revealed Knowledge of the Prophecies and Times*. He was confined eleven years in a lunatic asylum, and died in 1824.

BROUGHAM, HENRY, first Lord Brougham and Vaux, man of letters, man of science, advocate, orator, statesman, and Lord High Chancellor of England, was born at Edinburgh on September 19, 1778, and died at Cannes in France on May 7, 1868. During a great portion of a life extended to the unwonted term of ninety years, but especially in the third and fourth decades of the present century, from 1820 to 1840, no Englishman in any civil career played so conspicuous a part in public affairs or enjoyed so wide a fame as Henry Brougham. His indomitable energy, his vehement eloquence, his enthusiastic attachment to the cause of freedom, progress, and humanity, to which he rendered so many signal services, caused him to be justly regarded as one of the most extraordinary and illustrious men of his age and of his country. He brought to all he undertook a vigor and variety of intellect almost unparalleled; for his ambition was to excel in all things, and he seemed to aspire to universal fame. He was no less conspicuous for his eccentricities and mannerisms than for his genius and distinguished ability, and no man more attracted public attention or called forth more bitter criticism.

At the bar there were greater and better advocates; on the bench there were more sure and learned judges; in science he made no real discoveries; in letters, notwithstanding the prodigious activity of his pen, he has left no work of lasting celebrity; and although as an orator he was in his best days unequaled, he himself outlived the evanescent glories of his eloquence. Hence it has come to pass, that within fifty years of his most brilliant period, and within ten years of his death, the figure of Lord Brougham has already become somewhat indistinct. The generation which was fascinated by his eloquence and amused by the endless coruscations and evolutions of his character is passing away, and it has become a task of difficulty to preserve a faithful record of so strange and wonderful a phenomenon. That, however, which remains, and must ever remain as the noblest memorial of his life, is his unvarying devotion to the progress of liberal opinions, to the reform of the law, to popular education, to the emancipation of the negro race from slavery, and to the maintenance of peace. In this sense, he was, as he was once portrayed by an accomplished caricaturist of the day, a citizen of the world. Of every human right, Brougham was a champion; of every human wrong, an avenger.

From his earliest age Brougham showed signs of extraordinary talents and energy. His mother averred that he spoke distinctly several words when he was eight months and two weeks old. In his cradle he was the terror of his nurses, and as he grew older his grandmother compared him to the admirable Crichton from his excelling in everything he undertook. When barely seven he was sent to the High School of Edinburgh, where he gained a triumph over Luke Fraser, his tutor, by successfully justifying the use of some Latin words which Fraser had condemned in an exercise, and in August, 1791, when he was not yet thirteen, he left the school as *dux*, or head of the fifth form, taught by the headmaster, Dr. Adam. He entered the University of Edinburgh in the winter of 1792, and in addition to the study of Greek under Professor Dalzell, he applied himself to the natural sciences under Professor Playfair, and especially to mathematics. At twelve one of his cousins met him with a huge quarto under his arm, which turned out to be Laplace's *Mecanique Celeste*, in French. In the mathematical class he hit upon the binomial theorem before he had been taught it; and he was soon conversant with the *Principia* of Newton. It was characteristic of his astonishing memory that he carried with him through life all he had learned in boyhood. We have seen him in later years vary the monotony of a legal argument by working a problem in algebra, or exchanging a Greek epigram with Lord Wellesley, in the midst of grave debates of politics or of laws. In 1794 he set to work to master the fluxional calculus; and in the following year he sent a paper to the Royal Society on some new phenomenon of light and colors, which was printed in the *Transactions* of that learned body. A paper on porisms was published in the same manner in 1798, and in 1803 his scientific reputation was so far established that he was elected a fellow of the society. But these efforts were more remarkable for their precocity than for their novelty. In

spite of his taste for mathematical reasoning Brougham's mind was not an accurate or exact one; and his pursuit of the physical sciences was rather a favorite recreation than a solid advantage to him. He continued his experiments in optics through life, however, and would sometimes impart observations, which he took for discoveries, to the French Academy of Science. An enthusiastic discourse on Newton and the Newtonian philosophy was written by him in his eighty-fifth year, when a statue of the great philosopher was erected at Grantham, and at that age he was still fond of commenting upon the *Principia*.

But whilst Henry Brougham was following lectures in every branch of knowledge at the university, his inherent animal spirits and sociable nature made him the ringleader of the gayest and wildest youths of the time. Practical jokes, wrenching knockers, braving the watch, and wasting the small hours of the night, were pastimes as familiar to him as the gravest discussions.

As early as 1792 he founded a debating society of a very juvenile character, to which several persons afterwards distinguished in life belonged. This society, however, subsequently merged in the "Speculative Society," which had a hall and library of its own in the college. Here Brougham, Horner, Jeffrey, Cockburn, Murray, and Moncreiff tried their early powers, and gave the promise of that eloquence which eventually placed them all in Parliament or on the bench of justice. Brougham surpassed them all, not, indeed, in depth of knowledge or soundness of reasoning, but in the astonishing flow of his language, his readiness in reply, the grace of his elocution, and his withering gift of sarcasm and ridicule. Of all the remarkable powers he possessed that of oratory was unquestionably the first. Conscious of his natural strength and of the advantages to be derived from this faculty in a country which is largely governed and swayed by rhetoric, he applied himself with peculiar zeal to the *art* of public speaking. He made himself perfectly conversant with the great masterpieces of ancient eloquence, which he knew to a great extent by heart; he ever maintained that the highest effects of the orator could only be achieved by diligent preparation and constant study; he bestowed extreme care upon the modulation of his voice, which was one of extraordinary compass and strength; even his gestures and attitudes were the result of thought, and it was remarked that in concluding the elaborate peroration of his speech on the queen's trial, he assumed the majestic bearing with which a minister of the Scottish Church invokes the blessing of God in dismissing his congregation. Both by study and by practice, then, oratory was his chief art, and he continued through life to cultivate it with the enthusiasm of an actor, who never entirely attains to the fulfilment of his own ideal. No doubt, in the resistless torrent of his invective, in appeals to the passions of his audience, in the rapid and lucid exposition of facts, in the skilful arrangement of his discourse, which was highly artificial, and in the power of wielding enormous and intricate sentences, Brougham was unrivalled. He entered the House of Commons, as we shall presently see, soon after the voices of Pitt and Fox had been hushed for ever. Except Canning, there was no one in Parliament who could be compared to Brougham, and he rapidly rose to a height of distinction which became at one moment supremacy. Yet on looking back, even to the most celebrated and successful of his efforts, subsequently revised and published by himself, little remains which can lay any claim to the dignity of classic eloquence. Notwithstanding Lord Brougham's study and enthusiastic admiration of Demosthenes, nothing was more unlike the stern simplicity and grandeur of the great Athenian — "*Densus, et brevis, et semper instans sibi*" — than the declamation of Lord Brougham. The force of the current was wasted in a flood which overleapt its banks and broke its barriers. The effect was more intense than permanent. Even in the judgment of his own contemporaries, Canning surpassed him in wit; Plunket in felicity of diction; Lyndhurst in terseness, policy, cogency of argument; Ellenborough in dignity; but none of them possessed his marvellous versatility, and it seemed as if he had borrowed from each of these great speakers a share in some gift, which they possessed in higher perfection than himself. Of all the branches of human knowledge to which Brougham directed his attention, and in which he attained to more or less proficiency, the study of the law was the least congenial to him. He speaks of it in early life as "the cursedest of all cursed professions," and even in 1808, when he had gone to England and acquired a certain degree of fame, he writes to Lord Grey: "Odious as that profession is (as God knows there are few things so hateful), I am quite clear that it would be folly in me to neglect so certain a prospect." He added that he was setting out on the Northern Circuit with too slender a provision of law,—his stock of practice being so small that he had never yet seen a *nisi prius* trial,—but thought he might push through the thing with a little presence of mind and quickness. Fortunately for his future career, he had followed for two years the lectures of the professor of civil law in the university of Edinburgh; and, as Lord Campbell admits, so far *legalized* his mind that he had gained a considerable insight into both Roman and feudal jurisprudence. These seeds of law, implanted in a powerful intellect, gave him a breadth of view not always combined with the technicalities of the English bar.

On the 23d May 1800 he was admitted to the Faculty of Advocates. It does not appear that he ever held a brief in the Court of Sessions, but he went a circuit or two, where he defended or prosecuted a few prisoners, and played a series of tricks on the presiding judge, Lord Eskgrove, which almost drove that learned person to distraction. The Scottish bar, however, as he soon perceived, offered no field sufficiently ample for his talents and his ambition. He resolved to transfer himself to London. He had already appeared as junior counsel in a Scotch appeal to the House of Lords. In 1803 he was entered at Lincoln's Inn, and on the 22d November 1808 he was called to the English bar by that learned society. It is a curious indication of the importance already attached to him as a party man, that the Tory attorney-general and the solicitor-general of the day thought it worth while to come down to Lincoln's Inn to endeavor to oppose his special call, which had been asked for, but was defeated by a single vote. He was called in the ordinary course in the ensuing term.

His wit and gaiety made him an ornament of society, and he sought to extend his literary reputation by the publication of an elaborate work on the colonial policy of the empire. But his hopes of obtaining a seat in Parliament were not yet realized. He was still eating his commons at Lincoln's Inn. He was still in search of a career. Thus it fell out that, in 1806, Mr. Fox being then Secretary of State, he was appointed secretary to a mission of Lord Rosslyn and Lord St. Vincent to the court of Lisbon, with a view to counteract the anticipated French invasion of Portugal. The mission lasted two or three months; it led to no results. Brougham came home out of humor and out of pocket; and meantime the death of Mr. Fox put an end to the hopes of the Whigs and to the broad-bottomed administration. The party to which Brougham had attached himself remained out of office for three-and-twenty years.

Brougham was disappointed by the abrupt fall of the ministry, and piqued that his Whig friends had not provided him with a seat in Parliament, the more so as some of his early friends and rivals were already launched on their political career. Nevertheless, he exerted his pen with prodigious activity during the election of 1809; and Lord Holland declared that he had filled the booksellers' shops with articles and pamphlets. The result was small. No seat was placed at his own disposal. He was too poor to contest a borough; and Perceval and Eldon obtained a majority greater than the majorities of Addington or Pitt. Fortunately for Brougham two questions at this time arose, which gave him a strong hold on the feelings and commercial interests of the country; and he was not slow to take advantage of them and lend them all the support of his energy and genius. When he entered public life the abolition of the slave-trade was well-nigh carried by the untiring efforts of Wilberforce, Thornton, Clarkson, Macaulay, and others. An immense organization had been formed, more especially by the Quakers and other non-conformists, to bring the whole force of public opinion, awakened by the call of humanity and justice, to bear upon the horrors of a system which was still defended by the West India interest and the Government. Brougham allied himself to the leaders of this movement, and he remained through life not only faithful, but passionately attached to the cause. He combated, in and out of Parliament, every attempt to elude the restrictions on the trade in man. One of the first measures he carried in the House of Commons was a bill to make the slave-trade felony. He labored incessantly to induce foreign countries to abolish the abhorred traffic, and he had at length the happiness, as Chancellor of England, to take a part in the final measure of negro emancipation throughout the British colonies. These services endeared him to a class of highly conscientious and influential persons, with whom he might not otherwise have been closely connected, and their support was of no small effect in the greatest triumph of his life, his election for the county of York in 1830.

Although till 1808 Brougham had no practice at the English bar, he had argued some Scotch appeals in the House of Lords and some prize cases at the "Cockpit." He had acquired some knowledge of international law, and some experience of the prize courts. This circumstance probably led to his being retained as counsel for the Liverpool merchants who had petitioned both Houses of Parliament against the Orders in Council, framed in retaliation for the Berlin and Milan decrees. Brougham conducted the lengthy inquiry which took place at the bar of the House, and he displayed on this occasion a mastery over the true principles of political economy and international law which at that time no one else possessed. It seems incredible (though even now the delusion is not entirely dissipated) that the Government of a great commercial nation should ever have thought that one of the most effectual and essential modes of carrying on war and destroying an enemy is to shut out the trade of neutrals, not perceiving that such measures react with at least equal force against themselves, and destroy the very sinews by which the burden of war can be sustained. The trade of the country was in truth suffering more from these fatal restrictions than from the war itself; and nothing in the whole collection of Lord Brougham's harangues is more forcible or more ably reasoned than the speeches in which he described those sufferings, and denounced the cause of them.

Nevertheless, in 1808, he was unsuccessful. Neither the evidence taken during a six months' inquiry nor the eloquence of the impassioned advocate prevailed. It was not until 1812, when Brougham was himself in Parliament, that he resumed his attack on the Orders in Council with increased authority and vigor, aided by Mr. Baring, and still more, perhaps, by the peril and disgrace of the quarrel with America, and he ultimately conquered. No answer was made to his great speech on that occasion, except an intimation from the Treasury bench that the Orders in Council would be revoked. Of this great triumph Brougham afterwards said: "It was second to none of the efforts made by me, and not altogether without success, to ameliorate the condition of my fellow-men. In these I had the sympathy and aid of others, but in the battle against the Orders in Council I fought alone."

The death of Lord Castlereagh in 1822, and the advancement of Canning to the office of Foreign Secretary, materially changed the character of Lord Liverpool's Government. Canning and Brougham sat on opposite benches — the one a follower of Pitt, the other of Fox; and they were constantly pitted against each other. Sometimes their rhetorical conflicts assumed an intense violence, as when Brougham accused the minister of "the most monstrous truckling for the purpose of obtaining office that the whole history of political tergiversation could furnish." Canning indignantly exclaimed, "It is false;" and the quarrel was with some difficulty appeased, though Brougham was not supposed to be very ready to employ any weapon sharper than his tongue. But Canning and Brougham were in truth rivals rather than antagonists; and the more liberal influence of the former in the ministry had almost brought them into union upon the leading questions of the day, always excepting that of parliamentary reform. Had Canning lived and maintained himself in power, it might have fallen to his lot to carry Catholic Emancipation and a more moderate measure of parliamentary reform. But if, as is believed, Earl Grey was excluded from Mr. Canning's Government by an express stipulation of the king, it follows *a fortiori* that the attorney-general of Queen Caroline could never be a minister of George IV. That sovereign had shown on several occasions that the attacks made on him by Brougham were never forgotten or forgiven; and Canning, whose own position at court was difficult enough, had certainly not the power to overcome the king's resentment. Brougham, however, promised and gave his shortlived administration an independent support — unlike Lord Grey, who fiercely and ungenerously attacked it.

To this period of his life belong two occurrences which cannot be passed over in silence. In 1825 the first steps were taken, under the auspices of Brougham, for the establishment of a university in London, absolutely free from all religious or sectarian distinctions, a scheme which has grown and ripened in half a century into no unworthy rival of the other universities of northern and southern Britain. In 1827 Brougham contributed to found the "Society for the Diffusion of Useful Knowledge," — an association which gave an immense impulsion to sound popular literature. Its first publication was an essay on the "Pleasures and Advantages of Science," written by himself. One can hardly imagine at the present time with what avidity this paper was read, for it had no novelty of substance and no great merit of style. But a thirst for knowledge seemed suddenly to have seized the nation. It broke forth in mechanics' institutes and every form of instruction. To use his own language on a celebrated occasion —"the schoolmaster was abroad;" and the excitement he had contrived to kindle on these subjects tended to hasten a great crisis in our political life. In the following year (1828) he delivered his great speech on "Law

Reform," which lasted six hours in the delivery in a thin and exhausted House, — a marvellous effort, — which embraced every part of the existing system of judicature, and concluded with one of his noblest perorations. "It was the boast of Augustus," he said, "and it formed part of the glory in which his early perfidies were lost, that he found Rome of brick and left it of marble, — a praise not unworthy of a great prince, and to which the present reign also has its claims. But how much nobler will be the sovereign's boast, when he shall have it to say that he found law dear and left it cheap; found it a sealed book, left it a living letter; found it the patrimony of the rich, left it the inheritance of the poor; found it the two-edged sword of craft and oppression, left it the staff of honesty and the shield of innocence!"

The death of Canning, the failure of Lord Goderich, and the accession of the duke of Wellington to power, again changed the aspect of affairs; but the resolution of ministers to carry Catholic Emancipation disarmed the Opposition, whilst it split the Tory party. Graver events were impending. The French Revolution of 1830, following close upon the death of George IV., awakened a passionate excitement throughout Europe, and especially in this country. The days of Tory government were numbered. The cry of "Reform" was raised; and the leader to "ride the whirlwind and and direct the storm" was Henry Brougham. Then it was that the united county of York spontaneously returned him to the new House of Commons as their representative. It was the proudest moment of his life, for he was literally not only the representative of the county of York, but of the people of England. A stranger by birth to that great province, and without an acre of land in it, he, by his talents, eloquence, public services, and love of freedom alone, triumphed over the proud Yorkshire families, and took his seat in the House of Commons with a power no Englishman of his age has possessed. The Parliament met in November. Brougham's first act was to move for leave to bring in a bill to amend the representation of the people; but before the debate came on the Government was defeated on other question; the duke resigned, and Earl Grey was commanded by William IV. to form an administration.

Amongst the difficulties the new premier and the Whig party had to encounter and to surmount, none was greater than that arising from the position, the attitude, and the talents of Mr. Brougham. He was not the leader of any party; he had no personal following in the House of Commons; he was distrusted by the Whigs, who looked up to Lord Althrop as their chief; he was dreaded alike by friends and foes; but there stood, in solitary might, the formidable member for the county of York, armed with invincible eloquence, and backed by the suffrages of the people. He himself had repeatedly declared that nothing would induce him to exchange his position as an independent member of Parliament for any office, however great; and, no doubt, as an independent member of Parliament he exercised at that moment a power greater than any office could give. On the day following the resignation of the Government, he reluctantly consented, in low and angry tones, to postpone for one week his motion on parliamentary reform. The attorney-generalship was offered to him by Lord Grey; it was indignantly rejected. Brougham himself affirms that he desired to be master of the rolls, which would have secured him a large income for life, and left him free to sit in the House of Commons. But this was positively interdicted by the king, and objected to by Lord Althorp, who declared that he could not undertake to lead the House with so insubordinate a follower behind him. Meanwhile Brougham had discovered, at a meeting of several leading members of his party at Holland House, that he was not taken freely into their councils; he came home exasperated and vowing vengeance against them. Lord Grey, personally, would have preferred to retain Lord Lyndhurst as his chancellor; but it was impossible to leave Brougham out, and he was only to be brought into the ministry by the offer of the great seal When the question was considered at the first meeting of the inchoate ministry at Lansdowne House, Lord Holland said to his colleagues, "I suppose it must be so, but this is the last time we shall meet in peace within these walls." Brougham himself hesitated, or affected to hesitate. He was undoubtedly reluctant to quit the House of Commons and his seat for Yorkshire. His mother, with great wisdom, dissuaded him from accepting these treacherous gifts and honors. He alleged that, as the ministry might be of short duration, he was making a large sacrifice in giving up his professsonal income for a pension of £4000 a year and a peerage which he had no other means to support. But he yielded to the representations of Lord Grey and Lord Althrop, that without him as Chancellor the Government could not be formed. On the 22d November 1830 the great seal was delivered to him by the king, and he took his seat on the Woolsack that evening as speaker of the House of Lords, being still a commoner. On the following day, after he had sat to hear a Scotch appeal, the patent of his peerage as Baron Brougham and Vaux was brought down. The Lord Chancellor then quitted the woolsack, robed, and was introduced as a baron by the Marquis Wellesley and Lord Durham.

It would be superflous in this place to follow the fortunes of the Reform Bill of 1832, and we shall confine ourselves to a brief notice of the part which Lord Brougham took in promoting it. The first grand crisis in the contest occurred in April 1831, when General Gascoyne's amendment was carried against the Government. A cabinet was held, and ministers agreed to advise the king to dissolve Parliament. The king not only assented, but expressed his readiness to go down to Westminster in a hackney coach if necessary. The elaborate narrative communicated by Lord Brougham to Mr. Roebuck, and adopted by Mr. Molesworth in his *History of the Reform Bill*, — by which it would appear that Lord Grey and the Lord Chancellor resorted to *management* and a species of mild compulsion in making this proposal to William IV., Lord Brougham having taken upon himself to order out the royal carriages and guards, — is found on more exact inquiry to be unfounded. Unquestionably it was the duty of the prime minister to take the king's pleasure on such an occasion, though the chancellor, contrary to the usual practice, did accompany him, but the whole correspondence of the king on the subject of reform is addressed to Earl Grey alone. The second great crisis in the passage of the bill was in May 1832, when it became necessary to obtain from the king his consent to make peers in sufficient number to carry the bill, if the majority in the Upper House persevered in the attempt to defeat it. It has been stated, apparently on Lord Brougham's authority, that in the course of an audience granted to Lord Grey and himself, he succeeded in extorting from the king, in writing, the following paper: —

"The king grants permission to Earl Grey, and to his chancellor Lord Brougham, to create such a number of peers as will be sufficient to ensure the passing of the Reform Bill, — first calling up eldest sons.

(Signed) "WILLIAM R.

"WINDSOR, *May* 17, 1832."

It is enough to say that this extraordinary document has never been seen by any one, and is not known to

exist, therefore its exact tenor must be a mystery. The king was not at Windsor on the 17th May, but at St. James's; and the Cabinet asked for an assurance of His Majesty's intentions on the following day (the 18th), which they would not have done if a written promise had been given the day before. This story, therefore, is incredible, and in Lord Brougham's autobiography nothing is said of this written paper.

It is surprising that Lord Grey's administration, which had achieved so great a work in passing the Reform Bill, and was supported by an immense majority in the reformed Parliament, should so soon have come to an end. But Lord Grey was perpetually threatening to resign office; Lord Althorp longed for retirement; the question of the Irish Church led to the secession of four important members of the Cabinet; the queen was hostile; and the king was alarmed and dissatisfied with the Whig ministers. In July 1834 the crisis arrived, and having carried on the government for three years and 231 days, Lord Grey resigned. Lord Brougham had contrived to monopolize the authority and popularity of the Government, and no doubt his insatiable activity contributed to this result; and there were those who accused him of having intrigued to bring it about, with a view to superseding Lord Grey himself. But this imputation is unjust. Brougham, however, had caused Mr. Littleton, the Irish secretary, to suggest to Lord Wellesley, the lord-lieutenant, that some of the clauses in the Irish Coercion Bill might be withdrawn on its renewal, with a view to conciliate O'Connell. Lord Althorp was of the same opinion; but Lord Grey refused to entertain the proposal, and on this rock the ship struck. Brougham declared with great vehemence that it was madness to resign, and that for his own part he had not tendered his resignation. Very much by his exertions the Cabinet was reconstructed under Lord Melbourne, and without Lord Grey; and he appeared to think that his own influence in it would be increased.

The term opened in November with the usual formalities. But on the 16th of that month the king dismissed his ministers. The chancellor, who had dined at Holland House, called on Lord Melbourne in his way home, and learned the intelligence. Melbourne made him promise that he would keep it a secret till the morrow; but the moment he quitted the ex-premier, he sent a paragraph to the *Times* relating the occurrence, and adding that "the queen had done it all." That statement, which was totally unfounded, was the last act of his official life. The Peel ministry, prematurely and rashly summoned to power, was of no long duration, and Brougham naturally took an active part in overthrowing it. Lord Melbourne was called upon in April 1835 to reconstruct the Whig Government with his former colleagues. But, formidable as he might be as an opponent, the Whigs had learned by experience that Brougham was even more dangerous to them as an ally, and with one accord they resolved that he should not hold the great seal or any other office. The great seal was put in commission, to divert for a time his resentment, and leave him, if he chose, to entertain hopes of recovering it. These hopes, however, were soon dissipated; and although the late chancellor assumed an independent position in the House of Lords, and even affected to protect the Government, his resentment against his "noble friends" soon broke out with uncontrolled vehemence. Throughout the session of 1835 his activity was undiminished. Bills for every imaginable purpose were thrown by him on the table of the House, and it stands recorded in *Hansard* that he made no less than 221 reported speeches in Parliament in that year. But in the course of the vacation a heavier blow was struck. Lord Cottenham was made Lord Chancellor The breach had manifestly become irreparable. Even Lord Brougham's buoyant and daring spirit sunk for a time under the shock. A dreadful period of depression succeeded to the wild frenzy of the preceding years, and during the year 1836 the voice of Lord Brougham was unheard. He passed the spring and summer in Westmoreland, and avoided all political conversation and correspondence. Fifty-six years of his life were spent, and not much more than twenty of them had been spent in Parliament, where he had earned the most prodigious reputation and influence of modern times. "What is the House or Lords without Brougham?"—we have heard Lord Lindhurst say—"Brougham *is* the House of Lords." For more than thirty years after his fall he continued to take an active part in its judicial business and in its debates. There was still a power in the tone of that voice, raised as it always was in the cause of peace, humanity, and freedom; but it would have been better for his fame if he had died in the midst of his glory. His reappearance in Parliament on the accession of Queen Victoria was marked by sneers at the Court, and violent attacks on the Whigs for their loyal and enthusiastic attachment to their young sovereign; and upon the outbreak of the insurrection in Canada, and the miscarriage of Lord Durham's mission, he overwhelmed his former colleagues, and especially Lord Glenelg, with a torrent of invective and sarcasm, equal in point of oratory to the greatest of his earlier speeches.

The fame of Lord Brougham had long extended far beyond the frontiers of his native land. The generous and lofty sentiments which he clothed in forcible language touched the heart of mankind. But there was something peculiarly congenial to his own mercurial temperament in the life and genius of France. In 1833 the Academy of Moral and Political Science had conferred upon him the high rank of an associate of the Institute. The Academy of Science did not disdain to listen to his demonstrations. The French, with their lively sympathy for brilliant intellectual power, forgave him all his eccentricities. He has been known to *tutoyer* M. Guizot. Of all the tributes to his memory which have issued from the press, none is at once more truthful and more tender than the discourse pronounced by M. Mignet in the Institute of France in honor of their great associate. Upon that southern coast the last days of this veteran combatant in the fields of law and politics were spent. There at Cannes, upon the 7th May 1868, in the ninetieth year of his age, he expired; and if Westminster proffered no sepulture to the greatest orator of our times, he rests, at least, in the spot which had his latest affections.

BROUGHTON, HUGH, a learned scholar and divine, was born at Oldbury in Shropshire in 1549. After receiving the rudiments of his education at a provincial school, he went to Cambridge, where in due time he was chosen a fellow of Christ's College, and took orders in the church. During his career at the university he laid the foundation of the Hebrew scholarship for which he was afterwards so distinguished. From Cambridge he went to London, where his eloquence gained him many and powerful friends. In 1588 he published his first work, "a little book of great pains," entitled the *Consent of Scriptures*. In 1589 he went to Germany, where he frequently engaged in discussions both with Romanists and with the learned Jews whom he met at Frankfort and elsewhere. In 1591 he returned to England, and published an *Explication of the article of Christ's descent into Hell*, which, like his former treatise, elicited a violent opposition. In 1592 he once more went abroad and cultivated the acquaintance of the principal scholars of the different

countries through which he passed. Such was the esteem in which he was held, even by his opponents, that he was offered a cardinal's hat if he would renounce the Protestant faith, which, however, he declined to do. On the accession of James he returned to England; but not being engaged to co-operate in the new translation of the Bible then begun, he retired to Middleburg in Holland, where he preached to the English congregation. In 1611 he returned to England, where he died the following year. Some of his works were collected and published in a large folio volume in 1662, with a sketch of his life by Dr. Lightfoot, but many of his theological MSS. remain still unedited in the British Museum.

BROUGHTON, THOMAS, a learned divine and one of the original writers in the *Biographia Britannica*, was born in London, July 5, 1704. He died December 21, 1774.

BROUGHTON, JOHN CAM HOBHOUSE, LORD, an English statesman, was the eldest son of Sir Benjamin Hobhouse, first baronet, and was born at Redlands, Bristol, June 27, 1786. In April 1833 he was named Chief-Secretary for Ireland, but lost his seat at the new election. In the following year he was returned M.P. for Nottingham, and received the appointment of Chief-Commissioner of Woods and Forests under Lord Melbourne. Retiring with the Liberal party in the autumn, he resumed office in April 1835 as President of the Board of Control, a post for which he was well qualified, and which he held till September 1841. He was recalled to the same office under the Russell Administration in 1846, and held it till 1852. Meanwhile he had lost his seat for Nottingham and had been returned for Harwich. In 1851 he was raised to the peerage, and from that time showed himself disposed to "rest and be thankful." He gradually ceased to take part in public affairs, and returned to the studies and literary enjoyments of his youth. Lord Broughton published a volume of *Imitations and Translations from the Classics;* an account of his *Journey through Albania and other Provinces of Turkey with Lord Byron;* and *Historical Illustrations of the Fourth Canto of "Childe Harold."* He was also a contributor to periodical literature. In 1828 he married Lady Julia Hay, youngest daughter of the Marquis of Tweeddale, by whom he had three daughters, but no son. His wife died many years before him. Lord Broughton died in London, June 3, 1869. As he left no male issue his peerage became extinct.

BROUKHUSIUS, or BROEKHUIZEN, JAN, a distinguished scholar, born in 1649 at Amsterdam. He died in 1707, aged 58.

BROUSSA, BRUSSA, or BRUSA, in Turkish *Bursa*, a city of Asiatic Turkey, in the province of Anatolia, and capital of the sanjak of Khodavendkiar, is situated in a fertile valley, at the northern foot of Mount Olympus or Keshish Dagh, 57 miles S.S.E. of Constantinople.

BROUSSAIS, FRANÇOIS JOSEPH VICTOR, a celebrated French physician, was born at St. Malo in 1772. From his father, who was also a physician, he received his first instructions in medicine, and he studied for some years at the college of Dinan. Of his works, which are very numerous, the most important are the *Examen* and *De l' Irritation et de la Folie*. He died in 1838.

BROUSSONET, PIERRE MARIE AUGUSTE, a distinguished French naturalist, was the son of a schoolmaster, and was born at Montpellier in 1761. France is indebted to him for the introduction of the Merino sheep and the Angora goat. None of his works are now of importance. He died in 1807.

BROUWER, ADRIAN, a Dutch painter, was born at Haarlem in 1608, of very humble parents, who bound him apprentice to the painter Frank Hals. The artist died in a hospital at Antwerp in 1640, at the early age of thirty-two, consequently his works are few and rarely met with. The largest collection of his masterpieces is in the picture gallery at Munich.

BROWN, CHARLES BROCKDEN, the first American novelist who acquired an European reputation, and the first American who made literature a profession, was born of Quaker parents in Philadelphia, January 17, 1771. A youth of delicate constitution and retiring habits, he early devoted himself to study; his principal amusement was the invention of ideal architectural designs, devised on the most extensive and elaborate scale. This characteristic talent for construction subsequently assumed the shape of utopian projects for perfect commonwealths, and at a later period of a series of novels distinguished by the ingenuity and consistent evolution of the plot. The transition between these intellectual phases is marked by a juvenile romance entitled *Carsol*, not published until the author's death, which professes to depict an imaginary community, and shows how thoroughly the young American was inspired by Godwin and Mary Wollstonecraft, whose principal writings had recently made their appearance. From the latter he derived the idea of his next work, *Alcuin*, an enthusiastic but inexperienced essay on the question of woman's rights and liberties. From Godwin he learned his terse style, condensed to a fault, but too laconic for eloquence or modulation, and the art of developing a plot from a single psychological problem or mysterious circumstance. The novels which he now rapidly produced offer the strongest affinity to *Caleb Williams*, and if inferior to that remarkable work in the subtlety of mental analysis, greatly surpasses it in affluence of invention and intensity of poetical feeling. All are wild and weird in conception, with incidents bordering on the preternatural, yet the limit of possibility is never transgressed. In *Wieland*, the first and most striking, a seemingly inexplicable mystery is resolved into a case of ventriloquism. *Arthur Mervyn* is remarkable for the description of the epidemic of yellow fever in New York in 1798, which had proved fatal to the author's most intimate friend. *Edgar Huntly*, a romance rich in local coloring, is remarkable for the effective use made of somnambulism, and anticipates Cooper's introduction of the Red Indian into fiction. *Ormond* is less powerful, but contains one character, Constantia Dudley, which excited the enthusiastic admiration of Shelley, who was also deeply entranced by Brown's other romances. "Nothing," asserts Mrs. Peacock, "so blended itself with the structure of his interior mind as the creations of Brown." The two had, indeed, nearly every leading trait in common, although Brown's weak health and narrow circumstances restrained him from carrying his enthusiastic aspirations into practice. Two subsequent novels, designed as representations of ordinary life, proved failures, and Brown betook himself to less ambitious literary pursuits, compiling a general system of geography, editing a periodical, and an annual register, and writing political pamphlets, which attracted considerable attention at the time. He died of consumption, February 22, 1810.

BROWN, JOHN, D.D., an English divine and author, was born at Rothbury, Northumberland, in November 1715. Among the most remarkable of his other productions are the *Estimate of the Manners and Principles of the Times*, a bitter satire; the *Additional Dialogue of the Dead*, which was a vindication of Chatham's policy; and the *Dissertation on the Rise, Union, and Power, &c., of Poetry and Music*. Dr. Brown, who had an hereditary tendency to insanity,

and from early life had been subject at times to fits of excessive melancholy, committed suicide on the 23d of September 1766.

BROWN, JOHN, author of the *Self-Interpreting Bible*, was born at Carpow, in Perthshire, in 1722. He died in 1787.

BROWN, JOHN, the founder of the Brunonian theory of physic, was born in 1735 at Lintlaws or at Preston, Berwickshire, and died of apoplexy in October 1788.

BROWN, JOHN, D.D., an eminent Scottish divine, was born at Whitburn, Linlithgowshire, on the 12th of July 1784. He died on the 13th October 1858.

BROWN, JOHN, an American abolitionist, celebrated as the originator of the Harper's Ferry insurrection, was born in Torrington, Connecticut, on the 9th May 1800. Originally intended for the church, he was compelled to give up study for this purpose on account of inflammation in the eyes. He then took up the business of a tanner, which he carried on for twenty years. Not being very successful in trade, he started business as a wool-dealer in Ohio in 1840. Failing also in this he removed to Essex county, New York, in 1849, and began to reclaim a large tract of land which had been granted to him. After two years he returned to Ohio and resumed his business as a wool-dealer. In 1855, with his four sons, he migrated to Kansas and at once took a prominent position as an anti-slavery man. He became renowned in the fierce border warfare which was carried on for some years in Kansas and Missouri, and gained particular celebrity by his victory at Ossowattomie. About this time he seems to have formed the idea of effecting slave liberation by arming the slaves and inciting them to rise in revolt against their oppressors. As the first step in this scheme, he designed to seize the arsenal of Harper's Ferry, where an immense stock of arms was kept. On the night of the 10th October 1859, he, with a handful of well-armed and resolute companions, overpowered the small guard and gained possession of the arsenal. During the next morning he made prisoners of some of the chief men of the town, but there was no rising of slaves as had been expected. The townsmen, too, recovered from their astonishment at the audacity of the act, and a bold attack was made on the arsenal. Fresh assailants poured in from the country round, and on the morning of the 18th the arsenal was recaptured, and Brown, severely wounded, was taken prisoner. On the 27th October he was tried at Charlestown for treason and murder, and was found guilty. The sentence passed upon him, death by hanging, was carried into execution on the 2d December.

BROWN, ROBERT, the founder of the Brownists, a numerous sect of dissenters in the reign of Queen Elizabeth, was born in 1550. He died in 1630, aged eighty. Brown boasted on his death-bed that he had been confined in thirty-two different prisons. He wrote a *Treatise of Reformation without tarrying for any*, and two other pieces, making together a thin quarto, published at Middleburg in 1582. See BROWNISTS.

BROWN, ROBERT, a celebrated botanist, who may be said to be the founder of the modern science of vegetable physiology, and to have placed the natural system of the classification of plants, originally introduced by Jussieu, upon that sure and ever-widening basis on which it has ever since remained.

On the 10th June 1858 he died in the 85th year of his age, in his house in Soho Square, bequeathed to him by Sir Jos. Banks. His place in botanical science has long been fixed; it is not necessary now to discuss it. His works are all standards, being distinguished by their thoroughness and conscientious accuracy, and displaying powers at once of minute detail and of broad generalization,—qualities rarely combined. Indeed, so careful was he in preparing his discoveries for the press that he directed in his will that, should any of his writings be republished, they should be printed *verbatim et literatim*.

BROWN, SAMUEL, chemist, poet, and essayist, was born at Haddington on the 23d February 1817, and died 26th September 1856.

BROWN, THOMAS, of facetious memory, as Addison designates him, was the son of a farmer at Shiffnal in Shropshire, and was born in 1663. He died in 1704.

BROWN, DR. THOMAS, one of the most original and subtle of Scottish psychologists, was born on the 9th January 1778, at Kirkmabreek, Kirkcudbright, of which parish his father was the clergyman. In 1780 the family removed to Edinburgh, but he was not placed at any of the schools in that city. At the age of seven he was sent to London, and began his regular education at a school in Camberwell, from which he was soon afterwards removed to Chiswick. At Chiswick he was thoroughly grounded in classics, and began to give promise of great ability, particularly in the department of verse composition, one of his school poems being deemed worthy of insertion in a magazine. He was a boy of a refined, gentle nature, intensely studious, a devourer of literature of all kinds, and much loved by his companions. After attending two other schools at Bromley and Kensington, he returned to Edinburgh, and in 1792 began his course at the university by joining the logic class, then conducted by Professor Finlayson.

As early as 1806 Dr. Brown had engaged in practice as a physician, having been received into partnership with Dr. Gregory; but though very successful in his profession, he was by nature more strongly attracted towards a literary life. He had twice failed in his application for a professorship in the university of Edinburgh, when in the session 1808–9 he was called upon to deliver a few lectures to the class of moral philosophy, in consequence of the temporary illness of Dugald Stewart. In the following year, Stewart's health still incapacitating him from active exertion, Dr. Brown delivered the lectures for the greater part of the session. His success in conducting the class was unequivocal; the enthusiasm of the students was such as one reflects on with a little wonder. They were fascinated not more by the splendid rhetoric of the lecturer than by the novelty and ingenuity of the views presented. In the summer of 1810 it was resolved to appoint Brown as colleague to Dugald Stewart, and in the ensuing session he began his course as professor of moral philosophy. During the few remaining years of his life he published only his poems, but he was busily engaged in preparing an abstract of his lectures to serve as a handbook for the class. His health, never strong, gave way completely under the pressure of his work. A voyage to London, which had been recommended, proved of no avail, and he died on the 2d April 1820, at the early age of forty-two. After his death were published the first part of his proposed text-book, *Physiology of the Human Mind*, and the *Lectures on the Philosophy of the Human Mind*, 4 vols., of which the *Physiology* is an abstract. The fame achieved by the *Lectures* when published surpassed even what they and attained when delivered. It is no exaggeration to say that never before or since has a work of metaphysics been so popular.

BROWN, ULYSSES MAXIMILIAN, a celebrated general in the imperial armies, son of Ulysses, Baron Brown and Camus, a colonel of cuirassiers, was descended of an ancient Irish family, and was born at Basel in 1705. After the death of the Emperor Charles VI. he became one of the foremost generals in the army

of the Empress-Queen Maria Theresa, and gained a high reputation for military skill. He was mortally wounded at the great battle of Prague, and was carried into the town, where he expired on the 20th June 1757.

BROWN, WILLIAM LAURENCE, born at Utrecht, January 7th, 1755, died in 1830; was for many years principal of Marischal College, Aberdeen, Scotland.

BROWNE, CHARLES FARRAR, an American humorous writer, best known under his *nom de plume* of Artemus Ward, was born at Waterford, Maine, in 1834. He began life as a compositor and an occasional contributor to the daily and weekly journals. In 1858 he published in the Cleveland *Plaindealer* the first of the "Artemus Ward" series, which in a collected form attained great popularity both in America and England. In 1860 he became editor of *Vanity Fair*, a humorous New York weekly, which proved a failure. About the same time he began to appear as a lecturer, and by his droll and eccentric humor attracted large audiences. In 1866 he visited England, where he became exceedingly popular both as a lecturer and as a contributor to *Punch*. In the spring of the following year his health gave way, and he died of consumption at Southampton on the 6th March, 1867. Artemus Ward has had a host of imitators in his peculiar line.

BROWNE, ISAAC HAWKINS, an English poet, was born in 1705 at Burton-upon-Trent, of which place his father was minister. He received his grammatical instruction first at Lichfield, and then at Westminster, whence, at sixteen years of age, he was removed to Trinity College, Cambridge, of which his father had been fellow. In 1754 he published his poem *De Animæ Immortalitate*, in which, besides a judicious choice of matter and arrangement, there is thought to be a happy imitation of Lucretius and Virgil. The wide popularity of this poem produced several English translations of it, the best of which is given by Soame Jenyns, in his *Miscellanies*. The author intended to have added a third book, but of this he had left only a fragment. He died, after a lingering illness, in 1760.

BROWNE, JAMES, LL.D., man of letters, for a number of years sub-editor of the seventh edition of the *Encyclopædia Britannica*, was born at Coupar-Angus in 1793. He died in 1841, from a stroke of apoplexy, brought on by his unremitting labors.

BROWNE, PETER, bishop of Cork and Ross, an able writer on theology, was born in Ireland some time after the Restoration. He entered Trinity College, Dublin, in 1682, and after ten years' residence obtained a fellowship. In 1699 he was made provost of the College, and in the same year published his *Letter in answer to a Book entitled "Christianity not Mysterious,"* which was recognized as the ablest reply yet written to Toland. It expounds in germ the whole of his later theory of analogy. In 1710 he was made bishop of Cork and Ross, which post he held till his death in 1735.

BROWNE, SIR THOMAS, a distinguished English writer, was born in London on the 19th October, 1605. He was educated at Winchester School, and afterward at Broadgate Hall (Pembroke College), Oxford, where he graduated B.A. in January 1626. In 1642 a copy of his *Religio Medici* was printed from one of his MSS. without his knowledge, and he was compelled to put forth a correct edition of the work, which appears to have been composed as early as 1634. Its success was very great, and the author at once became celebrated as a man of letters. In 1646 appeared his *Pseudodoxia Epidemica*, or *Enquiries into Vulgar and Common Errors*, which added to his fame. In 1658, on the occasion of the discovery of some ancient urns in Norfolk, he wrote his *Hydriotaphia* or *Urnburial*, to which was appended *The Garden of Cyrus*. These four works were all that he published, though several tracts, notably the *Christian Morals* and *Antiquities of Norwich*, were prepared for publication, and appeared after his death. In 1671 he received the honor of knighthood from Charles II. on his visit to Norwich; and in 1682 he died on his seventy-seventh birthday.

BROWNE, WILLIAM, an English poet, descended of a good family, was born at Tavistock in Devonshire, in 1590, and died about 1650.

BROWNE, WILLIAM GEORGE, an eminent traveller, was born at Great-Tower-Hill, London, July 25, 1768. At seventeen he was sent to Oriel College, Oxford. Having had a moderate competence left him by his father, on leaving the university he applied himself entirely to literary pursuits. But the fame of Bruce's travels, and of the first discoveries made by the African Association, determined him to become an explorer of Central Africa. Accordingly, he left England at the close of 1791 and arrived at Alexandria in January 1792. He spent a few months in visiting Siwah, the supposed site of the temple of Jupiter Ammon, and employed the remainder of the year in examining the whole of Egypt. In the spring of 1793 he visited Suez and Sinai, and in May set out for Dafûr. This was his most important journey, in which he acquired a great variety of original information. He endured much hardship, and was unable to effect his purpose of returning by Abyssinia. He did not reach Egypt till 1796; after this he spent a year in Syria, and did not arrive in London till September 1798. In 1800 he published his travels in Africa, Egypt, and Syria, from the year 1792 to 1798, in one volume 4to. The work was highly esteemed, and is classed by Major Rennel among the first performances of the kind; but, from the abruptness and dryness of the style, it never became very popular. In 1800 Browne again left England, and spent three years in visiting Greece, some parts of Asia Minor, and Sicily. In 1812 he set out on a more extensive journey, proposing to penetrate to Samarkand, and survey the most interesting regions of Central Asia. He spent the winter in Smyrna, and in the spring of 1813 proceeded through Asia Minor and Armenia, made a short stay at Erzeroum, and arrived on the 1st of June at Tabriz, where he met Sir Gore Ouseley. About the end of the summer of 1813 he left Tabriz for Teheran, intending to proceed thence into Tartary; but unhappily he never reached that destination. Near the banks of the Kizil-Ouzen his party were attacked by banditti, and, according to the report of the survivors, Browne was plundered and murdered.

BROWNING, ELIZABETH BARRETT, the most distinguished poet of her sex that England has produced, was born in London in the year 1809. She was the daughter of Mr Barrett, an English country gentleman. From a very early age, almost before the years of childhood had passed, she exhibited a remarkable preference for the arts, but especially that of the poetic. Previous to attaining her fifteenth year she had written verse upon which was the stamp of true genius — poems eminently worthy of preservation. Whatever she wrote, however, was sacred to all eyes save those of her father, to whom she refers in the first collected edition of her poems as "my public and my critic." Her physical constitution was most fragile and delicate, but nature seemed to have supplemented her deficiency in this respect by bestowing upon her an unusually sensitive mental and spiritual organization. One who knew her intimately, Miss Mitford, has described her as a "slight delicate figure, with a shower of dark curls falling on each side of a most expressive face, large tender eyes, richly fringed by dark eye-lashes, and a smile like a

sunbeam." All descriptions of Miss Barrett concur in this, that she possessed a grace and a delicacy which defied representation by the artist. Her studies were early directed to the poets of antiquity, and, under the guidance of her blind tutor, Boyd, whose name she always warmly cherished, she mastered the rich treasures of Æschylus. In 1846 she married ROBERT BROWNING (*q.v.*), the union being a singularly felicitous one. They removed to Italy, where Mrs. Browning spent the rest of her life. Her knowledge of Greek literature was most profound; she was intimately familiar with all the Attic writers in tragedy and comedy. Yet this did not prevent her from drinking at the wells of English undefiled. Her correspondence with eminent contemporaries of both sexes proves her to have been thoroughly acquainted with English literature in its progress from Chaucer downwards. Mrs. Browning died at Florence in the year 1861, after testifying in many ways her singular devotion to the country of her adoption.

The poetry of this writer is distinguished for its emotional spirit; had her imagination equalled her capacity for feeling she might have taken rank with the highest of our poets. Sensibility and intuition, those endowments of supreme importance to writers of genius, whose greatness is to grow in proportion to their understanding and interpretation of human life, were in her united in a degree seldom witnessed. Mrs. Browning's fame chiefly rests upon *Aurora Leigh*, except with diligent and reverent students of her other works. The longest poem, nevertheless, which came from her hand is the one, to quote her own words, into which her "highest convictions upon life and art have entered." The position of Mrs. Browning as a poet is now yielded. Her genius was perhaps as great as that of any poet of our generation, but circumstances retarded its highest possible development. In certain intellectual qualities she was inferior to Tennyson and the author of *Sordello*, but in others she was their superior.

BROWNISTS, a religious sect, which sprang up towards the close of the 16th century, and which received its name from the first promulgator of the doctrines, Robert Brown. Their numbers increased rapidly, and Sir Walter Raleigh, in a speech in 1592, estimated them at no less than twenty thousand. The harsh measures that were taken against them, and the disgust generally excited by the tone of their attacks upon the Established church, for a time stamped out the sect in England. But the remnant found a refuge in Holland, and the church included many eminent men.

BROWNSVILLE, a port of entry and capital of Cameron county, Tex., on the north bank of the Rio Grande, opposite Matamoros, about thirty-five miles from the mouth of the river in the Gulf of Mexico. It has a custom house and some river trade by steamers. The Rio Grande railroad connects it with Point Isabel twenty-two miles east near the gulf. In May, 1846, the town was occupied and fortified by a few United States troops, who maintained their position in the face of a heavy bombardment that lasted for 160 hours. Population (1890), 6,000.

BRUCE, JAMES, a celebrated African traveller, was born at Kinnaird House, Stirlingshire, on the 14th December 1730. He was educated at Harrow, and at first turned his attention to the bar. After his marriage, however, he entered into business as a wine-merchant, but soon gave up any active share in the concern. His wife had died within a year of their marriage, and Bruce, after acquiring a knowledge of the Spanish and Portuguese languages, travelled on the Continent for some time, returning to England in 1758. He then made a proposal to the English Government that they should make a descent upon Spain at Ferrol, assuring them from his own observation that the coast was without defence at that place. His suggestions were not adopted; but Lord Halifax, to whom he had been introduced, and who had consulted him about the exploration of the Nile, appointed him soon afterwards to the consulship at Algiers. He arrived at that place in March 1762, and after spending a year in the study of Arabic and other Oriental languages, set out through Tunis, Tripoli, and the North of Africa. He then visited Rhodes and Cyprus, and explored great part of Syria and Palestine, making very careful drawings of Palmyra and Baalbec. These drawings were afterwards presented to the king and placed in the royal library at Kew. It was not till June 1768, that Bruce arrived at Alexandria, and prepared to start on his great exploring expedition. From Cairo he sailed up the river as far as Syene; he then struck across the desert to Kosseir, and reached Jidda in May 1769. He remained for some time in Arabia, set sail from Loheia on the 3d September, and on the 19th arrived at Massowah. There he was detained for some time; but at last, on the 15th February 1770, he made his way to Gondar, the capital of Abyssinia. He gained great favor with the Abyssinian king, and remained with him till October, when he set off up the Bahr-el-Azrek, which he looked upon as the main branch of the Nile. On the 14th November he reached the sources of the Bahr-el-Azrek, and proudly imagined himself to have solved the great geographical problem. Slowly and with great difficulty he made his way back through the deserts of Nubia. On the 29th November 1772 he reached Assouan on the Nile. Thence he returned into the heart of the desert to recover his baggage, which had been abandoned in consequence of the death of all his camels. In January 1773 he arrived at Cairo. On his way home to England he spent some time at Paris, where he was warmly received by Buffon and other eminent men of science. The celebrated *Travels* did not appear till 1790, when they were published in five large quarto volumes, profusely illustrated. The work was received with favor on account of its freshness and interest, but with almost universal incredulity. The *Travels* were looked upon as veritable travellers' tales, not entitled to any respect as authentic narrative. Succeeding investigations, however, have thoroughly dispelled these suspicions, and reinstated the book in popular estimation. Bruce died in 1794, in consequence of a fall down the staircase of his own house. A second edition of his work, on which he was engaged at the time of his death, was published in 1804.

BRUCE, MICHAEL, a minor Scottish poet, was born at Kinnesswood, Kinross-shire, 27th March 1746, and was the son of a weaver. He was early sent to school, but his attendance was often interrupted. He had frequently to herd cattle on the hills in summer, and this early companionship with nature greatly influenced his mind and awoke the latent poetry of his genius. Delicate from birth he grew up contemplative, devotional, and humorous, the pet of his family and his friends. His parents gave him an education superior to their position; at fifteen, when his school education was completed, his father was enabled to send Michael to Edinburgh University, which he attended during the four winter sessions 1762–5. He became a divinity student of a dissenting Scottish sect known as the Burghers, and in the first summer of his divinity course accepted the charge of a new school at Forrest Mill, where "he lead a melancholy kind of life." Poverty, disease, and want of companions depressed his spirits, but in that solitariness he wrote "Lochleven," a poem inspired by the memories of his childhood. In consequence of advanced consumption he had to give up the school, and returned to his father's house, where he

wrote his last and finest poem, "Elegy written in Spring," and died on July 5, 1767, aged twenty-one years and three months.

BRUCE, ROBERT, king of Scotland. See SCOTLAND.

BRUCHSAL, a town of the Grand Duchy of Baden, in the circle of Carlsruhe, fourteen miles from the city of that name, on the Salzbach. Population, 10,000.

BRUCK, the names of two towns of Austria—

(1). BRUCK ON THE MUR, the chief town of a circle in the province of Steyermark, situated at the junction of the rivers Mur and Mürz, with a station on the railway from Vienna to Trieste, twenty-five miles northwest of Gratz. Population, 3,000.

(2). BRUCK ON THE LEYTHA, the chief town of a circle in Lower Austria, with the castle of the counts of Harrach. Population, 4,500.

BRUCKENAU, a town and fashionable watering-place of Bavaria, in the circle of Lower Franconia, on the Sinn, sixteen miles northwest of Kissingen. Population, 3,000.

BRUCKER, JAMES, theologian, historian, philologer, and biographer, was born at Augsburg on January 22, 1696, and died in 1770. In 1741, at Leipsic, appeared the first volume of his great work, *Historia Critica Philosophiæ, a mundi incunabulis ad nostram usque ætatem deducta.* Four other ponderous quartos, completing the first edition of this elaborate history, followed in 1744.

BRUGES (in Flemish BRUGGE), a city of Belgium, the capital of West Flanders, is situated in the midst of a fertile plain, intersected by the canals of Ghent, Ostend, and Sluys, in a direct line, about seven miles from the sea, twelve miles east of Ostend, twenty-four northwest of Ghent, and sixty miles in the same direction from Brussels. The history of Bruges dates from about the third century of the Christian era. In the seventh it had emerged into importance; and its corporation of weavers, which afterward in its best days numbered 50,000 men, was already highly renowned in the time of Charlemagne. In the ninth century Bruges became subject to the counts of Flanders, who resided there, and made the city one of the most populous and wealthy in Europe by the great advantages and immunities which they offered to merchants and manufacturers. The inhabitants guarded with the most jealous care the privileges which they sometimes received and sometimes exacted from their rulers, and not infrequently rose in arms for their defense. Though Bruges, and Ghent, and other Flemish towns owned a common lord, their interests were never identified, and they seldom let an opportunity pass of doing each other as much injury as possible. In the middle of the fourteenth century Bruges passed by marriage into the hands of the dukes of Burgundy, under whom it reached the highest point of its prosperity. In 1430 Philip the Good, duke of Burgundy, instituted at Bruges the chivalric order of the Golden Fleece, a compliment to the town, no small portion of whose prosperity arose from its woolen trade. In the fourteenth and fifteenth centuries, Bruges was the chief emporium of the cities of the Hanseatic league; and merchants from every quarter of the world found there a ready market for their goods. The argosies of Venice and Genoa came laden with the produce of the East; ships of every nation took in and discharged their cargoes at the quays; the warehouses were filled with bales of wool from England, and with silk from Persia. Not the least famous of the manufactures was that of tapestry, in which the people of Bruges acquired great skill a century before the looms of Beauvais or the Gobelins were set up. The prosperity of Bruges was undiminished till it passed under the dominion of the house of Hapsburg. For a violation of some of their prerogatives, the inhabitants imprisoned the Archduke Maximilian in 1488, and a terrible vengeance was inflicted upon the town for this outrage. It trade was transferred to Antwerp, and its ruin was ultimately completed by the religious persecutions of the bloody duke of Alva at the end of the sixteenth century. Such of the inhabitants as escaped with their lives fled to England and introduced into that country many of the arts and manufactures which they and their forefathers had cultivated with success for many generations. In more modern times the town has frequently suffered from the effects of war. In 1704 it was besieged by the Dutch and in 1708 and 1745 it was captured by the French. The contrast between the Bruges of the fifteenth century and the Bruges of recent times is as striking as it is painful. Present population, 50,000.

BRUISE, or CONTUSION. Flesh is said to be bruised when the smaller blood vessels are mangled so that the blood escapes from its proper channels into the cellular tissue of the true skin. The normal color and condition are gradually restored to the parts through the agency of little vessels known as absorbents. Treatment enters for the purpose of preventing the effusion of blood into the cellular tissue. To this end cold water serves admirably, aided by the elevation, if possible, of the injured parts above the level of the body. If the bruised flesh be situated over a bone, the effusion of blood is slow; elsewhere it is slow or rapid, as the injury is limited or extensive. When the bruise reaches its maximum density of color, the object of treatment should be to hasten the absorption of the clotted blood, and to reduce the swelling. Tincture of iodine will assist absorption, and puncturing the large dark-brown blisters may permit the blood to escape externally.

BRUMAIRE (Fr. foggy month), a division of the year in the Republican calendar of France. It includes the time from October 22 to November 20. The celebrated 18th Brumaire, which witnessed the overthrow of the Directory and the establishment of the sway of Napoleon, corresponds with November 9, 1799, of the Gregorian calendar.

BRUMATH, or BRUMPT, a town of Lower Alsace, in the circle of Strasburg, on the River Zorn. It has a castle and mineral wells, and occupies the site of the ancient Brucomagus. Population (1890), 6,000.

BRUMMELL, GEORGE BRYAN, better known as "Beau Brummell," born in London, June 7, 1778, the son of Lord North's private secretary. He was distinguished for the exquisiteness of his dress and manners; and after four years in the army, having come into a fortune of $150,000, he entered society as arbiter of elegancies. He died March 30, 1840.

BRUNAI, an independent Mohammedan territory in the northwest of Borneo, whose Sultan was formerly overlord of the whole island. Area, about 18,000 square miles; population estimated at from 125,000 to 225,000. The capital, Brunaï, is built on piles, and has 30,000 to 35,000 inhabitants.

BRUNCK, RICHARD FRANCOIS PHILIPPE (1729–1803), a French scholar, was born at Strasburg, December 20, 1729. In 1781 he published an edition of *Virgil*, for which he was pensioned by the French king. At the outbreak of the French Revolution, in which he took an active part, he lost his pension, and was reduced to such extremities that he was obliged to sell a portion of his library. In 1802 his pension was restored to him, but too late to prevent the sale of the remainder of his books. He had brought out an edition of *Plautus* in 1788, and was in the act of republishing it when he died, June 12, 1803.

BRUNDUSIUM, or BRUNDISIUM. See BRINDISI.

BRUNE, GUILLAUME MARIE ANNE, a French

marshal of the First Empire, born March 13, 1763. In 1792 he entered the army, fought in the Vendean war and in Italy under Massena, and after Rivoli, was made General of Division. Sent by the Directory to Switzerland in 1798, he executed his orders with brilliant success. In 1799 he was appointed to the command of the Army of Holland. He defeated the Duke of York at Bergen, September 19, and forced him to capitulate at Alkmaar. In 1803 he was embassador to Turkey; next he obtained the dignity of Marshal. In 1807 he became Governor-General of the Hanseatic towns. After the return from Elba he joined the Emperor, and was made a peer. On August 2, 1815, he was murdered by an infuriated royalist mob at Avingnon.

BRUNEL, Isambard Kingdom (1806–1859), one of the most distinguished civil engineers of the age, was born at Portsmouth, April 9, 1806. He was the only son of Sir Marc Isambard Brunel, from whom he inherited some rare intellectual gifts, and to whom he owed his first education. From his earliest years he took an eager and intelligent interest in all the plans and undertakings of his father, who had then just completed the construction of the remarkable block machinery at Portsmouth. In March 1833, Brunel, at the age of twenty-seven, attained one of the highest professional positions by his appointment as engineer of the newly-projected Great Western Railway. For several years his energies were taxed to the utmost by the conflict with obstructive landowners and short-sighted critics; but he showed himself equal to the occasion, not only as a professional man, but a persuasive negotiator. For solidity of construction and for skill and beauty of design the Great Western Railway, though one of the first made in England, holds a very high place. Among the triumphs of the engineer are the Hanwell Viaduct, the Maidenhead Bridge, and the Box Tunnel, at the time the longest in the world; and, on extensions of the line, the great bridges at Chepstow and Saltash. The now notorious "battle of the gauges" took its rise from Brunel's introduction of the broad gauge on this line. In 1846 he resigned his office as engineer of the Great Western Railway. In 1844 he had recommended the adoption of the Atmospheric System on the South Devon Railway, but after a year's trial this system was abandoned. The last and greatest of Brunel's railway works was the Royal Albert Bridge of the Cornwall Railway, crossing the River Tamar at Saltash. This work, sanctioned by parliament in 1845, was constructed between 1853 and 1859. In addition to the arduous labors of railway engineering, Mr. Brunel had taken a leading part in the systematic development of ocean steam navigation. As early as October 1835 he had suggested, to the amusement of the directory of the Great Western Railway, that they should "make it longer, and have a steamboat to go from Bristol to New York, and call it the Great Western." The project was taken up, and the "Great Western" steamship was designed by Brunel, and built at Bristol under his superintendence. It was much longer than any steamer of the day, and was the first steamship built to make regular voyages across the Atlantic. A greater work was at once undertaken, and the "Great Britain" was built. This was the first large iron steamship, the largest ship afloat at that time, and the first large ship in which the screw-propeller was used. She made her first voyage from Liverpool to New York in August and September, 1845; but the following year was carelessly run upon the rocks in Dundrum Bay on the coast of Ireland. After lying there nearly a year without material damage she was got off and was employed in the Australian trade. Brunel soon after began to meditate a vaster project still, the construction of a vessel large enough to carry all the coal required for a long voyage out, and if coal could not be had at the out port, then to carry enough also for the return voyage. During his connection as engineer with the Australian Mail Company he worked out into a practical shape his conception of a "great ship," and in 1852 his scheme was laid before the Directors of the Eastern Steam Navigation Company. It was adopted, the projector was appointed their engineer, and after much time occupied about contracts and specifications, the work was begun in December 1853. Immense difficulties in the progress of construction caused delays from time to time. The operations of launching was several times attempted in vain; but at length the gigantic vessel, the since familiar "Great Eastern," was got afloat January 31, 1858. Much remained to complete the ship, and her engineer, overworked and worn out, broke down and did not live to see her sail on her first voyage. For the sake of his health he spent the winter of 1858–9 in Egypt, returning to England in May. He was on board his "great ship" September 25, 1859, and the same day was attacked with paralysis. The ship sailed on her first voyage on the 7th, and he died on the 15th of the month.

BRUNEL, Sir Marc Isambard (1769–1849), was born at Hacqueville, in Normandy. His family had for several centuries held a respectable station in the province, living as farmers and small landowners on the estate on which he was born, and numbering among its members Nicholas Poussin. He was educated at the seminary of St. Nicaise at Rouen, with the intention of his entering holy orders; but his predilection for the physical sciences was so strong, and his genius for mathematics and mechanics so decided, that, on the advice of the superior of the establishment, he was removed to follow a more congenial career. His father then destined him for the naval service, which he entered on the appointment of the Marshal de Castries, the minister of marine, and made several voyages to the West Indies. In this position, although only in his seventeenth year, his mechanical talents developed themselves actively on many occasions, and he surprised his captain by the production of a sextant of his manufacture with which he took his observations. On his return to France in 1792, he found the Revolution at its height, and like all who entertained royalist principles, he was compelled to seek safety in emigration. He effected his flight with considerable difficulty, and found refuge in the United States of America, where, driven by necessity to the exercise of his talents as a means of support, he followed the bent of his inclination and became a civil engineer and architect. His first engagement was on the survey of a tract of land near Lake Erie; he then became engaged in cutting canals, and was employed to erect an arsenal and cannon foundry at New York, where he applied several new and ingenious machines. His highly ornamental design for the House of Representatives at Washington was rejected, as being inconsistent with the simplicity of a republic; he was, however, engaged to design and superintend the construction of Bowery Theatre, New York, since destroyed by fire, the roof of which was peculiar and original.

The idea of substituting machinery for manual labor in the making of ship's blocks had long occupied his mind; and, in 1799, having matured his plans, he determined to visit England. Earl St. Vincent was at that time at the head of the Admiralty, and after the usual delays and difficulties, which were ultimately overcome chiefly through the powerful influence of his steady friend and patron Earl Spencer, aided by the recommendation of Brigadier-General Sir Samuel Bentham, who at once preceived and appreciated the merit of the machines and the talent of the inventor, the system was

adopted, and the machinery erected. The construction of the machines was entrusted to Mr. Henry Maudslay, whom Brunel had selected with true discrimination, and by whom he was ably assisted.

The block machinery was completed in 1806, and it was estimated that the economy produced by it in the first year was about £24,000, two-thirds of which sum was awarded to the ingenious inventor, who was soon after engaged by the Government to erect extensive saw-mills, on improved principles, at Chatham and Woolwich. He there suggested modifications of the systems of stacking and seasoning timber, which were afterwards carried into effect. Some time previously he had invented the ingenious little machine for winding cotton-thread into balls, which, simple as it may at first sight appear, has exercised great influence on the extension of the cotton trade.

He found time also to invent an instrument for combining the use of several pens, so as to produce simultaneously a number of copies of a manuscript; a simple and portable copying-machine; and a contrivance for making the small boxes used by druggists, which had been previously imported in large quantities from Holland. A nail-making machine also occupied his attention; and he discovered the system of giving the efflorescent appearance to tinfoil, by which it was fitted for ornamental purposes. Among other more important improvements may be mentioned that of cutting veneers by circular saws of large diameter, to which is mainly due the present extensive application of veneers of wood to ornamental furniture. About the year 1812 he had devised a scheme for making shoes by machinery; and, under the countenance of the duke of York, the shoes so manufactured, in consequence of their strength, cheapness, and durability, were introduced for the use of the army; but at the peace in 1815, manual labor becoming cheaper, and the demand for military equipments having ceased, the machines were laid aside.

The whole power of his mind, however, was for many years concentrated on one great object, the construction of the tunnel for communication from shore to shore beneath the bed of the River Thames. It is said that the original idea occurred to him, as applied to the Neva at St. Petersburg, in order to avoid the inconvenience arising from the floating ice,—a plan which he offered to the Emperor Alexander, on the occasion of his visit to England in 1814. Undismayed by previous signal failures in the attempt to construct a tunnel beneath the Thames, Brunel, confident in his own powers, persevered, and in 1824, under the auspices of the duke of Wellington, who always entertained a favorable view of the practicability of the scheme, a company was formed for its execution; and after numerous accidents and suspensions of the works, this great and novel undertaking was successfully accomplished, and the tunnel opened to the public in the year 1843.

BRUNELLESCHI, Filippo, (1377–1446), one of the greatest Italian architects, the reviver in Italy of the Roman or Classic style, was born at Florence in 1377. He died in 1446, and was buried in the great church of Santa Maria.

BRUNET, Jacques Charles, the eminent bibliographer, was born at Paris in 1780, and died in 1867.

BRUNI, Leonardo (1369–1444), author of the *History of Florence*, was an eminent scholar of the 15th century. He was born at Arezzo, and is generally known as L. Aretine. From 1427 to his death in 1444 he was chancellor to the republic of Florence.

BRÜNN, the capital of the Austrian margraviate of Moravia, is situated for the most part between two hills at the confluence of the Schwarzawa and Zwittawa, 69 miles N. of Vienna and 115 W.S.W. of Prague, with both of which it is connected by railway. On one of the hills known as the Spielberg stands the castle of the same name, which has long been used as a prison, and is famous for his connection with the patriotic Silvio Pellico, who was confined within its walls for about eight years. The old town, which is comparatively small, still retains some of its fortifications, but most of them have given place to promenades.

BRUNO, St., the founder of the Carthusian order of monks, was born at Cologne about the year 1030. In 1084, after some disputes with Manasses, the archbishop of Rheims, he retired with six companions into the desert of Chartreuse, where he built an oratory, with cells at a little distance from each other. Six years afterwards he went to Rome, where Urban II. pressed him to accept the archbishopric of Reggio. He declined the honor, and withdrew into the solitudes of Calabria, where he died October 6, 1101. He wrote treatises on the Psalms and on some of the Epistles, but none of his works are extant. His canonization took place in 1514, This saint is not to be confounded with others of the same name,—the bishop and apostle of the Prussians (970–1008), and the great archbishop of Cologne (925–968).

BRUNO, Giordano, the most genial and interesting of the Italian philosophers of the Renaissance, was born at Nola about the year 1548. Little is known of the life of this knight-errant of philosophy; the very date of his birth rests in obscurity. What we do know is attractive enough to render it matter of regret that the materials should be so scanty. In his fifteenth year he entered the order of the Dominicans at Naples, and is said to have composed a treatise on the ark of Noah. Why he should have submitted to the bonds of a discipline palpably unsuited to his fiery and vehement spirit, we cannot tell. He soon found the restraints intolerable and became an outcast from his church and a wanderer on the face of the earth. His opinions with regard to some of the Romish mysteries seem to have been too liberal to find toleration with so strict an order as that of St. Dominic. He was accused of impiety, and after enduring persecution for some years, he fled from Rome about 1576, and wandered through various cities, reaching Geneva in 1577. The home of Calvinism was no resting-place for him, and he travelled on through Lyons, Toulouse, and Montpellier, arriving at Paris in 1579. Everywhere he bent his irrepressible energies to the exposition of the new thoughts which were beginning to effect a revolution in the thinking world. He had drunk deeply of the very spirit of the Renaissance, the determination to open his eyes and see for himself this noble universe, unclouded by the mists of authoritative philosophy and church tradition. The discoveries of Copernicus, which were unhinging men's minds and teaching them to look upon their little world in a new light, were eagerly accepted by him, and he used them as the lever by which to push aside the antiquated system that had come down from Aristotle, and which was loaded with the weight of that great thinker's name. For Aristotle, indeed, he had a perfect hatred. Like Bacon and Telesius he infinitely preferred the older Greek philosophers, who had looked at nature for themselves, and whose speculations had more of reality in them. He had read widely and deeply, and in his own writings we come across many expressions familiar to us in earlier systems. Yet his philosophy is no eclecticism. He owed something to Lucretius, something to the Stoic nature-pantheism, something to Anaxagoras, to Heraclitus, to the Pythagoreans, and to the Neoplatonists, who were partially known to him; above all, he had studied deeply and profoundly the great German thinker Nicolas of Cusa, who was indeed a

speculative Copernicus. But his own system has a distinct unity and originality; it breathes throughout the fiery spirit of Bruno himself.

Bruno had been well received at Toulouse, where he had lectured on astronomy; even better fortune awaited him at Paris. He was offered a chair of philosophy, provided he would receive the Mass. He at once refused, but was permitted to deliver lectures. These seem to have been altogether devoted to expositions of a certain logical system which Bruno had taken up with great eagerness, the *Ars Magna* of Raymond Lully.

In the train and under the protection of the French ambassador, Michel de Castelnau, Bruno passed over in 1583 to England, where he resided for about two years. He was much disgusted with the brutality of the English manners, which he paints in no flattering colors, and he found in Oxford pedantry and superstition as rampant as at Geneva. But he indulged in extravagant eulogies of Elizabeth, and he formed the acquaintance at London of Sir Philip Sidney, Fulke Greville, and other eminent Englishmen. At Oxford he was allowed to hold a disputation with some learned doctors on the rival merits of the Copernican and so-called Aristotelian system of the universe, according to his own report, had an easy victory. The best of his works were written in the freedom of English social life.

In 1586 he returned to Paris with Castelnau, but was soon driven from his refuge, and we next find him at Marburg and Wittenberg, the headquarters of Lutheranism. There is a tradition that here or in England he embraced the Protestant faith; nothing in his writings would lead one to suppose so. Several works, chiefly logical, appeared during his stay at Wittenberg. In 1588 he went to Prague, then to Helmstadt. In 1591 he was at Frankfort, and published three important metaphysical works, *De Triplici Minimo et Mensura; De Monade, Numero, et Figara*; *De Immenso et Innumerabilibus*. He did not stay long at Prague, and we find him next at Zurich, whence he accepted an invitation to Venice. It was a rash step. The emissaries of the Inquisition were on his track; he was thrown into prison, and in 1593 was brought to Rome. Seven years were spent in confinement. On the 9th February 1600 he was excommunicated, and on the 17th was burned at the stake.

As has been said, for an estimation of Bruno's philosophy, the most important works are the two Italian dialogues and the three last-mentioned Latin treatises. It is not an easy matter to put his opinions into small compass, for the general form of exposition adopted by him, the dialogue, imposes a certain looseness on his own mode of thinking.

To Bruno as to all other great thinkers, the end of philosophy is the search for unity. Amid all the varying and contradictory phenomena of the universe there is something which gives coherence and intelligibility to them. Nor can this unity be something apart from the things; it must contain in itself the universe, which develops from it; it must be at once all and one.

The unity which sunders itself into the multiplicity of things which may be called *monas monadum*, each thing being a *monas* or self-existent, living being, a universe in itself. Of these monads the number is infinite. The soul of man is a thinking monad, and stands mid-way between the divine intelligence and the world of external things. As a portion of the divine life, the soul is immortal. Its highest function is the contemplation of the divine unity, discoverable under the manifold of objects.

Such is a brief summary of the principal positions of Bruno's philosophy. It seems quite clear that in the earlier works, particularly the two Italian dialogues, he approached more nearly the pantheistic view of things than in his later Latin treatises. The unity expounded at first is simply an *anima mundi*, a living universe, but not intelligent. There is a distinct development traceable towards the later and final form of his doctrine, in which the universe appears as the realization of the divine mind.

BRUNSWICK (German BRAUNSCHWEIG), a duchy and state of Northern Germany, forming part of the new German Empire, and included in the Prusso-German Zolverein. It consists of three larger and five smaller portions of territory. The principal part, containing the cities of Brunswick, Wolfenbüttel, and Helmstedt, is situated between Hanover and Prussia, to the S.E. of the former, and has its surface diversified by hill and plain. The part containing Holzminden and Gandersheim extends eastward from the Weser to Goslar, and is intersected by branches of the Hartz Mountains. The Blankenburg portion lies to the S.E. of the former, between Prussia, Anhalt, and Hanover, and is traversed by the Hartz. Of the smaller portions some form *enclaves* in Hanover and others in Prussia.

Brunswick has an area of 1424 English square miles, and is divided into six circles, comprehending thirteen cities, and between four and five hundred smaller towns and villages. Besides the cities already mentioned the most important are Schöningen, Seesen, and Schöppensted. The population numbers over 350,000.

The people of Brunswick are, with comparatively few exceptions, of Saxon race. The country people speak dialects of Low German, while High German is employed by the educated classes in the city.

BRUNSWICK, an important manufacturing city of Cumberland county, Me., twenty-seven miles north-northeast of Portland, on the right bank of the Androscoggin River, which, with a fall of about 50 feet in half-a-mile, supplies a large amount of water-power. Numerous industrial establishments have been erected, the most important being a cotton factory, flour-mills, and bleach-works. The lumber-trade, which was formerly of great extent, has been in great measure replaced by the building and owning of ships. Besides possessing an excellent system of graded schools, Brunswick is the seat of Bowdoin College, founded in 1802, and of the Maine Medical School, which dates from 1820. Population (1890), 5,998.

BRUNSWICK, a city of Glynn county, Ga., has grown into prominence within the past twenty years, and particularly has developed since 1886. It possesses what is described as the best deep-water harbor on the South Atlantic coast, and this has been greatly improved by the construction of jetties and by dredging. There is a depth of twenty-two feet on the bar at high water. The location of Brunswick, which has extensive railroad connections, gives it exceptional advantages as a shipping point. In 1888 the exports were valued at $8,000,00 . They included 90,000,000 feet of lumber, 150,000 barrels of resin, 60,000 casks of spirits of turpentine, and 130,000 bales of cotton. The city possesses water works, gas and electric light works, street railways, telegraph and telephone facilities, a fire department, and a system of graded schools. The manufacturing interests include nearly all branches of industry. There are two national banks, with a capital of $150,000. Rich deposits of phosphates exist in the neighborhood. Pop. 8,459.

BRUNTON, MRS. MARY (1778–1818), a novelist of the early part of the 19th century, was born on the 1st November 1778, in the island of Barra, Orkney. Mrs. Brunton died on the 19th December 1818. An unfinished tale, *Emmeline*, was published after her death by her husband, with a notice of her life.

BRUSHES AND BROOMS are implements com-

posed of a solid basis in which a tuft or tufts of hair or of a vegetable or other fibres are secured. They are mentioned by various ancient writers, as Homer, Sophocles, and Euripides. Perhaps the earliest notice is the figurative "besom of destruction." Brushes are of two kinds, simple and compound. The former consists of but one tuft, as hair pencils and painters' tools. The latter have more than one tuft. Brushes with the tufts placed side by side on flat boards, as plasterers' brushes, are called stock-brushes. The single tuft brushes, or pencils for artists, are made of the hair of the camel, badger, goat, and other animals for the smaller kind, and pig's bristles for the larger. The hairs for pencils are carefully arranged so as to form a point in the centre, and, when tied together, are passed into the wide end of the quill or metal tube and drawn out at the other end to the extent required. The small ends of the quills having been previously moistened, in drying contract and bind the hair. A similar effect is produced with metal tubes by compression. Compound brushes are — first, set or pan-work; second, drawn-work. Of the former, an example is the common house-broom, into the stock of which holes are drilled of the size wanted. The necessary quantity of bristles, hair, or fibre, to fill each hole is collected together, struck on the working bench at the thick ends, dipped into molten cement chiefly composed of pitch, bound round with thread, dipped again, and then set into a hole of the stock with a peculiar twisting motion only to be acquired by practice. In draw-brushes, of which those for shoes, teeth, nails, and clothes are examples, the holes are more neatly bored, and have smaller ones at the top communicating with the back of the brush, through which a bight or loop of wire passes from the back of the stock. Half the number of hairs or fibres needed for the tufts to fill the holes are passed into the bight of the wire, which is then pulled smartly so as to double the hairs and force them into the loop-hole as far as possible. With all brushes, when the holes have been properly filled, the ends of the fibres outside are cut with shears, either to an even length or such form as may be desired. The backs are then covered with veneer or other material to conceal the wire and other crudities of the work. A process called trepanning is adopted with some small brushes. The drawholes come out at some inconspicuous part of the stock, and the hairs or fibres having been properly secured, the holes are plugged up in order to conceal them as much as possible.

One of the greatest advances in the brushmaking of the present day is the Woodbury machine, an American invention for bunching, wiring, and inserting bristles in the stock.

BRUSSELS (French, *Bruxelles;* Flemish, *Brussel;* German, *Brüssel*), capital of Belgium and of the province of South Brabant, is situated on the small River Senne, about 50 miles from the sea, in the midst of a beautiful and fertile country, and is picturesquely built on the top and sides of a hill, which slopes down to the Senne. The general contour of the old town of Brussels is pentagonal, and is well defined by the boulevards, which occupy the site of the old fortifications; but extensive additions have been made, especially to the east and south, and present a very irregular outline.

Brussels may be considered to consist of two parts, each presenting characteristics peculiar to itself. The New Town or upper part of the city is dry and healthy, and contains a very large number of handsome buildings, both public and private. The lower part is the more ancient and interesting of the two, but is damp, and in summer unhealthy, from the exhalations of the river and the numerous canals. In the former are situated nearly all the public offices, the royal palace, the chamber of deputies, the residence of the foreign representatives, and the principal hotels. The latter contains the Hotel de Ville, and some of the best remains of the old Gothic architecture, and is the seat of nearly all the trade and commerce of the town. The facilities for commerce are very considerable. Though the Senne is not navigable itself, and has within the last few years been arched over to afford room for a new boulevard, it supplies water to some of the canals that intersect the lower portion of the city. By these canals Brussels comunicates with the great Belgian cities, Mechlin, Ghent, Bruges, and Antwerp on the north, and Charleroi on the south. It further enjoys the advantage of railway communication with France and Germany, and the chief towns of the Belgian dominions. The streets are for the most part well paved, well lighted, and the population exceeds 450,000.

The history of Brussels, though it does not date from so remote a period as that of other Flemish cities, can still be clearly traced back to the 7th century. At that time St. Gery, bishop of Cambray, built a chapel on one of the small islands in the river, and by his eloquence and piety soon attracted a large congregation. The site being well adapted for building, a hamlet soon sprung up, and speedily became a town, which in the 11th century was walled in and fortified. Though in commercial importance Brussels did not at this time equal Ghent or Bruges, its traffic in cloth was very considerable, and its workers in iron and steel were not surpassed by any in Europe. In the 14th century the various trades were incorporated into guilds, who regulated the taxes and other financial matters of the city, and drew up a code of municipal laws, in which the principle of trial by jury was admitted. These arrangements had scarcely been completed, when a dreadful fire visited the city and nearly burnt it to the ground. At the end of this century a general persecution of the Jews in Europe took place. In Brussels, many of them were put to death, and the value of the confiscated property amounted to upwards of half a million sterling. At the beginning of the 15th century, Brussels was again visited by a destructive fire, from the effects of which it speedily recovered by the patriotic exertions of its rulers, and soon became more distinguished than ever as a seat of learning, art, and science. In 1489, and again in 1587, it was visited by the plague, which, on the former of these occasions, carried off many thousands of the inhabitants. Its horrors were enhanced by the ensuing famine, which lasted for four years.

Brussels was highly favored by Charles V., who often resided in the city, and raised it to the rank of capital of the Netherlands. Under his son Philip II. it became the centre of the great revolutionary movement, which resulted in the independence of the United Province. In 1598 Brussels passed into the dominion of the Austrians, and soon began once more to prosper. In 1695 the French under Marshal Villeroy besieged Brussels, but were obliged to retire after doing much damage to the town; and in 1706 the city opened its gates to the duke of Marlborough. In 1746 it was again besieged by the French under Marshal Saxe, and after a siege of three weeks was obliged to surrender. In 1792 it fell into the hands of General Dumouriez, who being soon after defeated at Louvain, evacuated Brussels for a while, but again entered it in 1794. From that year till 1814, it remained in the possession of the French, as capital of the department of the Dyle. On the fall of Napoleon, Belgium and Holland were united into one kingdom under William of Nassau, and Brussels was the seat of government alternately with the Hague. In 1830, however, after a sanguinary conflict of four days

in the streets of the city, the Belgians declared their independence; and erecting their state into a separate kingdom, offered the crown to Leopold of Saxe-Coburg, whose long and peaceful reign (1831–1865) contributed greatly to the development of the resources of the country.

BRUTON, a market-town of England, in the county of Somerset, pleasantly situated in the valley of the Brue, about 10 miles S.S.W. of Frome by rail.

BRUTUS. The name of a distinguished plebeian family at Rome. The first who bore it was LUCIUS JUNIUS BRUTUS, one of the first two consuls, 509 B.C. According to the legends, his mother was the sister of Tarquinius "Superbus," the last of the Roman kings and at his father's death, his elder brother had been put to death by the reigning family in order to get possession of his wealth. Junius, the younger, owed his safety to his reputed dulness of intellect (whence his surname of Brutus), which character, however, he had assumed with a view both to his present security and future revenge. The opportunity came when Lucretia, wife of Collatinus, was outraged by Sextus Tarquinius; and he took a leading part, together with her husband and father, in expelling the family of the Tarquinii from Rome. He and Collatinus were therefore elected consuls,— or rather prætors, which was the original title. In a conspiracy formed afterwards for the restoration of the banished dynasty, the two sons of Brutus were found to be deeply implicated, and were executed by sentence of their father, and in his sight. The Etruscans of the cities of Veii and Tarquinii making an attempt to restore Tarquinius to the throne, a battle took place between them and the Romans, in which Junius Brutus engaged Aruns, son of the deposed king, in single combat on horseback, and both fell by each other's hand. The Roman matrons are said to have mourned a year for him, as "the avenger of woman's honor," and a statue was erected to him on the Capitol.

Many members of the family rose to eminence in the Republic, and are found, as plebeians, ranged on the popular side. The most distinguished of these was DECIUS JUNIUS BRUTUS, consul, 325 B.C.

In later times came MARCUS JUNIUS BRUTUS, a jurist of high authority, considered as one of the founders of Roman civil law, to whom Cicero dedicates his treatise called *Orator*. His son, of the same name, made a great reputation to the Roman bar, chiefly by undertaking prosecutions, and from the vehemence and bitterness of his speeches became known as "the Accuser."

DECIUS JUNIUS BRUTUS first served under Julius Cæsar in Gaul, and afterwards commanded his fleet, and was held by him in great honor and esteem. Nevertheless, whether from patriotism or from lower motives, he joined in the conspiracy against his patron, and, like his relative Marcus Junius Brutus, was one of his assassins. He afterwards resisted the attempt of Antony to obtain absolute power; and after heading the republican armies against him for some time with success, was deserted by his soldiers in Gaul, betrayed by one of the native chiefs, and put to death by order of Antony, 43 B.C.

Best known of all is MARCUS JUNIUS BRUTUS, son of a father of the same name (treacherously put to death by order of Pompey during the civil wars), and of Servilia, sister of Cato of Utica. Young Marcus was only eight years old at his father's death, and was educated with great care by his mother and uncles. He at first practiced as an advocate. In spite of his father's fate, he at first supported the cause of Pompey against Cæsar, but was pardoned by the latter after the victory of Pharsalia, and subsequently appointed by him to the government of Cisalpine Gaul. His justice and moderation won him honor from the provincials under his rule.

BRUTUS, or BRUTE, is asserted in the fabulous history of Geoffrey of Monmouth to have been the grandson of Æneas, and to have destroyed the race of giants in Britain, to which he gave his name, founding there the city of New Troy, afterward London.

BRÜX, a city in the circle of Saatz, in the Austrian kingdom of Bohemia, on the River Bila. Pop. 6,000.

BRUYÈRE, JEAN DE LA. See LA BRUYÈRE.

BRYAN, the county-seat of Williams county, Ohio, is situated fifty-three miles west-southwest of Toledo. It has a population of 5,000, a national bank, machine-shops and newspaper offices, and five churches. It has good railroad connections and some shipping trade.

BRYAN, the capital of Brazos county, Tex., is situated eighty-five miles east-northeast of Austin, and about six miles from the Brazos river. It is the seat of the Agricultural and Mechanical College of Texas, and does a large business in shipping cotton. Bryan contains two banks, a court house, chair and carriage factories, saw mills and grist mills, and two newspaper offices, and has a population (1890) of 4,800.

BRYANT, JACOB (1715–1804), a writer on theological and mythological subjects, was born at Plymouth in 1715. Bryant died in his eighty-ninth year, on November 14, 1804.

BRYAXIS, a Greek sculptor, the contemporary of Scopas and Praxiteles, with whom he took part in the sculptures of the mausoleum at Halicarnassus, about 345 B. C.

BRYDGES, SIR SAMUEL EGERTON (1762-1837), a miscellaneous writer, was born 30th November 1762. He died at Geneva in 1837. Sir Egerton was a most prolific author; he is said to have written 2,000 sonnets in one year. His first volume of poems was published in 1785; of his other numerous works, including novels, political pamphlets, and biographies, perhaps the most important are *Censura Literaria*, 10 vols. 1805–9.

BRZEZANY, a town of Austria, in Galicia, S.E. of Lembergo, on the river Zlota-Lipa. Pop., 10,000.

BUBASTIS, the great name of the Egyptian goddess Bast, supposed to hold the same place in the Egyptian Pantheon as Artemis or Diana. The triad of Memphis consisted of three gods — Ptah or Vulcan, the Greek Hephaistos; Bast, the wife of Ptah and mother by him of Nefer-Atum, or "the good Tum;" and Sexet, formerly called Pasht, the sister or antithesis of Bast. This last goddess was also called *Merienptah*, or "the beloved of Ptah." Although the names of Bast, Sexet, and Merienptah are written with different hieroglyphs, their types are exactly alike, being that of a lion-headed goddess having on her head the sun's disk entwined by an uræus. Sexet and Bast appear both to have personified fire acted upon by Ptah, the cosmic demiurgos, and Vulcan.

BUCCANEERS, a band of piratical adventurers of different nationalities united in their opposition to Spain, who maintained themselves chiefly in the Caribbean Seas during the 17th century.

The island of St. Domingo was one of several in the West Indies which had early in the 16th century been almost depopulated by the oppressive colonial policy of Spain. Along its coast there were several isolated establishments presided over by Spaniards, who were deprived of a free and convenient market for the produce of the soil by means of the monopolies imposed by the mother country. Accordingly English, Dutch, and French vessels were welcomed with eagerness, and their cargoes readily bought. The island, thinned of its former inhabitants, had become the home of immense herds of wild cattle, which multiplied with great rapidity;

and it became the habit of the hardy smuggler to provision his ship at St. Domingo. The natives still left upon the island were skilled in preserving flesh by means of fire and smoke at their little establishments called Boucans. The adventurers learned "boucanning" from the natives; and gradually Hispaniola became the scene of an extensive and illicit butcher trade. A sailor in those days when piracy abounded was expert with his weapons, and was almost a fighting man by trade. Spanish monopolies were the pest of every port from Mexico to Cape Horn; and the seamen who had sailed the Caribbean were filled with a natural hate of everything Spanish. The pleasures of a roving life gained upon them, while the monotony of its routine was broken by occasional skirmishes with the forces organized and led by Spanish officials. Out of such conditions arose the Buccaneer, alternately sailor and hunter, even occasionally a planter,—roving, bold, not overscrupulous, not unfrequently savage, with an intense detestation of the power and the representatives of Spain.

In the year 1625 indirect assistance and encouragement previously given culminated in a combined venture on behalf of the Buccaneers by the Governments of England and France. Each nation contributed a band of colonists, and selected the island of St. Christopher, in the West Indies, where the settlers of both nations were simultaneously planted. The English and French were, however, not over-friendly; and in 1629, after the retirement of several of the former to an adjoining island, the remaining colonists were surprised and partly dispersed by the arrival of a Spanish fleet of thirty-nine sail. Many were carried off, and threats were freely used as to the future settlement of the island. But on the departure of the fleet the scattered bands returned, and encouragement was given to their countrymen in St. Domingo. For buccaneering had now become a most profitable employment, operations were extended, and a storehouse secure from the attacks of the Spaniards was required. The small island of Tortuga lying to the N.W. of Hispaniola was seized for this purpose in 1630, converted into a magazine for the goods of the rivals, and made their headquarters, St. Domingo itself still continuing their lucrative hunting ground.

Spain was not indifferent to this proceeding, though she could not prudently take immediate action. Eight years, however, had not gone, ere, watching her opportunity when many Buccaneers were absent in the larger island on their ordinary pursuit, she attacked Tortuga, and massacred every settler she could seize. But the hunters to the number of 300 returned; and the Buccaneers, now distinctly seen to be in open hostility to the Spanish arms, began to receive recruits from every European trading nation, and for three-quarters of a century became the acknowledge scourge of the Spanish American trade and dominions.

France, throughout all this, had not been idle in watching over her own interests. She had named the Governor of St. Christopher "Governor-General for the French West India Islands," and in 1641 he took possession of Tortuga for the Crown of France, expelled all English from the island, and attempted the same with less success in St. Domingo. England had at home something vastly more important to attend to, and the Buccaneers had to maintain themselves as best they could,—now mainly on the sea.

In 1654 the Spaniards regained Tortuga from the French, into whose hands it again, however, fell after a period of six years. But this state of matters was, as may be readily conceived, too insecure even for these rovers, and they would speedily have succumbed to the perils of their mode of life, had not a refuge been found for them by the fortunate conquest of Jamaica in 1655 by the navy of Cromwell, on behalf of the English Commonwealth. These conquests were not made without the aid of the Buccaneers themselves. The taking and retaking of Tortuga by the French was always with the assistance of the roving community; and at the conquest of Jamaica the English navy had the same influence in its favor. The Buccaneers, in fact, by this time constituted a mercenary navy, ready for employment against the power of Spain by any other nation, on condition of sharing the plunder to be obtained; and they were noted for their daring, their cruelty, and their extraordinary skill in seamanship.

Their history now conveniently divides itself into three distinct epochs. The first of these extends from the period of their rise to the capture of Panama by Morgan in 1671, during which time their characteristic peculiarity as robbers was that they were hampered neither by Government aid nor, till near its close, by Government restriction. The second, from 1671 to the time of their greatest union and power, 1685, when the scene of their operations was no longer merely the Caribbean, but principally the whole range of the Pacific, from California to Chili. The third and last period extends from that year onwards; it was a time of disunion and disintegration, when the independence and rude honor of the previous periods had degenerated into unmitigated vice and brutality.

The proximate causes of the disappearance of this remarkable body of men are to be found in European policy. The accession of William of Orange to the English throne in 1689 had raised the jealousy of Louis XIV., and the war which ensued was protracted and severe.

BUCCARI, a royal free town of the Hungarian crown, situated in the comitat of Fiume, on a small bay of the Adriatic. Population, 2,500.

BUCCINO, a town of Italy in the province of Principato Citeriore, and district of Campagna, situated on the River Botta, which is here crossed by an ancient Roman bridge. Population, 6,500.

BUCENTAUR (Ital. *bucentoro*), the name of the state-galley in which the former Doges of Venice used to sail out every year on Ascension-day, in order, by sinking a ring into the sea, to wed it in token of perpetual sovereignty.

BUCEPHALUS (Gr. ox-head), the name of the favorite charger of Alexander the Great, was probably also the name of a peculiar breed of horses in Thessaly. —The town BUCEPHALIA, on the River Hydaspes (Jhelum), in India, was founded near the grave of Bucephalus, who died in India.

BUCH, LEOPOLD VON (1774–1853), an eminent German geologist and geographer, was born at Stolpe in Pomerania, April 25, 1774. In 1790 he studied at the mining school of Freiberg under the celebrated Werner, one of his fellow-students there being the illustrious Alexander Von Humboldt. At the age of twenty-three he published his *Attempt at a Mineralogical Description of Landeck*, and also an *Attempt at a Geognostic Description of Silesia.* He was at this time a zealous upholder of the Neptunian theory of his illustrious master. In 1799 he paid his first visit to Vesuvius, which he did not again see till 1805, when he was accompanied by Humboldt and Gay-Lussac. They had the good fortune to witness a remarkable eruption, which supplied Buch with data for refuting many erroneous ideas then entertained regarding the activity of volcanoes. The scientific results of his investigations he embodied in his *Geognostical Observations during Travels through Germany and Italy*, Berlin, 1802–9, 2 vols. 8 vo. From the south of Europe Von Buch repaired to the north, and spent two years among the

Scandinavian islands, making many important observations on the geography of plants, on climatology, and on geology. He also established the fact that the whole of Sweden is slowly but continuously rising above the level of the sea from Frederickshall to Abo. The details of these discoveries are given in his *Travels through Norway and Lapland*, Berlin, 1810. In 1815 he visited the Canary Islands in company with Christian Smith, the Norwegian botanist. His observations here convinced him that these and other islands of the Atlantic owed their existence to volcanic action of the most intense kind, and that the groups of islands in the South Sea are the remains of a pre-existing continent. The physical description of the Canary Islands was published at Berlin in 1825. His excursions he always undertook on foot, with a staff in his hand, and the large pockets of his over-coat filled with papers and geological instruments. Under this guise, the passer-by would not easily have recognized the man whom Humboldt pronounced the greatest geologist of his time. He died at Berlin on the 4th of March 1853. In addition to the works already mentioned Von Buch published others, of which we may specify the magnificent *Geological Map of Germany*, in 42 sheets, Berlin, 1832.

BUCHANAN, GEORGE (1506–1582), a celebrated Scottish historian and scholar, was born in February 1506. His father, a younger son of an old family, was the possessor of the farm of Moss, in the parish of Killearn, Stirlingshire, but he died at an early age, leaving his widow and children in poverty. George, the third son, is said to have attended Killearn school, but not much is known of his early education. In 1520 he was sent by his uncle to the university of Paris, where he prosecuted his studies with great ardor, and especially trained himself in poetical composition. In 1522 his uncle died, and Buchanan being thus unable to continue longer in Paris, returned to Scotland. After recovering from a severe illness, he joined the French auxiliaries who had been brought over by the duke of Albany, and took part in an unsuccessful inroad into England. In the following year he entered the university of St. Andrews, where he graduated as B.A. in 1525. He had gone there chiefly for the purpose of attending the celebrated John Major or Mair's lectures on logic; and when that teacher removed to Paris Buchanan accompanied him.

In 1560 or 1561 he returned to Scotland, and in April 1562 we find him installed as tutor to the young queen Mary, who was accustomed to read Livy with him daily. Buchanan now openly joined the Protestant or Reformed Church, and in 1566 was appointed by the earl of Murray principal of St. Leonard's College, St. Andrews. Two years before he had received from the queen the valuable gift of the revenue resulting from Crossraguel Abbey. He was thus in good circumstances, and his fame was steadily increasing So great, indeed, was his reputation for learning and administrative capacity that, though a layman, he was made moderator of the General Assembly in 1567. He had sat in the Assemblies from 1563.

While discharging the functions of royal tutor he also held other important offices. He was for a short time director of chancery, and then became lord privy seal, a post which entitled him to a seat in Parliament. He appears to have continued in this office for some years, at least till 1579. He died September 28, 1582.

BUCHANAN, JAMES (1791–1868), the fifteenth President of the United States, was born in Franklin county, Penn. His father, of the same name, was an Irishman who had eight years before emigrated from Donegal, and had become a well-to-do farmer. The son completed his education at Dickinson College, Carlisle, and took his degree in 1809. He then applied himself to the study of the law, was admitted to the bar in 1812, and settled at Lancaster in Pennsylvania. Notwithstanding his youth he soon gained considerable reputation, and with it a large and growing practice. In 1812 he joined a party of volunteers who, under the command of Judge Shippen, marched to the defence of Baltimore against the British; but their services were not wanted. He was at this time a zealous federalist. In 1814 he was elected member of the State Legislature, and constantly recommended the vigorous prosecution of the war. He was re-elected the following year; and in 1820 he became a member of Congress. Among his important early speeches were those on a deficiency in the military appropriation, in January 1822; on the bankrupt law, in March following, when he successfully opposed its extension to all citizens whether traders or not; and on the tariff question, on which he maintained that duties ought to be levied for revenue only. He uttered grave warnings against forming alliances with Mexico and the South American Republics, the condition of which was not calculated to inspire hopefulness, and insisted on the immense importance of Cuba, both commercially and strategically, to the United States. In 1828 he supported General Jackson at the Presidential election, and was at the same time re-elected to Congress. In the following year he succeeded Daniel Webster as head of the judiciary committee, and in this capacity conducted the trial on impeachment of Judge Peck,—one of the *causes célèbres* of American jurisprudence. On completing his fifth term, Buchanan retired from Congress (1831), and the next year was appointed envoy extraordinary and minister plenipotentiary to St. Petersburg. His mission is marked by the negotiation of the first treaty of commerce between the United States and Russia,—a treaty by which important privileges in the Baltic and the Black Sea were secured to the former. On his return from Russia he was elected United States senator; and he retained his seat till 1845. In the great struggle between President Jackson and the party headed by Mr. Calhoun, Buchanan warmly defended the president and his claims. In the first years of the movement against slavery, he saw the large results which were likely to follow, and desired to suppress the agitation in its infancy, and this by suppressing the discussion of the subject in Congress. He advocated the recognition by Congress of the independence of Texas, and at a later time its annexation. During the presidency of Van Buren, Buchanan greatly distinguished himself in support of the principal measure of the Government—the establishment of an independent treasury. In 1845 he was appointed Secretary of State under President Polk; and at the close of his term of office in 1849 he retired into private life. But four years later he accepted from President Pierce the post of United States Minister to Great Britain. In 1854 he was the originator and one of three members of the Ostend Conference on the subject of the acquisition of Cuba by the United States, and with his colleagues maintained that, on the principle of self-preservation from dangers of the gravest kind, an armed intervention by the United States and the capture of the island from the Spaniards would be justifiable. He returned from England in 1856, and the same year was elected, as Democratic candidate, to the Presidential chair. For a short time there seemed to be ground for hope that political passions and excitement would subside. But this hope was soon found to be fallacious. The troubles in Kansas and the large questions involved in them gave rise to new discussions and division. The president gave his support to the pro-slavery party, and dissensions grew during his administration to such an

extent that disruption and war between North and South followed the election of his successor, President Lincoln. From the close of his administration in 1860 till his death, Buchanan led a retired life. He died at Wheatland in Pennsylvania, June 1, 1868. Two years before his death he published an account of his administration.

BUCHAREST, BUKHOREST, BUKOREST, or as it is called by the inhabitants, BUCURESCI (that is, according to their own etymology, City of Joy), is the capital of Roumania, the residence of the king and the seat of a bishop. It is situated in a hollow on the River Dimbovitza, a tributary of the Danube, and occupies an area of more than 20 English square miles. The number of its cupolas and minarets, and the profusion of acacia, poplar, and other trees that fill the numerous spaces of unoccupied ground, give it a picturesque appearance from a distance. The population, which was 121,754 in 1859, had increased by 1870 to 200,000, and is now stated at 251,000.

Bucharest owes its foundation in the 13th century to Radel the Black of Wallachia. Burnt in 1595 by Sinan Pusha it was soon afterwards restored, but it was not till the 18th century that it appeared much in European history. It was frequently of importance in the contests for the neighboring provinces, which so often broke out between the Turks and their northern rivals Austria and Russia; and in 1812 it gave its name to the treaty by which Bessarabia and a third of Moldavia was ceded to the latter power. In the war of 1828 it was occupied by the Russians, who made it over to the prince of Wallachia in the following year. A rebellion against Prince Bibesko in 1848 brought both Turkish and Russian interference, and the city was again held by Russian troops from 1853 to 1854. On their departure an Austrian garrison took possession and remained till March 1857. In 1858 the international congress for the organization of the Danubian principalities was held in the city; and in 1861 the union of Wallachia and Moldavia was proclaimed. Prince Couza, the first ruler of the united provinces, was driven from his throne by an insurrection in Bucharest in 1866.

BUCHEZ, PHILIPPE JOSEPH BENJAMIN (1796-1865), French author and politician, was born at Matagne-la-Petite, in the department of the Ardennes. He finished his general education in Paris, and afterwards applied himself to the study of natural science and medicine. Hatred of the Government of the Restoration, and enthusiasm for democratic ideas, were at that time widely diffused among the young men of the schools of Paris, and these passions gained full possession of the mind of Buchez. With his friends Bazard and Flotard he founded, in 1821, a secret association — a system of French carbonarism — which spread rapidly and widely, and displayed itself in repeated attempts at revolution. In one of these attempts — the affair at Belfort — which cost General Berton, Colonel Caron, and four soldiers of Rochelle their lives, he was gravely compromised, although the jury which tried him did not find the evidence sufficient to warrant his condemnation. M. Buchez edited, along with M. Roux Laverne, the *Histoire parlementaire de la Revolution Française.*

BUCHNER, LUDWIG, physician and materialist philosopher, was born at Darmstadt, March 29, 1824. He became a lecturer at Tübingen University, and in 1355 published *Kraft und Stoff* (14th ed. 1876; Eng. trans. *Force and Matter*, 1870). His brother, GEORGE (1830–37), made a name for himself as a poet; and his sister, LUISE (1823–77), was a poetess and novelist.

BUCHU or BUKA LEAVES are the produce of several shrubby plants belonging to the genus *Barosma*, natives of the Cape of Good Hope. The principal species, *B. crenulata*, has leaves of a smooth leathery texture, oblongo-ovate in shape, from an inch to an inch and a half in length, with cerrulate or crenulate margins, on which as well as on the under side are conspicuous oil cells. Buchu leaves are chiefly used in European pharmacy in inflammatory disorders of the bladder and urinary organs; in the United States they are much employed by vendors of secret medicines. An infusion of the leaves is tonic, sudorific, and diuretic. At the Cape buchu has great reputation in gout and rheumatism, and as a stomachic stimulent; and in the form of buchu brandy and buchu vinegar it is applied as an embrocation in sprains, contusions, and rheumatic pains.

BUCK, a name distinctively appropriated to the adult male of the deer, the female of which is a *doe*.

BUCK-BEAN, or MARSH TREFOIL (*Menyanthes trifoliata*), a species of Gentianaceæ, widely distributed in all the colder parts of the northern hemisphere. It is easily recognized by its trefoiled leaves, and its small white or pink shaggy flowers.

BUCK-EYE, a chestnut, more especially applied to *Æ. Glabra* and its varieties. *Pavia rubra* and its varieties are known as red buck-eye, *Æ. flava* as sweet buck-eye, etc. Ohio is known as the "Buckeye State."

BÜCKEBURG, the capital of the principality of Schaumburg-Lippe, is situated at the foot of the Harrlberg on the River Aue, about six miles from Minden, on the Minden and Hanover railway.

BUCKINGHAM, COUNTY OF, BUCKINGHAMSHIRE, or BUCKS, an inland county of England, is bounded north by Northamptonshire, west by Oxfordshire, south by Berkshire, and east by Bedfordshire, Hertfordshire, and Middlesex. It has an area of 477,151 acres, and a population (1890) of 185,000. It is well supplied with railroads, two of the great trunk lines passing through it. The principal industry is agriculture, and large numbers of cattle are raised. The manufactures are not important, the chief being lace and straw plait.

BUCKINGHAM, the chief town of Buckinghamshire, a parliamentary and municipal borough and market-town in the hundred of the same name, fifty-eight miles by a branch of the North-Western railway from London, is situated on the left bank of the River Ouse, which surrounds it on every side but the north, and is crossed by three bridges. Population, 8,000.

BUCKINGHAM, GEORGE VILLIERS, DUKE OF (1592–1628), born August 20, 1592, was a younger son of Sir George Villiers, of Brooksby.

Since Salisbury's death James had taken the business of government upon himself. Robert Carr, who had lately become earl of Somerset, had had his head turned by his elevation. He had grown peevish toward his master, and had placed himself at the head of the party which was working for a close alliance with Spain.

The appearance of Villiers was therefore welcomed by all who had an interest in opposing the designs of Spain. With such powerful backing Villiers prospered at court, became a gentleman of the bed-chamber, was knighted, and received a pension of £1,000 a year. For some little time, however, Somerset's pre-eminence was maintained. But the charge of murder brought against him completed his ruin, and Villiers at once stepped into the place which he had vacated. In August, 1616, he was raised to the peerage as Viscount Villiers. In January, 1617, he became earl of Buckingham. In January, 1618, he was a marquis by the same title. Estates to the value of some £15,000 a year were settled on him. With the exception of the earl of Pembroke he was the richest nobleman in England.

The Parliament which met in 1621 broke out into a

loud outcry against the system of monopolies, from which Buckingham's brothers and dependants had drawn a profit, which was believed to be greater than it really was. At first he pleaded for a dissolution. But he was persuaded that it would be a wiser course to offer to put himself at the head of the movement, and when he came forward to say that he would rather sacrifice his brother than countenance wrong doing, he only gave utterance to those sentiments of patriotism which he really felt, when patriotism did not call upon him to sacrifice his own wishes. When, at a later period of the session, Bacon's case was brought forward, he made no attempt to meet the attack directly, but he did his best to shield the falling chancellor from the extreme penalties demanded by his adversaries. It was not long before he showed on how shallow a basis impulsive generosity rests. Bacon clung, after his fall, to the possession of York House, the home of his childhood. Buckingham desired to purchase it, and he stood in the way of the king's favor to the great philosopher till he had consented to sell him the house.

In the winter of 1621, and the succeeding year Buckingham was entirely in Gondomar's hands; and it was only with some difficulty that in May 1622 Laud argued him out of a resolution to declare himself a Roman Catholic. In December 1621 he actively supported the dissolution of Parliament, and there can be little doubt that when the Spanish ambassador left England the following May, he had come to an understanding with Buckingham that the Prince of Wales should visit Madrid the next year, on which occasion the Spanish Court hoped to effect his conversion to the Roman Catholic Church before giving him the hand of the Infanta Maria. By this time Buckingham had gained over Charles an influence which he never lost; and when he carried him in February 1623 to Madrid it was with the hope of effecting a great political object. The Palatinate had gradually fallen into the possession of Spain and of the Catholic League, and the two young men fondly expected that the grave statesmen of the Spanish monarchy would break with their co-religionists in Germany in order to present the Palatinate as a marriage gift to Charles.

It was not long before it became plain to Buckingham that the Palatinate was not to be gained at Madrid. From that time he urged the prince to return. Charles was not to be persuaded so soon to relinquish the hope of carrying his bride home with him to England. But at last his eyes were opened, and when the two young men sailed together from Santander in September, it was with the final resolution to break entirely with Spain.

James had gratified his favorite in his absence by raising him to the highest title known in the English peerage. But the splendor which gathered round the new duke was owing to another source than James's favor. He had put himself at the head of the popular movement against Spain, and when James, acknowledging sorely against his will that the Palatinate could only be recovered by force, summoned the Parliament which met in February 1624, Buckingham, with the help of the heir apparent, took up an independent political position. James was half driven, half persuaded to declare all negotiations with Spain at an end. For the moment Buckingham was the most popular man in England.

Buckingham, for Buckingham was now virtually the ruler of England, had thus to commence war without money. He prepared to throw 12,000 Englishmen, under a German adventurer, Count Mansfield, through France into the Palatinate. The French insisted that he should march through Holland. It mattered little which way he took. Without provisions, and without money to buy them, the wretched troops sickened and died in the winter frosts. Buckingham's first military enterprise ended in a disastrous failure.

Buckingham had many other schemes in his teeming brain. He had offered to send aid to Christian IV., king of Denmark, who was proposing to make war in Germany, and had also a plan for sending an English fleet to attack Genoa the ally of Spain, and a plan for sending an English fleet to attack Spain itself.

Before these schemes could be carried into operation James died on March 27, 1625. The new king and Buckingham were at one in their aims and objects. Both were anxious to distinguish themselves by the chastisement of Spain, and the recovery of the Palatinate. Both were young and inexperienced. But Charles, obstinate when his mind was made up, was sluggish in action and without fertility in ideas, and he had long submitted his mind to the versatile and brilliant favorite, who was never at a loss what to do next, and who unrolled before his eyes visions of endless possibilities in the future. Buckingham was sent over to Paris to urge upon the French Court the importance of converting its alliance into active co-operation.

There was a difficulty in the way. The Huguenots of Rochelle were in rebellion, and James had promised the aid of English ships to suppress that rebellion. Buckingham, who seems at first to have consented to the scheme, was anxious to mediate peace between the king of France and his subjects, which would set him free from foreign enterprises, and save Charles from compromising himself with his Parliament by the appearance of English ships in an attack upon Protestants. When he returned his main demands were refused, but hopes were given him that peace would be made with the Huguenots. On his way through France he had the insolence to make love to the Queen of France. Unless the testimony of his warmest admirers is false, he had convinced himself by a sad experience that the women found it difficult to resist his seductive tongue and handsome face.

Soon after his return Parliament was opened. It would have been hard for Charles to pass through the session with credit. Under Buckingham's guidance he had entered into engagements involving an enormous expenditure, and these engagements involved a war on the Continent, which had never been popular in the House of Commons. The Commons, too, suspected the marriage treaty contained engagements of which they disapproved. They asked for the full execution of the laws against the Catholics, and voted but little money in return. Charles adjourned then to Oxford, that he might plead with them more persuasively. Before they met there, the English ships had found their way into the hands of the French, to be used against Rochelle. The Commons met in an ill-humor. They had no confidence in Buckingham, and they asked that persons whom they could trust should be admitted to the king's council before they would vote a penny. Charles stood by his minister, and on August 12 he dissolved his first Parliament.

Buckingham and his master set themselves to work to conquer public opinion.

When Charles's second Parliament met on February 6, 1626, it was not long before, under Eliot's guidance, it asked for Buckingham's punishment. He was impeached before the House of Lords on a long string of charges. Many of these charges were exaggerated, and some were untrue. But as long as Charles refused to listen to the complaints of his minister's incompetency, the only way in which the Commons could reach him was by bringing criminal charges against him. Charles dissolved his second Parliament as he had dissolved his first.

To find money was the great difficulty. Recourse was had to a forced loan, and men were thrown into prison for refusing to pay it. There had been disasters to Charles's allies in Germany, and a French war was impending in addition to the Spanish one. The French were roused to reprisals by Charles's persistence in seizing French vessels. Unwilling to leave Rochelle open to the entrance of an English fleet, Richelieu laid siege to that stronghold of the French Huguenots. On June 27, 1627, Buckingham sailed from Portsmouth at the head of a numerous fleet, and a considerable land force, to relieve the besieged city.

His first enterprise was the siege of the fort of St. Martin's, on the Isle of Rhé. The ground was hard, and the siege operations were converted into a blockade. On September 27, the defenders of the fort announced their readiness to surrender the next morning. In the night a fresh gale brought over a flotilla of French provision boats, which dashed through the English blockading squadron. The fort was provisioned for two months more. Buckingham resolved to struggle on, and sent for reinforcements from England. Charles would gladly have answered to his call. But England had long since ceased to care for the war. There was no money in the exchequer, no enthusiasm in the nation to supply the want. Before the reinforcements could arrive the French had thrown a superior force upon the island, and Buckingham was driven to retreat with heavy loss.

His spirits were as buoyant as ever. Ill luck, or the misconduct of others, was the cause of his failure. He had new plans for carrying on the war. But the Parliament which met on March 17, 1628, was resolved to exact from the king an obligation to refrain from encroaching for the future on the liberties of his subjects.

In the parliamentary battle, which ended in the concession of the Petition of Right, Buckingham took an active share as a member of the House of Lords. He resisted as long as it was possible to resist the demand of the Commons, that the king should abandon his claim to imprison without showing cause. When the first unsatisfactory answer to the petition was made by the king on June 2, the Commons suspected, probably with truth, that it had been dictated by Buckingham. They prepared a remonstrance on the state of the nation, and Coke at last named the duke as the cause of all the misfortunes that had occurred. Though on June 7 the king granted a satisfactory answer to the petition, the Commons proceeded with their remonstrance, and on June 11 they informed the king that Buckingham had "so abused his powers," that it was no longer safe to continue him in office.

Once more Charles refused to surrender Buckingham, and a few days later he prorogued Parliament in anger. The popular feeling was greatly excited. Lampoons circulated freely from hand to hand, and Dr. Lambee, a quack doctor, who dabbled in astrology, and was believed to exercise influence over Buckingham, was murdered in the streets of London. Rude doggerel lines announced that the duke should share the doctor's fate.

With the clouds gathering round him, Buckingham went down to Portsmouth to take the command of one final expedition for the relief of Rochelle. For the first time even he was beginning to acknowledge that he had undertaken a task beyond his powers. There was a force of inertia in the officials which resisted his efforts to spur them on to an enterprise which they believed to be doomed to failure. He entered gladly into a scheme of pacification proposed by the Venetian ambassador. But before he could know whether there was to be peace or war, the knife of an assassin put an end to his career. John Felton, who had served at Rhé, had been disappointed of promotion, and had not been paid that which was due to him for his services, read the declaration of the Commons that Buckingham was a public enemy, and eagerly caught at the excuse for revenging his private wrongs under cover of those of his country. Waiting, on the morning of August 23, beside the door of the room in which Buckingham was breakfasting, he stabbed him to the heart as he came out. The man who for four years had been practically the ruler of England fell dead upon the ground. He had only completed his thirty-sixth year three days before.

BUCKINGHAM, George Villiers, Second Duke of (1627–1688), was born at London January 30, 1627, about a year and a half before the murder of his father. He was educated at Cambridge, returned from a Continental tour on the outbreak of the civil war, and at once threw in his lot with the king. The detachment in which he held a command was defeated at Nonsuch, and he with difficulty effected an escape from England. His estates were confiscated by Parliament, and part of them were bestowed upon Fairfax. He returned with Charles II. and took part in the battle of Worcester, after which he again fled. About 1657 he returned secretly to England and married one of Fairfax's daughters. Arrested by order of Cromwell, he was thrown into the Tower and kept in confinement for some time. After the Restoration he recovered his estates, and rose to high favor with Charles II. He was a man of great talent, but utterly without principle, versatile and whimsical to the last degree.

He died on the 17th April 1688, in the house of one of his tenants, having been seized with a fever produced by sitting on the damp ground after being heated with riding.

BUCKINGHAMSHIRE, John Sheffield, Duke of (1649-1721), was the son of Edmund, second earl of Mulgrave, and succeeded to that title on his father's death in 1658. He died 24th February 1721. His works consist of two tragedies, a few small poems of little value, and of the rhymed *Essay on Poetry*. His *Essay on Satire* is said to have been revised by Dryden, and is sometimes printed among the latter's works. The *Essay on Poetry* was highly praised by Addison, Pope, and other critics of the time, but the praise must have been due to the rank and not to the abilities of the poet. His works were published in 1723.

BUCKLAND, The Very Rev. William (1784–1856), the eldest son of the Rev. Charles Buckland, rector of Templeton and Trusham, in the county of Devon, was born at Axminster in Devonshire, 12th March 1784. He was educated at the ancient Grammar School of Tiverton, and at Winchester, and in 1801 was elected by examination a scholar of Corpus Christi College, Oxford. In 1805 he proceeded to the degree of B.A., and in 1808 he was elected a fellow of his college. From early boyhood he had exhibited a strong taste for natural science; his innate bias was at this time stimulated by the lectures of Dr. Kidd on mineralogy and chemistry, and his attention was thus more especially drawn to the then infant science of geology. He now devoted himself systematically to an examination of the geological structure of Great Britain, making many excursions on horseback, and investigating both the order of superposition of the strata and the characters of the organic remains which they contained. As a teacher he possessed powers of the highest order; and the university of Oxford is enriched by the large and valuable private collections, illustrative of geology and mineralogy, which he amassed in the course of his active life, and which are now known as the "Buckland Museum." It is, however, upon his published scientific works that Dr. Buckland's great reputation is

mainly based. His first great work was the well known *Reliquiæ Diluvianæ, or Observations on the Organic Remains attesting the Action of a Universal Deluge*, published in 1823, in which he supplemented his former observations on the remains of extinct animals discovered in the cavern of Kirkdale in Yorkshire, and expounded his views as to the bearing of these and similar cases on the Biblical account of the Deluge.

BUCKLE, Henry Thomas (1821–1862), the son of Thomas Henry Buckle, a wealthy London merchant, and his wife, Jane Middleton, was born at Lee, in Kent, November 24, 1821. He was a feeble and delicate child, who took no pleasure in the society and amusements of other children, but who loved to sit for hours hearing his mother read the Bible, and whose own love of reading was called forth by a present from her of the *Arabian Nights*. He gained his first distinctions not in literature but in chess, being reputed, before he was twenty, one of the first players in the world. His father died in January 1840, and in July of that year his mother, his unmarried sister, and himself left England and traveled in France, Italy, and Germany for a year, during which time, as also after his return home, he studied diligently modern languages. From the spring of 1843 to that of 1844 was likewise spent on the Continent. He had by that time formed the resolution to direct all his reading and to devote all his energies to the preparation of some great historical work, and during the next seventeen years, with rare self-denial, he bestowed ten hours each day in working out his purpose. At first he contemplated a history of the Middle Ages, but by 1851 he had decided in favor of a history of civilization. The six years which followed were occupied in writing and rewriting, altering and revising the first volume, which appeared in June 1857. It at once made its author a literary and even social celebrity,—the lion of a London season. On 19th March 1858 he delivered at the Royal Institution a lecture on the *Influence of Women on the Progress of Knowledge*, which was published in *Fraser's Magazine* for April 1858, whence it has been reprinted in the first volume of the *Miscellaneous and Posthumous Works*. The professed aim of this his first and only lecture in public was to prove that women naturally prefer the deductive method to the inductive, and that by encouraging in man deductive habits of thought, they have rendered an immense, though unconscious, service to the progress of knowledge, by preventing men of science from being as exclusively inductive as they would otherwise be; but the facts and reasons adduced in support of these propositions were few and indecisive, the discourse being in the main simply an eloquent general pleading for the combination of deduction and induction in scientific investigation.

The fame of Buckle must rest wholly on his so-called *History of Civilization in England*. It is a gigantic unfinished introduction, of which the plan was, first, to state the general principles of the author's method and the general laws which govern the course of human progress; and secondly, to exemplify these principles and laws through the histories of certain nations characterized by prominent and peculiar features,—Spain and Scotland, the United States and Germany. Its chief ideas are,—1. That owing partly to the want of ability in historians, and partly to the complexity of social phenomena, extremely little has as yet been done towards discovering the principles which govern the character and destiny of nations, or, in other words, towards establishing a science of history; 2. That while the theological dogma of predestination is a barren hypothesis beyond the province of knowledge, and the metaphysical dogma of free will rests on an erroneous belief. Human actions are governed by laws.

BUCKLES, metal instruments, consisting of a rim and tongue, used for fastening straps or bands in dress, harness, etc.

BUCKRAM. This name is now applied to a coarse, open-woven fabric of cotton or linen made very stiff with size. It is used for the framework of ladies' bonnets, for the inside of belts and collars of dresses, and for bookbinding. The buckram of olden times was an entirely different kind of stuff.

BUCKSKIN is a soft leather made of deerskin; also a strong, twilled woolen cloth, cropped of nap and carefully finished.

BUCKTHORN (*Rhamnus*), a genus of Rhamnaceæ, including sixty species, all shrubs or trees, widely distributed through temperate and tropical regions, but absent from Australia. The common buckthorn (*R. carthartícus*) is characterized by its spinous and cross-like branchlets, serrate leaves, and yellow-green dicœcious flowers. The alder buckthorn, or breaking buckthorn (*R. frangula*), also (wrongly) called black alder, or berry-bearing alder, is spineless, with oval entire leaves, and small, whitish, axillary flowers. Dyer's buckthorn (*R. infectorius*) is a low shrub, abundant in the south of Europe, whose unripe fruit yields a brilliant yellow dye. Of North American buckthorns there are, besides the common one, six or more peculiar species. The most important is the *R. purshiana* of the northwest Pacific slope (especially southwest Oregon), the cathartic bark of which is used in medicine under the name of cascara sagrada. The sea buckthorn (*Hippophaë rhamnoides*) is a shrub of a different genus and order (*Eleagneæ.*) It is occasionally planted as an ornamental shrub.

BUCKWHEAT, the seeds of various species of *Fagopyrum*, chiefly *F. esculentum*, an herbaceous plant, native of central Asia, but cultivated in Europe for its seeds. It is used for food in this country.

BUCYRUS, the county seat of Crawford county, Ohio, is situated on the Sandusky river, twelve miles from Crestline. It has a population of 6,000, and considerable manufactures of machinery, railroad cars and engines, and agricultural implements. It contains a court-house, two banks, nine churches, three newspaper offices, and has direct railroad communication and telegraph facilities.

BUD. The bud is the rudiment of an axis with its appendages. Starting with the seed, we may trace the continued upgrowth of the primeval bud or plumule in germination. In some hardy shrubs and trees the buds are quite inconspicuous in winter, being so minute as to be hidden under an apical coating of bark (*e. g.*, Taxodium, Philadelphus); generally, however, the buds are well formed before autumn, and are thus fully exposed to the severity of winter. Budding is a process in the propagation of ligneous plants analogous to grafting. It consists in transferring a bud from one shoot to another on the same or different plants. Shield-budding is preferred for fruit trees with gummy sap, such as the plum, cherry, peach and apricot. On account of the uncertainty of its results, budding has been largely superseded by grafting.

BUDA (German, Ofen), a royal free town of the kingdom of Hungary, on the right bank of the Danube, opposite the capital, Pesth, with which it has been united since 1849 by a suspension bridge.

BUDÆUS, or Bude, Gillaume (1467–1540), descended of an ancient and illustrious family, was a native of Paris, where he died in 1540.

BUDAUN, a district of British India, in the Rohilkhand division under the jurisdiction of the Lieutenant-Governor of the North-Western Provinces, bounded

on the N. by the British district of Moradabad, on the N.E. by the district of Bareilly, on the S.E. by that of Shâhjahânpur, on the S. by Farukhabad and Mainpuri, and on the west by Aligarh and Bulandshahr.

BUDDÆUS, JOHN FRANCIS (1667–1729), a celebrated Lutheran divine, and one of the most learned men Germany has produced, was born at Anklam, a town of Pomerania, where his father was minister. He studied with great distinction at Greifswald and at Wittenberg, and having attained to eminence in languages, theology, and history, was appointed Greek and Latin professor at Coburg, afterwards professor of ethical science and politics in the university of Halle, and at length, in 1705, professor of divinity at Jena, where, after having acquired a very great reputation, he died in 1729.

BUDDHISM is the name of a religion which formerly prevailed through a large part of India, and is now professed by the inhabitants of Ceylon, Siam, and Burma (the southern Buddhists), and of Nepāl, Tibet, China, and Japan (the northern Buddhists). It arose out of the philosophical and ethical teachings of Siddhārtha Gautama, the eldest son of Suddhōdana, who was rāja in Kapilavastu, and chief of the tribe of the Sākyas, an Aryan clan seated during the 5th century B.C. on the banks of the Kohāna, about 100 miles N. of the city of Benāres, and about 50 miles S. of the foot of the Himālaya Mountains.

We are accustomed to find the legendary and the miraculous gathering, like a halo, around the early history of religious leaders, until the sober truth runs the risk of being altogether neglected for the glittering and edifying falsehood. Buddha has not escaped the fate which has befallen the founders of other religions; and as late as the year 1854 the late Professor Wilson of Oxford read a paper before the Royal Asiatic Society of London in which he maintained that the supposed life of Buddha was a myth, and "Buddha himself merely an imaginary being." No one, however, would now support this view; and it is admitted that, under the mass of miraculous tales which have been handed down regarding him, there is a basis of truth already sufficiently clear to render possible an intelligible history, which will become clearer and clearer as older and better authorities are made accessible.

The chief sources of our at present available information regarding the life of Buddha are — 1, The *Manual of Buddhism*, published in 1860 by the Rev. R. Spence Hardy, compiled from various *Singhalese* sources; 2, The translation into English (published by Bishop Bigandet in Rangoon in 1858 under the title *Legend of the Burmese Buddha*) of the translation into *Burmese* of a *Pāli* work called by Bigandet *Mallalingara-Wouttoo*, of unknown author and date; 3, the original *Pāli* text of the Jātaka commentary, written in Ceylon in the 5th century A.D., edited in 1875 by Mr. Fausböll of Copenhagen (this is our best authority); 4, Mr. Beal's recently published translation into English (under the title *The Romantic Legend of Sakya Buddha*) of a translation into *Chinese*, made in the 6th century A.D., of a *Sanskrit* work, called *Adhinishkramana Sūtra*; 5, A *Sanskrit* work called the *Lalita Vistara*, undoubtedly very old, but of unknown author or date, the text of which has appeared in the *Bibliotheca Indica* in Calcutta, and a translation through the Tibetan into French by M. Foucaux in Paris (1848). The first three books represent the views of the southern Buddhists, whose sacred books are in Pāli, and last the two those of the northern Buddhists, whose sacred books are in Sanskrit. The former are much the more reliable and complete, the latter being inflated to a great length by absurd and miraculous legends, the kernel of fact at the centre of which agrees in the main with the account found in the former. These have their miraculous incidents too, the relation of the Sanskrit sources to the Pāli resembling in many respects that of the apocryphal gospels to the New Testament.

As there has been little or no intercommunication between the two churches since the 3d century B.C., great reliance may reasonably be placed on those statements in which they agree; not indeed as a proof of the actual facts of the Buddha's biography, but as giving us the belief of the early Buddhists concerning it. It is to be regretted that the books we have to compare are, as yet, of so comparatively modern a date; but, after the respective canons had once been fixed, it is not likely that translators would deviate very materially from the text of the biographies, so sacred to them, with which they had to deal. The southern canon — usually called the Tripitake or three collections — was finally determined about 250 B.C., at the Council of Pātaliputra on the Ganges, held under the auspices of the Emperor Asoka the Great; and the northern about the commencement of our era at the Council of Jālandhara, in Kashmīr, held under Kaāishka, a powerful Indo-Scythian monarch. To the former belongs the Buddhavansa, or History of the Buddhas, on which, together with its commentary, our three southern accounts are chiefly based; to the latter belongs the Lalita Vistara, the last of the authorities mentioned above.

At the end of the 6th century B.C. the Aryan tribes from the Panjāb had long been settled on the banks of the Ganges; the pride of race had put an impassable barrier between them and the conquered aborigines; the pride of birth had built up another between the chiefs or nobles and the mass of the Aryan people; and the superstitious fears of all yielded to the priesthood an unquestioned and profitable supremacy; while the exigencies of occupation and the ties of family had further separated each class into smaller communities, until the whole nation had become gradually bound by an iron system of caste.

The population was most thickly scattered within 150 miles of Benares, which was already celebrated as a seat of piety and learning; and it was at Kapilavastu, a few days' journey north of Benares, that in the 5th century B.C. a rāja Suddhōdana ruled over a tribe who were called the Sākyas, and who from their well-watered rice-fields could see the giant Himālayas looming up against the clear blue of the Indian sky. Their supplies of water were drawn from the River Rohini, the modern Kohāna; and though the use of the river was in times of drought the cause of disputes between the Sākyas and the neighboring Koliyans, the two clans were then at peace; and two daughters of the rāja of Koli, which was only 11 miles east of Kapilavastu, were the principal wives of Suddhōdana. Both were childless, and great was the rejoicing when, in about the forty-fifth year of her age, the eldest sister, Mahāmāyā, promised her husband a son. In due time she started with the intention of being confined at her parent's home, but the party halting on the way under the shade of some lofty satin trees, in a pleasant garden called Lumbini on the river side, her son, the future Buddha, was there unexpectedly born. The marvellous stories which gathered round the belief in his voluntary incarnation and immaculate conception, the miracles at his birth, the prophecies of the aged saint at his formal presentation to his father, and how nature altered her course to keep a shadow over his cradle, whilst the sages from afar came and worshipped him, will be referred to hereafter under the head of later Buddhism.

He was in after years more generally known by his family name of Gautama, but his individual name was

Siddhārtha. When he was nineteen years old he was married to his cousin Yasodharā, daughter of the Koliyan rāja, and gave himself up to a life of Oriental luxury and delight. Soon after this, according to the southern account, his relations formally complained to the rāja that his son lived entirely for pleasure without learning anything, and asked what they should do under such a leader if war arose. Gautama, hearing of this, is said to have appointed a day for a trial of his prowess, and by defeating all his competitors in manly exercise, and surpassing even his teachers in knowledge, to have won back the good opinion of the disaffected Sākyas. This is the solitary record of his youth; we hear nothing more till, in his twenty-ninth year, it is related that, driving to his pleasure-grounds one day, he was struck by the sight of of a man utterly broken down by age, on another occasion by the sight of a man suffering from a loathsome disease, and some months after by the horrible sight of a decomposing corpse. Each time his charioteer, whose name was Channa, told him that such was the fate of all living beings. Soon after he saw an ascetic walking in a calm and dignified manner, and asking who that was, was told by his charioteer the character and aims of the ascetic. The different accounts of this vary so much as to cast great doubts on their accuracy. It is, however, clear from what follows, that about this time the mind of the young Rājput must, from some cause or other, have been deeply stirred. Many an earnest heart full of disappointment or enthusiasm has gone through a similar struggle, has learnt to look upon all earthly gains and hopes as worse than vanity, has envied the calm life of the cloister, troubled by none of these things, and has longed for an opportunity of entire self-surrender to abstinence and meditation.

Subjectively, though not objectively, these visions may be supposed to have appeared to Gautama. After seeing the last of them, he is said to have spent the afternoon in his pleasure-grounds by the river side; and having bathed, to have entered his chariot in order to return home. Just then a messenger arrived with the news that his wife Yasodharā had given birth to a son, his only child. "This," said Gautama quietly, "is a new and strong tie I shall have to break." But the people of Kapilavastu were greatly delighted at the birth of the young heir, the rāja's only grandson. Gautama's return became an ovation; musicians preceded and followed his chariot, while shouts of joy and triumph fell on his ear. Among these sounds one especially attracted his attention. It was the voice of a young girl, his cousin, who sang a stanza, saying, "Happy the father, happy the mother, happy the wife of such a son and husband." In the word "happy" lay a double meaning; it meant also freed from the chains of existence, delivered, *saved*. Grateful to one who, at such a time, reminded him of his highest hopes, Gautama, to whom such things had no longer any value, took off his collar of pearls and sent it to her. She imagined this was the beginning of a courtship, and began to build day-dreams about becoming his principal wife, but he took no further notice of her and passed on. That evening the dancing-girls came to go through the Nātch dances, then as now so common on festive occasions in many parts of India; but he paid them no attention, and gradually fell into an uneasy slumber. At midnight he awoke; the dancing-girls were lying in the ante-room; an overpowering loathing filled his soul. He arose instantly with a mind fully made up, "roused into activity," says the Singhalese chronicle, "like a man who is told that his house is on fire." He called out to know who was on guard; and finding it was his charioteer Channa, he told him to saddle his horse. While Channa was gone Siddhārtha gently opened the door of the room where Yasodharā was sleeping, surrounded by flowers, with one hand on the head of their child. He had hoped to take the babe in his arms for the last time before he went, but now he stood for a few moments irresolute on the threshold looking at them. At last the fear of awakening Yasodharā prevailed; he tore himself away, promising himself to return to them as soon as his mind had become clear, as soon as he had become a Buddha, —*i.e.* Enlightened,—and then he could return to them not only as husband and father, but as teacher and savior. It is said to have been broad moonlight on the full moon of the month of July, when the young chief, with Channa as his sole companion, leaving his father's home, his wealth and power, his wife and child behind him—went out into the wilderness to become a penniless and despised student, and a homeless wanderer. This is the circumstance which has given its name to the Sanskrit work, the fourth of those mentioned above, of which Mr. Beal has given us a version through the Chinese, the *Mahabhinishkramana Sūtra*, or *Sūtra of the Great Renunciation*.

Disenchanted and dissatisfied, Gautama had given up all that most men value, to seek peace in secluded study and self-denial. Failing to attain his object by learning the wisdom of others, and living the simple life of a student, he had devoted himself to that intense meditation and penance which all philosophers then said would raise men above the gods. Still unsatisfied, longing always for a certainty that seemed ever just beyond his grasp, he had added vigil to vigil, and penance to penance, until at last, when to the wondering view of others he had become more than a saint, his bodily strength and his indomitable resolution and faith had together suddenly and completely broken down. Then, when the sympathy of others would have been most welcome, he found his friends falling away from him, and his disciples leaving him for other teachers. Soon after, if not on the very day when his followers had left him, he wandered out towards the banks of the Nairanjara, receiving his morning meal from the hands of Sujātā, the daughter of a neighboring villager, and set himself down to eat it under the shadow of a large tree (a *Ficus religiosa*), to be known from that time as the sacred Bo tree or tree of wisdom. There he remained through the long hours of that day debating with himself what next to do. All his old temptations came back upon him with renewed force. For years he had looked at all earthly good through the medium of a philosophy which taught him that it, without exception, contained within itself the seeds of bitterness, and was altogether worthless and impermanent; but now to his wavering faith the sweet delights of home and love, the charms of wealth and power, began to show themselves in a different light, and glow again with attractive colors. He doubted, and agonized in his doubt; but as the sun set, the religious side of his nature had won the victory, and seems to have come out even purified from the struggle. He had become clear in his mind, the Buddha, the Enlightened One, and had determined in the main to adhere to his belief; but from that night he not only did not claim any merit on account of his self-mortification, but took every opportunity of declaring that from such penances no advantage at all would be derived. All that night he is said to have remained in deep meditation under the Bo tree; and the orthodox Buddhists believe that for seven times seven nights and days he continued fasting near the spot, when the archangel Brahmā came and ministered to him. As for himself, his heart was now fixed,—his mind was made up,—but he realized more than he had ever done before the power of temptation, and the difficulty, the almost

impossibility, of understanding and holding to the truth. For others subject to the same temptations, but without that earnestness and insight which he felt himself to possess, faith might be quite impossible, and it would only be waste of time and trouble to try to show to them "the only path of peace." To one in his position this thought would be so very natural, that we need not hesitate to accept the fact of its occurrence as related in the books. It is quite consistent with his whole career that it was love and pity for humanity — otherwise, as it seemed to him, helplessly doomed and lost — which at last overcame every other consideration, and made Gautama resolve to announce his doctrine to the world.

Gautama had intended to proclaim his new gospel first to his old teachers Alāra and Udraka, but finding that they were dead, he determined to address himself to his former five disciples, and accordingly went to the Deer-forest near Benares where they were then living, An old gāthā or hymn of the northern Buddhists tells us how the Buddha meets, full of his newly-discovered mission, an acquaintance on the way, who, struck with his appearance, asks him what religion it is that makes him so glad and yet so calm. Gautama tells him that he has now become free from all desires, &c. But his acquaintance, apparently not caring much about these details, further asks him where he is going. The reply is striking. "I am now going," says the Buddha, "to the city of Benares to establish the kingdom of righteousness, to give light to those enshrouded in darkness, and open the gate of immortality to men." His acquaintance only sneers at his high-flown pretensions, asking what he means by all this. The Buddha adds, "I have completely conquered all evil passions, and am no longer tied down to material existence; and I now only live to be the prophet of perfect truth." His acquaintance replies, "In that case, venerable Gautama, your way lies yonder," and turns away in the opposite direction.

Nothing daunted, the new prophet walked on to Benares, and in the cool of the evening went on to the Deer-forest where the five ascetics were living. Seeing him coming, they resolved not to recognize as a superior one who had broken his vows; to address him by his name, and not as "master" or "teacher;" only, he being a Kshatriya, to offer him a seat. He understands their change of manner, calmly tells them not to mock him by calling him "the venerable Gautama;" that they are still in the way of death, where they must reap sorrow and disappointment, whereas he has found the way to salvation and can lead them to it. They object, naturally enough, from a Hindu point of view, that he had failed before while he was keeping his body under, and how can his mind have won the victory now, when he serves and yields to his body. Buddha replies by explaining to them the principles of his new gospel; and it will be necessary here to anticipate somewhat, and explain very briefly what this was, as the narrative will otherwise be difficult to follow.

Everything corporeal is material, and therefore impermanent, for it contains within itself the germs of dissolution. So long as man is bound up by bodily existence with the material world he is liable to sorrow, decay, and death. So long as he allows unholy desires to reign within him, there will be unsatisfied longings, useless weariness and care. To attempt to purify himself by oppressing his body would be only wasted effort; it is the moral evil of a man's heart which keeps him chained down in the degraded state of bodily life,— of union with the material world. It is of little avail to add virtue to his badness, for so long as there is evil, his goodness will only ensure him for a time, and in another birth, a higher form of material life; only the complete *eradication of all evil* will set him free from the chains of existence, and carry him to the "other side," where he will be no longer tossed about on the waves of the ocean of transmigration. But Christian ideas must not be put into these Buddhist expressions. Of any immaterial existence Buddhism knows nothing. The foundations of its creed have been summed up in the very ancient formula probably invented by its founder, which is called *the Four great Truths*. These are — 1, That misery always accompanies existence; 2, That all modes of existence (of men or animals, in earth and heaven) result from passion or desire (tanha); 3, That there is no escape from existence except by destruction of desire; 4, That this may be accomplished by following the fourfold way to Nirvāna. Of these four stages, called "*the Paths*," the first is an awakening of the heart. There are few that do not acknowledge that no man can be really called happy, and that men are born to trouble as the sparks fly upwards, but the majority glide through life filling up their time with business or with pleasure. buoyed up with ever-changing hopes in their mad pursuit of some fancied good. When the scales fall from their eyes, when they begin to realize the great mystery of *Sorrow*, that pain is inseparable from existence, and that all earthly good leads to vexation of spirit, when they turn for comfort and for guidance to the Enlightened One, then they may be said to be awake, and to have entered the *first stage* of the Buddhist way of salvation. When the awakened believer has gone further, and got rid, firstly, of all *impure desires*, and then of all *revengeful feelings*, he has reached the second stage; in the third he successfully becomes free (1) from *all evil desires*, (2) from *ignorance*, (3) from *doubt*, (4) from *heresy*, and (5) from *unkindliness and vexation*. "As even at the risk of her own life a mother watches over her child, her only child, so let him (the Buddhist saint) exert good-will without measure towards all beings."

Gautama then remained at the Deer-forest near Benares until the number of his personal followers was about three-score, and that of the outside believers somewhat greater. The principal among the former was a rich young man named Yasa, who had first come to him at night out of fear of his relations, and afterwards shaved his head, put on the yellow robe, and succeeded in bringing many of his former friends and companions to the teacher, his mother and his wife being the first female disciples, and his father the first lay devotee. It should be noticed in passing that the idea of a priesthood with mystical powers is altogether repugnant to Buddhism; every one's salvation is entirely dependent on the modification or growth of his own inner nature, resulting from his own exertions. The life of a recluse is held to be the most conducive to that sweet serenity at which the more ardent disciples aim; but that of a layman, of a believing householder, is held in high honor; and a believer who does not as yet feel himself able or willing to cast off the ties of home or of business, may yet "enter the paths," and by a life of rectitude and kindness ensure for himself a rebirth under more favorable conditions for his growth and holiness.

After the rainy season Gautama called together those of his disciples who had devoted themselves to the higher life, and whom, for want of a better name, we may call monks, and said to them, "Beloved Rahans, I am free from the five passions which, like an immense net, hold men and angels in their power; you too, owing to my teaching, enjoy the same glorious privilege. There is now laid on us a great duty, that of working effectually for men and angels, and gaining for them

also the priceless blessing of salvation. Let us, therefore, separate, so that no two of us shall go the same way. Go ye now and preach the most excellent law, explaining every point thereof, unfolding it with diligence and care. . . . For my part I shall go to the village of Sena, near the deserts of Uruwela." Throughout his career Gautama yearly adopted the same plan, collecting his disciples round him in the rainy season, and after it was over travelling about as an itinerant preacher; but in subsequent years he was always accompanied by some of his most attached disciples.

In the solitudes of Uruwela, there were at this time three brothers, fire-worshippers and hermit philosophers, who had gathered round them a number of scholars, and enjoyed a considerable reputation as teachers. Gautama settled among them, and after a time they became believers in his system,—the elder brother, Kāsyapa, taking henceforth a principal place among his followers. His first set sermon to his new disciples is related by Bishop Bigandet under the name of the Sermon on the Mount, the subject of which was a jungle-fire which broke out on the opposite hillside. He warned his hearers against the fires of concupiscence, anger, ignorance, birth, death, decay, and anxiety; and taking each of the senses in order he compared all human sensations to a burning flame which seems to be something it is not, which produces pleasure and pain, but passes rapidly away, and ends only in destruction.

Accompanied by his new disciples, Gautama walked on to Rājagriha, the capital of King Bimbisāra, who, not unmindful of their former interview, came out to welcome him. Seeing Kāsyapa, who, as the chronicle puts it, was as well known to them as the banner of the city, the people at first doubted who was the teacher and who the disciple; but Kāsyapa put an end to their hesitation by stating that he had now given up his belief in the efficacy of sacrifices either great or small; that Nirvāna was a state of rest only to be attained by a change of heart; and that he had become a disciple of the Buddha. Gautama then spoke to the king on the miseries of the world which arise from passion, and on the possibility of release by following the way of salvation, which has been briefly sketched above. The rāja invited him and his disciples to eat their simple mid-day meal at his house the following morning; and then presented Gautama with a garden called Veluvana or Bamboo-grove, afterwards celebrated as the place where the Buddha spent many rainy seasons, and preached many of his most complete discourses. There he taught for some time, attracting large numbers of hearers, among whom two, Sāriputra and Moggallāna, who afterwards became conspicuous leaders in the new crusade, then joined the Sangha, or Society, as Buddha's order of mendicants was called.

Meanwhile the old Rāja Suddhōdana, who had anxiously watched his son's career, heard that he had given up his asceticism, and had appeared as an itinerant preacher and teacher. He sent therefore to him urging him to come home, that he might see him once more before he died. The Buddha accordingly started for Kapilavastu, and stopped according to his custom in a grove outside the town. His father and his uncles and others came to see him there, but the latter were angry and would pay him no reverence. It was the custom to invite such teachers and their disciples for the next day's meal, but they all left without doing so. The next day, therefore, Gautama set out at the usual hour, carrying his bowl to beg for a meal. As he entered the city he hesitated whether he should not go straight to the rāja's house, but determined to adhere to his custom. It soon reached the rāja's ears that his son was walking through the streets begging. Startled at such news he rose up, seizing the end of his outer robe, and hastened to the place where Gautama was, exclaiming, "Illustrious Buddha, why do you expose us all to such shame? Is it necessary to go from door to door begging your food? Do you imagine that I am not able to supply the wants of so many mendicants?" "My noble father," was the reply, "this is the custom of all our race." "How so?" said his father, "Are you not descended from an illustrious line of kings? no single person of our race has ever acted so indecorously." "My noble father," said Gautama, "you and your family may claim the privileges of royal descent; my descent is from the prophets (Buddhas) of old, and they have always acted so; the customs of the law (Dharma) are good both for this world and the world that is to come. But, my father, when a man has found a treasure it is his duty to offer the most precious of his jewels to his father first. Do not delay; let me share with you the treasure I have found." Suddhōdana, abashed, took his son's bowl and led him to his house. There the women of the palace came to welcome him, but not Yasodharā, whom he had not seen since he had watched her sleeping in their chamber with their newborn babe by her side on that eventful night now seven long years ago. "I will wait and see," she had said; "perhaps I am still of some value in his eyes; he may ask, or come. I can welcome him better here." Gautama noticed her absence, and remembering, doubtless, that a recluse could not touch or be touched by a woman, he said, "The princess is not yet free from desire as I am; not having seen me so long she is exceeding sorrowful. Unless her sorrow be allowed to take its course, her heart will break. She may embrace me; do not stop her." He then went to her, and when she saw him enter,—not the husband she had mourned so long, but a recluse in yellow robes with shaven head and shaven face,—though she knew it would be so, she could not contain herself, and fell on the ground, and held him by the feet, and wept; then remembering the impassable gulf between them, she rose and stood on one side. The rāja thought it necessary to apologize for her, telling Gautama how entirely she had continued to love him, refusing to enjoy comforts which he denied himself, taking but one meal a day, and sleeping on a hard uncanopied bed. The different accounts often tell us the thoughts of the Buddha on any particular occasion; here they are silent, only adding that he then told a Jātaka story, showing how great had been her virtue in a former birth. And then they parted: she became an earnest hearer of the new doctrines; and when long afterwards the Buddha was induced, much against his inclination, to establish an order of female recluses, his widowed wife Yasodharā became one of the first of the Buddhist nuns.

The next day a great festival was to take place to celebrate the marriage of Gautama's half-brother, Nanda. Gautama went to the pavilion and said to Nanda, "the greatest festival after all is the destruction of all evil desires, the life of a recluse, the knowledge of truth, and the attainment of Nirvāna." He then gave him his alms-bowl, and Nanda followed him to the Nigrodha grove where he was staying. On their arrival there Gautama asked him if he would not enter the Society; but Nanda, though tenderly attached to his half-brother, with whom he had been brought up as a play-fellow (Gautama having no brothers of his own), did not yet desire to give up the world. After much persuasion, however, he consented, and became a disciple. A few days afterwards Yasodharā dressed Rāhula, her child and Gautama's, in his best, and told him to go and ask his father for his inheritance. "I know of no father," said the child, "but the rāja. Who is my father?"

Yasodhara took him in her arms, and holding him up to the window pointed out to him the Buddha, who was then taking his mid-day meal at the palace. "That monk," she said, "whose appearance is so glorious, is your father; he has four mines of wealth; go to him, and entreat him to put you in possession of your inheritance." Rāhula went up to Gautama and said to him, without fear and with much affection, "My father, how happy I am to be near you." Gautama silently gave him his blessing; but presently when he arose to go, Rāhula followed him asking for his inheritance. None of the people stopped him, and Gautama still said nothing. When they reached the Nigrodha grove, he called Sāriputra, and said, "Beloved disciple, Rāhula is asking for a worldly inheritance which would avail him nothing; I will give him a spiritual inheritance which will not fade away; let him be admitted among us." When Suddhōdana heard this he was exceedingly grieved; he had lost his two sons as far as all worldly hopes were concerned, and now his grandson was taken from him. Full of sorrow he determined to save other parents a similar affliction, and going to Gautama asked him to establish a regulation that no one should in future be admitted to the Society unless he had the consent of his parents. Gautama granted his request, and after some more interviews with his father returned to the Bambu grove at Rājagriha.

Eighteen months had now elapsed since the turning-point of Gautama's career — his great struggle under the Bo tree. Thus far all the accounts agree, and follow chronological order. From this time they simply narrate disconnected stories about the Buddha, or the persons with whom he was brought into contact,— the same story being usually found in more than one account, but not often in the same order. It is not as yet possible, except very partially, to arrange chronologically the snatches of biography to be gleaned from these stories. They are mostly told to show the occasion on which some memorable act of Gautama's took place, or some memorable saying was uttered, and are exact as to place as they are indistinct as to time. It would be impossible within the limits of this article to give any large number of them, but space may be found for one or two.

A merchant of Sūnaparanta having joined the Society was desirous of preaching to his relations, and is said to have asked Gautama's permission to do so. "The people of Sunaparanta," said the teacher, "are exceedingly violent. If they revile you what will you do?" "I will make no reply," said the mendicant. "And if they strike you?" "I will not strike in return," was the reply. "And if they try to kill you?" "Death is no evil in itself; many even desire it, to escape from the vanities of life, but I shall take no steps either to hasten or to delay the time of my departure." These answers were held satisfactory, and the monk started on his mission.

At another time a rich farmer held a harvest home, and Gautama, wishing to preach to him, is said to have taken his alms-bowl and stood by the side of the field and begged. The farmer, a wealthy Brāhman, said to him, "Why do you come and beg? I plough and sow and earn my food, you should do the same." "I, too, O Brāhman," said the beggar, "plough and sow; and having ploughed and sown I eat." "You profess only to be a farmer; no one sees your ploughing, what do you mean?" said the Brāhman. "For my cultivation," said the beggar, "faith is the seed, self-combat is the fertilizing rain, the weeds I destroy are the cleaving to existence, wisdom is my plough, and its guiding-shaft is modesty; perseverance draws my plough, and I guide it with the rein of my mind; the field I work in is the law, and the harvest that I reap is the never-dying nectar of Nirvāna. Those who reap this harvest destroy all the weeds of sorrow."

On another occasion he is said to have brought back to her right mind a young mother whom sorrow had for a time deprived of reason. Her name was Kisgāotamī. She had been married early, as is the custom in the East, and had a child when she was still a girl. When the beautiful boy could run alone he died. The young girl in her love for it carried the dead child clasped to her bosom, and went from house to house of her pitying friends asking them to give her medicine for it. But a Buddhist convert thinking "she does not understand," said to her, "My good girl, I myself have no such medicine as you ask for, but I think I know of one who has." "Oh, tell me who that is?" said Kisāgotamī. "The Buddha can give you medicine; go to him," was the answer. She went to Gautama; and doing homage to him said, "Lord and master, do you know any medicine that will be good for my child?" "Yes, I know of some," said the teacher. Now it was the custom for patients or their friends to provide the herbs which the doctors required; so she asked what herbs he would want. "I want some mustard-seed," he said; and when the poor girl eagerly promised to bring some of so common a drug, he added, "you must get it from some house where no son, or husband, or parent, or slave has died." "Very good," she said; and went to ask for it, still carrying her dead child with her. The people said, "Here is mustard-seed, take it;" but when she asked, "In my friend's house has any son died, or a husband, or a parent, or slave?" They answered, "Lady! what is this that you say? the living are few, but the dead are many." Then she went to other houses, but one said "I have lost a son," another "We have lost our parents," another "I have lost my slave." At last, not being able to find a single house where no one had died, her mind began to clear, and summoning up resolution she left the dead body of her child in a forest, and returning to the Buddha paid him homage. He said to her, "Have you the mustard seed?" "My lord," she replied, "I have not; the people tell me that the living are few, but the dead are many." Then he talked to her on that essential part of his system, the impermanency of all things, till her doubts were cleared away, she accepted her lot, became a disciple, and entered the "first path."

For forty-five years after entering on his mission Gautama itinerated in the valley of the Ganges, not going further than about 150 miles from Benares, and always spending the rainy months at one spot — usually at one of the vihāras, or homes, which had been given to the Society. In the twentieth year his cousin Ānanda became a mendicant, and from that time seems to have attended on Gautama, being constantly near him, and delighting to render him all the personal service which love and reverence could suggest. Another cousin, Dewadatta, the son of the rája of Koli, also joined the society, but became envious of the teacher, and stirred up Ajātasatru (who having killed his father, Bimbisāra, had become king of Rājagriha) to persecute Gautama. The account of the manner in which the Buddha is said to have overcome the wicked devices of this apostate cousin and his parricide protector is quite legendary; but the general fact of Ajātasatru's opposition to the new sect and of his subsequent conversion may be accepted. The rival teachers, or sophists, as might be expected, were bitter enemies of the new philosophy, and the Brahmins did all they could to put down a faith which inculcated such dangerous doctrines as the equality within the Society of all ranks and castes, and the possibility of salvation without sacrifices or the

assistance of the priests. They instigated certain men to murder Moggallāna, one of the two chief disciples, and made several attempts on the life of the teacher himself; but many of the chiefs, and the great bulk of the common people, are represented, with probable truth, as being uniformly in favor of his doctrine, though the number of those who actually joined the Society was comparatively small.

The confused and legendary notices of the journeyings of Gautama are succeeded by tolerably clear accounts of the last few days of his life. On a journey towards Kusi-nagara, a town about 120 miles N.N.E. of Benares, and about 80 miles due E. of Kapilavastu, the teacher, being then eighty years of age, had rested for a short time in a grove at Pawa, presented to the Society by a goldsmith of that place named Chunda. Chunda prepared for the mendicants a mid-day meal, consisting of rice and pork; and it may be noticed in passing how highly improbable it is that any Buddhist would have invented the story of the Buddha's last illness having been brought on by such a cause. He started for Kusi-nagara in the afternoon, but had not gone far when he was obliged to rest, and soon afterwards he said, "Ananda, I am thirsty;" and they gave him water to drink. Half-way between the two towns flows the River Kukushtā. There Gautama rested again, and bathed for the last time. Feeling that he was dying, and careful lest Chunda should be reproached by himself or others, he said to Ananda, "After I am gone tell Chunda that he will receive in a future birth very great reward; for, having eaten of the food he gave me, I am about to pass into Nirvāna; and if he should still doubt, say that it was from my own mouth that you heard this. There are two gifts which will be blest above all others, namely, Sujātā's gift before I attained wisdom under the Bo tree, and this gift of Chunda's before I enter the final rest of Nirvāna." After halting again the party at length reached the River Hiranyavati, close by Kusi-nagara, and there for the last time Gautama rested; and lying down under some Sal trees, with his face towards the south, he talked long and earnestly with Ananda about his burial, and about certain rules which were to be observed by the Society after his death. Towards the end of this conversation, when it was evening, Ananda broke down and went aside to weep, but Gautama missed him, and sending for him comforted him with the promise of Nirvāna, and repeated what he had so often said before about the impermanence of all things,—"O Ananda! do not weep; do not let yourself be troubled. You know what I have said; sooner or later we must part from all we hold most dear. This body of ours contains within itself the power which renews its strength for a time, but also the causes which lead to its destruction. Is there anything put together which shall not dissolve? But you, too, shall be free from this delusion, this world of sense, this law of change. Beloved," added he, speaking to the rest of the disciples, "Ananda for long years has served me with devoted affection. He knows all that should be done; after I am gone listen to his word." And he spoke to them at some length on the insight and kindness of Ananda.

About midnight Subhadra, a Brahman philosopher of the Kusi-nagara, came to ask some questions of the Buddha; but Ananda, fearing that this might lead to a longer discussion than the sick teacher could bear, would not admit him. Gautama heard the sounds of their talk, and asking what it was, told them to let Subhadra come. He began by asking whether the six great teachers knew all laws, or whether there were some that they did not know, or knew only partially. "This is not the time," was the answer, "for such discussions. To true wisdom there is only one way, the path that is laid down in my law. Many have already followed it, and conquering the lust and pride and anger of their own hearts, have become free from ignorance and doubt and wrong belief, have entered the calm state of universal kindliness, and reached Nirvāna even in this life. Save in my religion the twelve great disciples, who being good themselves rouse up the world, and deliver it from indifference, are not to be found. O Subhadra! I do not speak to you of things I have not experienced. Since I was twenty-nine years old till now I have striven after pure and perfect wisdom, and following the good path, have found Nirvāna." A rule had been made that no follower of a rival system should be admitted to the Society without four months' probation. So deeply did the words or the impressive manner of the dying teacher work upon Subhadra that he asked to be admitted at once, and Gautama granted his request. Then turning to his disciples he said, "When I have passed away and am no longer with you, do not think that the Buddha has left you, and is not still in your midst. You have my words, my explanations of the deep things of truth, the laws I have laid down for the Society; let them be your guide; the Buddha has not left you." Soon afterwards he again spoke to them, urging them to reverence one another, and rebuked one of the disciples who spoke indiscriminately all that occurred to him. Towards the morning he asked whether any one had any doubt about the Buddha, the law, or the Society; if so, he would clear them up. No one answering, he said, "Beloved mendicants, if you revere my memory, love all the disciples as you love me and my doctrines." Ananda expressed his surprise that amongst so many none should doubt, and all be firmly attached to the law. But Buddha laid stress on the final perseverance of the saints, saying that even the least among the disciples who had entered the first path only, still had his heart fixed on the way to perfection, and constantly strove after the three higher paths. "No doubt," he said, "can be found in the mind of a true disciple." After another pause he said, "Beloved, that which causes life, causes also decay and death. Never forget this; let your minds be filled with this truth. I called you to make it known to you." These were the last words Gautama spoke; shortly afterwards he became unconscious, and in that state passed away.

The accounts of Gautama's cremation and of the distribution of his relics are full of the miraculous, but it seems that the body was burnt with great reverence by the local rājas of Malva. Even before this ceremony had taken place dissensions began to break out in the Society,—one member of the order, Subhadra (not the Brahman mentioned above), having even gone so far as to rejoice that now at last they were free from control, and could not always be told to do this, or not to do that. Struck by this language, the chief disciples began at once to consider the expediency of holding a council, where all points of difference should be definitely set at rest. Chief among the leaders was the aged Kāsyapa of Uruvela, whose distinguished position before his conversion, and his great learning, were not the only grounds of the respect in which he was held by the infant Society. He had been one of those most intimate with Gautama; so much so, that on one occasion, when walking together and talking of the deepest truths of their belief, the two friends had entered into a more than unusual confidence and intercommunion of thought and feeling, and had then changed robes with one another in token of their sympathy and love. Sāriputra and Moggallāna were dead; but Ananda, the beloved disciple, and Upāli, who though of low caste origin was looked

up to in the Society as the greatest authority on points of conduct and discipline, were of one opinion with Kāsyapa as to the advisability of a council. This was agreed upon; the disciples first separated and went to their homes, and when they met again for the rainy season in that vihāra at Rājagriha, which had been the first gift to the Society, the council was held under the presidency of Kāsyapa, and with the patronage and assistance of Ajātasatru, the powerful rāja of Magadha. The number of believers present was five hundred, but if any discussion took place no tradition of it has survived. We are told that at each daily sitting of the council, which lasted seven months, Ananda or Upāli repeated some portion of the law, and the whole assembly chanted it after them. A second council is said to have been held one hundred years later in Vaisāli, about 70 miles N. of Rājagriha, and another was certainly held about 250 B.C. under the Buddhist emperor Asoka, in his capital Pātaliputra, the Palibothra of the Greeks and the modern Patna. There is reasonable ground for belief that the sacred books of the Buddhists at present existing in Ceylon are substantially the same as the canon settled at this last council of Pātaliputra, and it is from these books that the modern accounts on which we are as yet obliged to depend purport to have been and, with some alterations and additions, undoubtedly have been derived. The orthodox Buddhists hold the present canon to be identically the same as that settled at the first council of Rājagriha; but the internal evidence of those parts of the canon which have as yet been published tends to show that they cannot possibly have been composed in their present state immediately after Buddha's death. The date, derived from Ceylon, which is usually assigned to that event is 543 B.C.; but those scholars who have devoted most attention to the point hold this calculation to contain a certain error of about 60 years, and a probable error of 80 to 100 more; so that the date for the death of Buddha would have to be brought forward to 400 B.C. or a few years later. As the date of Asoka's council has been determined with certainty to have been within a year or two of 250 B.C., there remains an interval of a century and a half between the first council and the earliest records now accessible to us, an interval amply sufficient for the growth of the supernatural element which they so largely contain. When these records have been published in the original Pāli, it may be possible to hold that they reproduce any earlier canon; at present we can only claim in the following brief outline to give an account of Buddhism as it existed 150 years after the decease of its founder.

Buddhism does not attempt to solve the problem of the ultimate origin of the kosmos. It takes as its own ultimate fact the existence of the material world and of conscious beings living within it; and it holds that everything is subject to the law of cause and effect, and that everything is constantly, though perhaps imperceptibly, changing. Though in its principles it anticipates much that modern science has proved, in its details it does not, as might be expected, rise much above the beliefs most current at the time of its origin; but it has formulated them into a hypothetical system sufficiently consistent with itself to have satisfied Buddhists for more than 2000 years, however little consistent with actual truth. Buddhism does not acknowledge the existence of a soul as a thing distinct from the parts and powers of man which are dissolved at death, and the Nirvāna of Buddhism is simply Extinction.

It will seem strange to many that a religion which ignores the existence of God, and denies the existence of the soul, should be the very religion which has found most acceptance among men, and it is easy to maintain that had Buddha merely taught philosophy, or had he lived in later ages, he might have had as small a following as Comte. Gautama's power over the people arose in a great degree from the glow of his practical philanthropy, which did not shrink in the struggle against the abuses most peculiar to his time; his philosophy and his ethics attracted the masses, from whose chained hands they struck off the manacles of caste, and in leaving the school for the world they insensibly became a religion. But there is no reason to believe that Gautama intended either at the beginning or the end of his career to be the founder of a new religion. He seems to have hoped that the new wine would go into the old bottles, and that all men, not excepting even the Brahmins, would gradually adopt his, the only orthodox, form of the ancient creed. However the question of the historical succession or connection between the different systems of Hindu philosophy be ultimately settled, whether any of them were post-Buddhistic or not, they afford at least sufficient evidence that beliefs very inconsistent with the practical creed of the masses met with little opposition from the priests so long as they were taught only in the schools of philosophy; and Buddhist morality was not calculated to excite anger or hatred. But the very means which Gautama adopted to extend and give practical effect to his teaching, while giving it temporary success, led to its ultimate expulsion from India. It was his Society rather than his doctrine, the Sangha rather than the Dharma, which both gave to his religion its practical vitality and excited the active hostility of the Brahmins.

Self-conquest and *universal charity*, these are the foundation thoughts, the web and the woof of Buddhism, the melodies on the variations of which its enticing harmony is built up. Such a religion could never remain buried in the cloister, or remain the privilege of the few. From the first it became an appeal to the many, and addressed itself not to the learned or the rich but to all mankind, to men and women, slaves and bondmen, Brahmins and Sudras, nobles and peasants alike. The abuses of caste and priestcraft could no longer grow and thrive among men who looked at every question from a rationalistic standpoint, while their hearts were aglow with real and practical philanthropy. In Guatama's view men differed one from another not by accident of birth, but by their own attainments and character; the same path to the same salvation lay equally open to all; and even in this life the poor and the despised were welcomed to the ranks of the order, where wealth was abandoned, and birth went for nothing in comparison with character or insight. It is true that, like Christianity, it did not in so many words condemn any of the political institutions amid which it arose; there is nothing said, at least in the older books, against slavery or despotism or wealth; and even as regards caste, Gautama did not directly interfere with it outside the limits of his Society. But the new wine soon burst the old bottles; the principles of the new creed were quite inconsistent with oppression and wrong of every kind; and the government of Asoka, as Buddhist emperor of India, was probably the most enlightened, and certainly the most philanthropic, which the natives of India have had.

It is not surprising that teaching so earnest and so high, so deep-reaching and so radical, should have met with eager acceptance among a people intensely religious, to whom the doctrines of the priests held out so little hope in exchange for the privileges it claimed from them on behalf of an oppressive caste. It is only to be regretted that the history of Buddhism in India lies under so thick a cloud that very little is known of it with certainty. Immediately after the death of Gautama

the first council of 500 was held at Rājagriha, as related above, and the young church, in the vigor of its purity and fresh enthusiasm, spread very rapidly among the surrounding tribes. In less than 150 years after the death of its founder, the new religion had become the most powerful in Northern and Central India, and was the state religion of Magadha, whose kings claimed the superiority over the whole peninsula. It probably continued to gain in the number of its adherents till two or three centuries later, but soon after the commencement of our era it began to decay; though Fa Hian, a Chinese pilgrim, who visited India about 400 A.D., found it still flourishing over a large area, it was certainly not increasing, and scarcely maintaining its ground. Hiouen Thsang, another Chinese pilgrim, has left us an account of his journey made two centuries later, and he found Buddhism in a much lower condition even than it had fallen to in the time of Fa Hian. In the 8th and 9th centuries a great persecution arose, and the Buddhists were so utterly exterminated that there is now not a Buddhist in all India; although of course the effects of so great a movement could not pass away, and it left its mark for ever on the Hinduism which supplanted it. The full reasons for this revolution are not known: but so much is clear, that long before its expulsion Buddhism had become very corrupt; the order had become wealthy and idle; and the laity, instead of following the precepts of the Teacher, had gone back to the old devil-worship, witchcraft, and astrology, which always underlay their nominal beliefs. From the great body of his followers the ethics and philosophy of Guatama were concealed by the mass of legends and superstitions which had grown up around the story of his life; and though the Buddhists no longer propitiated the favor of the gods by sacrifices of living beings, they rested their hopes more on their liberality to the monks than on the harder duties of self-control and charity,—the latter word having thus become even more limited in its meaning than it has among ourselves. Their worship of the relics of the Buddha came very near to rank idolatry; their reverence for their ancesters came very near to worship, and was a dangerous source of emolument to the monks; while the old Hindu gods were regarded much more highly than was at all consistent with the Buddhist Abhidharma.

Buddhism had, however, been introduced into Ceylon, at a time when it was comparatively pure, by Mahendra and Sanghamitrā, the son and daughter of the emperor Asoka. It became at once the state religion, and the only religion of the island, on which Brahminism had never gained much hold. Protected there by its isolated position, and by the patriotic spirit which identified it with the Singhalese nation, whose hereditary enemies, the Tamils, were first Jains and afterwards Hindus, it had retained almost its pristine purity to modern times. From Ceylon it was introduced into Burma in the 5th century A.D., whence it penetrated into Arakan, Kāmbaya, and Pegu, and finally into Siam in the 7th century of our era. As already mentioned, it became, in a less pure form, the state religion of Kashmīr about the time of Christ, and was thence carried to Nepal and to Tibet and China.

BUDGELL, EUSTACE (1685–1736), a literary man of some eminence in his time, the son of Dr. Gilbert Budgell, was born at St. Thomas, near Exeter.

BUDGET (lit. a bag or small sack), the name applied to an account of the ways and means by which a minister of finance purposes to defray the expenditure of the state. In federal governments, such as the United States, the German Empire, or the Argentine Republic, the budgets of the several states of the federation have to be consulted, as well as the federal budget, for a knowledge of the finances. The local taxation of the United Kingdom is equal to nearly one half the imperial revenue, and requires in its various provinces the same process of examination.

BUDWEIS (in Bohemian, *Ceske Budegovice*), the capital of a circle in the Austrian kingdom of Bohemia, is situated on the right bank of the Moldau, at its junction with the Maltsch. Population, 18,000.

BUENAVENTURA, a town on the Pacific coast of the Republic of Colombia. Population, 5,000.

BUENA VISTA, a village of Mexico, seven miles south of Saltillo, where, on February 22–23, 1847, 5,000 United States troops under Taylor defeated 20,000 Mexicans under Santa Anna.

BUENOS AYRES, the largest and most important province of the Argentine Republic, is bounded on the north by the Parana, which separates it from the province of Entre Rios, and by the provinces of Santa Fé, Cordova, and San Luis; on the east by the Atlantic; on the south by Patagonia; and on the south and west by the country of the Indians, which extends westward to the Andes. The area of the province is estimated at about 440,000 square miles. Its seaboard along the Rio de la Plata and the ocean is upward of 900 miles in length. According to the last census of 1869 the population was 488,706, of which 171,404 belonged to the city of Buenos Ayres; in the present year (1890) it may be estimated at 750,000, of which 460,000 belong to the city, and 290,000 to the province. By the last returns the number of immigrants is from 60,000 to 90,000 per annum, the greater part of whom remain in the province.

The general aspect of the country as viewed from the sea, is eminently uninteresting. From the mouth of the Plata to the Bahia Blanca the sea-line presents an unbroken series of sand-dunes, varied here and there with low ridges of rock. From this latter point to the Patagonian frontier, the aspect of the coast is less monotonous, though equally destitute of life or interest. Though Buenos Ayres is the only province of the Argentine Republic that borders upon the sea, and though all the exports and imports of the country pass through it, it possesses very few harbors. One of these (that of the city of Buenos Ayres) is extremely bad; another (that of Bahia Blanca, near the southern extremity of the province), possesses great natural advantages, which are by no means adequately appreciated. It might be turned to good account as a starting point for vessels engaged in trade with the South American states that border upon the Pacific, but the difficult and sometimes dangerous navigation of the adjoining seas counterbalances in the meantime the other advantages which it offers. The interior of the country, except where it is intersected by the low mountain ranges of the Ventana and Vaulcan in its southern portions, and the spurs of the Andes in the west, is one vast plain, of which by far the larger part is laid out in *estancias*, or cattle farms, though the soil is in itself well adapted for producing all the European cerealia. Agricultural pursuits, however, are by no means in favor with the natives, who cannot bring themselves to engage in any pursuit that cannot be prosecuted on horseback. "Every man, woman, and child in the country rides," says Parish. "One might fancy one's self in the land of centaurs, amidst a population half-men, half-horses. Even beggars ride on horseback." Some of the cattle-farms are of immense extent; one in particular is mentioned by travellers as comprising more than 300 square miles of land, and yielding an enormous revenue to the proprietor. Some of the largest of them belong to British settlers, and are worked by British servants. The cattle were formerly hunted down and killed merely

for the sake of their hides and tongues, while the carcases were abandoned to beasts and birds of prey. They are now slaughtered in abattoirs, where every part of the animal is made available. The beef is salted for exportation; the tallow is boiled down, and now forms an important item in the farmer's revenue; and the trade in hides is steadily increasing. Beef and an infusion of the native tea are the staple food of the natives. In the province of Buenos Ayres there are 45,500,000 sheep, which give a yield of 136,500,000 lb unwashed wool; 5,116,000 cows; and 1,500,000 horses.

Of the cereals grown in Buenos Ayres the most important is maize, which is indigenous to the country. Wheat thrives well in the southern parts of the province, but the inhabitants rarely grow more than enough to supply their own necessities. In the event of a surplus it is commonly exported to Brazil. The vine, fig, orange, and olive have been introduced from the Old World, and are found to suit the climate admirably; but the most valuable of European fruits is the peach. A considerable fruit trade is carried on in coasting vessels by merchants for the most part Italian or French.

BUENOS AYRES, the capital of the Argentine Republic and of the province of Buenos Ayres, is situated on the right bank of the estuary of the La Plata. The river is at this point so wide that it is quite impossible with the naked eye to distinguish the opposite bank, and at the same time so shallow, that ships drawing 15 or 16 feet of water must anchor seven or eight miles from the city. Small craft generally anchor in what are called the inner roads, abreast of the city. The depth of water is never sufficient to admit of their coming to shore. The city, including suburbs, contains 459,663 inhabitants—about a third of whom are of European birth or descent. Among the Europeans the vast majority are Italian; the rest are principally Spanish, French, and British.

BUFFALO, the English name of *Bubalus*, a genus of Ruminant Mammals, belonging to the family *Bovidæ*, and including the well-known Indian and South African species. The Indian Buffalo *(Bubalus Buffalus)* is characterized by its arched forehead, large horns compressed at the base, slightly triangular, and curved in the form of a half moon, and its thick hide covered sparingly with coarse hairs, which become still more scanty in aged individuals.

BUFFALO, the capital of Erie County, N. Y., about 293 miles northwest from New York. It is a port at the east end of Lake Erie, at the mouth of Buffalo River, and at the head of Niagara River, which is here crossed by a fine iron railroad bridge. The city runs for about five miles along the shore of the lake and Niagara River. In population Buffalo is the third city in New York, and the eleventh in the United States. It was founded in 1801, became a military post in 1813, and was burned by the British on the last day of the year 1813. After the war the place was rebuilt, and in 1832 it attained the rank of a city. In 1820 it contained 2,095 inhabitants. After the opening of the Erie Canal in 1825, its growth was rapid, the population being 8,653 in 1830, 18,213 in 1840, 42,261 in 1850, 81,129 in 1860, 117,714 in 1870, 134,238 in 1875, and 255,664 in 1890. The city commands a fine view of the lake; the climate is pleasant and healthful; the streets, broad and generally lined with trees, are well paved, lighted, and supplied with sewers. There are many fine residences with attractive grounds, and numerous squares and public places. A combination of parks or pleasure grounds has been laid out, extending to over 500 acres. It comprises three sections, situated respectively in the northern, western, and eastern parts of the city, connected by boulevards which together afford a drive of nearly ten miles. The most prominent public buildings are the City and County Hall, a granite structure, in the form of a double Roman cross, with a tower 245 feet high, erected at a cost of over $2,000,000; the United States Custom House and Post Office, the State Arsenal, and the Erie County Penitentiary, which is one of the six penal establishments of New York, intermediate between reformatories and states prisons.

The position of Buffalo on the great water and railway channels of communication between the West and the East gives it a commercial importance surpassed by that of few other American cities. Its harbor is capacious, and is protected by extensive breakwaters. The city is the center of an important system of railroads. Besides other lines which converge here, it is the eastern terminus of the Lake Shore and Michigan Southern railway, of the Canada Southern, and of a branch of the Grand Trunk railway of Canada; it is the western terminus of the Erie Canal, the New York Central railway, and a division of the Erie railway. The manufacturing interests of Buffalo are extensive, and have grown with marked rapidity in recent years. The leading establishments are blast furnaces, rolling-mills, foundries, breweries, tanneries, manufactories of agricultural implements, and flour-mills.

BUFFIER, CLAUDE (1661–1737), a writer on grammar and history of considerable note, but more remarkable for his researches in psychology and metaphysics, was born in Poland May 25, 1661, of French parents, who returned to their native country shortly after their son's birth, and settled at Rouen. He was educated at the Jesuits' college there, and was received into the order at the age of nineteen. Soon after his admission a dispute with the archbishop regarding certain points in theology compelled him to leave Rouen. He went to Rome, but did not long remain there; and on his return to France he retired to the college of the Jesuits at Paris, where he spent the rest of his life, studying and writing, and fulfilling with much success his duties as a college lecturer. He seems indeed to have been an admirable teacher, having, as his works show, a great power of lucid and precise exposition. Buffier's object in his *Traite des verites premières*, his best known philosophical work, is to discover the ultimate principles upon which all knowledge is based, to lay down "propositions so clear and obvious that they can neither be proved nor refuted by other propositions of greater perspicuity." The basis of all human knowledge and the foundation of every other truth he finds in the sense we have of our own existence and of what we feel within ourselves. He thus takes as the foundation of his philosophy substantially the same ground as Descartes, *cogito ergo sum;* but the superstructure is reared on very different principles. Descartes tried to reach a knowledge of the not-self by an *a priori* or metaphysical proof of the divine existence. Buffier rejects this sort of evidence as useless. I want, he in effect says, to obtain a certain knowledge of what is distinct from myself, and this I can never do by mere metaphysical demonstration, which only gives me the hypothetical certainty of ideas logically connected together; in order to know what exists distinct from myself I must have recourse to "common sense." Common sense is that disposition which nature has placed in most men in order to enable them, when they have arrived at the age of reason, to form a judgment from their own perception, and not as a consequence of anterior principle. Buffier died in 1737.

BUFFON, GEORGE LOUIS LECLERC, COMTE DE, was born on September 7, 1707, at Montbard, in Burgundy, and died at Paris on April 15, 1788. His father, M. Leclerc de Buffon, was councilor of the

Burgundian parliament, and his mother, Anne Christine Marlin, appears to have possessed considerable natural gifts. Buffon was the eldest of five children, and does not seem to have been in any way a precocious child. On the contrary, he seems from his earliest years to have been characterized more especially by great perseverance, patience, knowledge of the value of time, and exceptional powers of steady application and protracted labor. He was originally destined to his father's profession, and studied law at the college of Jesuits at Dijon; but he soon exhibited a marked predilection for the study of the physical sciences, and more particularly for mathematics. Whilst at Dijon he made the acquaintance of Lord Kingston, a young Englishman, who was at the time staying there along with his tutor, a man of ability and discernment. In this agreeable companionship, Buffon travelled through Italy, being then nineteen years of age. Returning to France, he commenced to study at Angers, still in company with Lord Kingston; but having quarrelled with a young Englishman at play, and subsequently wounded him, he was compelled to leave this town. He thereupon removed to Paris, and during his sojourn in the capital he translated Newton's *Fluxions* and Hale's *Vegetable Statics*, which he subsequently presented to the Academy of Sciences. From Paris he proceeded to England, where he remained three months; but his travels seem to have ended here. In the spring of 1739 he was elected a member of the Academy of Sciences; and at a later period of the same year he was appointed keeper of the *Jardin du Roi* and of the Royal Museum. This appears to have finally determined him to devote himself to the biological sciences in particular, and he commenced to collect materials for his *Natural History*. In the preparation of this voluminous work, he associated with himself Daubenton, to whom the descriptive and anatomical portions of the treatise were entrusted, and the first three volumes made their appearance in the year 1749. He belonged to a very long-lived race, his father having attained the age of ninety-three, and his grandfather eighty-seven years. He died himself at the age of eighty-one, of vesical calculus, having refused to allow of any operation for his relief.

BUG, the name of two Russian rivers. The Western Bug rises in Austrian Galicia, and joins the Vistula near Warsaw. The Eastern Bug, the Hypanis of the ancients, rises in Podolia, and flows 520 miles southeast into the estuary of the Dnieper.

BUG, a name common to all the species belonging to the *Cimicidæ*, a family of Hemipterous Insects, the best known example of which is the House Bug or Bed Bug (*Cimex lectularius*). This disgusting insect is of an oval shape, of a rusty red color, and, in common with the whole tribe to which it belongs, gives off an offensive odor when touched; unlike the others, however, it is wingless.

BUGEAUD, THOMAS, French marshal, was born in 1784, entered the army in his nineteenth year, and by 1814 earned a colonelcy. Recalled from a fifteen years' retirement to active life by the July Revolution of 1830, he was elected Deputy in 1836, was despatched to Algeria, where he distinguished himself against Abd-el-Kader; and in 1840 was appointed Governor-General. He was made a marshal in 1843, and his victory at Isly in 1844 over the Emperor of Morocco's forces gained him the title Duc d'Isly. In the revolution of February, 1848, he commanded the army in Paris. He died in Paris, June 9, 1849.

BUGENHAGEN, JOHANN (1485–1558), surnamed Pomeranus, a German Reformer, was born at Wollin, in Pomerania, on June 24, 1485. He died on April 20, 1558. Among his numerous works is a history of Pomerania, which remained unpublished till 1728, *Pomerania in IV. Libros Divisa.*

BUGLE (Fr. *bugle;* Ger. *flügelhorn;* Ital. *tromba*), a treble musical instrument. The bell is less expanded than the trumpet, and the tube is shorter and more conical. This form gives it that peculiar, penetrating, and far-reaching sound which renders it so admirably suited for its sole purpose—viz., a military signaling instrument. It is made in the key of B flat, and its notes are the open notes of the tube—C (below the stave), G, C, E, G. It has also C, octave lower, and B flat, and C above. It is provided with two rings, to which a cord is attached for suspension to the shoulder of the bugler. Bugle calls, as the military signals are called, are all written within the compass of the five principal notes of the bugle. They vary in character from a single note G, meaning "right" (two G's being center, and three left), to the infantry "reveille," or morning call, which may be said to have some pretensions to being a musical composition, as it has five movements, a largo, a allegretto, vivace, adagio, and presto.

BUGULMA, a town of European Russia, in the government of Samara, 243 miles from the city of that name, on the small river Bugulminka, a sub-tributary of the Volga. Population (1890), 6,000.

BUGURUSLAN, a town of European Russia, in the government of Samara, situated at the junction of the rivers Kinell and Tarkhanka, 177 miles east-northeast of Samara. Population (1890), 8,000.

BUHLE, JOHANN GOTTLIEB (1763–1821), distinguished as a scholar and a historian of philosophy, was born at Brunswick, and graduated at the University of Göttingen, where he obtained a chair at a very early age. Thence he was called to the professorship of ancient languages at Moscow. After his return to Brunswick he was appointed to the chair of natural law, which he held till his death in 1821. His *History of Modern Philosophy* has been translated into French, 6 vols. (Paris) 1806.

BUHL-WORK, otherwise Bool, Boule, or Boulle-work, is a kind of inlaying and ornamentation of cabinet-work, so named after the inventor, André Charles Boule, a celebrated French cabinetmaker (1642–1732). By a happy selection of different woods from India and Brazil, arranged with great taste, and the use of brass, ivory, gold, tortoise-shells, etc., Boule produced upon his furniture arabesques and pictures, representing a variety of animals, flowers, and fruits; and he finally succeeded in producing historical scenes, as battles and hunts, landscapes, and other artistic effects. Louis XIV. appreciated his abilities, gave him lodgings in the Louvre, and in 1672 appointed him engraver in ordinary of the royal seals. In the patent authorizing this he received also the designations of "architect, painter, carver in mosaic, artist in cabinet-work, chaser, inlayer, and designer of figures." His skill was great in all these branches, and he carried them to a high degree of artistic perfection in timepieces, screens, furniture, and other articles. He worked for the royal residences and for foreign princes, and attained fortune and position.

BUHRSTONE, a variety of quartz, containing many small empty cells, which give it a peculiar roughness of surface, particularly adapting it for millstones. The name is given without reference to geological relations, but it is *vein quartz*, rather than true *quartz rock*, which ordinarily assumes the character of buhrstone. Buhrstones are quarried in New York, Pennsylvania, and North Carolina.

BUILDING. Building includes what is called construction, which is the branch of the science of architecture relating to the practical execution of the works required to produce any structure.

The object of construction is to adapt and combine fit materials in such a manner that they shall retain in use the forms and dispositions assigned to them. If an upright wall be properly constructed upon a sufficient foundation, the combined mass will retain its position, and bear pressure acting in the direction of gravity, to any extent that the ground on which it stands and the component materials of the wall can sustain. But pressure acting laterally has a necessary tendency to overturn a wall, and therefore it will be the aim of the constructor to compel, as far as possible, all forces that can act upon an upright wall to act in the direction of gravity, or else give it permanent means of resistance in the direction opposite to that in which a disturbing force may act. Thus when an arch is built to bear against an upright wall, a buttress or other counterfort is applied in a direction opposed to the pressure of the arch. In like manner the inclined roof of a building, spanning from wall to wall, tends to thrust out the walls, and hence a tie is applied to hold the opposite sides of the roof together at its base, where alone a tie can be fully efficient, and thus the roof is made to act upon the walls wholly in the direction of gravity; or where an efficient tie is inapplicable, buttresses or counterforts are added to the walls, to enable them to resist the pressure outwards. A beam laid horizontally from wall to wall, as a girder to carry a floor and its load, may sag or bend downwards, and tend thereby to force out the walls; or the beam itself may break. Both these contingencies are obviated by trussing, which renders the beam stiff enough to place its load on the walls in the direction of gravity, and strong enough to carry it safely. Or, if the beam be rigid in its nature, or uncertain in its structure, or both (as cast-iron is), and will break without bending, the constructor, by the smith's art, will supply a check and insure it against the possible contingency.

Perfect stability, however, is not to be attained with materials which are subject to influences beyond the control of man, and all matter is subject to certain influences of that nature. The influences mostly to be contended against are heat and humidity, the former of which produces movement of some kind or to some extent in all bodies, the latter, movement in many kinds of matter; while the two acting together contribute to the disintegration or decay of materials available for the purpose of construction. These pervading influences the constructor seeks to counteract by the selection and disposition of his materials accordingly. Timber, being practically unchangeable in the direction of its length from the mere absorption of either heat or humidity, and at the same time practically both inextensible and incompressible in that direction, and being also readily wrought and easily combined alike with other timber and with iron, it is a valuable material in the hands of the constructor; but it shrinks and swells in the direction of its thickness, and, in consequence, is subject to rapid decay when exposed to alternations of moisture and dryness.

Stone and brick, the other chief available materials in general construction, keep their places in combination by means of gravity. They may be merely packed together, but in general they are compacted by means of mortar or cement, so that although the main constituent materials are wholly incompressible, masses of either or of both combined in structures are compressible, until the setting medium has indurated to a like condition of hardness. That kind of stone is best fitted for the purposes of general construction which is the least absorbent of moisture, and at the same time free to work. Absorbent stone exposed to the weather rapidly disintegrates; and for the most part non-absorbent stone is so hard that it cannot always be used with a due regard to economy.

Good bricks are less absorbent of moisture than any stone of the same degree of hardness, amd are better non-conductors of heat than stone. As the basis of a stable structure, brickwork is more to be relied upon than stone in the form of rubble, because the brick, by its shaped form, seats itself truly, and produces by bonding a more perfectly combined mass; while the imperfectly shaped and variously sized stone as dressed rubble can neither bed nor bond truly with mortar, and for the irregularity of size of the main constituent. The most perfect stability is to be obtained, nevertheless, from truly wrought and accurately seated and bonded blocks of stone, mortar being used to no greater extent than may be necessary to exclude wind or water, to prevent the disintegrating action of both upon even the most durable stone. When water alone is to be dealt with, and especially when it is liable to act with force, mortar is necessary for securing to every block in the structure its own full weight and the aid of every other collateral and super-imposed stone in order to resist the loosening effect which water in powerful action is sure to produce.

Thus, a bridge, consisting of a series of arches, however extensive, may be but one piece of construction, no arch being complete in itself without the collateral arches in the series to serve as its abutments, and the whole series being dependent thereby upon the ultimate abutments of the bridge, without which the structure would not stand.

A bridge, of which the way is formed upon arches of masonry, may be thus but one piece of construction; and in like manner, that paragon of constructive skill, the complete church, whether cathedral or otherwise, built in the Pointed style when that style was practiced in full accordance with true constructive principles, is but one piece of construction. As in the long series of arches in a bridge,—nothing may be omitted, as nothing can be removed from the structure without leaving something unsupported or unresisted that requires vertical support or lateral resistance.

Steel Framework Building in the United States.

The most startling innovation in building began in the city of Chicago in 1889. It has changed the ideas of all past ages, and substitutes a high, square, hollow tower for the pleasing distribution of masses over areas which heretofore held in all conceptions of buildings intended for human occupancy.

As each successive old style building grew a little taller than its predecessor, the economical limit was soon reached because walls had to be much thicker than before at the bottom, entailing increased cost and occupying more space. The solid walls of tall structures built in the old style are also enormously heavy, and the soil of Chicago does not lend itself readily to foundation building. The great city, in its business district, grew crowded for office space, and began seriously to lack facilities of that kind for the transaction of an enormous business. The result was, suddenly, and without public discussion of the problem, that the unique structure known as the "sky-scraper" began to rise on every hand.

The features wherein it differs from all other buildings and from all established ideas of building, are simple. The sky-scraper is merely a steel-ribbed

square tower, with protecting walls of masonry on the outside to shelter the interior structure and its inmates from the weather, and to hold windows, cornices, and architectural ornamentation. The actual building is altogether and throughout of structural steel. The construction of the modern bridge is its prototype, the delay of its adoption in architecture being the cost of material. For until very recently the cost of such prepared material had been too great except for use under the absolute necessity of which a long railroad bridge is a fair example. Now the question of economy in production has been solved. Many millions have been invested in the new idea in Chicago alone, and the idea is gaining ground elsewhere. The ultimate collateral results, not of the manner of building but of its effects, are still discussed. The discussion branches to the subjects of fire-control, light and ventilation in the streets below, the pouring out upon the streets of enormous multitudes at stated periods of the day, and the final confining of enormous and varied business interests to a small space that must somehow be reached from outside localities every day. The discussion so far has a decision in favor of the engineers as to strength, cost and convenience, and as to the sanitarians, the fire department and the police is still undecided.

The detail of the modern tall building need hardly be gone into. It entails no new principle. Trusses, girders, rafters, joists, are all of structural steel, whose weight is so calculated, and whose size and stress is so designed, that an airy framework like a gigantic cage rises upon its foundations to the unusual height of 16 stories, and often to 18 stories, the outside walls meantime creeping slowly up around the framework. The frame is fastened with bolts and hot rivets, cross-braces and stays running in all directions, yet in such a manner as not to interfere with doors and windows. The engineer has supplemented the architect, and the scope of both professions is enlarged. In one of these buildings the cost is more nearly known beforehand than ever before, and may be said to be capable of an absolute estimate. The buildings are fire-proof, notwithstanding the well-known difficulties attending the making so of iron structures as they were formerly built.

The most noteworthy example of the possibilities of steel building may be found in the palaces of the World's Columbian Exposition, at Jackson Park in Chicago. Faced with the material called "staff," and intended to endure only for six months, the interior of each is an intricate and beautiful network of steel, without whose aid, coming just in time as to cost, thought and intention, the wonderful White City could never have arisen.

But the modern steel building could never have been except for a contrivance not usually thought of in connection with it, though it is an integral part of the building art, and as such is here described. This is the lift, or, as universally and very properly known in the country of its invention, the elevator. The evolution of the elevator idea may be traced from the rope "hoist," worked by hand or machinery. The first American elevator was tried in hotels in New York and Philadelphia, and was an upright screw, running through the shaft from top to bottom; a block fitting which, with engaging threads, was attached to the bottom of the car. The operation of this machine was slow, it was expensive, and it was easily out of repair. So the ideas of inventors were turned to the original "hoist" mechanism of ropes and pulleys, with safety devices.

The hydraulic elevator came next for passenger service. Its early form consisted of a bucket attached to the end of a cable running over pulleys at the top of the shaft. The bucket was lighter than the car, which of course descended by gravity, drawing the empty bucket to the top. There it was filled with water from a tank or hydrant, with appropriate arrangements for the purpose, and thus weighted drew the car up with its passengers. When it reached the bottom the water was automatically emptied and the car could again descend. There were brakes which clamped the car-guides, thus controlling its movements, and stopping it when desired.

The American type of elevator is now used all over the world, and has supplanted every other, and this it was that rendered the sky-scraper possible. It is hydraulic, and with all modifications by various builders is essentially the same. It consists of an hydraulic cylinder, vertical or horizontal, placed in the shaft or basement. In this cylinder there is a piston, the rod of which passes through a stuffing-box in the head, and is connected with the ropes of the car, running over pulleys at the top of the shaft. The piston is pushed in the cylinder by letting in water, which has a pressure of 225 to 700 pounds to the square inch.

Notwithstanding the seeming dangers of all elevators there are fewer persons injured by them than by any other mode of conveyance. This is because of safety devices, some of which will be described. There is a very large margin of strength allowed in construction. Four, six, or even eight steel cables may be observed attached above the car. One of these would sustain it. The breaking, or even the stretching of one of these operates the safety devices. Formerly there was a toothed rack attached to the guides, into which cogs which were held back by catches slipped when the cables ceased to retain by tension of the catch. This was abandoned because the car was stopped too suddenly by the catches. A device common now is a system of compound wedges to compress the guide straps. This is the invention of R. C. Smith. One wedge pulls the next succeeding one, gradually stopping the falling car. A governor, similar in operation to that of the steam engine, is also used. Its swinging balls, by a velocity too great, operate a brake. The stop at each end of the run of an elevator is always automatic. The estimation in which the American elevator is held is shown by its use in structures like the Washington monument and the Eiffel tower at Paris, where the length of shafts is frightful, but where accidents are quite unknown.

There is an insurance system for elevators, combined with an inspection at frequent and stated intervals, whose details have worked out to entire success.

BUILDING SOCIETIES, or societies "for the purpose of raising, by the subscriptions of the members, a stock or fund for making advances to members out of the funds of the society upon freehold, copyhold, or leasehold estate by way of mortgage," may be "either terminating or permanent."

A "terminating" society is one "which by its rules is to terminate at a fixed date, or when a result specified in its rules is attained;" a "permanent" society is one "which has not by its rules any such fixed date or specified result, at which it shall terminate."

A more popular description of these societies would be,—Societies by means of which every man may become "his own landlord," their main purpose being to collect together the small periodical subscriptions of a number of members, until each in his turn has been

able to receive a sum sufficient to aid him materially in buying his dwelling-house.

The origin and early history of these societies is not very clearly traceable. A mention of "building clubs" in Birmingham occurs in 1795; one is known to have been established by deed in the year 1809 at Greenwich; another is said to have been founded in 1825, under the auspices of the earl of Selkirk at Kirkcudbright in Scotland, and we learn that similar societies in that kingdom adopted the title of "menages."

Building societies abound in the United States, and have proved of great benefit, by enabling working people and those receiving small salaries to obtain homes of their own. The land system of this country and the cheapness of transfer and simplicity of title, as compared with the cost and legal complications characteristic of European nations, tend to give encouragement to the acquirement by American citizens of homes for themselves. Building associations in this country are all of the "terminating" order. The periodical installment paid for stock is from 50 cents to $1 per share per month, the average being about 65 cents. The funds are lent to members only, who pay a premium for the privilege, in addition to the interest (usually 6 per cent.) on the loan. Such loans are secured by first mortgages on real estate. There are fines for the non-payment of dues. Properly conducted, such institutions offer a maximum of security, while, from the fact that all the funds are lent out on interest as rapidly as they accrue, the earnings are considerably in excess of simple interest. The usual life of such investments—that is, the time required for a series of stock to attain to par—is from six to eight years.

BUILDING STONE. No artificial building material such as brick, terra-cotta, or cement can give such dignity and beauty to a building as is imparted by ordinary limestone or sandstone, which can be cut by a chisel. By far the most common kinds of building stone are sandstones and limestones. The term freestone is applied to such kinds as dress freely with masons' tools. Both are bedded on sedimentary rocks, and both as a rule, when cut up into blocks for building, should be laid on their natural beds. Many excellent building stones are found in America. The quarries of Maine have been an important source of the supply of granites. The granite from Hallowell, Me., is remarkable, as its dressed surfaces are nearly as white as marble. New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, Wisconsin, and several other States also contain granite. Sandstones constitute the most valuable group of building stones in the United States, as they have a wide distribution, have much diversity of tint and texture, and can be cheaply produced. White marble has been quarried on a considerable scale for important public buildings. That from Lee, Mass., which is strong and durable, was used in the construction of the Capitol at Washington, and for the City Hall at Philadelphia. From Stockbridge, in the same State, the marble was procured for the State House at Boston and the City Hall of New York. Tuckahoe marble, which is pure white, strong, and coarse-grained, has been employed for some of the finest buildings in New York. For St. Patrick's Cathedral a pure white dolomite called "snowflake marble," from Pleasantville, N. Y., has been chiefly used. Rutland county, Vt., is the great center of the marble industry for purely decorative purposes. Numerous beds of marble have been discovered in the United States during the last few years, some of which are located in the Rocky Mountains. Illinois is rich in limestone.

BUITENZORG, the capital of an assistant-residency in the island of Java, is 66 miles S. of Batavia, with which it has been connected by rail since 1872. Lying 830 feet above the level of the sea, and possessing a salubrious climate, it is becoming a favorite place of residence for the Dutch of the greater city. In the neighborhood of Buitenzorg is Battou-Toulis-Cocabatou, a sacred wood held in high veneration by the natives.

BUJALANCE, a town of Spain, in the province of Cordova. Leather and woollen cloth are manufactured. Population, 8946.

BUKOWINA, a duchy and crown-land of the Austrian empire. It has an area of 4036 English square miles, and the population in 1889 amounted to 541,964. The country, especially in its southern parts, is largely occupied by offshoots of the Carpathian mountains. Its northern border is skirted by the Dniester, and a considerable section is drained by the Pruth, but by far the larger portion belongs to the system of the Danube, and is watered by the head streams of the Sereth, the Moldava, and the Bistritza. The climate is healthy but severe, especially in winter; and the soil, particularly in the north, is of great fertility. A large part of the surface,—or nearly one-half of the whole,—is occupied by woodland; and the very name of the country is derived from the abundance of beech-trees. Wheat, rye, oats, maize, barley, beans, potatoes, flax, and hemp are all more or less cultivated. The mineral productions comprise copper, iron, lead, silver, coal, salt, sulphur, and alabaster, some of which, however, are only yielded in very moderate quantities.

BULACAN, the chief town of a province of the same name in the Philippine island of Luzon. Population estimated at about 10,000.

BULANDSHAHR, a district of British India, in the Meerut division, under the jurisdiction of the Lieutenant-Governor of the N.W. Provinces. The district stretches out in a level plain, with a gentle slope from north-west to south-east. Principal rivers, the Ganges and Jumna,—the former navigable all the year round. The Ganges canal intersects the district, and serves both for irrigation and navigation. Area of Bulandshahr district, 1910 square miles, of which 1368 are under cultivation. Population in 1889, 966,593. Of the total population, 81.2 per cent. were Hindus; 175,900 or 18.8 per cent. Mahometans; and 91 Christians and others.

BULB. Perennial herbs which die down during the winter, have always accumulated during the summer some store of reserve material (starch and nitrogenous matters) which serves as capital upon which to draw for their new and rapid start in spring. This subterranean store may be deposited in roots (*e. g.*, orchis), in an underground creeping stem (*e. g.*, *rhizome* of iris or primrose), in definite portions of rhizome which are then called *tubers* (*e. g.*, potato, Jerusalem artichoke), or in the lower portion of the main axis (*corm* or crocus), which thus assumes a bulbous form. The term bulb is, however, restricted by botanists to those cases in which the store is deposited in the leaf-bases, or in modifications of entire leaves. The incipient bulb is best seen in the common wood-garlic (*Allium ursinum*), in which the store is deposited in the swollen spindle-shaped base of a foliage leaf. The first leaf of the following year's growth is not swollen, but almost completely insheathes the developing flower axis, the first foliage leaf of which again thickens as the bulb, and develops in its axil the bud of next year. The use of the bulb to the plant, as affording at once a citadel of refuge during the severity of the winter of cold climates, or of the dry season of warmer ones, and a store of materials for a vigorous start in spring before the competition of other plants

has become active, will be sufficiently obvious, and the importance of bulbous plants in such peculiar climates as that of Siberia or of the Cape of Good Hope is thus readily accounted for.

BULBUL, a Turkish name (used also in Persian) for the nightingale.

BULGARIA, a principality in the Balkan peninsula, created by the treaty of Berlin in July, 1878; now (1890) governed by Prince Ferdinand of Saxe-Cobourg. On the east it is washed by the Black Sea, and on the west is conterminous with Servia. Its area is estimated at 32,932 square miles. It may be roughly described as a great table-land. By far the larger proportion of the area belongs to the basin of the Danube. Throughout the most of the province the soil is excellent, and if it were properly cultivated would yield the richest crops. The cereal most abundantly grown is wheat, but Indian corn is also pretty common with the Mussulman farmers. Little hay is made, and turnips are quite unknown. Potatoes are only cultivated by the Tartar settlers in the Dobrudsha. The peach, the apricot, the grape, and many other fruits come to great perfection; and wine is manufactured in considerable quantities, but in a very careless and rude manner. The buffalo is the animal chiefly used in agricultural labor, though horses are sufficiently common. Cows, pigs, and goats are also kept, and sheep-farming is largely carried on in many parts, but the character of the various stocks is very poor. The mineral wealth of the province is totally neglected, and its rich supplies of timber are often heedlessly wasted. Roads can hardly be said to exist; for though several have been constructed by enterprising pashas, they have soon been allowed to fall into total disrepair. A single railway line stretches from Kustendji to Chernavoda on the Danube. A considerable amount of traffic, however, is carried on by the river, and the export trade on the Black Sea is of growing importance.

The population along the coast is of a very mingled description, the genuine Bulgarian looking down on the Gagaous, as he calls the mongrel race, with no small contempt. The Tartars are emigrants from the Crimea, who were permitted to leave the Russian empire after the last war. They are industrious and prosperous, but the Circassians, who have fled from the Caucasus at the advance of Russia, are for the most part very poor. The Turks, Tatars, Albanians, and Circassians are Mahometans; the Roumanians, the Armenians, and most of the Russians belong to the Greek Church; and the Gypsies are part Mahometan, part Christian, and part Pagan.

The Bulgarians were originally a people of Ugrian or Finnish extraction, according to Professor Rösler, a Samoyede race. They appear for the first time in history about 120 B.C., when a band, under the leadership of a chieftain called Vound, took refuge in Armenia and settled on the banks of the Araxes.

The Bulgarians retain but little trace of their Finnish origin. They still have high cheek bones; their hair is light and thin; their eyelids do not open wide; and the general form of the face is frequently oval. Of their condition in heathen times little is known, though a few important deductions, such as that they had slaves, can be drawn from the questions presented by them to the Pope in 866. They were so far Slavonicized by the 9th century that the church service was held in Slavonic. At present, though their language is still fundamentally Slavonic, and is usually placed between the Russian and the Servian, yet it is largely mingled with Turkish and Persian, and has even a considerable element of Italian and Greek. No inconsiderable number of Bulgarians are to be found beyond the province that bears their name. They form a more or less important element in the whole region from the Danube to the Ægean, and from the Black Sea to Eastern Albania. There are 4,000,000 in the Turkish empire, and in Servia 100,000. Much more important are the Bulgarian settlements in Bessarabia, which in 1862 numbered 70,000 inhabitants.

BULGARIN, THADDAUS (1789–1859), a distinguished Russian writer, was born in Lithuania. His father was an officer under Kosciusko in the last disastrous Polish campaign. By some influence of friends Thaddäus was entered at the college for military cadets at St. Petersburg, and afterward received a commission in the Russian army, with which he served against Napoleon and in Finland. He then left the Russian army, joined the Poles under Napoleon, and took part in nearly all the great campaigns in Spain, Germany, and Russia. After the fall of the emperor he took up his residence in Warsaw, and devoted himself to literature, writing in his native Polish language. In 1819 he removed to St. Petersburg, learned Russian, and became Russian in every way. In 1829 his first novel, *Ivan Vuizhageu*, gained great popularity.

BULGARUS, the most celebrated of the famous "Four Doctors" of the law school of Bologna. Bulgarus was a native of Bologna, and was regarded as the Chrysostom of the Gloss-writers, being frequently designated by the title of the "Golden Mouth." Bulgarus died in 1166 A.D., having attained a great age.

BULKHEADS, in a ship, are the partitions between the several portions of the interior, whether to separate it into compartments to suit the exigencies of stowage or loading, or as a safeguard against foundering. Bulkheads are either *transverse—i. e.*, running athwart the vessel—or *longitudinal—i. e.*, in the direction of the vessel's length, and should be watertight, thus dividing the interior of the vessel into three, four or more compartments, each of which is self-contained, and watertight in reference to its neighbors.

BULL, a ludicrous blunder in speech implying some obvious absurdity or contradiction. Bulls in their best form are usually alleged to be an especial prerogative of Irishmen—at least it is certain that the best examples have come from Ireland. The bull consists in the bringing together of two incompatible thoughts, with the sensation but without the sense of their connection. See the *Essay on Irish Bulls* (1803) by Miss Edgeworth and her father.

BULL, GEORGE (1634–1710), bishop of St. David's, was born at Wells. He entered Exeter College, Oxford, but had to leave in consequence of his refusal to take the oath of allegiance to the Commonwealth. He was ordained privately by Bishop Skinner in 1655. The first benefice he enjoyed was that of St. George's, near Suddington in Gloucestershire, prebendary of Gloucester, archdeacon of Llandaff, and in 1705 hishop of St. David's. He died February 17, 1710.

BULL, JOHN, a distinguished English composer and organist, was born in Somersetshire about 1563. In 1591 he was appointed organist in the Queen's chapel in succession to Blitheman, from whom he had received his musical education. In 1617 he was appointed organist to the cathedral of Nôtre Dame at Antwerp, and he died in that city on March 12, 1628. Contemporary writers speak in the highest terms of Bull's skill as a performer on the organ and the virginals.

BULLA (literally a bubble) was the term used by the Romans for any boss or stud, such as those on doors, sword-belts, shields, etc. It was applied, however, more particularly to an ornament, generally of gold, worn suspended from the neck by children of noble birth until they assumed the *toga virilis*, when it was

hung up and dedicated to the household gods. See COSTUME. In ecclesiastical and mediæval Latin *bulla* denotes the metal seal of oval or circular form, bearing the name and generally the image of its owner, which was attached to official documents. The bulla of the empire was of gold, while the Papal bulla was of lead.

BULLFINCH, a species of conirostral bird belonging to the family *Fringillidæ*, of a bluish-gray and black color above, and generally of a bright tile-red beneath, the female differing only in having its colors somewhat duller than the male. It is a shy bird, not associating with other species, and frequents well-wooded districts, being very rarely seen on moors or other waste lands.

BULLINGER, HEINRICH (1504–1575), an eminent Reformer, was born at Bremgarten, near Zurich. He studied at Emmerich and Cologne, where he read some of Luther's works, and after his return home lectured at the Abbey of Kappel. In 1527 he heard Zwingli at Zurich, and in the following year he accompanied him to the great conference at Berne. He was made pastor at Bremgarten in 1529, and married a nun. In 1531 he had to fly to Zurich in consequence of the Catholic victory at Kappel, and was soon afterward appointed minister of the principal church. Bullinger died at Zurich in 1575.

BULLION is a term applied to the gold and silver of the mines brought to a standard of purity. The term is of commercial origin, and has reference to the precious metals as a medium of exchange. It followed from this office of gold and silver that they should approximate in all nations to a common degree of fineness; and though this is not uniform even in coins, yet the proportion of alloy in silver, and of carats alloy to carats fine in gold, has been reduced to infinitesimal differences in the bullion of commerce, and is a prime element of value even in gold and silver plate, jewellery, and other articles of manufacture. All the new gold and silver coinage of France, Germany, Spain, Italy, Belgium, and the United States — probably of a still wider circle of the principal coining countries in the world — contain nine-tenths of pure metal. The California mines were computed to have in three years yielded gold to the value of £35,000,000 sterling. The Australian mines, still more prolific, were estimated in three years from their opening to be equal to an annual produce of £20,000,000 sterling. It must be admitted that California and Australia remain the most gold-productive countries in the world.

When the coffers of the great banks of Europe were filled with the virgin gold of California and Australia, one of the first consequences was a desire on the part of countries in which silver was either a collateral standard of value with gold, or the sole standard of value, to discard the silver standard and adopt gold as the sole standard, involving in either case a large displacement of silver coinage and reserve, and a large infusion in its room of gold coinage and reserve. This result was exhibited in the mint operations both of France and England. In the former country silver retains its quality of legal tender in a modified degree; but the proportion of silver authorized by the Bank Charter Act of 1844 has long disappeared from the bullion reserve of the Bank of England, which now consists wholly of gold. It was one of the first resolutions of the German Empire, on the conclusion of the war of 1870-71, not only to make gold the sole standard, but to dislodge all the old silver money of the German States.

As regards the production of the precious metals two great revolutions are to be observed in the 16th and 19th centuries. Between 1493 and 1520 the total production of gold and silver was in the proportion of about 57 per cent. of gold and 43 per cent. of silver (the value being reckoned at the actual value of the time), while between 1581 and 1600 the proportion became (in value) 17.2 gold to 82.8 silver. The change was principally due to the discovery of the silver mines of Potosi (1545). Between 1831 and 1840 the production (in value) was 34.9 gold to 65.1 silver, and for the period 1851 to 1855 the proportion had become 77.6 gold to 22.4 silver. This change was caused by the discovery of the great gold mines in Australia and California. The magnitude of these discoveries may be estimated from the fact that between 1493 and 1850 (358 years) the total production of gold is given at 4,752,070 kilograms, while between 1851 and 1885 (35 years) it is given at 6,383,388 kilograms. The value of a kilogram of gold is $675. Since 1855 the relative production of gold to silver has gradually declined, the figures for 1881 to 1885 being 49.3 gold to 50.7 silver. The total production of gold (in value) was (1493 to 1850) about $3,215,000,000; and from 1851 to 1885 about $4,316,500,000; the total production of silver (estimated at its actual gold value at different times) was (1493 to 1850) about $7,139,200,000, and from 1851 to 1885 about $2,328,000,000.

The most remarkable circumstance in these changes in the relative amount of gold and silver produced is its slight effect on the ratio between gold and silver. Before the discovery of the rich silver mines of Potosi the ratio was (1521 to 1540) about 11¼:1, and from 1601 to 1620 it was only 12¼:1. Again, just before the great gold discoveries in this country (1841 to 1850) the ratio was 15.83:1, and between 1851 and 1855, in spite of the enormous increase in gold, it fell only to 15.41:1. Since that time gold has shown a decided appreciation as compared with silver, weight for weight.

BULL-FIGHT. Combats of men with bulls for the entertainment of the public were common in Greece, particularly in Thessaly, and in Rome under the emperors, though in latter times they were forbidden both by emperors and popes. They are still a common spectacle in Spain and Mexico, where, indeed, the *corrida de toros* is the national pastime. In Madrid the bull-fighting season commences in April and lasts until November. During that time there is at least one Sunday or Saint's-day afternoon in every week devoted to the sport. From six to ten bulls are usually dispatched in a single day, twenty minutes being about the time taken to slay one.

BULLFROG (*Rana mugiens*), a species of frog found in most parts of the United States and Canada, but chiefly abundant in the Southern States. It is of a large size, eight to twelve inches long. The color is olive green or reddish brown, with large brown or black spots, and with a yellow line along the back. The under surface is yellowish. It receives its name from its remarkable voice, which may be distinctly heard at a distance of forty or fifty yards. Its flesh is tender, white, and affords excellent eating, the hind legs, however, being the only part used.

BULL RUN, a small stream separating Fairfax and Prince William counties in Virginia, about twenty-five miles west-by-south of Washington, and giving its name to a famous battlefield, where two battles were fought during the Civil War on July 21, 1861, and August 29, 1862. In the first the Union army lost 2,950 men, while the Confederates' loss was 1,652. At the second the Union loss was 11,000, that of the Confederates 7,241.

BULLS AND BEARS. In the slang of the Stock-Exchange, a *bull* is a person who seeks artificially and unduly to raise the price of stock, and speculates on a rise. On the other hand, a *bear* is one who speculates on a fall; who sells stock for delivery at a future date

n the hope that meanwhile prices will fall, so that he vill buy at a lower price what he has sold at the higher rice.

BULLS AND BRIEFS, Papal, are the two kinds f authoritative letters issued by the popes in their offiial capacity as head of the church, the bulls being the nore important. They are distinguished from each ther by several marks.

BÜLOW, Friedrich Wilhelm (1755–1816), a Prussian general, was born at Falkenberg on February 16, 1755. He entered the army at the age of ourteen. He took part in the campaigns of 1806–7, nd in 1809 was made major-general and brigadier of nfantry. On the renewal of the war against France n 1813 he took the field with the rank of lieutenantgeneral, was engaged in the battle of Möckern, and tormed the defenses of Halle. He was victorious over Oudinot at Luckau and Grossbeeren, and over Ney at Dennewitz. He led the attack on the fortifications at Leipsic, and was conspicuous in the Prussian victory at Laon. To him also belonged the honor of closing the ampaign by the capture of Montmartre. For his valable services he was raised to the rank of general, and nade Baron Dennewitz, with a handsome revenue. During the Hundred Days he commanded the fourth rmy corps, and by his rapid march contributed to Blücher's success at Waterloo. After the war he reurned to Königsberg, where he died on Feb. 25, 1816.

BULWER, Sir Henry Lytton Earle (1804–72), tatesman and diplomatist, created a peer, under the itle of Baron Dalling and Bulwer, in 1871. See Dalling.

BULWER-LYTTON, Sir Edward George Earle Lytton (1806–73), brother of the preceding, created a peer, under the title of Baron Lytton, in 1866. See Lytton.

BUMBLE-BEE. See Humble-bee.

BUNDELKHAND, an extensive tract, consisting partly of British districts and partly of native states, in he North-Western Provinces of India. Length of Bundelkhand—200 miles from southeast to northwest; breadth, 155 miles; area variously estimated from 18,99 to 23,817 square miles.

The tree vegetation consists rather of jungle or copse han forest, abounding in game which is preserved by he native chiefs. There are also within these coverts everal varieties of wild animals, such as the tiger, leopard, hyena, wild boar, and jackal.

British Bundelkhand contains a population of 2,161,95 souls. The total population of Bundelkhand, British and native, has been estimated at 2,260,714. The eople represent various races. The Bundelás,—the ace who gave the name to the country,—still maintain heir dignity as chieftains, by disdaining to cultivate the oil, although by no means conspicuous for lofty sentiments of honor or morality. The inhabitants are a tout and handsome race of men, well off and contented.

The prevailing religion in Bundelkhand is Hinduism.

The principal crops are wheat, cotton, indigo, sugarane, a red dye called *ách*, various kinds of millets and ulses. Carpets and paper are manufactured. Bamboo nd *Acacia catechu* from the jungles form important rticles of trade. The Jabalbur line of the East Indian ailway passes through the native states of Bundelkand. The climate of Bundelkhand is sultry and unealthy.

BUNDI, a Rájput state of India, under the political uperintendence of the Government of India through its gent in Rájputáná. Many parts of the state are wild nd hilly, inhabited by a large Niná population, a race f robbers. Two rivers, the Chambiá and the Niji, ater the state; the former is navigable by country boats. Area, 2,291 square miles; population in 1889–90, 224,000. The chieftain and the greater part of his followers are Rájputs. Principal crops—Indian corn, wheat, pulses, and oil-seeds. Iron is found. Bundi pays an annual tribute of £4,000 to the British Government. The chief town, Bundi, has a population of 20,744 and is a very strongly fortified place, commanding the principal pass.

BUNGALOW, the species of house occupied by Europeans in India, and commonly provided for officers' quarters in cantonments. Bungalows are usually of one story, with a veranda, and a pyramidal roof, generally of thatch, although tiles are sometimes used; houses of masonry, with terraced roofs, are distinguished as *pucka houses*.

BUNION is a term applied in surgery to enlarged bursæ, or synovial sacs, situated on any part of the foot, but most common over the metatarso-phalangeal joint of the first or the fifth toe, and accompanied by more or less distortion of the joint. In the great majority of cases, bunions are directly produced by the pressure of badly-fitting boots or shoes. The best preventive is roomy boots or shoes. Poultices may be applied and the application of iodine or mercurial ointment is suggested.

BUNKER HILL, an elevation (112 feet), on the Peninsula of Charlestown, now part of Boston, Mass., connected by a ridge, 700 yards long, with Breed's Hill (75 feet). The two heights were the scene of the first hard-fought battle of the American Revolution, June 17, 1775, in which the Americans, from behind works constructed during the preceding night, repulsed two attacks by General Gage's forces, and were dislodged only after reïnforcements had been brought up, and their ammunition was spent. The British loss was 1,054, that of the Americans 449. A granite obelisk, 221 feet high, marks the site of the redoubt.

BUNSEN, Christian Charles Josias, Baron von (1791–1860), was born at Corbach, an old town in Waldeck, one of the smallest of German principalities. He was of honorable but humble origin. It was quite a day of rejoicing in Göttingen when Bunsen had won the university prize essay of the year 1812 by a treatise on the *Athenian Law of Inheritance*, and again a few months later when the University of Jena granted him, unsolicited, the honorary degree of doctor of philosophy.

At the close of 1815 Bunsen found his way to Berlin, to lay before Niebuhr the historian what was then already a many years' plan of learned inquiry. This step led to important consequences in the life of Bunsen. Niebuhr not only approved of the Titanic scheme, and hoped that Prussia, in which all the hope of Germans then began to be centered, would in time find money for assisting it, but so powerful an impression did he receive on that occasion, that when they met again two years later, Niebuhr, having meanwhile become Prussian envoy to the Papal court, exerted all his influence to draw Bunsen into official life. Of the two intervening years it will suffice to relate that they had been spent by Bunsen in assiduous labor among the libraries of Paris and Florence, whither the hope of meeting his former pupil, Mr. Astor, had led him; and that he contracted during his stay in the capital of France a love for the peculiar graces of French genius which never left him through life.

Fascinated by the condescending friendship of Niebuhr, by the glories of Rome, and also by the charms of English society, Bunsen continued his stay in that city. When he left the Eternal City, he was able to look back upon a term of years filled with everything that could adorn life—intense domestic contentment, intimacy with distinguished men of every nation who

had sojourned in Rome during his twenty-one years' residence there, success in establishing institutions which, like the Archæological Institute, the German Hospital, and the Protestant chapel, have outlived his stay, experience in public affairs, and a deepening of his religious convictions. Religion had become the centre of his most tender emotions, of his intellectual activity, of his practical aspirations. To restore to the Bible that place in the households of his country which it had possessed in the first generations after the Reformation, to revive the knowledge and the love of the German Reformer's hymns, to give his people such a Book of Common Prayer, resting upon the liturgies of all Christian ages, as would help congregations in "presenting themselves a living sacrifice," to rekindle the fervor of other days for works of self-devotion and charity, to work out a Christian philosophy of history, — such were the purposes to which he devoted his happiest and best hours in each succeeding year. Whilst he was at Rome a book of ancient hymns and a liturgy were printed.

Few strangers have ever lived on terms of greater intimacy with Italians, or possessed a more entire command of their language than Bunsen. He was a believer in their national revival, and political future at a time when Italy was "a geographical expression" only and when her art treasures and her blue sky were her only acknowledged qualities.

Towards England, then, did he turn his face in 1838 to enjoy the leisure occasioned by his removal from the Capitol, and in England, except when he held a brief diplomatic appointment as Prussian ambassador to Switzerland from 1839 to 1841, the remainder of his official life was spent.

Between the Crown Prince of Prussia and Bunsen a very close intimacy had sprung up ever since they met at Berlin in 1828. They were attracted to each other by similarity of literary tastes, of poetic temperament, and of religious aspiration.

The new king had no sooner ascended the throne under the name of Frederick William IV. than he contemplated the erection of an Anglo-Prussian bishopric at Jerusalem, intended to represent European Protestantism as a united power, and to give a rallying point to Protestant missions in Syria and Palestine. King Frederick William summoned Bunsen to his capital, and instructed him to negotiate in London the establishment of such a bishopric on Mount Zion. In an incredibly short time (June to November 1841) Bunsen succeeded in bringing it about, with the English Govern ment's courteous assent, and the energetic furtherance of the archbishop of Canterbury and the bishop of London, Prussia paying in a capital which secured one-half of its endowment, whilst the other half was to be raised in England. Much suspicion was felt and opposition raised against any association of the Church of England with German Protestantism, in both countries alike, though from opposite motives. To Bunsen this "special mission" brought in a rich harvest of friendly feeling among the leaders of both parliamentary parties, so that when Queen Victoria selected his name out of three proposed by the chivalrous courtesy of the Prussian king for the post of Prussian ambassador, he found himself well received by all classes of English society. The king's visit to England in February 1842, as sponsor to the Prince of Wales, helped to prove the earnest desire of Prussia to seek the friendship of Great Britain.

In the year 1844 his advice was asked by the king on the constitutional changes, — from absolutism to a representative government, — upon which Prussia, although in a first-rate financial, military and administrative condition, found herself irresistibly constrained to enter. His advice, though studiously conservative, was considered of too sweeping a nature, and the king contented himself in 1847 with convoking an assembly composed of all members of the eight provincial diets of the monarchy, and clothed with scarcely any constitutional powers.

The king's expectations of a quiet time for maturing his work of reconstruction in church and state were rudely broken in upon by the French Revolution of February 1848. Bunsen's warning voice had been raised in vain; the discontent of the educated classes helped to weaken the distracted councils of Frederick William IV., and, though a constitution was eventually promulgated, Prussian politics succumbed under the tutelage of the Austrian premier, Prince Schwartzenberg. In 1849 Bunsen's diplomatic labors were mainly directed to settle, as German commissioner, the dispute with Denmark about the duchies of Holstein and Schleswig, Great Britain having offered her mediation. In these duchies a strong agitation of several years' standing had roused the German population, which occupies the whole of the former and part of the latter, to oppose the centralizing tendencies of the Danish Government. During the troubles of March 1848 they had taken up arms against Denmark and found assistance in Germany, then for the first time aspiring again to the position of a national power. This disturbance of the public peace of Europe was, however, regarded with so much disfavor by all powers, and secretly also by the sovereigns of Prussia and Austria, that the Danes obtained, in 1852, a European protocol, which reversed the political autonomy of the two duchies, and settled the crown of Denmark, after the death of the king and his son, upon Prince Christian of Glücksburg. It was the fate of Bunsen to be obliged to add his signature to this protocol, although it contained an abrogation of those "constitutional rights of Schleswig and Holstein," upon which he had dilated in a *Letter to Viscount Palmerston*, printed in April 1848.

The unity of Germany was another of those wishes in which Bunsen and his royal patron had been one ever since the beginning of their acquaintance, and yet found themselves widely apart when the question came to be practically tested. The king sincerely aimed at the resuscitation of the venerable German empire, fancying that the leadership within the federation of sovereigns might be divided between Austria and Prussia, yet so as to leave a kind of ceremonial primacy to the former. Enlightened Germans, on the contrary, had then already arrived at the conviction that the leadership must be in Prussian hands. Austria, hampered as she is by the numerical preponderance of non-German populations, and the divergence of her interests from those of Germany, should, they thought, take her place within a wider federation. Gradually and almost imperceptibly did this truth work its way through time-honored tradition. Bunsen was one of its most eloquent apostles, in his official correspondence as well as in pamphlets published in 1848. Several times he was sanguine enough to believe such a policy to be permanently grasped in Berlin, but the king's vacillating temper and his adherence to tradition refused to be wrought upon beyond the approval of half-measures. Thus the opportunity was lost, the potentiality of the Prussian military power neglected, and a gnawing disappointment left in the minds of the best patriots throughout Germany.

Bunsen resigned his post as minister in London in April 1854.

The remaining years of Bunsen's life were spent in almost unbroken literary labors, first at a villa on the banks of the Neckar, near Heidelberg, and at the last in Bonn.

Twice only was Bunsen tempted away from his Heidelberg retreat to show himself at Berlin,—once, at the king's desire and as his guest, in September 1857, to attend the meeting of the Evangelical Alliance, in the main objects of which he sympathized as warmly as King Frederick William IV. On that occasion, and after much confidential intercourse, the two friends parted never to meet again on this side of the grave. One of the last papers signed by the king before his mind gave way in October of that year was that which raised Bunsen to the rank of baron, and conferred upon him a life peerage. Baron Bunsen died on November 28, 1860, and lies buried in the churchyard of Bonn, not far from the grave of his early friend and benefactor Niebuhr.

BUNSEN BURNER, so named after the distinguished chemist. See BUNSEN, ROBERT WILHELM, Vol. X, p. 6493. Prior to its introduction, the heating by gas or oil had been unsatisfactory, owing to the imperfect combustion of the carbon causing the deposit of soot on any body in contact with the flame. Applying the principle of the blowpipe, a plentiful supply of air was caused to mingle with the gas before ignition, so that a smokeless flame of low luminosity, but great heating power, was the result. The simplest form consists of an ordinary gas-jet, over which is placed a piece of metal tube, four to six inches long, and perforated with holes at the bottom. The gas having been turned on, air rushes in at the holes, so that when a light is applied to the upper end of the tube, a greenish-blue flame is obtained. If the air is in excess, the flame inclines to green; if deficient, a yellow flame results. In cooking, fire lighting, heating, ironing, soldering and other uses the value of the Bunsen burner is well-known, while for the production of asbestos gas fires many ingenious devices have been used.

BUNTING, a word of uncertain origin, properly the common English name of the bird closely allied to the Finches. The Buntings generally may be also outwardly distinguished from the Finches by their angular gape, the posterior portion of which is greatly deflected; and most of the Old-World forms, together with some of those of the New World, have a bony knob on the palate — a swollen outgrowth of the dentary edges of the bill. In most other respects the Buntings greatly resemble the Finches, but their eggs are generally distinguishable by irregular hair-like markings on the shell.

BUNTING, JABEZ, D.D., a distinguished Wesleyan minister, who exerted an influence in his denomination second only to that of John Wesley himself, was born at Manchester 13th May 1779, and died on the 16th June 1858.

BUNYAN, JOHN, (1628-1688), the most popular religious writer in the English language, was born at Elstow, in the year 1628. He may be said to have been born a tinker. The tinkers then formed a hereditary caste, which was held in no high estimation. They were generally vagrants and pilferers, and were often confounded with the gipsies, whom in truth they nearly resembled. Bunyan's father was more respectable than most of the tribe. He had a fixed residence, and was able to send his son to a village school where reading and writing were taught.

The years of John's boyhood were those during which the Puritan spirit was in the highest vigor all over England; and nowhere had that spirit more influence than in Bedfordshire. Before he was ten, his sports were interrupted by fits of remorse and despair; and his sleep was disturbed by dreams of fiends trying to fly away with him. As he grew older, his mental conflicts became still more violent. Bunyan was, at eighteen, what, in any but the most austerely puritanical circles, would have been considered as a young man of singular gravity and innocence. Indeed, it may be remarked that he, like many other penitents who, in general terms, acknowledge themselves to have been the worst of mankind, fired up, and stood vigorously on his defence, whenever any particular charge was brought against him by others. He declares, it is true, that he had let loose the reins on the neck of his lusts, that he had delighted in all transgressions against the divine law, and that he had been the ringleader of the youth of Elstow in all manner of vice. But when those who wished him ill accused him of licentious amours, he called on God and the angels to attest his purity. No woman, he said, in heaven, earth, or hell, could charge him with having ever made any improper advances to her. Not only had he been strictly faithful to his wife; but he had, even before his marriage, been perfectly spotless. The four chief sins of which he was guilty were dancing, ringing the bells of the parish church, playing at tipcat, and reading the history of Sir Bevis of Southampton.

When he was about seventeen, the ordinary course of his life was interrupted by an event which gave a lasting color to his thoughts. He enlisted in the Parliamentary army, and served during the decisive campaign of 1645. All that we know of his military career is, that, at the siege of Leicester, one of his comrades, who had taken his post, was killed by a shot from the town. It may be observed that his imagination was strongly impressed by the glimpse which he had caught of the pomp of war. To the last he loved to draw his illustration of sacred things from camps and fortresses, from guns, drums, trumpets, flags and truce, and regiments arrayed each under its own banner. His Greatheart, his Captain Boanerges, and his Captain Credence are evidently protraits, of which the originals were among those martial saints who fought and expounded in Fairfax's army.

In a few months Bunyan returned home and married. His wife had some pious relations, and brought him as her only portion some pious books.

At one time he took it into his head that all persons of Israelite blood would be saved, and tried to make out that he partook of that blood; but his hopes were speedily destroyed by his father, who seems to have had no ambition to be regarded as a Jew.

At another time Bunyan was disturbed by a strange dilemma: "If I have not faith, I am lost; If I have faith, I can work miracles." He was tempted to cry to the puddles between Elstow and Belford, "Be ye dry," and to stake his eternal hopes on the event.

"None," he afterwards wrote, "knows the terrors of those days but myself."

Neither the books which Bunyan read, nor the advisers whom he consulted, were likely to do much good in a case like this. His small library had received a most unseasonable addition, the account of the lamentable end of Francis Spira. One ancient man of high repute for piety, whom the sufferer consulted, gave an opinion which might well have produced fatal consequences. "I am afraid," said Bunyan, "that I have committed the sin against the Holy Ghost." "Indeed," said the old fanatic, "I am afraid that you have."

At length the clouds broke; the light became clearer and clearer; and the enthusiast who had imagined that he was branded with the mark of the first murderer, and destined to the end of the arch traitor, enjoyed peace and a cheerful confidence in the mercy of God. Years elapsed, however, before his nerves, which had been so perilously overstrained, recovered their tone. He was indeed illiterate; but he spoke to illiterate men. The severe training through which he had passed

had given him such an experimental knowledge of all the modes of religious melancholy as he could never have gathered from books; and his vigorous genius, animated by a fervent spirit of devotion, enabled him not only to exercise a great influence over the vulgar, but even to extort the half-contemptuous admiration of scholars. Yet it was long before he ceased to be tormented by an impulse which urged him to utter words of horrible impiety in the pulpit.

Counter-irritants are of as great use in moral as in physical diseases. It should seem that Bunyan was finally relieved from the internal sufferings which had embittered his life by sharp persecution from without. He had been five years a preacher, when the Restoration put it in the power of the Cavalier gentleman and clergymen all over the country to oppress the dissenters; and, of all the dissenters whose history is known to us, he was perhaps the most hardly treated. In November 1660 he was flung into Bedford jail; and there he remained with some intervals of partial and precarious liberty, during twelve years. His persecutors tried to extort from him a promise that he would abstain from preaching; but he was convinced that he was divinely set apart and commissioned to be a teacher of righteousness, and he was fully determined to obey God rather than man. He was brought before several tribunals, laughed at, caressed, reviled, menaced, but in vain. He was facetiously told that he was quite right in thinking that he ought not to hide his gift; but that his real gift was skill in repairing old kettles. He was compared to Alexander the coppersmith. He was told that if he would give up preaching he should be instantly liberated. He was warned that if he persisted in disobeying the law he would be liable to banishment, and that if he were found in England after a certain time his neck would be stretched. His answer was, "If you let me out to-day, I will preach again to-morrow." Year after year he lay patiently in a dungeon, compared with which the worst prison now to be found in the island is a palace. His fortitude is the more extraordinary because his domestic feelings were unusually strong. Indeed, he was considered by his stern brethren as somewhat too fond and indulgent a parent. He had several small children, and among them a daughter who was blind, and whom he loved with a peculiar tenderness. He could not, he said, bear even to let the wind blow on her; and now she must suffer cold and hunger; she must beg; she must be beaten; "yet," he added, "I must, I must do it." While he lay in prison, he could do nothing in the way of his old trade for the support of his family. He determined, therefore, to take up a new trade. He learned to make long-tagged laces; and many thousands of these articles were furnished by him to the hawkers. While his hands were thus busied he had other employments for his mind and his lips. He gave religious instruction to his fellow-captives, and formed from among them a little flock, of which he was himself the pastor. He studied indefatigably the few books which he possessed. His two chief companions were the Bible and Fox's *Book of Martyrs*. His knowledge of the Bible was such that he might have been called a living concordance.

At length he began to write, and though it was some time before he discovered where his strength lay, his writings were not unsuccessful. They were coarse, indeed, but they showed a keen mother wit, a great command of the homely mother tongue, an intimate knowledge of the English Bible, and a vast and dearly bought spiritual experience. They therefore, when the corrector of the press had improved the syntax and the spelling, were well received by the humbler class of dissenters.

During the years which immediately followed the Restoration, Bunyan's confinement seems to have been strict. But as the passions of 1660 cooled, as the hatred with which the Puritans had been regarded while their reign was recent gave place to pity, he was less and less harshly treated. The distress of his family, and his own patience, courage, and piety, softened the hearts of his persecutors. At length the prisoner was suffered to pass most of his time beyond the walls of the jail, on condition, as it should seem, that he remained within the town of Bedford.

He owed his complete liberation to one of the worst acts of one of the worst governments that England has ever seen. In 1671 the cabal was in power. Charles II. had concluded the treaty by which he bound himself to set up the Roman Catholic religion in England. The first step which he took towards that end was to annul, by an unconstitutional exercise of his prerogative, all the penal statutes against the Roman Catholics; and in order to disguise his real design, he annulled at the same time the penal statutes against Protestant Nonconformists. Bunyan was consequently set at large. In the first warmth of his gratitude he published a tract, in which he compared Charles to that humane and generous Persian king, who, though not himself blessed with the light of the true religion, favored the chosen people, and permitted them, after years of captivity, to rebuild their beloved temple.

Before he left his prison he had begun the book which has made his name immortal.

The *Pilgrim's Progress* stole silently into the world. The year of publication has not been ascertained. It is probable that during some months the little volume circulated only among poor and obscure sectaries. God's love and sympathy for men began to produce effect. In puritanical circles, from which plays and novels were strictly excluded, that effect was such as no work of genius, though it were superior to the *Iliad*, to *Don Quixote*, or to *Othello*, can ever produce on a mind accustomed to indulge in literary luxury. In 1678 came forth a second edition with additions; and then the demand became immense. Bunyan has told us, with very pardonable vanity, that in New England his dream was the daily subject of the conversation of thousands, and was thought worthy to appear in the most superb binding. He had numerous admirers in Holland, and among the Huguenots of France.

Bunyan's place in society was now very different from what it had been. There had been a time when many dissenting ministers, who could talk Latin and read Greek, had affected to treat him with scorn. But his fame and influence now far exceeded theirs. He had so great an authority among the Baptists that he was popularly called Bishop Bunyan. His episcopal visitations were annual. From Bedford he rode every year to London, and preached there to large and attentive congregations. Bunyan did not live to see the Revolution. In the summer of 1688 he undertook to plead the cause of a son with an angry father, and at length prevailed on the old man not to disinherit the young one. This good work cost the benevolent intercessor his life. He had to ride through heavy rain. He came drenched to his lodgings on Snow Hill, was seized with a violent fever, and died in a few days (August 31). He was buried in Bunhill Fields; and the spot where he lies is still regarded by the Nonconformists with a feeling which seems scarcely in harmony with the stern spirit of their theology.

The *Pilgrim's Progress* is perhaps the only book about which, after the lapse of a hundred years, the educated minority has come over to the opinion of the common people.

BUNZLAU (1.), the chief town of a circle in the government of Liegnitz in Prussian Silesia, on the right bank of the Bober, about twenty-seven miles from the city of Liegnitz by the Berlin and Breslau railway, which crosses the river by a noble viaduct. The older part of the town is still surrounded with fortifications. In 1813 it was the scene of a battle between the French and the Allies. Population in 1889, 10,000.

BUNZLAU (2.), the chief town of a circle in Bohemia, on the left bank of the Iser. Population, 9,000.

BUONAFEDE, APPIANO (1716–1793), an Italian writer on philosophy and social economy, was born at Comachio, in Ferrara. He became professor of theology at Naples in 1740, and entering the religious body of the Celestines in 1734, rose gradually to be general of the order. He died at Rome.

BUONARROTI. See MICHELANGELO.

BUONONCINI, or BONONCINI, is the name of three Italian composers. The elder, Giovanni Maria (1640–88), wrote instrumental pieces, songs, and church music. His sons, Marc Antonio (1660–1726), and Giovanni Ballesta (1667–1750), were known as composers of operas. The latter settled in London in 1720, and for some years was very famous and popular.

BUOY, a floating body used as a means of denoting any desired spot in a river, channel, or other place frequented by shipping. Buoys are made of various shapes and material, such as a small log of wood 6 or 8 inches diameter and about twice that length, an ordinary cask, or a special structure either of iron or wood, varying in strength, shape, and size according to the duty it is required to perform. Before an anchor is let go a buoy is generally attached to it, the length of the buoy-rope being slightly greater than the depth of water at high tide. This is done that if for any reason it should become necessary to slip the cable, both anchor and cable may be afterwards recovered the more readily, their position being denoted by the buoy, and also because it is of service to know the position of the anchor before attempting to weigh it. The buoys most commonly used for this purpose are of the shape of two cones brought together at their bases, and are made of sheet iron, usually galvanized; they are called *Nun-buoys*.

A bell which is frequently placed on a buoy is of great service at night or in foggy weather, the motion of the buoy as it is tossed about by the waves causing the bell to ring.

BUPALUS AND ATHENIS, Greek sculptors, about 540 B.C., lived in the island of Chios, which at that time had a school of sculptors who had acquired some celebrity by their works in marble, which material they had introduced as a substitute for the bronze and wood previously employed for sculpture. There is a story that Bupalus had made a caricature portrait of the poet Hipponax, who was known for his ugliness, and that the poet replied by some verses, the sting of which caused the sculptor to hang himself.

BUPHONIA, called also DIIPOLIA, a religious festival held on the 14th of the month Skirophorion (July) at Athens, when the very ancient ceremony was gone through of sacrificing an ox to Zeus.

BURBAGE, RICHARD, an English actor, born about 1567. Richard made his début early, by 1588 having already earned some reputation, and during the next ten years outstripped all competitors, and earned the title of "Roscius." He was a partner with Shakespeare in the famous Globe Theatre, and died in 1618.

BURCKHARDT, JOHN LUDWIG (1784–1817), a celebrated Swiss traveler, was born at Kirchgarten, near Lausanne. After studying at Leipsic and Göttingen he visited England in the summer of 1806, carrying a letter of introduction from the celebrated Blumenbach to Sir Joseph Banks, who, with the other members of the African Association, accepted his offer to explore the interior of Africa. After studying in London and Cambridge, and inuring himself to all kinds of hardships and privations, he left England in April, 1809, for Malta, whence he proceeded, in the following October, to Aleppo. In order that he might acquire Arabic thoroughly he disguised himself as a Mussulman, under the name of Sheik Ibrahim Ibn Abdallah; and, after two years passed in that part of Asia, he had so mastered the language as not to be distinguished from the natives, and had acquired such accurate knowledge of the contents of the Koran, and of the commentaries upon its religion and laws, that after a critical examination the most learned Mussulmans entertained no doubt of his being really what he professed to be, a learned doctor of their law. In 1812, while waiting for the departure of the caravan, he undertook a journey to the Nile, as far up as Mahass; and then, in the character of a poor Syrian merchant, he made a journey through the Nubian desert which Bruce had traversed, passing by Berber and Shendy to Suakin, on the Red Sea, whence he performed the pilgrimage to Mecca by way of Jiddah. In April, 1817, he was seized with an illness of which he died in October.

BURDER, GEORGE, one of the founders of the London Missionary Society, was born in London, June 5, 1752, and died there Nay 29, 1832.

BURDETT, SIR FRANCIS (1770–1844), Baronet. The rudiments of his education he received at Westminster school, whence he removed in due time to Oxford. He did not wait to graduate at that university, but in 1790 set out on a Continental tour, in the course of which he became strongly imbued with the revolutionary principles then dominant in France and other countries. On his return to England in 1793 he married the youngest daughter of Thomas Coutts, a London banker, with whom he received a large fortune. In 1797 he succeeded his grandfather in the baronetcy, his father and elder brother having predeceased him. At the outset of his political career he was a zealous supporter of ultra-liberal measures. On the occasion of the Manchester riots, in 1819, he wrote a letter to his constituents, for which he was tried for libel, found guilty, and condemned to three months' imprisonment, and to pay a fine of £1,000. He died in June, 1844.

BURDOCK (*Arctium*), a genus of Compositæ familiarly characterized by the bracts of the involucre which are hooked inward at the point. By means of these hooks the flower-head, popularly called a *bur*, readily lays hold of the clothes of a passer-by, wool of a sheep, or similar objects, and thus the seed is transported from one place to another, the short hairy pappus being insufficient to waft them far on the wind.

BUREAU, a French word, signifying a writing-table or desk; also an office for transacting business, a department of government, or the officials that carry it on. BUREAUCRACY is a name often given to signify the kind of government where the administration is centralized in regularly graded series of government officials, who interfere with and control every detail of public and private life.

BURG, a town of Prussian Saxony, on the River Ihle, and on the railway from Berlin to Magdeburg. It has long been noted for its woolen manufactures, which afforded employment to a great part of its population. It owes its prosperity to the large influx of industrious French, Palatinate, and Walloon refugees, which took place in the end of the seventeenth century. Population in 1889, 17,600.

BURGAGE is a form of tenure, both in England and Scotland, applicable to the property connected with

the old municipal corporations and their privileges.

BURGDORF (in French BERTHOUD), a town in the Swiss canton of Bern, on the River Emme, about 14 miles by railway from the chief city. Ribbons and damask, tobacco and chocolate are manufactured; and a large trade is carried on in the dairy produce of the Emmenthal. The castle of Burgdorf was built at a very early date, and the town became the capital of Lesser Burgundy and the residence of the dukes of Zähringen. Pestalozzi had his educational establishment in the castle for a number of years. Population, 5078.

BÜRGER, GOTTFRIED AUGUST (1748–1794), a celebrated German poet, was born on the 1st of January 1748 at Wolmerswende, a village in the principality of Halberstadt, where his father was a Lutheran minister. In his childhood he showed little inclination to study; the Bible was the only book which had any attraction for him, and his first attempts in versification were imitations of the Psalms. In 1764 Bürger, who was intended for the clerical office, began to attend the course of lectures given by the professors of the university. Klotz, a learned classical scholar, admitted him into the select number of the young men whose talents he took a pleasure in cultivating. He was appointed to the collectorship of Altengleichen, in the principality of Calenberg. The following winter, some fragments of a ghost story, which he heard a peasant girl singing by moonlight, caught his imagination, and suggested his celebrated ballad of *Leonora*. This remarkable production at once established his reputation as a poet. Reduced to the inconsiderable emoluments of *The Almanack of the Muses*, which he had edited since 1779, he removed to Göttingen with a view to giving private lessons there, and in the hope of obtaining a professor's chair in the department of belles-lettres. Five years later the title was conferred on him, but without a salary; and this was the only public recompense obtained during his whole life by a man who was one of the favorite authors of his nation, and who, while yet young, had achieved the highest reputation. He died in the forty-seventh year of his age.

BURGERSDYK, or BURGERSEICUS, FRANCIS, a celebrated Dutch logician, was born at Lier, near Delft, in 1590, and died at Leyden in 1629, in the thirty-ninth year of his age. His *Logic* was at one time widely used, and is still a very valuable compendium.

BURGÉSS, DANIEL (1645–1712), a learned and witty dissenting divine of the 17th century, born at Staines, in Middlesex, of which parish his father was minister. Besides preaching he gave instructions to private pupils, of whom the most distinguished was Henry St. John, afterwards Lord Bolingbroke.

BURGESS, THE RIGHT REV. THOMAS (1756–1837), bishop of Salisbury, was born at Odiham, in Hampshire. He was educated at Winchester, and in 1775 he removed to Oxford, where he gained a scholarship at Corpus Christi College. In 1789 he published his *Considerations on the Abolition of Slavery*, in which he advocated the principle of gradual emancipation. In 1803 he was promoted by his old schoolfellow Addington, then prime minister, to the vacant see of St. David's, which he held for twenty years, and where he gave evidence of his philanthropic disposition by establishing the Society for the Promotion of Christian Knowledge, and founding the College of Lampeter, which he liberally endowed. In the midst of his useful and laborious career, he was cut off by an attack of dropsy, February 19, 1837.

BURGHLEY, WILLIAM CECIL, LORD. See CECIL.

BURGKMAIR, HANS or JOHN, a celebrated engraver on wood, believed to have been a pupil of A. Dürer, was born at Augsburg, in 1743, and died about 1531. Professor Christ ascribes to him about 700 woodcuts, most of them distinguished by that spirit and freedom which we admire in the works of his supposed master. His principal work is the series of 135 prints representing the triumphs of the Emperor Maximilian I.

BURGLARY, or NOCTURNAL HOUSE-BREAKING, has always been looked upon as a very heinous offense. The definition of a burglar, as given by Sir Edward Coke, is "he that by night breaketh and entereth in a mansion-house with intent to commit a felony." The punishment is imprisonment for life, or any term not less than five years, or imprisonment not exceeding two years, with or without hard labor and solitary confinement.

BURGLEN, a village of Switzerland, in the Canton of Uri, about a mile from Altorf, is the traditional birthplace of William Tell. The supposed site of the patriot's house is now occupied by a chapel, erected in 1522, upon the walls of which are represented certain mythical scenes from his history. Population, 1,478.

BURGOMASTER, the Anglicized form of the Dutch *burgemeister* (German *bürgermeister*), the title of the chief magistrate of a city or town, analogous to the French *maire*, the English and American *mayor*, and the Scotch *provost*.

BURGOS, the capital formerly of the kingdom of Old Castile, and now of a separate province, stands on the slope of a hill. The principal square is the Plaza Mayor, or Plaza de la Constitucion, in the center of which is a bronze statue of Charles II. The most important public building is the cathedral, begun by Bishop Maurice, traditionally an Englishman, in 1221, but not completed till 1567.

Besides furnishing a mart for the agricultural produce of the neighboring districts, Burgos carries on a considerable export trade in linen and woolen stuffs, made in imitation of English goods. The principal articles of manufacture are paper, hats, stockings, and leather goods. Its population amounted to 32,000 at the census of 1889.

BURGOYNE, JOHN, an English General in the American War of Independence, was born about 1730, and died 1792. He entered the army when young, and made a runaway marriage with a daughter of the earl of Derby. In 1761 he sat in parliament for Midhurst, and in the following year he served as brigadier-general in Portugal. On the outbreak of the American war he was appointed to a command, and in 1777 he was at the head of the British reinforcements designed for the invasion of the colonies from Canada. In this disastrous expedition he gained possession of Ticonderoga and Fort Edward; but, pushing on, was detached from his communications with Canada, and hemmed in by a superior force at Saratoga. On the 17th October his troops, about 3500 in number, laid down their arms. The success was the greatest the colonists had yet had, and it proved the turning point in the war. The indignation in England against Burgoyne was great, but perhaps unjust. The general himself resigned all his appointments, and demanded a trial, but without avail. In 1782, however, he was restored to his rank, and made commander-in-chief in Ireland. His *Dramatic and Poetical Works* appeared in 2 vols., 1808. One comedy, *The Heiress*, kept the stage for long.

BURGOYNE, SIR JOHN FOX, son of the preceding, was born in 1782, and died October 7, 1871. He was educated at Eton and Woolwich, obtained a commission, and served in 1800 in Abercromby's expedition to the Mediterranean. He afterwards served in the Peninsular campaigns, but before the end of them was sent with Pakenham's division to New Orleans. He was engaged at Alma, Balaklava, and Inkerman, and conducted the siege of Sebastopol till his recall in March, 1855. He was made field-marshal in 1868.