

fixed by Watt at 33,000 ft.-lbs. per minute, is above what a good horse will do for a day of 10 hours. Walking at $2\frac{1}{2}$ m. per hour on the level, he exerts a tractive force of 100 lbs., equivalent to 22,000 ft.-lbs. per minute; but as the speed increases the tractive force diminishes, being, indeed, inversely proportional to the speed, between $\frac{3}{4}$ and 4 m. per hour. The draught of an averagely good horse is reckoned, as above, at 100 lbs. for 10 hours, at $2\frac{1}{2}$ m. per hour; for 9 hours, 111 lbs.; for 8 hours, 125; for 7 hours, 143; 6 hours, 167; 5 hours, 200 lbs. A man hauling along a level road at $1\frac{1}{2}$ to 3 m. per hour is reckoned at one-sixth of a horse; he does 3,670 ft.-lbs. per minute for a 10 hours' day. In rowing, he does 4,000 ft.-lbs. for 10 hours; on treadmill, 3,100; turning a handle, 2,600. While the horse gives, as above, 22,000 ft.-lbs. per minute, the ox gives 12,000, the mule 10,000, and the ass 3,500. See Trautwine's *Engineer's Pocket-book*.

Animals, CRUELTY TO. See CRUELTY.

Animals, INTELLECTUAL CAPACITY OF. See INSTINCT.

Animal-Worship. The deification and worship of certain of the lower animals, a usage traceable in most ancient religions, and still practised by many living races, appears to owe its origin to various complex causes. Among savages in the lowest stage of culture, a dread of the ferocity and the superior strength of the tiger, bear, and alligator seems undoubtedly to have been the motive which led to the worship of these animals, with the view of propitiating them; and although in modern times we find that some races kill and eat the object of their reverence (as in the case of Northern Asiatics and Red Indians), this apparent inconsistency may be explained by assuming that their ideas on the

subject are passing through a state of transition. Then, again, there are instances in which animals are held sacred, not out of fear for them, but because their bodies are believed to be the homes of the tribal deity or deities—an idea almost inseparable from that of demoniacal possession, and akin to the doctrine of metempsychosis. Animal-worship in this aspect survives among Polynesians, and in a still more distinct form among Hindus. 'The sacred cow is not merely to be spared; she is, as a deity, worshipped in annual ceremony, daily perambulated and bowed to by the pious Hindu. Hanuman, the monkey-god (whose living representative is the entellus monkey), has his temples and his idols, and in him Siva is incarnate, as Durga is in the jackal; the wise Ganesa wears the elephant's head; the divine king of birds, Garuda, is Vishnu's vehicle; the forms of fish, and boar, and tortoise were assumed in those avatar-legends of Vishnu which are at the intellectual level of the Red Indian myths they so curiously resemble' (Tylor's *Primitive Culture*). The religion of ancient Egypt was permeated with these ideas; and a similar origin is assignable to the worship by the Jews of the golden calf and the brazen serpent. Serpent-worship forms, indeed, a separate phase of this question; with which totemism, animism, and ancestor-worship are also involved. For in some cases a particular animal is held in reverence, not because the spirit of a deity dwells within it, but because it represents the tribal ancestor. Yet another variety of animal-worship was the reverence paid to dwarfs. Thus, the Malagasy of Madagascar deified the Vazimba, an extinct aboriginal race, 3 ft. 6 in. in stature. See Professor Windle's *Pygmies* (1894), p. xxxvi. The same idea

is suggested by the dwarf god Ptah of ancient Egypt, from whom have been derived the Phœnician Pataeki and Kobeiri. See R. G. Haliburton's *Dwarf Survivals* (1895), and J. G. Frazer's *Golden Bough* (1900), and *Totemism and Exogamy* (1910).

Animism (Lat. *anima*, 'soul'), a term originally used to denote the theory of the German chemist Stahl, who early in the 18th century developed and modified the classical theory which identified the vital principle with the soul, attributing to it the functions of ordinary animal life in man, while the life of other creatures was assigned to mechanical laws. It was applied by Dr. Tylor, in his work on *Primitive Culture*, to express the doctrine which attributes a living soul, not merely to human beings, but also to the lower animals, and to inanimate objects and natural phenomena generally. Since the publication of Dr. Tylor's work it has been almost exclusively used in that sense, though some anthropological writers have employed it more loosely to include the simpler conception which, in the evolution of savage thought, probably preceded it—*viz.* that of all beings, animate and inanimate, as endowed with personality and conscious life. Savage man interprets all external phenomena in the terms of his own consciousness. When he begins to reason concerning himself, the phenomena of sleep, of dreams, of trance, and of death lead to the view that he is composed of two parts—the more obvious part, the body, and an inner or less substantial part, the soul or spirit. The latter is capable of being separated from the body temporarily during sleep or trance, when it goes forth on various adventures, which the owner remembers as dreams and visions; or in sickness, when its place is often occupied by other

and less desirable spirits. In the latter case the great object of the savage medicine-man is to recover the soul; to drive out, if necessary, the invaders who have taken its place; and to induce it to re-enter the body, its proper abode. Death is the permanent separation of soul and body. This involves the decay and destruction of the body, but not of the soul, which is capable of existing apart. Separation, however, may continue for an indefinite time without causing death. A large class of folk-tales is based upon the belief that it is even for the advantage of the owner that his soul should be extracted and hidden away out of danger. This belief is carried into practice by some savages, as by the Alfures of Minahassa, in Celebes, on removal into a new house. Such removal is fraught with supernatural danger to the inmates. Consequently the priest collects beforehand all their souls into a bag, of which he takes charge, and afterwards, with the proper ceremonies, restores them to their owners.

The human soul is usually conceived as a miniature man or woman. But it is not necessarily human in form; it often appears as one of the lower animals—*e.g.* a beast, a snake, or even an insect. Again, it is often held to be the breath, the shadow (whence the word *shade* for a disembodied soul), or the image reflected in a pool of water or a mirror. It is originally not conceived as immaterial. This is a refinement of a later stage. The lower animals, trees, plants, and even inanimate objects, being all endowed with souls precisely analogous to those of men, they are not merely credited with human feelings and passions, but are often held to be transformed men. Personal identity in spite of entire change of form is thus an article of savage belief. This develops, in a higher plane of

culture, into the philosophical doctrine of the transmigration of souls, which has played so large a part in more than one religion. Other savage speculations as to the future condition of the human soul have had an important influence on religion. The belief that the soul can exist apart from the body has led to one or other of three conclusions: (1.) It continues to mingle more or less continuously with the living, and to interfere in their affairs; hence the superstitions concerning ghosts and vampires, and the cult of the dead. (2.) It carries on an existence of the same sort as in the body, but of a thinner and less substantial form, in some region apart from mankind. (3.) It passes to a place where the good are rewarded, and the wicked punished, for deeds done in the body. The last of these three opinions, though its germs may be found in the lower culture, is, generally speaking, later in civilization than the first and the second. It has survived in all the higher religions.

The immortality of the soul is not, as a rule, a savage doctrine. The soul of a departed human being is conceived as alive so long as any memory of the man remains in those who have known him in this life, or have heard him spoken of. The Polynesians of the Harvey group believe, as reported by Gill, that, while the souls of those who die a violent death are immortal, the souls of those who die a natural death are cooked and eaten by certain demons, and by this means annihilated. Some savage peoples are of opinion that there is a series of spirit-worlds, which are successively inhabited by the soul, death in each of them resulting in transfer to another, until in the last of them death means definitive annihilation. For the Dyaks death in the spirit-world means either

rebirth into this world or annihilation, according to accident, since the soul, on death in the spirit-world, enters into a fruit or a leaf, or some other edible substance. If then an animal or a human being eats the substance, the soul becomes reincarnated in the offspring of the eater; otherwise it perishes.

The difficulties of savage metaphysics have resulted, in many parts of the world, in the supposition that a human being has more than one soul. This hypothesis is found among peoples as widely different as the N. American Indians, the Melanesians, the Malagasy, the Negroes, and the Khonds. In the philosophy of more civilized races it appears among the Chinese, the Hindus, and the ancient Egyptians. There are even traces of it in Homer; while later Greek, Roman, and scholastic philosophers and the rabbinical writers made similar or even more subtle distinctions. The fates of these separate souls are not the same. When three or four souls are supposed to be united in one person, one of them frequently remains in or about the grave, another is born again into a fresh body, a third enters the spirit-world, and a fourth sometimes dies with the body. One of these souls is often identified with the shadow, another with the reflected image, a third is the dream-soul, and so on.

Another doctrine of the utmost importance appears to owe its origin to the belief that the soul can exist apart from the body—*viz.* that of the existence of spirits analogous to the human soul, which have never been permanently united to a body of any kind, but which exist independently of all corporeal ties. These spirits haunt the air, the earth, the heavens. Their power was regarded as of various degrees. They required to be appeased.

conciliated, and bound by mutual ties of service and protection to mankind. As the ethical sense grew with advancing civilization, they began to be differentiated into favourable and hostile, good and evil. Many of the former thus developed into gods, the latter into devils. They were regarded as able to hold commerce with the human race, and even to enter into individuals, to inspire them and take entire possession of them. They were equally able to inhabit the lower animals, trees, and other natural objects. In polytheistic religions they are conjured by appropriate ceremonies into the idols intended to represent them. The highest development of animism is in dualism or monotheism; for, to sum up, animism is, as Dr. Tylor says, 'the groundwork of the philosophy of religion, from that of savages up to that of civilized men.' See E. B. Tylor's *Primitive Culture: Researches into the Development of Mythology, Philosophy, Religion, Art, and Custom* (1871; 3rd ed. 1891), of which chaps. xi.-xvii. still remain the principal authority. On the animism of particular peoples, see Canon H. Callaway's *Religious System of the Amazulu* (1870); Rev. W. Gill's *Myths and Songs from the South Pacific* (1876), especially ch. 2, 8-10; R. M. Dorman's *Origin of Primitive Superstitions, and their Development into the Worship of Spirits and the Doctrine of Spiritual Agency among the Aborigines of America* (1881); R. H. Codrington's *The Melanesians: Studies in their Anthropology and Folk-lore* (1891), especially ch. 7, 10, 13; Mary H. Kingsley's *Travels in West Africa* (1897), ch. 19-22, and *West African Studies* (1899), ch. 5-7; Erwin Rohde's *Psyche: Seelencult und Unsterblichkeitsglaube der Griechen* (2nd ed. 1898); J. J. M. de Groot's *The Religious System of China; its Ancient Forms, Evolu-*

tion, History, and Present Aspect, Manners, Customs, and Social Institutions connected therewith (4 vols., pub. Leyden, 1892-1901), especially vol. iv., on 'The Soul in Philosophy.'

Animuccia, GIOVANNI (c. 1500-1571), composer, born at Florence; music master at St. Peter's, Rome (1555-71). His friend and confessor, San Filippo Neri, requested him to compose *Laudi Spirituali* (2 vols. 1565 and 1570), to be interspersed throughout his sermons; these hymns were the origin of the oratorio. His chief works are *Madrigali e Motetti a Quattro e Cinque Voci* (1548), and *Il Primo Libro di Messe* (1567). His brother PAOLO (d. 1563) was also a musician and composer.

Anio, mod. ANIENE, riv. of Italy, rises in the Hernician Hills (Monte Cantaro), flows s.w. past Subiaco and Tivoli, where it forms the famous five falls, and enters the Tiber 2 m. above Rome after a course of 70 m. Also known as the Teverone.

Anion, the portion of a compound that is liberated at the anode or positive pole when electrolysis takes place. See IONS; ELECTROLYSIS.

Anise Fruit, misnamed seed, is obtained from an umbelliferous plant of S. Europe, and is cultivated in Egypt, Spain, Germany, and elsewhere. 'Anise seed'—usually aniseed—is used in the preparation of liqueurs and by confectioners, is a mild stomachic, and relieves flatulence. The whole plant is aromatic. A cooling drink is made from the fruit in Italy. STAR ANISE is the fruit of an evergreen shrub of the magnolia order, a native of China, and star-shaped, having the properties of aniseed.

Anjangaon, tn., Berar, India, 30 m. N.W. of Amraoti. Pop. 11,000.

Anjar, tn., Bombay Pres., India, in Cutch, 160 m. W. of Ahmadabad. Pop. 13,000.

Anjer, seapt. on w. coast of Java, on Strait of Sunda, 60 m. w. of Batavia, a port of call for Batavia; was destroyed by Krakatoa eruption in 1883. Pop. 3,000.

Anjou, anc. prov. of France, round Angers, now the dep. Maine-et-Loire and part of the deps. Mayenne, Sarthe, and Indre-et-Loire. The 11th Count of Anjou, named Plantagenet, married (1128) the daughter of Henry I. of England, and was the father of Henry II. Anjou was reunited with the French crown in 1203. The title of Comte d'Anjou was revived in 1246, and bestowed by Louis upon his youngest brother Charles, who became the head of a new house of Anjou associated with the history of Naples and of Provence. After the death of 'le Roi René' in 1480, the nominal title of Duc d'Anjou was borne by the younger sons of the kings of France. See Marchegay and Salmon's *Chroniques d'Anjou* (1856-71), and Bessonneau's *L'Anjou en 1900* (1900).

Anker, an obsolete English liquid measure of from 9 to 10 gallons; still in use in Germany, Russia, and Denmark. The Scots anker contained 20 Scots pints.

Anklam, tn., dist. Stettin, prov. Pomerania, Prussia, 53 m. by rail n.w. of Stettin; is the seat of a military school. Pop. 15,600. See Saunder's *Anklam* (1900).

Ankle, THE, is a hinge-joint, the bony surfaces of which are covered with cartilage, and are bound together by ligaments. The movements of the joint are mainly those of flexion and extension, but a certain amount of lateral motion is possible when the foot is extended. From its position the ankle is a frequent seat of sprains, fractures, and dislocations. *Treatment*.—Quick and firm bandaging is of great importance, to prevent swelling. Wrap the ankle in plenty of cotton-wool, and bandage, leaving the toes exposed, in order that their colour

may indicate if the bandage becomes too tight. Numbness or discoloration of the toes shows that less pressure must be used; otherwise the ankle may be left untouched, and completely at rest, for three days, after which passive movement (*i.e.* the gentle movement of the joint by hand, not by its own muscles) may begin in many cases. If much swelling has taken place before the injury can be attended to, a hot fomentation will relieve the pain very much, and afterwards the bandage can be used, not to prevent swelling, but to keep the joint at rest. Passive movement and massage should both be used as early as possible after the swelling begins to subside, to aid absorption and prevent adhesions. Stiffness and weakness following a sprained ankle are best treated with cold douches and special movements—*e.g.* tiptoe exercises. Fractures occur in the immediate vicinity of the ankle joint. The commonest of these is 'Pott's fracture,' produced by forcible twisting of the foot, in which the fibula breaks about three inches above the external malleolus. Treatment consists in the reduction of the deformity, and putting the limb into a suitable splint. In dislocations the entire foot may be displaced in any direction. Compound dislocation of the ankle is always serious, and may necessitate amputation. See JOINTS.

Ankleshvar, tn., Broach dist., Bombay Presidency, India, 50 m. s. by E. of Baroda; cotton and paper mills. Pop. 10,000.

Ankober, or ANCOBER, caravan centre, former cap. of Shoa, Abyssinia, 350 m. E. of Zeila, on the E. slope of the hills forming the Shoa plateau, at an alt. of 8,700 ft. Pop. 2,000.

Ankole, or ANKORI, a dist., Uganda Protectorate, British East Africa, between Edward Nyanza on the w. and the Vic-

toria Nyanza on the E. A land of thorny scrub in the E., traversed by ranges of about 5,000 ft.; fertile and well cultivated in the W.; has iron ores. The inhabitants comprise the Wanzankori, the true aborigines, and the Wahumas, intruders from Gallaland. All speak a Bantu dialect closely related to that of Unyoro.

Ankylosis, the partial or complete rigidity of a joint, is due to morbid growth, often following a neglected dislocation or a fracture. Ankylosis may also follow on severe articular rheumatism.

Ankylostomiasis, a disease, leading to acute anæmia, caused by the bite of the parasitic nematoid worm *Ankylostoma*, common in Egypt and Brazil, and sometimes called the 'tunnel-worm' because of its frequency among the workers at the St. Gothard tunnel. An epidemic among the Kimberley miners is recorded. The treatment is by anthelmintics, followed by iron tonics.

Ann, or ANNAT, in Scots law, is the half-year's stipend due at the first vesting period after the death of a parish minister of the Church of Scotland, and is payable to his family or next of kin, or, failing them, to the Church of Scotland Ministers' Widows' Fund. As the right to ann vests in the next of kin, it is not assignable, nor can it be attached by the minister's creditors.

Anna, an Indian coin, the sixteenth of a rupee.

Annaberg, tn., prov. Zwickau, Saxony, on the N. slope of the Erzgebirge, 16 m. S. of Chemnitz. It manufactures haberdashery and lace, buttons, and cardboard. There are silver, cobalt, and iron mines. Pop. 17,000.

Annabon, or ANNOBOM, isl. in the Gulf of Guinea, W. Africa, belonging to Spain; is mountainous (2,800 ft.), well wooded, fertile, and healthy. Area, 6½ sq. m. Pop. about 3,000.

Anna Comnena (1083-1148), Byzantine princess, historian, and patron of learning, daughter of Alexius I.; endeavoured unsuccessfully to induce her dying father to name her husband, Nicephorus Bryennius, as his successor. She afterwards formed a plot against the life of her brother; it was discovered, and Anna, with her husband, fled to Greece. The rest of her life was given to writing; she is remembered for her *Anna Comnena Alexides* (1069-1118), a biography of her father. The best edition is that of Schopen and Reifferscheid (1839-78); a German translation was published by Schiller in his *Historische Memoiren* (1790). See Oster's *Anna Comnena* (1868-71), and Chalandon's *Règne d'Alexis I.* (1900).

Anna Ivanovna, Empress of Russia (1693-1740), daughter of Ivan, half-brother of Peter the Great. On the death of Peter II. (1730) she succeeded to the throne, declared herself autocratic, and gave supreme power to her favourite, Biron, who ruled the empire with intolerable tyranny and oppression. At her death Anna left the throne to Ivan, son of her niece, Anna Carlovna.

Annals. See RECORD OFFICE.

Annam (properly ANNAN, from *Chin-Ngan-nan*, 'Southern Peace'; Annamese, *Dang Trang*, 'Inner Route'), a kingdom of Indo-China, formerly comprising the whole of Tong-king and Cochin-China. Annam is bounded on the N. by Tong-king, on the E. by the China Sea, on the S. by Cochin-China and Cambodia, and on the W. by Siam. The area is 52,100 sq. m., and the pop. 6,500,000.

Between the Mekong valley and the China Sea the surface is occupied by a series of plateaus and ranges, the latter reaching altitudes of 5,000 to 8,000 ft. There are several sheltered harbours, the finest Nan-Thiet (between

Kega and Vinay Points), Kana (under Cape Padaran), and the spacious Hon-Kohe inlet. Farther N. is Tourane Bay, at the mouth of the Hane R., a few miles S. of Hué Bay, the safest haven on the whole coast, and accessible to the largest vessels.

The climate is largely determined by the Coast Range, which shelters Annam from the moist S.W. monsoon, and intercepts the N.E. winds which prevail from September to January. This is the season of almost continuous rain, often accompanied by typhoons, and has an average temperature of about 60° F. In June, July, and August the temperature often rises to 85° or 95° F. during the day.

In Annam there are three vegetable zones: that of the seaboard, overgrown by the mangrove, pandanus, and calamus palm; that of the mountain slopes; and the intervening belt of alluvial lowlands, under rice, fruits, and other cultivated crops. The upland zone is, with that of the Malay Peninsula, by far the richest in Asia for the variety and abundance of its vegetable forms. Here the floras of Japan, of China, and the N. Himalayas are intermingled with the indigenous growths—notably ironwood, teak, eaglewood, dyewoods, lacquer, and other gummiferous plants; benzoin, cardamom, and many valuable drugs. Only 500,000 ac. are under rice, and great quantities of that food are imported from China and Cochin-China. Of other economic plants, cotton, sugar-cane, tea, and cinnamon are cultivated.

The inhabitants of Annam belong almost exclusively to the S. division (Indo-Chinese) of the Mongol family. Socially they form two well-marked groups—the settled and somewhat civilized Annamese of the cultivated plains, and the rude, wild tribes called Moï. The masses are Buddhists; the lettered classes call themselves

Confucianists. The Annamese are essentially an agricultural people. Cap. Hué. The chief ports of entry are Tourane and Fai-Foo. The great natural resources of the country remain undeveloped, owing to the total absence of railways; even roads are rare. Lower Cochin-China was ceded to France by the treaties of 1862 and 1867. A protectorate was proclaimed over Cambodia in 1863, and French interests were secured in Tongking by treaties concluded with Annam in 1874. The treaties of 1884 and 1886 ended Chinese interference and extended the French protectorate over Annam itself.

See Luro, *Le Pays d'Annam* (1876; 2nd ed. 1898); Dutreuil de Rhins, *Le Royaume d'Annam et les Annamites* (2nd ed. 1889); Lemire, *Indo-Chine, Annam, et Tonkin* (1888); J. L. de Lanessan, *L'Indo-Chine Française* (1889), and *La Colonisation française en Indo-Chine* (1895); J. Barral, *La Colonisation française au Tonkin et en Annam* (1899); Barthélemy (Comtede), *En Indo-Chine* (1899); E. Gallois, *A Travers les Indes* (1899), *Mission Pavie Indo-Chine, 1879-95* (1899); Orléans (Prince Henri d'), *Du Tonkin aux Indes* (1897); Chenau, *Du Protectorat français en Annam* (1904); Goselin, *L'Empire d'Annam* (1904).

Annan. (1.) Seapt. and parl. bur., Scotland, on Annan R., 15 m. S.E. of Dumfries; has shipbuilding, distilling, fishing, tanning, milling, and cotton manufactures. Pop. 6,000. (2.) Riv., Dumfriesshire, Scotland, rises in the Moffat hills, and flows S. to the Solway Firth. Length, 49 m.

Annandale. (1.) Scotland, the middle of the three divisions of Dumfriesshire. It is about 30 m. long and 15 m. broad. Has many Roman remains and mediæval antiquities. (2.) Suburb of Sydney, N.S.W. Pop. 8,500.

Annandale, CHARLES (1843), born in Kincardineshire, edu-

cated at Aberdeen University; has edited *The Imperial Dictionary* (1882); Blackie's *Modern Cyclopædia* (1890); *The Popular Cyclopædia*; *The Student's Dictionary* (1895); *Concise Dictionary*; *Burns's Works*; and wrote introduction and continuation of Thomson's *History of Scotland*.

Annandale, THOMAS (1838-1907), regius professor of clinical surgery in the University of Edinburgh from 1877, and senior surgeon to the Royal Infirmary, was born at Newcastle. He published many important books and papers on operative surgery.

Annapolis. (1.) City, cap. of Maryland, U.S.A., 27 m. E. of Washington, D.C., situated on Chesapeake Bay; contains U.S. Naval Academy (1845) and St. John's College (1789). Industry, oyster-tinning. Here the Convention of 1786 met to consider alterations of the Articles of Confederation. Pop. 9,000. (2.) Tn., formerly Port Royal, on an arm of the Bay of Fundy; the first settlement in Nova Scotia (1604). It passed into the hands of the British in 1713, and remained the capital of the colony till Halifax was founded in 1749. Pop. 1,500. (3.) Co. of Nova Scotia, bounded by the Bay of Fundy in the N. In it are situated the famous fruit orchards of the Annapolis valley. Pop. 20,000.

Ann Arbor, city, Michigan, U.S.A., situated on the Huron R., 38 m. W. of Detroit; is the seat of the state university (1837). Pop. 15,000.

Annates. See FIRST-FRUITS.

Annatto, or ARNOTTO, a colouring matter obtained from the seeds of an evergreen plant, *Bixa orellana*, from Brazil and Cayenne (French Guiana); is a red, soft solid, slightly soluble in water, but readily in alcohol or in alkaline solutions. It dyes silk, cotton, and wool fibres; but the colour is fugitive, and its principal

use is to colour butter, cheese, varnishes, and lacquers. It is greatly adulterated with flour, chalk, gypsum, alkali, soap, turmeric, red ochre, etc.

Anne, ST. (ANNA), according to tradition the mother of the Virgin Mary; born in Bethlehem; was married to Joachim. Tradition represents Mary as the only child of this marriage, but Engisippus and others maintain that Anne was thrice married, and was the mother of a daughter Mary in each case, in order to reconcile tradition with the reference to the sister of Mary (John 19:25). A church was built in her honour in Constantinople by Justinian in 550, but it was not till 1584 that the observance of her festival was enjoined on the Roman Catholic Church. She is the model of married women, and of those who have the care of children. See Baring-Gould's and Butler's *Lives of the Saints* (1872-7).

Anne (1456-85), queen of Richard III. of England, younger daughter of the Earl of Warwick, the 'king-maker,' was betrothed to Edward, Prince of Wales (1470). After his death at Tewkesbury (1471), Richard of Gloucester, desiring to share the wealth of the Warwicks, compelled her to marry him (1473), and on his usurpation of the crown (1483) she became queen. See Strickland's *Queens of England* (1864-5).

Anne (1665-1714), Queen of Great Britain and Ireland, second daughter of James II., was born at St. James's Palace. Like her elder sister, Mary, she was brought up as a member of the Church of England—a circumstance which vitally affected her subsequent career. At eighteen she was married (July 28, 1683) to Prince George of Denmark, brother of King Christian V. The death of Mary, on Dec. 28, 1694, without leaving an heir, and there- after the death of William on

March 8, 1702, left the succession to the throne, in terms of the Declaration of Right, vested in Anne, who was accordingly crowned on April 23, 1702. The chief event of her reign was the union of the Parliaments of England and Scotland in 1707. Hardly less important were the Jacobite intrigues (culminating in the rebellion of 1715), and the war with France, the campaigns of Marlborough and Peterborough, the victories of Blenheim (1704), Ramillies (1706), Oudenarde (1708), and Malplaquet (1709), leading up to the treaty of Utrecht (1713). Her reign has been fitly styled the Augustan age of English literature. A woman of strong character, and possessed of many amiable qualities, she nevertheless offended the Whig party by her marked Toryism (see GODOLPHIN; OXFORD, EARL OF; and MASHAM, ABIGAIL), and her Scottish subjects by her narrow Anglicanism. See histories of the reign by Burton and Oldmixon, also Ashton's *Social Life in the Reign of Queen Anne*, and *Queen Anne*, by Herbert Paul (1906).

Anne OF AUSTRIA (1601-66), daughter of Philip III. of Spain, married Louis XIII. of France (1615). On his death (1640) she became regent for her son, Louis XIV., until he was proclaimed king at thirteen (1651), though she entrusted the affairs of the kingdom to the strong hands of Mazarin. See Freere's *Regency of Anne of Austria* (1866), and Mrs. Grant's *Queen and Cardinal* (1907).

Anne OF BOHEMIA (1366-94), daughter of the Emperor Charles IV. of Germany, sister of King Wenceslaus of Bohemia, and married to Richard II. of England (1382); was greatly beloved by her husband and people, and was known as 'Good Queen Anne.'

Anne OF CLEVES (1515-57), daughter of John, Duke of Cleves, and fourth queen of Henry VIII. of England. The marriage (Jan.

1540) was arranged by Thomas Cromwell. Henry's disappointment with Anne, after the glowing description which he had received, aided by Holbein's flattering portrait, was so great that in June of the same year he had the marriage annulled. Anne was granted Richmond Palace and £3,000 a year. See Strickland's *Queens of England* (1864-5).

Anne OF DENMARK (1574-1619), daughter of Frederick II.; married (1589) James VI. of Scotland, but becoming alienated from him, soon ceased to take part in public affairs. After the Union (1603) she lived extravagantly at Hampton Court until her death. See Strickland's *Queens of England* (1864-5).

Annealing, the process of rendering glass or metal less brittle. When glass is rapidly cooled, it easily cracks and flies to pieces if exposed to variations of temperature or when scratched. After rapid cooling, the outer surface, which solidifies first, is in a state of strain differing from that of the inner layers; but slow cooling makes the mass homogeneous. Glass vessels are placed in an annealing oven, where, from a temperature approaching the fusion point, they cool very slowly. Many metals become brittle when hammered or drawn into wire, but after being heated to redness and slowly cooled they recover their former toughness. Tool steel is hardened by plunging it when hot into water or oil, the toughness being restored according to the degree to which it is reheated.

Anne Boleyn. See BOLEYN.

Annecy, tn. and episc. see, cap. of dep. Haute-Savoie, at the N.W. extremity of the lake of the same name, France, 22 m. S. of Geneva. Health resort (alt. 1,511 ft. above sea-level); industries, cotton, silk, leather, etc. Pop. 15,000.

Annelids, the segmented worms —e.g. the earthworm, lobworm, and leech. See WORMS.

Annen, tn., Westphalia, Prussia, near Hörde. Has coal mines and iron and steel foundries. Pop. 12,000.

Annexation. (1.) OF TERRITORY, the term applied by international jurists to the proclamation by which a nation expresses its intention to appropriate territory which has not hitherto belonged to it. Like all other unilateral acts, annexation is only effected when coupled with *de facto* power to annex. In practice it should always be accompanied by either conquest or an effective military occupation, and unless so accompanied it need not be recognized as binding either on other states or on the subjects of the territory annexed. (2.) In Scots law annexation means the uniting of lands to the crown, and declaring them to be inalienable. An Act of 1455, followed by other acts, the latest of which is that of 1633, annexed the lands and revenues which were the patrimony of the Scottish crown, so that they cannot be alienated or feued without the consent of Parliament. They are under the management of the Commissioners of Woods and Forests, and are surrendered in exchange for the Civil List. After the reformation, church lands in Scotland were, with certain exceptions, annexed to the crown by an Act of 1587. Annexation of lands *quoad sacra* means the union to another church of lands lying at a distance from the church to which they belong, so that the inhabitants may be under the care of the minister of that church, though as regards civil matters the lands remain part of the old parish.

Anniston, city, Calhoun co., Alabama, U.S.A., 60 m. E. by N. of Birmingham. Manufactures cotton goods, locomotives, boilers, etc. Pop. 10,000.

Anniviers, VALD' (Ger. *Eivischthal*; incorrectly, *Einfischthal*), an Alpine glen in the Swiss canton of

Valais. Its chief village is Sierre, above which are the summer resorts of St. Luc, Chandolin, and, at the head of the glen, Zinal.

Anno, or HANNO (1000-1075), archbishop of Cologne. He succeeded in gaining possession of the young German emperor, Henry IV., and in transferring the regency from the king's mother to himself.

Anno Domini, ANNO HEJIRÆ, ANNO MUNDI, ANNO URBIS CONDITÆ. See A.D., A.H., A.M., A.U.C.

Annonay, tn., France, dep. Ardèche, 50 m. S. of Lyons. It manufactures leather, paper, and cotton and silk goods. Pop. 17,300.

Annual Register, an English periodical, published annually in June (London), contains a review of events at home and abroad, a retrospect of literature, science, and art, an obituary, etc. It was first issued by Dodsley in 1758.

Annals, plants which complete their life-history in one growing period. The seed germinates in spring; the plant flowers, fruits, and dies before the end of the year. By preventing an annual from flowering, it may in some cases be induced to continue its growth for a second season.

Annals, popular illustrated books intended as Christmas gift-books, published during the early 19th century. Among the first were *Forget-me-not* (1823-48); *Friendship's Offering* (1824-44); and *Literary Souvenir* (1824-34), to which Scott, Wordsworth, Turner, Landseer, and others, contributed. After 1840 their popularity waned. The most important of modern annals are the reference year-books, containing a varied assortment of current information on matters of immediate interest. Amongst the most useful of such publications are *The Statesman's Year-Book*, containing an account of the government, finance, population, commerce, and general statistics of every country in the

world; *Hazell's Annual*, an alphabetically-arranged record of men and topics of the day; *Whitaker's Almanac*; and *Who's Who*, consisting of biographies of living celebrities supplied by themselves; *The Literary Year-Book*; *The Daily Mail Year-Book*; *The Liberal Year-Book*; and *The Constitutional Year-Book*. Similar annuals are published in the United States and on the Continent, the most important being the *Almanach de Gotha*, founded in 1763; and that issued by Hachette of Paris.

Annuity. An annuity may be defined as a periodical payment for a fixed number of years, or during the lifetime of some person, called the *nominee*, or, more generally, so long as some given condition is satisfied. The period during which the annuity is to be payable may be dependent upon the combination of any number of lives and terms of years, besides involving the chances of marriage, birth of issue, or any other contingency, and is technically called the *status* of the annuity. The payments may be made either yearly or at shorter intervals—*e.g.* half-yearly, quarterly, monthly, or weekly—but whatever the intervals be, the total sum payable in a complete year is spoken of as 'the annuity.'

An *annuity certain* is one where the status is a fixed number of years; and if the payment is to be continued for ever, it is called a *perpetuity*. When the annuity is not to commence until after a certain term, it is said to be *deferred* for that term. The first payment of a yearly annuity is usually made at the end of the first year; of a half-yearly annuity, at the end of the first six months; and if the annuity be payable at shorter intervals, at the end of the first such interval. When the first payment is to be made immediately, the annuity is called an *annuity due*. A life annuity may

either cease with the last annual, half-yearly, or other periodical payment falling due before death, or it may include a proportional payment for the time between the last periodical payment and the date of death. In the former case the annuity is said to be *curtate*, and in the latter *complete* or *apportionable*. By Act of Parliament all life annuities (except premiums on policies of assurance) are apportionable, unless an express stipulation to the contrary be made in the deed creating the annuity. In the United States both methods are in use, but usually life annuities are made apportionable. The most important examples of annuities certain are to be found in the terminable annuities of the National Debt, ground rents, and municipal loans; and the stocks of various governments, perpetual debenture stocks of railway and other companies, and feu-duties, are examples of perpetuities.

The magnitude of an annuity is generally the same from year to year; but varying annuities are sometimes met with, perhaps the best-known example being British consols, where the rate was reduced from $2\frac{3}{4}$ to $2\frac{1}{2}$ per cent. in the year 1903. The values of all annuities certain can be found by the application of algebra to the theory of compound interest, but life annuities require in addition a knowledge of the probabilities of human life. The earliest attempt of which record has been kept to ascertain the value of a life annuity arose out of the Falcidian law of ancient Rome (40 B.C.), which provided that no person should bequeath more than three-fourths of his property to persons other than his heirs. Hence, whenever a testator gave an annuity under his will, it became necessary to value the annuity in order to ascertain whether the above law had been complied with. Up till about 230

A.D. the rule for finding the value was to take thirty years' purchase for all ages below thirty, and one year's purchase less for each year of age above thirty. This rule was improved upon by the Prefect Ulpianus, who constructed what is known as the Roman table of annuities.

This table was probably constructed from actual observations of some kind, but apparently the element of interest was left out of account altogether. After the lapse of about sixteen centuries this table was adopted by the Tuscan government, notwithstanding that many more accurate tables had been formed in the meantime. The following is the Roman table:—

AGE.	YEARS' PURCHASE.
Birth to 20	30
20 „ 25	28
25 „ 30	25
30 „ 35	22
35 „ 40	20
40 „ 41	19
41 „ 42	18
42 „ 43	17
43 „ 44	16
44 „ 45	15
45 „ 46	14
46 „ 47	13
47 „ 48	12
48 „ 49	11
49 „ 50	10
50 „ 55	9
55 „ 60	7
60 and upwards	5

The next recorded estimate was made by Johan de Wit, in a report to the States-General of Holland (1671) on the subject of life annuities. It had been the custom for towns to raise money by the sale of annuities, the price being then fourteen years' purchase, having risen from six years' purchase at the beginning of the century. De Wit showed that an annuity on a young and healthy life was certainly worth more than sixteen years' purchase. In a correspond-

ence with Hudde there is indicated a hypothesis, suggested by the latter, that out of every eighty-six persons born one will die every year, so that the last dies between the ages of eighty-five and eighty-six. This celebrated hypothesis was independently suggested by De Moivre in 1725, and is known by his name. For the greater part of life it represents the law of mortality with moderate accuracy, but at very young and very old ages it is considerably in error. In 1693 Dr. Halley published a table of annuity values for every fifth age, computed at six per cent. interest, having deduced the probabilities of life from the births and deaths recorded in Breslau, and this was probably the first table of annuities calculated by a correct scientific process. About the same time the British government first began to raise money by the sale of annuities, which they granted at the rate of £14 for every £100 paid to them (about seven years' purchase), irrespective of the age of the nominee. The actual experience of these annuitants was afterwards investigated, and it was found that the prices ought to have ranged from seventeen years' purchase at age ten to four and a half years' purchase at age seventy-five. Annuities payable during the life of the survivor of two persons were granted at eight and a half years' purchase, and to the survivor of three persons at ten years' purchase. In 1703 these prices were raised to nine, eleven, and twelve years' purchase respectively; but it was not till 1808, when the Northampton table was adopted, that the prices were fixed with any regard to scientific principles by making them depend on the age of the nominee. Although the foregoing terms were extremely favourable to purchasers, only a small volume of business was transacted, chiefly with Dutchmen, who, owing to the

publications of Kerseboom, knew sufficient of the subject to nominate young female lives, while the English purchasers selected their nominees without regard to age or sex, and therefore found the transactions much less profitable.

The Northampton table just mentioned was published by Dr. Price in 1780, having been deduced from statistics regarding 4,689 deaths which occurred in Northampton between the years 1735 and 1780. The method of calculation left out of account the number of the population, and would have been correct only if the population had remained stationary during the period, which was not the case. The table largely overestimated the rate of mortality throughout the greater part of life, and therefore brought out too low prices for annuities, so that its adoption by the government led to a heavy annual loss. In 1819 Mr. Finlaison proved that the loss was then at the rate of no less than £8,000 per month; but the Chancellor of the Exchequer took no steps to remedy matters, nor did his successor. In 1827 Mr. Finlaison again drew the attention of government to the matter, pointing out that the loss was by that time at the rate of £8,000 per week, and in the following year the government discontinued the use of the Northampton table. Fresh tables were carefully prepared, giving rates for all ages from fifteen to ninety, the annuity allowed at the latter age being £62 for each £100 of purchase money, the first payment to be made three months after purchase. This rate is obviously very large, but nevertheless the government believed that the new tables were correct, and adopted them in 1829. They were soon undeceived. Clever speculators at once realized the opportunity for making large profits, scoured the country in search of hale old yeomen, and purchased

large annuities on their lives. Although some of the annuitants died shortly after purchase, large profits could be obtained by spreading the annuities over several lives, and thus averaging the risks, and numerous fortunes were made in this manner. The mistake was then remedied by the removal of the advanced ages from the table, and the government finally put a stop to such speculation by providing that no annuity should be granted on a nominee over sixty-five years unless the nominee should have a *bona fide* beneficial interest in the annuity.

Up till 1854 the Usury Acts prevented a lender charging more than a fixed rate of interest, and, with a view to evade those acts, money-lenders were in the habit of arranging their dealings in the shape of annuity transactions. Instead of granting loans, they purchased annuities from their victims; and as they thus risked losing their capital in the event of the annuitant's early death, the borrowers were made to insure their lives and pay the premiums, as well as interest, thus making the annual payment very heavy. The unfortunate borrowers were, in fact, compelled to pay much more dearly than if there had been no restriction on the rate of interest, thus suffering a loss owing to the very laws which were intended to protect them. The extent to which this evasion of the law was carried was shown by a great diminution in annuity transactions shortly after the Usury Acts were repealed.

Since 1829 the government have continued to grant annuities in exchange for stock, with a view to the gradual reduction of the National Debt as the annuities expire. The security for these annuities is, of course, better than can be obtained from any other source, and the terms offered are, in consequence, somewhat less favourable to pur-

chasers than are granted by insurance companies. Over £1,250,000 is annually paid away by government in life annuities, and over £1,500,000 by insurance companies. Annuities are also granted by the government through the Post Office to the extent of not less than £1 nor more than £100 on any one life of either sex not less than five years of age. About 2,000 such annuities are sold each year, securing an annual payment of about £55,000; and the total number now running is over 20,000, securing payments of over £500,000 a year. Out of the fund raised by the *Daily Telegraph* and other newspapers for the widows and orphans of soldiers killed in the South African

with the result that the 'expectation of life' of annuitants is considerably greater than that of the average population. This is shown by the following table, which also illustrates the greater longevity of females than males.

It should be observed that the 'expectation of life' cannot be used to find the value of an annuity. A common error is to suppose that a life annuity is equivalent to an annuity certain for a term equal to the expectation of life; the actual fact being that the latter is always greater than the former, and the true value of a life annuity can only be obtained by a lengthy calculation involving the theory of probabilities.

EXPECTATION OF LIFE				
OF THE GENERAL POPULATION.			OF ANNUITANTS.	
Age.	Males.	Females.	Males.	Females.
20 . . .	39·5 yrs.	40·3 yrs.	40·2 yrs.	45·3 yrs.
30 . . .	32·8 "	33·8 "	33·6 "	38·0 "
40 . . .	26·1 "	27·3 "	28·8 "	31·2 "
50 . . .	19·5 "	20·8 "	21·0 "	24·2 "
60 . . .	13·5 "	14·3 "	14·9 "	17·0 "
70 . . .	8·5 "	9·0 "	9·2 "	10·5 "
80 . . .	4·9 "	5·3 "	5·2 "	5·6 "
90 . . .	2·8 "	3·0 "	2·9 "	3·0 "

war, annuities of £15 each were purchased through the Post Office for about 250 widows.

In the United States the business of selling annuities has been carried on chiefly by the life insurance companies. The purchasers consist chiefly of women of 65 years and more.

It has long been a well-recognized fact that annuitants as a class are longer lived than the average. This arises partly from the fact that annuitants usually lead quiet and retired lives, and partly from the fact that no person in bad health is likely to invest money in the purchase of an annuity. A process of selection, or choosing out the best lives, is thus gone through,

In law, if a testator directs his trustees to purchase a government annuity of fixed amount for A, or to lay out a fixed sum in buying an annuity, A is entitled to have the capital sum paid to him. As a rule, an annuity is charged on income only, and the annuitant is not entitled to have any arrears made up out of capital; but he is entitled, in the administration of the testator's estate, to have a capital sum set aside, the income from which is sufficient to satisfy the annuity. By the Real Property Limitation Act, 1833, only six years' arrears of an annuity charged on land may be recovered; and if the annuity is unclaimed for twelve years, the

right is barred altogether. Special provisions are contained in the Stamp Act, 1891, the Sequestration (Scotland) Act, 1856, and the Death Duties Act, 1895, for ascertaining the capitalized value of an annuity for purposes of taxation, etc., but no estate duty is payable on the dropping of an annuity for which full value was given. See *Institute of Actuaries' Text Book*, King's *Theory of Life and Annuity Assurance* (vol. i. 1887), and various articles in the *Jour. of the Inst. of Actuaries* (London).

Annuity Tax, a rate levied by Charles I. in the royalty of Edinburgh and elsewhere to support the Established Church. It latterly provoked strenuous and defiant opposition (1833-48), was reduced (1860), and finally abolished (1870). See *Report of Select Committee on Annuity Tax* (1851).

Annular Eclipse. See ECLIPSE.

Annulet, in architecture, a small band encircling a column; in heraldry, the mark of cadency of a fifth son.

Annunciation, the appearance of the angel Gabriel to the Virgin Mary to announce to her the incarnation (Luke 1:27-38); is now a church festival on March 25, or Lady Day. The subject has been a favourite one in religious art; Tintoretto, Donatello, Botticelli, Della Robbia, and in our day Burne-Jones and D. G. Rossetti, have treated it. Various conventual orders have received this name; and the highest order of knighthood of the house of Savoy is called the Supreme Order of the Annunciation. It was founded in 1360, and reconstituted in 1518.

Annunzio. See D'ANNUNZIO.

Annus Deliberandi, in Scots law the period of one year before the end of which an heir had to decide whether to accept or renounce the inheritance, including its liabilities. The period is now restricted to six months, and the heir is no longer liable

for debts of his ancestor beyond the value of the estate.

Annus Mirabilis, a poem (1667) by Dryden. The year referred to is 1666, when the English fleet destroyed the maritime power of the Dutch. In the same year occurred the Great Fire of London.

Annweiler (anc. *Anvilre*), tn., Bavaria, 22 m. w. of Germersheim, in a valley of the Haardt Mts.; manufactures paper, straw-plait, leather, and wine. Pop. 4,000.

Anode, the positive pole of a battery, as distinguished from the cathode, or negative pole, in a system for the electro-deposition of metals. See ELECTROLYSIS.

Anodynes, or ANALGESICS, drugs which relieve pain. Opium and morphine are the most powerful; antipyrin, exalgin, phenacetin, and antifebrin are very useful, do not exert a harmful influence on the brain, and are specially used in cases of neuralgia. All are dangerous when used by persons ignorant of their qualities and composition. Aconite, belladonna, opium, and cocaine are applied locally.

Anointing. See EXTREME UNCTION.

Anomalistic Year. The earth is in perihelion when it is at the point in its orbit nearest to the sun. This point is not fixed, but has a slow eastward motion of about 11' a year; hence the return to perihelion occupies a longer period than a complete revolution. This period is the anomalistic year, which is nearly five minutes longer than the sidereal year.

Anomaluridæ, the scale-tailed squirrels, an African family of flying rodents, with imbricating scales on the under side of the tail which are of assistance in climbing.

Anomaly, irregularity or departure from the common rule. In astronomy, the angle subtended at the sun by the portion of its orbit through which a planet, at a given instant, has moved from

its perihelion. Planetary orbits being elliptical, the 'true anomaly' increases at an unequal rate in different parts of them; while the 'mean anomaly' is calculated on the supposition of uniform angular velocity in an orbit traversed in the actual period. The difference between these is termed the 'equation of the centre.' The 'excentric anomaly' is the angle between the axis and the radius vector drawn from the centre of the orbit to meet the point on the auxiliary circle of which the position of the planet in its elliptic orbit is the projection.

Anomodontia, a group of fossil reptiles, mostly of considerable size. In many the jaws were toothless, but were covered with horny plates; in others there were two teeth in the upper jaw. Some were uncouth, short-limbed animals with massive bodies; others were adapted to a more agile life. The remains have been found chiefly in the Karroo beds of S. Africa, also in N. America, and in the New Red Sandstone of Elgin, Scotland. See H. N. Hutchinson's *Extinct Monsters* (1892), and Smith Woodward's *Vertebrate Palæontology* (1898).

Anona. See CUSTARD APPLES.

Anonymous (Gr. 'not named'), a term applied to a work published without its author's name. Where an assumed name is used, the work is said to be *pseudonymous*. The following is a list of some English works published anonymously: *The Rehearsal*; Mulgrave's *Essay on Satire* and his *Essay on Poetry*; Swift's *Battle of the Books* and *Tale of a Tub*, and all his publications previous to 1712; Thomson and Mallet's masque *Alfred*, in which 'Rule Britannia' first appears; Goldsmith's *Citizen of the World*; Aken-side's *Pleasures of the Imagina-*

tion; Gray's *Elegy in a Country Churchyard*; Horace Walpole's *Castle of Otranto*. Also the following famous French works: Pascal's *Provinciales*; La Rochefoucauld's *Réflexions, ou Sentences et Maximes Morales*; La Bruyère's *Caractères*; *Manon Lescaut*, by the Abbé Prévost; Montesquieu's *Esprit des Lois*; Voltaire's *Dictionnaire Philosophique*. Anonymity is the general rule in British and American journalism, though of recent years signed articles have become common. Leading articles are still uniformly anonymous, the theory being that the policy of an individual paper as thus embodied is something more than the mere expression of individual opinion. See Halkett and Laing's *Dict. of Anonymous and Pseudonymous Lit.* (1881-8); Cushing's *Anonyms* (1889); indexes to *Notes and Queries*; *The Secrets of our National Literature* (1908); Barbier's *Dictionnaire des Ouvrages Anonymes* (1872-9 and 1889); Quérard's *Les Supercheries Littéraires Devoilées* (1869-71); Holtzmann and Bohatta's *Deutsches Anonymenlexikon* (1902-3); Melzi's *Dizionario di Opere Anonime* (1848-59 and 1887).

Anopheles. See MOSQUITOES; MALARIA.

Anoplotherium (Gr. 'unarmed beast'), an extinct genus of quadrupeds, containing several species of the Artiodactyla. They belong to the late Eocene and Oligocene periods, and have been found in France (Montmartre, Paris, 1806), and the British Isles (the Isle of Wight). *A. commune* was about the size of a red deer.

Anor, ry. junction, dep. Nord, France, on the lines Hirson-Valenciennes and Hirson-Namur. Marble quarries and steel forges. Pop. 4,600.

