Aristotle's Lantern, a masticatory apparatus found in sea urchins, consisting of five large ossicles, forming sockets or alveoli, in each of which is a long, sharp-edged tooth. Through the centre of these alveoli the gut runs, and the five protruding teeth perforate the membrane which surrounds the mouth. The lantern lies within the shell, but can be bulged outwards by a series of muscles. By means of the apparatus the sea urchins can crop weed.

Aristoxenus (*c.* 350 B.C.), Greek philosopher, born at Tarentum; was a pupil of Aristotle. He wrote principally on music, his chief work being *Elements of Harmony* (ed. with German trans. by Marquard, 1869).

Arita, tn., Japan, in the W. of Kiushiu, 25 m. N. of Nagasaki; noted for its porcelain. Pop. 6,000.

Arithmetic is that branch of the science of mathematics which treats of the properties of numbers, and of the operations which can be performed with them. The development of the science has had close relation to the method used to express numbers — the Greeks, otherwise clever mathematicians, and after them the Romans, making but little progress, because of the clumsy modes of notation they used. The Roman system was in general use throughout Europe until the end of the 16th century, and is still occasionally seen in dates, numbering of chapters in books, on clock dials, etc. The symbols now in use were introduced some time before 1200 A.D., from the Arabs, who derived them from the Hindus, to whom also is to be ascribed the introduction of the symbol 0, the greatest step ever taken in the history of arithmetical science, and one which completely escaped the Greeks and Romans. By the use of the ten symbols it has been possible to develop the decimal system of numeration by grouping numbers into tens and giving names to the groups (tens, hundreds, thousands, etc.). Of this decimal system, which doubtless arose from the fact that man had ten fingers, traces are found in the early inscriptions of Babylonia and Egypt. Following the introduction of the Arabic system about 1200 A.D., the science of arithmetic advanced rapidly, two important stages being marked by (1) the discovery of the double rule of three (compound proportion) in the 16th century, and (2) the invention of logarithms by Napier of Merchiston in the 17th century; while a fundamental development was effected by the extension of notation to express what part one quantity is of another, thus introducing the study of fractions. The elementary operations of arithmetic are *addition*, *subtraction*, *multiplication*, and *division*. The complete investigation of arithmetical rules and of the properties of numbers has been hindered by the prejudice against the employment of literal symbols, which have been considered to belong exclusively to the domain of algebra. For such investigations, more fully developed on the Continent, see J. Bertrand's *Traité d'Arithmétique*

Arithmometer. See CALCULATING MACHINE.

Arius (256–336), founder of Arianism; an Alexandrian theologian, and one of the two principal figures in the first great controversy of the early church. Upon being advanced to the priesthood he was assailed by his bishop, Alexander of Alexandria, as a heretic for maintaining that Jesus Christ was an originated being, denying that Christ was 'unoriginate, or part of the unoriginate, or made of the same substance (ὁμοούσιον), or of any previously existing substance.' For this the Egyptian bishops excommunicated him.

The result was a fierce dispute in the church, to settle which the Emperor Constantine called (325) the Council of Nicæa—the first œcumenical council. After a long controversy Arius was defeated, and the Nicene Creed, brought forward by Athanasius, prevailed. Arius and Eusebius, who would not accept the creed, were banished to Illyria and Gaul respectively. Soon after the accession of Athanasius to the see on the death of Alexander, Arius, having obtained the support of Constantia, the sister of the emperor, was allowed to return to Egypt, where the strife was renewed. The emperor ordered Athanasius to reinstate Arius, and on his refusal he was banished (336). Eventually the bishop of Constantinople agreed to reinstate him; but on the eve of the ceremony the great controversialist suddenly died. Arius is described as 'a rigorous ascetic, a persuasive advocate, an ardent propagandist. Tall, gloomy, fanatical, with downcast eyes and tangled hair, he went about singing his doctrines, which he had set to the music of the theatres' (Chadwick). Constantius, the son of Constantine, was a zealous Arian, and during his reign as sole emperor (353–361) enforced his doctrines on the Church of the West as well as of the East. The Emperor Valens, who ruled over the East from 364 to 378, pursued the same policy. But his successor in the East, Theodosius I., who became sole emperor in 392, declared himself in 380 in favour of Athanasianism, which was now officially denominated "the Catholic faith" (Cod. Theod. xvi. 1, 11). He promulgated a number of edicts against Arianism (Cod. Theod. xvi. 5, *et seq.*), and in 381 summoned a council to Constantinople (the second General Council), which reasserted the Nicene doctrine. From this period Arianism rapidly lost ground within the Church. It continued, however, to spread among the German nations by missionary effort; but before 650 Nicene doctrines had ultimately prevailed there also. In modern times pure Arianism can hardly be said to exist, and what was left of it has become merged in Unitarianism. Apart from the question in dispute, Arianism was a plea for freedom of theological speculation against the dogmatism of the Athanasian party; though, under the patronage of Constantius and Valens, its adherents belied their principle by the persecution of their opponents, who in turn were not slow to retaliate under Theodosius and his successors. The more important original sources are the *Eccles. Hist.* and the *Veta Constantini* of Eusebius; the works of Athanasius, Basil, and the two Gregories; *Eccles. Hist.* of Socrates and of Sozomen. English translations of these will be found in *The Nicene and Post-Nicene Fathers*, edited by Wace and Schaff. Short authoritative expositions are given by Harnack, *Outlines of the History of Dogma* (Eng. trans., 1893), and by Loofs, *Lutfaden der Dogmen Geschichte* (1889). See also Newman's *Arians of the Fourth Century* (1833); Stanley's *Eastern Church* (1861); Gwatkin's *The Arian Controversy* (1889); and *Studies of Arianism* (2nd ed. 1900).

Arizona (abbreviated ARIZ.), a territory in the S.W. part of the U.S.A., organized in 1863; area, 113,020 sq. m., of which 100 sq. m. is water. It is situated between the parallels 31° 20′ and 37° N., and between the meridians 109° 3′ and 114° 54′ W. The N.E. part is a high plateau, ranging in altitude from 6,000 to 8,000 ft., traversed by the Colorado R., which sweeps round N.W. and W. in a great cañon 5,000 to 6,000 ft. in depth. The S.

and w. parts of the territory consist of low, hot desert valleys, separated by narrow, abrupt ranges of mountains. The Colorado R. flows along the w. boundary, separating this territory from Nevada and California. The s. part of the territory is traversed by Gila R., a large branch of the Colorado. These two rivers, particularly the latter, furnish most of the water used in irrigation. There is a scheme in progress for the formation of a vast lake in one of the arid depressions. In 1909 immense subterranean caves, rivalling the Mammoth Cave in Kentucky, were discovered in the N.W. Sheep-breeding is the most important industry connected with agriculture. The most important crop is alfalfa; next to it, wheat and barley. Industries are confined almost entirely to copper-smelting, but mining is developing rapidly. In 1908 the principal products of Arizona were as follows:—Gold, value £500,000; silver, £310,000; copper, 129,251 tons; and lead. In copper production Arizona stands second among the states, only Montana producing a greater amount. The territory sends one delegate to Congress. The population in 1910 was 204,354, or a little over 1·8 per sq. m. Cap. Phœnix. Nearly one-fifth of the population is of foreign birth. In June 1910 a Bill admitting Arizona and New Mexico to statehood became law.

Ark OF NOAH, a huge vessel of gopher wood (possibly cypress), built by the patriarch for the purpose of preserving the race of man and of the land animals during the flood. (See DELUGE and ARARAT.) It was 120 years in building, measured 300 cubits in length, 50 in breadth, and 30 in height; it had three stories, and was divided into 'nests.' (See Gen. 6 and 7.)

Ark of the Covenant, THE, also called the 'Ark of Jehovah of hosts,' 'Ark of God,' and 'Ark of the Testimony,' was a chest of shittim (acacia) wood, containing the stone tablets on which were inscribed the ten commandments, and held in the highest veneration among the ancient Israelites. According to the latest source of the Pentateuch (P; see HEXATEUCH), the ark was constructed according to directions given to Moses, and was located in the most holy place of the tabernacle. It accompanied the Israelites in their march through the desert, and was a prominent factor in such events as the taking of Jericho. It was subsequently deposited at Shiloh, Ashdod (the Philistines having captured it), Beth-shemesh, and Kirjath-jearim, whence David had it conveyed to Jerusalem. What ultimately became of it is unknown. The ark seems to have been regarded not only as a symbol of the Divine presence, but actually as the *dwelling-place* of Jehovah; yet, arguing that the fact of its containing the tables of the law would rather indicate the *absence* of the Lawgiver, some have thought that it really held a sacred stone of fetish origin.

Arkansas (abbreviated ARK.; pron. *Ar'k'nsaw*, popularly known as the 'Bear State'), one of the south-central states of the U.S.A., situated between 33° and 36° 30′ N. lat., and between 89° and 95° W. long. Area, 53,850 sq. m., of which 805 sq. m. is water. It is bounded on the E. by the Mississippi R. and Tennessee, on the S. by Louisiana, on the W. by Indian Territory and Texas, and on the N. by Missouri. In the S.E. section and along the E. border the land is low and level and subject to inundation from the overflowing of the Mississippi and its tributaries. The N.W. part of the state rises into hills known as the Ozark Hills or Mountains. South of the Arkansas R. these consist of crooked, branching

ridges of sandstone or quartzite, alternating with limestone valleys. North of that river they take the form of a plateau, deeply cut by streams. The state has a warm climate and an ample rainfall, and is on the whole healthy. The dominant industry is agriculture. Apples, peaches, strawberries, and other fruit are extensively grown in the N.W. The chief product of the state is cotton, which yields in the rich bottom lands a fibre of exceptional length and value. The cotton crop of 1908 amounted to 796,000 bales. Until recently little mining was done. Now, however, mining is steadily increasing in importance. Coal leads the way (2,078,357 tons in 1908), but clay products, whetstones, and limestone are also important. The state has a forest area of about 30,000 sq. m., with over 125 varieties of hard and soft woods, of which yellow pine is the most abundant. The cutting and working of timber is an important industry. The population in 1900 was 1,311,564, and the density of population was 28·8 to the sq. m. Only 5 per cent. of the inhabitants were found in the cities, of which the chief is Little Rock, the capital. The foreign-born constituted little more than 1 per cent.; while, on the other hand, negroes formed 25 per cent. of the entire population. Wage-earners formed about 45 per cent. of the population over ten years of age, 74 per cent. of these being engaged in agriculture. In 1910 the pop. was 1,574,449. Arkansas formed part of the Louisiana territory until 1812, and of the Missouri territory until 1819, when it was organized as Arkansas Territory; it became a state in 1836. See Lewis's *Natural Resources of Arkansas* (1869); and Hillyard's *The New South* (1887).

Arkansas River, U.S.A., one of the great W. branches of the Mississippi. It rises in the high mountains in central Colorado, which it traverses through cañons to the plains. Flowing out of Colorado, it crosses S. Kansas, N.E. Oklahoma, Indian Territory, and central Arkansas to its mouth in the S.E. part of the last-named state. Its principal branches are the Cimarron and Canadian Rs. Its drainage area is 185,671 sq. m.; total length, 2,000 m.

Arkhangelsk. See ARCHANGEL.

Arklow, seapt., Co. Wicklow, Ireland, 15 m. S. by W. of Wicklow, on the r. bk. of the Avoca, in a district noted for its scenery. The fisheries are important, and in the vicinity are large oyster beds. The town and castle were granted in the time of Henry IV. to Theobald Fitzwalter, who founded here a Cistercian monastery. Battles, in which the Irish were defeated by the English, were fought in 1281 and 1316. In 1647 the castle was taken, and the garrison put to the sword; and it was again captured in 1649 by Cromwell, and subsequently demolished. In the rebellion of 1798 the insurgents were defeated in a battle near Arklow Bridge. Pop. 5,000.

Arkona, or ARCONA, cape on N.E. of Rügen I., Baltic Sea, Germany. A lighthouse (1827) was erected on the top of the chalk cliffs 177 ft. high. Here are the ruins of a very strong fortress, destroyed in 1168 by Waldemar I., king of Denmark, which surrounded the sanctuary of the Wend god Svantevit.

Arkwright, SIR RICHARD (1732–92), cotton-spinning inventor, born at Preston, Lancashire. He learned the trade of barber, and became a dealer in hair, adding to his profits by the invention of a successful hair-dye. About 1767 he began to turn his attention to the invention of a machine or frame for carrying out all the operations of spinning at one time, and by one appli-

cation of force. In 1768 he set up in Preston his first spinning-frame. It consisted principally of two pairs of rollers, the first pair moving slowly in contact, passing the sliver to a second pair, which revolved with greater velocity, and drew out the cotton to the necessary degree of tenuity. The sliver was then attached to a spindle and fly, whose revolutions twisted the cotton into a thread, and at the same time wound it on a bobbin. By increasing the length of the rollers and number of spindles, a corresponding number of threads could be spun and wound at once by the same motive power. His patent was obtained in 1769, when he set up near Hockley his first mill, driven by horses. In 1771, with two capitalists (Strutt of Derby and Need of Nottingham), he built a mill at Cromford, in Derbyshire, driven by water; and in 1790 he introduced the steam-engine into his Nottingham mills. Arkwright's invention met with very determined opposition, one of his factories being destroyed by the mob. He, however, amassed a large fortune, and was knighted in 1786. See Baines's *History of Lancashire* (new ed. 1886-93).

Arlberg, Alpine pass (5,912 ft.) leading from Feldkirch, in Austria (near the Rhine valley), to the Inn valley, near Landeck. It is traversed by a carriage road, while beneath it a railway tunnel (6 m. 650 yds. long) was pierced in 1880–3, connecting Vorarlberg with the Tyrol.

Arles (anc. *Arelate*), tn. and riv. port, dep. Bouches-du-Rhône, on l. bk. of Grand Rhone, 45 m. W.N.W. of Marseilles; has a trade in corn, oil, wine, fruits, *saucisson d' Arles*, etc. The industries are chiefly silk-spinning, hat-making, and shipbuilding. Known as the 'Gallic Rome,' and a favourite residence of Constantine, Arles was colonized in 100 B.C., and is said to have had a population exceeding 100,000. Later it became the capital of the Visigoths; and was an independent republic from 1150–1251, when it began to share the fortunes of Provence. The chief Roman remains are the amphitheatre, which accommodated 26,000 persons, and was turned (8th century) into a fortress; the theatre, where the Venus of Arles was discovered in 1651; the cathedral of St. Trophimus (7th century); the Roman and Christian burial-grounds. Important ecclesiastical councils were held in Arles: in 314 the Donatists were condemned; in 353 the Arians were favoured; in 452 certain disciplinary canons were adopted; and in 1234 the persecution of the Albigenses was organized. Arles was an archiepiscopal see from the time of Constantine to 1801. Pop. 28,000. See Beissier's *Le Pays d' Arles* (1889); Peyre's *Nîmes, Arles* (1902).

Arlington, resid. tn., Middlesex co., Mass., U.S.A., 6 m. N.W. of Boston. Pop. 8,600. See Cutter's *History of Arlington* (1880).

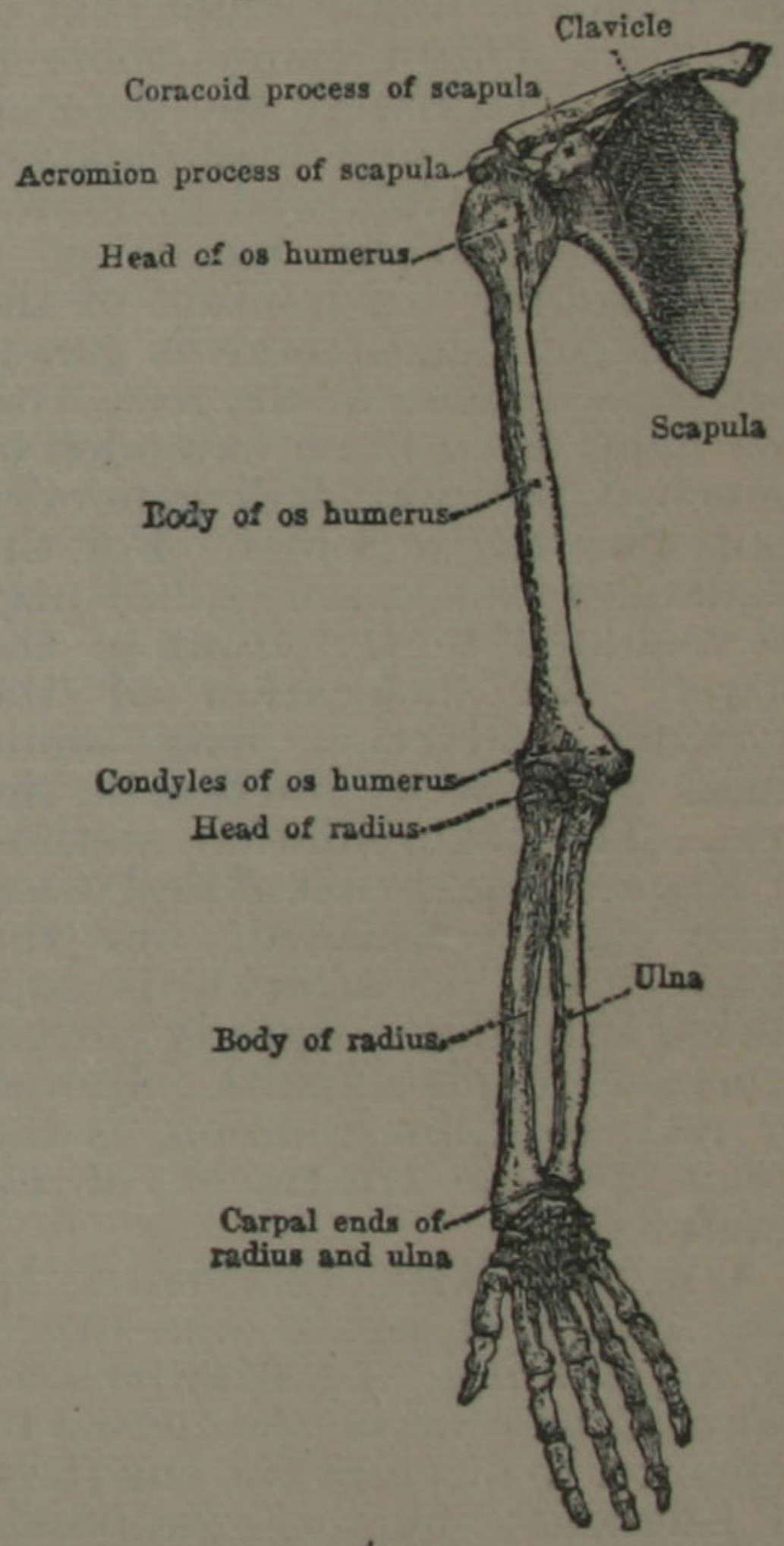
Arlington, HENRY BENNET, EARL OF (1618–85), a statesman of the reign of Charles II.; joined the royal army in the civil war; was severely wounded at Andover; knighted by Charles II. at Bruges in 1658; and sent as an envoy to Spain. He became principal Secretary of State in 1663; was a constant opponent of Clarendon; created a baron and Earl of Arlington in 1672. He is said to have brought about the first Dutch war, and was concerned in the treaty of Dover; was unsuccessfully impeached by the Commons in 1674; sold his secretaryship, and purchased the office of lord chamberlain, which he held till 1681. See his *Letters to Sir W. Temple*, published pos-

thumously in 1701; the *Lauderdale Papers;* and *Diaries* of Evelyn and Pepys.

Arlon (Flem. *Aarlen*), cap. of prov. Luxemburg, Belgium, 17 m. by rail N.W. of Luxemburg. It has woollen and iron industries. Here the French general Jourdan defeated the Austrians in 1793. Pop. 10,000.

Arm. The upper limb may be divided into a proximal part or shoulder, a distal part or hand, and an intermediate shaft which consists of an upper arm and a fore arm. The bones are: in the shoulder, the clavicle (collar bone) and the scapula (shoulder blade); in the upper arm, the humerus; in the fore arm, the radius and ulna; in the hand, the carpal and metacarpal bones and the phalanges. The smooth, round 'head' of the humerus articulates with the glenoid cavity of the scapula, forming the shoulder joint—a ball-and-socket joint. At the lower end of the humerus are two articular surfaces for the bones of the fore arm—the outer rounded for the head of the radius, the inner a pulley for the ulna. These form the elbow joint—a hinge joint. At their lower extremities the radius and ulna articulate with the carpus to form the wrist joint—a hinge joint. The arm receives its blood supply from the brachial artery and its branches, and the veins finally unite in the axillary vein. The nerves pass down by the side of the brachial artery, then are distributed as musculo-spiral, ulnar, and median.

Fractures of the Arm. — No bone except the radius is more frequently broken than the clavicle, or collar bone. This is due to its exposed position, and to its buttress-like action in keeping out the point of the shoulder. The treatment consists in correcting any displacement, and afterwards keeping the broken ends apposed. If the patient can be depended on to lie quiet, it is enough to keep him in bed on his back, with a pillow between his shoulders; but if bandaged in such a way that the shoulders are braced back, the elbow supported, and the upper arm kept fixed to the side, he may go about. In fractures of the neck of the scapula the arm must be



Arm.

kept to the side and the elbow supported. In fractures of the humerus place a pad in the axilla, bind the arm to the side, and keep the hand supported by a sling. In fractures at the elbow joint much care is needed to prevent, by suitable splints, ankylosis or deformity. Fractures of the radius and ulna are treated with appropriate splints. The

lower end of the radius is frequently broken, constituting what is known as Colles's fracture—almost invariably due to falls on the outstretched palm. The deformity produced by the fracture is very characteristic. The hand is deflected to the radial side, and usually pointed, with the fingers somewhat flexed (dinner-fork deformity). The styloid process of the radius is higher than that of the ulna, and of course there is crepitus. To reduce the deformity, extension and manipulation are necessary, followed by immobility, secured by means of a Gooch splint. In fracture of the metacarpal bones there is generally little displacement; rest, with the hand fixed in an extended or clenched position, will generally soon cure the mischief. For the phalanges a small zinc splint may be moulded to the front of the finger. In dislocation of the shoulder, reduction may sometimes be made by traction on the arm. The manipulation method of Kocher is less violent and often more easily managed, but the elbow must be afterwards supported in a sling. Speedy correction of all displacements, followed by rest, to allow reunion, is the common-sense treatment of all fractures.

Armada, THE SPANISH. In 1583 Philip of Spain was urged by his admiral, the Marques de Santa Cruz, one of the heroes of Lepanto, to attempt the conquest of England; and these proposals were renewed in 1586, in consequence of the action of Queen Elizabeth's seamen in the W. Indies and elsewhere. Although Santa Cruz died in February 1588, the suggestion, ere that time, had so completely taken possession of the mind of Philip that a huge fleet was then ready for the adventure. Its command was entrusted to the Duke of Medina Sidonia, a man of no naval experience. He was instructed to proceed to the Strait of Dover, avoiding unnecessary fighting on his way up Channel, and to embark from Flanders a large army which lay there under the Duke of Parma, to effect an invasion. The Spanish fleet, called *La Felicisima Armada*, left Corunna on July 12, 1588. It consisted of 130 ships, many of which were very large, with 28,000 men. The whole number of English ships available to meet it was 101; but of these only 28 belonged to the royal navy, and several even of them were small, while the total number of men on board was only 9,000. The English were under the lord high admiral, Lord Howard of Effingham (in the *Ark*), Sir Francis Drake (in the *Revenge*), Sir John Hawkins (in the *Victory*), and many famous captains, including Lord Henry Seymour, Lord Thomas Howard, the Earl of Cumberland, Lord Sheffield, Sir William Winter, Sir Martin Frobisher, Edward and William Fenner, and Richard Hawkins. The greater part of the English fleet was at Plymouth when, on July 19, news of the approach of the enemy was brought thither by Captain Flemyng of the *Golden Hind*. Howard warped out, and on July 20 first caught sight of the Spaniards. On the 21st he began a running fight with them. This was continued on the 22nd. A more general but indecisive engagement took place off Portland on the 23rd. On the 25th there was another fierce battle off the Isle of Wight. On the 27th the Armada entered the roadstead of Calais, by which time nearly the whole English fleet was united. On the night of the 28th Howard sent fire-ships among his enemies, so that they, in panic, slipped or cut their cables and made off in confusion. They were followed, and so badly mauled off Gravelines on the 29th

that they never afterwards formed a coherent body. Most of them fled north-about, and were chased as far as Newcastle-on-Tyne. The remains of the Armada passed between the Orkneys and the Shetlands, and then rounded the west coast of Ireland, suffering even more from the elements than from the English. Of its 128 sail, 2 were abandoned to the English, 3 were wrecked on the French coast and 2 on the coast of Flanders, 2 were sunk in action off Gravelines, 19 were known to have been wrecked off Scotland and Ireland, and 35 others never returned to Spain. Thus 63 in all were lost. The effect upon the naval power of Spain was great, though not absolutely crippling. The effect upon the prestige of the Elizabethan navy was immense. See Duro's *La Armada Invincible* (1884–5); Laughton's *State Papers relating to the Defeat of the Spanish Armada* (Navy Records Soc., 1894); Clowes's *The Royal Navy* (6 vols. 1897–1901); also Macaulay's ballad; Charles Kingsley's *Westward Ho!* (1865); T. G. Law's *Collected Essays and Reviews*, for secret history (1904); and *Cambridge Modern History*, iii. (1904).

Armadale, tn., Scotland, in co. of and 2 m. s.s.w. of Linlithgow. It has extensive coal, iron, limestone, and brick-clay fields, and chemical and paraffin works. Pop. 6,500.

Armadillos, S. American animals belonging to the mammalian order Edentata, with bodies covered by an armour of bony plates. Numerous species exist, examples being *Priodon gigas*, the great armadillo, and *Dasypus sexcinctus*, the six-banded armadillo. Most are nocturnal in habit, and all are omnivorous. In addition to the protection of their bony scutes, they are armed with strong claws on the fore limbs, by means of which they burrow; and they can also run with great rapidity. They range from Mexico to Patagonia, and are prized as food by the natives. In the caves of Brazil fossil armadillos have been found, one of them as large as a rhinoceros. The largest existing form is 3 ft. in length, exclusive of the tail; the smallest measures less than a foot.

Armageddon (R.V. 'Har-Magedon'). The name as used in Rev. 16 : 16 is probably derived from Megiddo, an important Canaanite fortress in Issachar (Josh. 12 : 21, etc.); placed by most writers at Lejjûn (Legio), w. of the plain of Esdraelon. The association of Megiddo with many battles—*e.g.* the defeat of the Canaanites by Barak, of the Gibeonites by Midian, of Saul by the Philistines, and of Josiah by the Egyptians—probably suggested it as the scene of the culminating conflict between good and evil referred to in the Apocalypse.

Armagh. (1.) Co., prov. Ulster, Ireland, lying s. of Lough Neagh and w. of Co. Down, with a few miles of coast on Carlingford Lough. Length (N. and S.), 37½ m.; breadth (E. and W.), 21. m. Its surface is fairly wooded and generally hilly, the highest point being the granite mass of Slieve Gullion (1,895 ft.), towards the s. The drainage is chiefly to Lough Neagh and Dundalk Bay; the principal rivers are the Upper Bann, the Blackwater, and the Newry R., the latter flowing into Carlingford Lough, and being joined to the Bann by the Newry Canal. The Ulster Canal enters the county in the W., and runs N. to the Blackwater. Peat bogs occupy nearly 6,000 ac., but more than two-fifths of the county is under oats, potatoes, turnips, mangel-wurzel, and flax. Building-stone, limestone, gravel, and clay are worked; and the staple

industry is linen, bleach-greens being numerous. The county returns a member for each of the three divisions (North, Middle, and South). Chief towns: Armagh, Lurgan, Portadown, and part of Newry. Area, 372 sq. m. Pop. 126,000. See Bassett's *Book of County Armagh* (1888). (**2.**) City and market tn., cap. Co. Armagh, eccles. metropolis of Ireland, 35 m. S.W. by W. of Belfast. The city stands on and at the foot of a hill crowned by a handsome cruciform cathedral (11th or 12th century), which probably incorporates part of St. Patrick's 5th century building burned by the Danes in 836. The new Roman Catholic cathedral was begun in 1840, completed in 1873, and reopened after alteration in 1904. The antiquarian remains include the ruins of a Franciscan abbey, and, 2 m. distant, *Emania*, or 'Navan Fort,' the site of a very ancient royal residence. 'The Book of Armagh,' preserved in Trinity College, Dublin, was partly written before A.D. 807; and the 'Shrine of Armagh Bell,' also in Dublin, is of exquisite 12th century workmanship, and contains the bell of St. Patrick, presented to the church of Armagh by St. Columba. In the 5th century St. Patrick founded the bishopric and an Augustinian monastery, which ultimately became renowned as a seat of learning. The see became an archbishopric in 1142, but a dispute as to its ecclesiastical supremacy was not settled until the 17th century. Pop. 10,000. See Stuart's *Historical Memoirs of Armagh* (1819).

Armagnac, former sub-prov., France, in Guienne. The department of Gers coincides with the 'Comté d'Armagnac' proper, but in the 14th and 15th centuries it extended beyond that limit. The capital was Auch, then Lectoure. It was united to the crown of France in 1607. See Berthault's *L'Armagnac* (1899).

Armagnacs, a name given to a body of French troops in the 15th century, raised (1410) by the Comte d'Armagnac against the Duke of Burgundy. They afterwards took part in the war against the English, but later got out of control and plundered the country, whereupon they were nicknamed *Ecorcheurs*. Charles VII. of France sent about 40,000 of them in an expedition against Alsace (1442–4). Soon after their return they were disbanded.

Armansperg, JOSEPH LUDWIG, COUNT VON (1787–1853), Bavarian statesman, born at Kötzting in Lower Bavaria. His advanced liberalism brought him into contact with the Camarilla and the Jesuits, and forced him into retirement (1831). He was president of the regency of Greece (1833–5) and Chancellor of State (1835–7).

Armatoles, warlike Christian tribes of N. Greece, who from the fifteenth century protected their southern neighbours from the Albanians, Servians, and Turks.

Armature. See DYNAMO.

Armed, in heraldry said of the fiercer animals, and of birds of prey, when their natural weapons —teeth, claws, horns, etc.—are blazoned of a particular colour or metal; also of the human figure, or parts thereof, when *in armour*.

Armed Neutrality. The Armed Neutrality of the Northern Powers—Russia, Denmark, Sweden, with Russia as controlling member—was formed (1780), and asserted the principles (1) that neutral vessels shall freely navigate, to the extent of carrying goods belonging to the subjects of powers at war, provided such goods are not contraband; (2) that no blockade shall be recognized unless there is a sufficient blockading force. Prussia and Austria accepted the prin-

ciples in 1781. Britain refused this interpretation of maritime and commercial law. After 1783, when peace was made, the principles continued in suspense. In 1793 both Russia and the United States, by treaty with Britain, recognized the right of search over neutral vessels; but in 1800, owing to the diplomatic skill of Napoleon, the Armed Neutrality was revived. It had a short life, owing to the British bombardment of Copenhagen and capture of the Danish fleet, and the assassination of Czar Paul I. in March 1801. The questions, however, were raised later, as in 1807; and not till 1856, in the Declaration of Paris, was a definitive settlement at international law adopted, unfavourable to Britain's past contentions. See Wheaton's *International Law* (3rd. ed. 1889), and Hall's *International Law* (ed. 1904).

Armenia (the Scriptural *Minni*), a country in the N.E. of Asia Minor, bounded on the N. by Trebizond and Transcaucasia, on the S. by Kurdistan, and on the E. by the Caspian Sea. It consists of three sections: the W. (Erzerum and Diarbekir) belongs to Turkey, the N. (including the districts of Kars, Erivan, and Tiflis) to Russia, and the S.E. (the prov. of Azerbaijan) to Persia. For the most part consisting of table-land, with an average elevation of over 5,000 ft. (the culminating point being Mount Massis, 16,950 ft., the meeting-place of the three divisions), it contains the head-waters of the Euphrates and Tigris, and of the Kura and its tributary the Aras. The salt lakes, Van in the Turkish division, Urmia in the Persian, and Gokcha in the Russian, are formed by depressions in the plateau. The climate is varied, being very cold in the highlands and exceedingly warm in the lowlands, while the plateau lands have severe winters and short, hot summers. The soil is generally fertile, producing abundance of tobacco, grain, cotton, and grapes; the valley pasturage is good. Many minerals—copper, silver, lead, and iron—are found. The Armenians are Caucasians, and speak a branch of the Aryan language. They have long been noted for their enterprising commercial spirit, and are to be found in all the Turkish possessions. The most important towns are Van, Erivan, Erzerum, and Arabkir. In Armenia the Armenians do not exceed one million; in Russia there are about half as many; in Asia Minor, outside of Armenia, about 150,000; in Europe, mostly in Turkey, some 420,000; and in Persia, 40,000—altogether about a little over 2,000,000. In their native country they follow agricultural and pastoral occupations. They dress like the Turks, but instead of the turban, wear a tall fur cap. Carpets, shawls, rugs, and similar articles are woven; and fruit, silk, and wine are produced. Apart from the Armenians, the inhabitants consist of Kurds, Turks, Georgians, Jews, and Gypsies. See Telfer's *Armenia and its People* (1891); Lynch's *Armenia* (2 vols. 1901); Bryce's *Transcaucasia and Ararat* (4th ed. 1896); Hogarth's *The Nearer East* (1902); Shoemaker's *The Heart of the Orient* (1904); Villari's *Fire and Sword in the Caucasus* (1906); Oswald's *Geology of Armenia* (1906).

History.—The name Armenia first appears in the 5th century B.C. Previous to this, however, the country was known to the Assyrians as Nairi or Urartu, the latter being identical with the Alarodians of Herodotus and the Biblical Ararat; and, after the chief god Chaldis, the people were also called Chaldini, a name which is not to be confused with that of the Chaldæans. To what race this people belonged, whether

to the Hittites or to the Indo-Germans, is at present quite uncertain. Their history extends from at least the 12th century to the second half of the 7th century B.C., when it ceases as suddenly as it had begun. In all probability this is due to the fact that the country was overrun by the great Indo-Germanic invasion of barbarians, among whom the ancestors of the present people would be included. The original home of the Armenians is therefore unknown, and whilst old classical writers suppose it to have been Phrygia or Thessaly, modern critics have argued in favour of Cilicia, or perhaps even a district north of the Black Sea.

Armenia, like Asia Minor in general, has never really had a history of its own, its fortunes always having been closely linked with those of the greater empires of Media, Persia, Rome, Byzantium, and Turkey. The country is called Haykh or Hayastan, after Hayk, son of Thorgom (the Septuagint form of Togarmah), son of Japheth; and the legendary accounts of its early days, as related by the native historians, are curiously influenced by the Old Testament narrative. In 546 B.C. it was conquered by Cyrus, whose schoolfellow, Tigranes, was the son of the defeated king of Armenia, and afterwards became the national hero. Tradition has much to say respecting this figure, ascribing to him, amongst other deeds, the overthrow of the Median empire. The last (the fifty-ninth) king of this highly legendary dynasty was Vahi, who was defeated by Alexander the Great in 328 B.C. During the succeeding years, with the exception of a short-lived independence under Ardvates, Armenia was ruled by governors appointed by the Seleucidæ. When Antiochus the Great was defeated by Scipio Africanus in 190 B.C., Zariadris (Zadriates) and Artaxias, the governors in W. and E. Armenia respectively, asserted their independence, and founded new dynasties. Artaxias, whose realm was by far the greater, may well be called the founder of the Armenian kingdom. Ultimately Artaxias was taken prisoner by Antiochus Epiphanes IV., and the country again fell into the hands of the Seleucidæ. In the middle of the 2nd century B.C. the Parthian Arsaces VI. (Mithridates I.) set upon the throne of Armenia his brother Valarsaces (Wagharshag I.), who became the founder of one of the greatest branches of the Arsacid family. His dynasty practically extended from 147 B.C. to 430 A.D. Under his great-grandson, Tigranes II. (90–55 B.C.), Armenia attained the height of her power; the rival district of W. Armenia was annexed, and the outlying smaller states became vassals. Tigranes (with whom tradition has probably confused Tigranes I.) became the most powerful monarch in Asia; but through his connection with his father-in-law, Mithridates the Great, king of Pontus, he found himself involved against Rome in the campaigns of Lucullus (69 B.C.) and Pompey, and at the conclusion of peace, in 66 B.C., Armenia was reduced to its former limits. His son Artavasdes, for treacherous dealings with Antony, was carried off to Rome, and ultimately beheaded by Cleopatra (30 B.C.). In the following years Armenia suffered from the rival schemes of Parthia and Rome to gain possession of the country. In 114 A.D. a Roman army under Trajan invaded Asia Minor, and Armenia, in company with other states, was forced to do him homage. In 238 Chosroes the Great was assassinated by one Anak, at the instigation of Persia, and the royal family, with the exception of one son, was entirely

exterminated. From this time onwards the country came under the power of the Sassanids. Tiridates III., son of Chosroes, through the help of Rome, where he had been educated, ascended the throne in 259. He began his reign by persecuting the Christians; but on his conversion, by Gregory the Illuminator (according to tradition a descendant of Anak), he used his energies on their behalf, with the result that Armenia was the first country to make Christianity the state religion, and Gregory became known as the historical founder of the Armenian Church. This new policy of Tiridates, though it led to friendship with Greece, involved the country in frequent quarrels with Persia and Rome; and finally, in 387 A.D., the eastern portion was ceded to the former (whence it received the name of Persarmenia), whilst the latter annexed the western. Artases (Artaxes) IV., last of the Arsacid dynasty, was removed in 429 through the machinations of the Armenian nobles, and the country was taken by the Persian king Bahram V., and until 632 was ruled by Persian governors (*marzbans*), several of whom were actually of Armenian origin. This period is marked by internal anarchy, by the persecution of the Christians, and by ever-recurring insurrections, the most remarkable of which was that of Vartan, as recounted by the native historian Elisæus (trans. Neumann, 1830). Meanwhile the Armenian Church, which had never accepted the decisions of the Council of Chalcedon (451), separated itself from the Orthodox Church in 491, and named itself after Gregory the Illuminator. At the Synod of Duin (551) the Armenian calendar was regulated, and a new era introduced, the first year beginning July 11, 552. Shortly after the invasion of Heraclius (624) Armenia gained her first experience of the newly arisen Mohammedan power, whose hordes overran the land in 637, and until 855 held it in bondage. Under the dynasty of the Pagratides (Bagratidés), a family claiming descent from an exiled Jewish prince, Armenia recovered some of her independence; but on the assassination of Gagik in 1079 the country fell into the hands of the Byzantines on the one hand, and of the Seljuk Turks on the other. At this time, too, the rival dynasty of the Artsrunian family, who claimed descent from the sons of Sennacherib (see 2 Kings 19 : 37), and had held Vasburagan and the surrounding district, were swallowed up by Byzantium, and practically the whole of Armenia proper was in the hands of foreigners. The invasion of the Seljuk Turks, however, had driven out a number of the inhabitants, who, crossing the Euphrates, founded settlements on the slopes of the Amanus and Taurus. Here a dynasty was founded by Rhupen (Reuben), a relative of Gagik, which not only held sway over Cappadocia and N. Cilicia, but was eventually able to extend its borders to the Mediterranean. This kingdom of Lesser Armenia became the last stronghold of Christianity in the East, and played no small part in the wars of the crusades. The kingdom allied itself with the invading Mongols against the Egyptian Mamluks; but when, in 1305, the former adopted Islam, and the crusaders were no longer a power to aid, it was exposed to the vengeance of Egypt. Its last king, Leon (Levon) VI., of the house of Lusignan (Cyprus), was taken prisoner in 1375, and ultimately died in Paris (1393). Lesser Armenia then became an Egyptian province. Thus Armenia slowly decayed. In 1604, the Persian Shah, Abbas, laid

waste the land, and carried off 40,000 of the inhabitants to Persia, where some attempt was made to revive the national feeling. But Armenia ceased to hold any position as a nation, and its subsequent history belongs to that of Turkey and Persia, and, as regards the last century, also of Russia.

Language and Literature.—The Armenian language is to be kept quite distinct from that of the pre-Armenian population of Urartu (see above), known to us from the cuneiform inscriptions of Van, which have been deciphered by Sayce (*Jour. of the Royal Asiatic Soc.*, 1882, 1893–4). The position of this language is still obscure. Armenian itself belongs to the Indo-Germanic family of languages, and has frequently been assigned to the Iranian branch. This view, however, is no longer held, and it is recognized that the Persian elements, in common with features of Persian religion and culture, were borrowed by the Armenians in later historical times. In fact, Armenian forms a more or less independent branch of its own, but appears to be more closely akin to the European than to the Asiatic representatives—a circumstance that is in substantial agreement with the theories respecting the origin of the people. The language is hard, rough, and remarkably rich in consonants, especially in sibilants. The accent is on the last syllable. Syntactically it bears a close resemblance to classical Greek. It has no grammatical gender. The nouns have seven cases (including an instrumental), and the adjective is declined like the noun. There is neither dual nor superlative. There are four conjugations, characterized by the vowels *a*, *e*, *u*, and (passive) *i*. The ancient language still survives in the church and literature, but in popular usage has been replaced by several dialects, the chief being the Western (Constantinople) and the Eastern (Armenia, Persia, India): the latter adheres more closely to the ancient language. The leading grammars are those of Ancher (Venice, 1819), M. Lauer (Vienna, 1869), H. Petermann (Berlin, 1872), Carrière (Paris, 1883); for the modern dialects, E. Riggs (Constantinople, 1856) deals with the Western, and Petermann (Berlin, 1867) with that of Tiflis. To these may be added the works of Hanusz (Polish-Ar.; Vienna, 1889) and Thomson (St. Petersburg, 1887, 1890). Among the various dictionaries, mention may be made of Bedrossian (Ar.-Eng.; Venice, 1878–9), and Ancher and Brand (Eng.-Ar.; Venice, 1868). For Armenian philology in general, the works of Lagarde (*Armenische Studien*, Göttingen, 1877), Fr. Müller, and Hübschmann should be consulted.

Armenian literature begins with Mesrop (439 A.D.), who introduced an alphabet of thirty-six characters, to which two more were added in the 12th century. It was probably reconstructed and elaborated from several sources, some scholars having argued in favour of a Greek origin, whilst others have derived it from the Aramæan, through the Pehlevi. Previous to Mesrop, at all events, the Pehlevi, Greek, or Syriac alphabet — perhaps even the language—was doubtless in use. To this Mesrop, and to Sahak (Isaac) Bartevatsi, is due the Armenian version of the Bible which was made between 432 and 437. It is not certain whether it was based upon the Syriac or the Greek alone; it seems to contain both elements, and, in particular, has been carefully revised by the help of the Hexaplar version of the latter. The best edition is that by Zohrab (Venice, 1805). Armenian literature is very largely theological, and contains many translations from the Greek

and Syriac, chiefly made in the 5th century. In a number of cases works have fortunately been thus preserved which are no longer extant in their native language; among these are the first part of the Chronicle of Eusebius, various writings of Philo, etc. (see Wenrich, *De Versionibus*, etc., Leipzig, 1842). The historical works are numerous, but, as regards the early history of the country, contain much unsound matter, and must be used with caution. On the other hand, they frequently offer important material relating to the several peoples with whom Armenia came into contact (Persians, Byzantines, Turks, and Mongols), and on this account are of considerable value. Among the best-known historians are Agathangelos, secretary to Tiridates the Great, continued by Faustus of Byzantium; Zenob, a pupil of Gregory the Illuminator; Moses of Choren, styled the 'Herodotus of Armenia,' in whose writings are embedded some fragments of the early literature previous to Mesrop's time. In the 7th century the chief names are John the Mamikon, Sebêos (author of a history of the wars of Heraclius), and Ghevond (Leontius), who wrote a history of the Mohammedan invasions of 661–788. For the 10th century, mention may be made of John Catholicus and Thomas Artsruni. Among the biographical works, the best are Korium's *Life of Mesrop* (Ger. by Welte, 1841), and the *Life of Nerses the Great*, by Mesrop the priest. Armenian folk-lore has always been rich in epic and legendary poems of very ancient date; but the introduction of Christianity in particular, if it did not lead to their suppression, at all events afforded no encouragement to their preservation in writing. A number of them have been recently published in the *Theologisch Quartalschrift*, vol. lxxvi., 1894 (Tübingen). Of the sacred poets, the best known is Nerses Klaietsi, called Shnorhali (1102–73). Among the more general literature are the fables of Vartan (ed. Saint Martin; Paris, 1825) and the astronomical and mathematical works of Ananias of Shirak (7th century). In the 18th century Armenian literature received a noteworthy stimulus by the erection of printing-presses at Amsterdam, Moscow, Smyrna, Vienna, etc., and more especially by the foundation of the Armenian Mekhitarist monks at San Lazzaro, Venice. Among the notable works printed by this community are the *History of Armenia*, by Michael Chamchian (Eng. by J. Avdall; Calcutta, 1827), and its *Antiquities and Archæology*, by Lucas Intshitshean (1835). For fuller surveys of Armenian bibliography, see the related works by Neumann (Leipzig, 1836); Somal (Venice, 1825, 1829); Langlois (Paris, 1867–9); Patcanian, *Mélanges Asiatiques*, iv. (1860), and sketch of the literature (Russ.; St. Petersburg, 1880); Dulaurier (Venice, 1894). For the history of Armenia in general, see the writings by the Armenian scholars already named, to which add M. Brosset (St. Petersburg, 1874–6), Gatteyrias (Paris, 1883), and Fr. Murad's recent contribution to Armenian history and literature, *Ararat und Masis* (Heidelberg, 1901), in which numerous bibliographical references will be found.

Armenian Atrocities. Within the last thirty years the juxtaposition of turbulent and bitterly hostile Mohammedans and Armenians in the Turkish empire, especially in Asia Minor, has resulted in the continued persecution and brutal massacre of the latter. In 1885 a revolutionary propaganda on the Nihilist plan

commenced among the Armenians of Turkish Armenia, but it was easily suppressed. In the summer of 1893 there was a recrudescence of the propaganda, and the Kurds, the national police, were ordered to raid the mountain districts. Regular Turkish troops were sent to their assistance, and in August 1894 there was a terrible slaughter at Sassun, which roused deep indignation throughout Europe. In November of the same year a Turkish commission of inquiry, accompanied by the consular delegates of Britain, France, and Russia, was sent to Armenia. This commission took evidence, which showed that there was no justification for the barbarity practised by the authorities; nevertheless the massacres continued. The three powers then pressed the Sultan for administrative reforms, especially in the vilayets of Erzerum, Van, Bitlis, Sivas, Mamuret-el-Aziz, and Diarbekir; but the Porte met the demand in the traditional Turkish manner with delays and counter-proposals, and the Sultan decorated the officials concerned in the Sassun massacre. On May 11, 1895, a complicated scheme of reforms was presented to the Porte, and was accepted in November of the same year. Meanwhile disturbances continued, and massacre after massacre took place in quick succession until Jan. 1, 1896. Intervention was proposed, but Russia would not agree to coercion, and Britain refused to act alone. In the summer of 1896 there were massacres at Van, Egin, and Niksar. Entire villages were desolated, and plague and famine attacked those whom the sword had spared. In August 1896 the Armenians of Constantinople seized the Ottoman Bank, to call attention to their desertion by the powers. In retaliation a Turkish mob, instigated by the government, massacred some seven or eight thousand Gregorian Armenians. No reparation could be demanded for this outrage, inasmuch as it arose out of the riotous conduct of the Armenian revolutionists. Since 1896 the massacres have been sporadic, and the Armenians are still at the mercy of their Mohammedan rulers. It is estimated that (excluding the slaughter at Constantinople) from twenty to fifty thousand men, women, and children have been put to death, and the destruction of property has been enormous. Efforts to relieve the destitute widows and orphans of the slain have been made by Britain and the United States, and, though opposed by the Turkish authorities, have met with some success. Kurdish outrages occurred again in 1904, and were the subject of questions in the British Parliament. In April 1909 a terrible massacre broke out in the district of Adana. Altogether 30,000 Armenian Christians were killed, 6,500 in Adana city alone. Government troops were sent to the afflicted district and the situation relieved. In Dec. 1909 twenty-six Moslems were executed for complicity in this massacre. See J. Bryce's *Case for the Armenians* (1896); Green's *The Armenian Crisis* (1895); Lepsius's *Armenia and Europe* (1897); MacColl's *England's Responsibility* (1895), and *Sultan and Powers* (1896). *Correspondence — Asiatic Province of Turkey* (1895), gov. pub.: Turkey, No. I. Parts I. and II. give the proceedings of the commission of the powers to inquire into the massacres. See also speech by Lord Rosebery (Oct. 1896), and articles in *Nineteenth Century* (vol. xl., pp. 654–680), *Contemporary Review* (Jan. and Feb. 1897), and *New Review* (vol. ix., pp. 201–210, 456–465, 648–654), and *Records of Society of Friends of Armenia*, 47 Victoria St., Westminster.

Armenian Church, the oldest of all national churches. It owes its foundation traditionally to St. Bartholomew, historically to St. Gregory the Illuminator, in A.D. 276. The Armenian state was the first formally to adopt Christianity as the religion of the state. After resolutely opposing the Nestorian heresies, the Armenian Church embraced the doctrines of Eutyches (Eutychianism), holding, against the Council of Chalcedon (451), that Christ possessed but one nature, the divine—the final separation from other Eastern churches on this point occurring in 554. The Armenians gradually formulated a system of theology differing from that of the other Eastern churches, while their liturgy remained practically the same. In baptism they considered it necessary to sprinkle and to dip, three times each, and to conjoin confirmation with baptism. In the celebration of the Lord's Supper pure wine and leavened bread must be used. Extreme unction must be given only to ecclesiastics, and that after death. They worshipped saints, but did not believe in purgatory.

In 1439 certain foreign members, especially those in Constantinople, met the overtures of the Pope for reunion in so far as to give up belief in the one nature of Christ. There were thus introduced two sects in the church —the Schismatics, who adhered to the traditional beliefs; and the Catholics, who gave up the Monophysite heresy. From their geographical position, the Armenian Christians have borne the brunt of cruel and incessant Mohammedan persecution. The head of the (Schismatic) church is the Katholikos of the Etchmiadzin monastery near Erivan, under whom are the patriarchs of Jerusalem and Constantinople. See Tozer's *The Church and the Eastern Empire* (1888); Harnack's *Ausbrutung des Christenthums*, vol. ii. (Eng. trans. by Moffatt, 1905); Malan's *Life and Times of St. Gregory* (1868) and *Liturgy of the Armenian Church* (1870).

Armentières, tn., dep. Nord, France, on river Lys, 10 m. N.W. of Lille, close to the Belgian frontier; largely manufactures cloth and table linen. Pop. 28,600.

Armes Parlantes, in heraldry the term applied to such armorial devices as a pun on the bearer's name or attributes. Also called rebuses.

Armfelt, Gustaf Mauritz (1757–1814), Swedish statesman; distinguished himself in the Danish war of 1788 and the Russian war of 1788–90, and was the Swedish plenipotentiary at the Congress of Värälä (1790). Being sent as ambassador to Naples, he plotted against the Swedish government, for which he was condemned to death in absence; but on Gustavus IV. attaining his majority, Armfelt returned to Sweden. In 1805–7 he successfully commanded the Swedish troops in Pomerania. His support of the claims of Gustavus IV.'s son to the throne caused his arrest, and in 1811 he was banished. Thenceforth he became a Russian subject, and Alexander I. made him governor-general of Finland in 1812–13. He encouraged the Czar to resist Napoleon I., and drew up for him the plan of the Russian campaign of 1812. See E. Tegnér's *Gustaf Mauritz Armfelt* (2nd ed. 1883–94); Ingman's *G. M. Armfelt* (1900).

Armida, in Tasso's *Jerusalem Delivered*, an enchantress, who by means of a magical girdle attempted to seduce the crusaders from their vows to deliver Jerusalem from the Saracens. Overcome by a Christian talisman, and conquered by Rinaldo, she turned Christian, adopting Rinaldo as her knight. The story has been made the subject of operas by Gluck (1777) and Rossini (1818).

Armidale, tn., New South Wales, in Sandon co., 240 m. N. of Sydney; alluvial gold is found in the vicinity. Pop. 4,300.

Armillary Sphere is an instrument formed by a combination of several rings, showing the relative positions of the imaginary circles of the celestial concave to which astronomers refer the situations of the sun, moon, and planets. The zodiac, or belt of the sky in which the movements of the greater planets take place, the equinoctial circle, the tropics of Cancer and Capricorn, the meridian and horizon, are represented, with the earth as centre. The instrument, by whose aid astronomical problems could be solved, has been superseded by the celestial globe.

Arminius (18 B.C.–19 A.D.) served in the German auxiliary troops with the Roman army. When Varus, the Roman governor, aroused the German tribes by his exactions, Arminius secretly raised the country against him, cut off his outlying forces, and annihilated his main army in the Teutoburger Wald. The disaster caused great consternation at Rome. Tiberius led a force to the Rhine, which again became the Roman frontier. From 14 to 17 A.D. Germanicus fought with varying success against Arminius, but was recalled by Tiberius in 17. On the ground of seeking absolute power over his countrymen, he was slain by his relatives. See Tacitus's *Annals;* Merivale's *Romans under the Empire* (1859–62).

Arminius, JACOBUS (1560–1609), whose proper name was Harmensen, founder of Arminianism, was born at Oudewater, S. Holland. He joined the ministry at Amsterdam (1588), and became a leading theologian and preacher. He was invited (1589) to refute the attack of Coornhert on the extreme predestinarianism in the Netherlands; but abandoned the task, convinced of the untenableness of either the higher or lower predestination. He then successfully defended himself before the ecclesiastical courts. In spite of the opposition of Gomarus of Leyden, whom he defeated in argument, he succeeded Junius in the university (1603). Gomarus next traduced him as a Papist, a Pelagian, and a 'Coornherter;' whereupon he was proscribed by the clergy, and his students were subjected to persecution, although the States-general reported that he taught nothing but what could be tolerated. Prostrated by persecution, Arminius died at Leyden. Arminianism is the antithesis to Calvinism. It maintains that in respect of responsibility, guilt, and penalty, there must be a free and unpredestined will. It gave rise subsequently to the Remonstrant Church of the Netherlands, and left traces of its influence upon the Church of England. Arminius's *Works* were translated into English by James Nichols (1825–75). See Brandt's *Life of Arminius* (1724); Eng. trans. Guthrie (1854).

Armistice. Agreements for the temporary cessation of hostilities are (according to Hall's *International Law*) called suspensions of arms when they are made for passing and merely military ends, and take effect for a short time and within a limited space. When concluded for a longer term, especially if they extend to the whole or a large part of the belligerents' forces, or have a political object, they are known as armistices or truces.

Armitage, EDWARD (1817–96), a historical and mural painter, born in London. He was a pupil (1836) of Paul Delaroche, to whom he gave assistance in the celebrated *Hemicycle* in the Ecole des Beaux Arts. For many years from 1842 he exhibited at the Royal Academy and elsewhere. In 1843 and following years he won three

prizes for frescoes for the Houses of Parliament, the subjects being *The Landing of Cæsar* (1843), *The Spirit of Religion* (1845), and *The Battle of Meeanee* (1847)—as an oil picture now at St. James's Palace. A visit to the Crimea in 1855 led to his painting *The Guards at Inkermann* and *A Cavalry Attack at Balaklava*. He also painted a fine series of frescoes for St. John's (R.C.) Church in Islington. He was elected an A.R.A. in 1867, an R.A. in 1872, and in 1875 was appointed lecturer on painting to the Royal Academy; in 1883 he published *Lectures on Painting*.

Armitage, THOMAS RHODES (1824–90), English physician, born in Sussex; practised in London. Failing sight compelled him to retire in 1860, and he devoted the rest of his life, and his means, to the interests of the blind. He brought the Braille system into general use in England, reorganized the Indigent Blind Visiting Society, and founded the British and Foreign Blind Association. The Royal Normal College was established Mar. 1, 1872, by Dr. Armitage, the Duke of Westminster, and others.

Armley, tnship. in the parl. bor. of Leeds, W. Riding of Yorkshire, England, on river Aire. Several woollen mills. Pop. (par.) 27,500.

Armorial Bearings, the generic term for insignia treated of in heraldry; strictly, those *borne* on the shield.

Armorica, div. of pre-Roman Gaul, identified with Brittany, and inhabited by the Armorici. During the Roman occupation it comprised the whole of the country N. of the Loire. After the German invasion the 'tractus Armoricanus' became a sort of federal republic, until annexed to the French crown by Clovis about 500 A.D. See BRITTANY.

Armour. See ARMS.

Armour, NAVAL. The introduction of armour for ironclads was the result of the invention of shell fire. Apart from some experimental craft never tried in warfare, the first armoured vessels were built in 1854–6 in France, for the purpose of attacking the Russian shore batteries in the Black Sea. At almost the same time several armoured iron floating batteries of similar type were built in England, the earliest being the *Trusty*, *Thunder*, *Glatton*, and *Meteor*. None of these were sea-going vessels in the ordinary sense of the term; but soon afterwards M. Dupuy de Lôme, in France, designed and built the sea-going armoured frigate *Gloire*, which began a new era in naval construction. The British Admiralty followed in May 1859, by laying down the large armoured ship *Warrior*, which was launched in December 1860. A somewhat similar vessel, the *Black Prince*, was launched in 1861. For the sake of economy, the French framed the *Gloire* of wood and plated her with iron. The *Warrior* and the *Black Prince* were built of as well as armoured with iron; and although, for some years later, it was the practice in England as well as abroad to armour wooden ships, the superior strength and lasting qualities of iron ones soon drove wood, as a constructive material, from the field. Against the guns of the *Warrior's* day her 4½ in. of iron armour with 18 in. of teak backing and ½ in. interior iron skin were proof. As guns grew more powerful, 5½ in. armour, such as was carried by British ships of the *Agincourt* class, came in. In 1865 the *Bellerophon* was launched, with armour 6 in. thick; in 1868 the *Hercules*, with 9 in.; and in 1871 the *Devastation*, with 12 in. So the increase went on, until the *Inflexible*, launched in 1876, bore some armour which was as much as 24 in. thick. It had already become necessary to look for armour offering greater resistance than mere

iron, as it was obvious that no vessel could carry much armour of such extreme weight. The difficulty was met to some extent by providing armour which, though still mainly of iron, had a steel face. This 'compound' armour, which was applied in certain positions to the *Inflexible*, marks the beginning of the complete supersession of iron by steel. Nearly all battleships built between 1880 and 1890 had 'compound' armour; but this then gave way gradually to armour composed throughout of steel, the natural resisting qualities of which were later immensely improved by the tempering process known as Harveyizing (see HARVEYED STEEL), and by the mixture with the steel of small proportions of other metals, and notably of nickel. The latest and best is known as Krupp armour, which contains small proportions of chromium, nickel, and manganese. The necessary thickness has therefore decreased, and instead of the 24 in. of wrought-iron armour used on the *Inflexible*, from 12 to 14 in. of Harvey nickel steel, or even less of Krupp armour, has been found to be far more efficacious, in spite of the greatly increased power of guns. Indeed, at the end of the 19th century, the major part of the armour of most new battleships was not more than 6 to 9 in. thick. In the earlier type of ships it was thought necessary to protect only the battery with thick armour, the sides of the ship being merely cased. The transition stage was marked by partial protection of the battery (turret, barbettes, and armoured casemates for separate guns), and by partial protection of the sides. Recent practice, as exemplified in the *St. Vincent*, employs a complete belt of armour, tapering in thickness from 9¾ in. amidships to 6 in. forward and 4 in. aft. The gun positions are protected by 8–12 in. armour, the conning towers by 8 in. and 12 in., and the communication tubes by 6 in. The German *Ostfriesland* class has a Krupp steel belt of 11·8 in. maximum thickness. An armour belt extends well below water-line, so that the ship shall not expose unprotected areas when rolling in a seaway. From the bottom of the belt an armoured deck, curving upwards both transversely and fore and aft, extends over the lower parts of the ship to screen the engines, magazines, etc., and armoured bulkheads divide the vessel into transverse sections. The protective deck, now universally applied to battleships and cruisers, was introduced as early as 1872. Armour is attached to its backing and the main framework of the ship by bolts screwed part way through the metal from the back, one bolt being allowed to about every 7 sq. ft. Behind armour where men are likely to be employed in action, the frames are covered with thin plating to intercept rivet and bolt heads which might fly off under the impact of a shell. See Very's *Navies of the World.... Construction*, etc. (1880); papers on armour in successive issues of Brassey's *Naval Annual; General Information Series* of U.S. Navy Department, especially v. p. 239, vi. p. 322, x. ch. vi., xi. ch. vi.; *Notes on Naval Progress* (Navy Dep., Washington); and *Proceedings* of U.S. Naval Institute.

Armour, JOHN DOUGLAS (1830–1903), Canadian judge, born at Otonabee, Upper Canada; was called to the bar in 1853, and created a judge of the Queen's Bench, Ontario, in 1877. Becoming president of the division ten years afterwards, he was transferred to the Supreme Court of Canada in 1902. In 1903 he was selected as an arbitrator of the Alaska Tribunal, but died prior to the sitting of the board.

Armour, Philip Danforth (1832–1901), American merchant and philanthropist, born at Stockbridge, N.Y. In 1863 he founded Armour, Plankinton, and Co., which, as Armour and Co., became the most extensive pork-packing business in the world. He was distinguished for his benefactions. He founded the Armour Institute of Technology and the Armour Mission in Chicago, with endowments amounting to two and a half million dollars.

Armoured Trains. See Trains, Armoured.

Armourer, in mediæval times a maker of armour; now a skilled artificer employed (1) in each of the larger army units, such as an infantry battalion, and (2) in each ship of the navy, to see that the rifles, bayonets, etc., are kept in proper repair.

Armourer-Sergeants. See Army Ordnance Department.

Armpit. See Axilla.

Arms. Previous to the discovery of metal, weapons and hunting-gear must have consisted of clubs, axes of stone, and flint arrow-heads. Axe-heads of many different kinds of stone and of a great variety of shapes and sizes are very characteristic implements of the earliest period. In addition to spear-heads and arrow-heads of exquisitely finished workmanship in flint, the art of fabricating weapons in this material reached its highest point in the knife-daggers, which, especially those of Scandinavian origin, display on their edges what is technically known as 'ripple-flaking.'

With the use of bronze the variety of weapons increased, in the form of axes, daggers, swords, and shields. The earliest form of bronze dagger is a thin, knifelike blade about six inches long, broad at the hilt, and fastened to the handle by large rivets of bronze. The leaf-shaped sword, found all over Europe, was cast with the handle-plate in one piece, and was without a guard. Scandinavian bronze swords are longer than British. A narrow rapier-shaped variety occurs frequently in Ireland. Spear-heads of bronze are chiefly leaf-shaped, though barbed examples have been found. The shields of the Bronze Age were circular, with concentric ridges and rows of studs, and the handle was fixed beneath the boss. In Central Europe the Early Iron Age produced swords of iron formed in exact imitation of the leaf-shaped sword of the previous age. The Heroic Age in Greece is characterized by a bronze sword, double-edged, long and sharp, having gold or silver studs set in the hilt and scabbard; and its defensive armour consisted of helmet, cuirass, greaves, and shield, all of bronze. In the earliest Egyptian period the archers were provided with arrows made of a reed tipped with bronze. Their swordsmen carried straight, double-edged weapons of bronze, tapering from hilt to point. Their shields were of peculiar form, round-headed but square below, and the spears used at this time were fitted with bronze leaf-shaped heads. The armour of the Etruscans was, in the main, similar to that of the Greeks.

About the 1st century B.C. the Romans used two varieties of sword—the short, double-edged *gladius*, and the long, single-edged *spatha*. But of all the weapons carried by the Romans the most characteristic was the *pilum*, a wooden shaft fitted with a stout iron head resembling the modern pike. It could either be hurled, javelin-wise, or used like a bayonet, as well as to ward off sword-strokes. On the Trajan Column there are shown two varieties of shield—one oblong, rectangular, and highly convex; the other oval

and flattened, the latter being borne by knights. During the Merovingian period (450–760 A.D.) the *francisca* or battle-axe was the characteristic weapon. It was hurled with unerring aim at an antagonist. The Frankish *angon* was a development of the Roman *pilum*.

Nearer the period prior to the Norman conquest, most weapons were of iron, consisting of broad-swords with or without guards, and the curved blade called in A.S. *seax*, with sheaths of wood or leather. The longbow became of great importance, and mace-heads of iron and bronze were much in vogue. The shield, oval or circular, was of wood covered with leather, and had a high conical boss. Body armour consisted chiefly of the *byrnie* (chain-mail), the *lorica*, and crested helmets. For two centuries after the conquest our principal authorities are the royal and baronial seals, in one of which Alexander I. of Scotland is depicted wearing hauberk and tunic, and bearing a lance and kite-shaped shield. A Norman knight was clad in hose of mail, steel knee-caps, a byrnie, gambeson, and helmet, and bore two swords, dagger, spear, and shield. Archery was encouraged in England by statute. The crossbow, at first prohibited by papal decree, came into use towards the close of the 12th century. With the 13th century we have fresh information in the knightly effigies which are extant. Archers and crossbowmen increased; and the varieties of armour, weapons, and decorations largely multiplied, including hoods of chain-mail, greaves of metal or of *cuir bouilli*, banded armour, the dagger or *miséricorde*, horse caparisons, and banners of display. With the advent of gunpowder in the 14th century, the use of body armour naturally decreased, chain-mail hauberks being discontinued. Leather and whalebone were much used in addition to metals in the manufacture of elbow-guards, gauntlets, knee-pieces, and sollerets (armed shoes). From the 14th to the 16th century Scottish Highland armour attained distinction by the fine interlaced-work carving of dirk handles, the iron-handled circular shields of wood and leather decorated with brass studs, the richly-carved powder-horns, steel pistols of fine workmanship, the Jedburgh staff, the Lochaber axe, and the claymore. See Ducange, Froissart, Hefner, in *Archæologia*, *Recherches Historiques*, and Du Sommerard's *Les Arts au Moyen-Age* (1838–46), Brett, *Ancient Arms and Armour* (illus. 1894).

Modern arms are classed as fire-arms, and those wielded at close quarters with a cut or thrust. The modern rifle, carbine, and revolver used by the European powers differ only in slight points of detail, and there is but little choice between them as effective weapons. The modern tendency is to reduce the length of the ordinary infantry rifle, and so make it available for all branches of the service. (See Rifle.) The cylinder of a revolver is usually chambered to hold six cartridges. The calibre of the barrel is larger than that of a rifle, as the weapon is only used at short ranges, and it is necessary to have the bullet of a weight that will not only wound a man, but stop him from closing. The Webley pistol is of ·441 calibre. It fires a 265-grain bullet with a velocity of 715 ft. per second. Of ancient and mediæval weapons in use before the introduction of gunpowder —such as the sword, pike, mace, javelin, axe, etc.—there only remain the various types of bayonet, sword, and lance. The ordinary sword or sabre has a blade of fine steel, and is adapted both for cutting and thrusting. The British cavalry sword has a blade of 32 in., and with its hand-guard

weighs 2 lbs. The Oriental sabre or scimitar and the naval cutlass are short weapons with a broad curved blade adapted for cutting only. On the other hand, the sword blade, when straight and narrow, is called a rapier, and is used only for thrusting. The ordinary sword of an infantry officer is of the rapier type, but is used more as a badge of authority than as a weapon of offence. In the S. African campaign the dismounted officers carried carbines or rifles instead of swords, in order to avoid being singled out for special attention by the enemy's riflemen. The lance used by cavalry has a shaft of bamboo or ash, with a head and shoe of steel. The British lance is 9 ft. long, and weighs about 4 lbs. See GUNS and RIFLE; also Williamson's *Engines of War* (1841); Greener's *Science of Gunnery* (1841); Jervis's *Our Engines of War* (1859); Tennant's *Story of the Guns* (1864); Kensington's *Artillery Machines* (1881); Greener's *The Gun and its Development* (1881; 7th ed. 1899); Bartlett's *Some Weapons of War* (1883); Bond's *Treatise on Military Small Arms* (1884); Burton's *Book of the Sword* (1884); Hutton's *Cold Steel: Treatise on the Sabre* (1889); *Treatise on Service Ordnance* (1900); Maindron's *Les Armes* (1900); and Fremantle's *Book of the Rifle* (1901); also Gerrare's *Bibliog. of Guns and Shooting* (1896).

Arms, COAT OF, the bearings on an individual shield. Originally embroidered on the sur*coat;* hence the name. See HERALDRY.

Armstead, HENRY HUGH (1828–1905), English sculptor; educated at the Royal Academy under Professors Bailey, Leigh, and Carey; became R.A. in 1879; modelled several of the allegorical groups on the south and east sides of the base of the Albert Memorial, Kensington Gardens, London; carved oak panels in H.M. robing-room in the New Palace, Westminster, illustrating the history of King Arthur and Sir Galahad; and executed many portrait-busts and statues, as that of Lord John Thynne in Westminster Abbey.

Armstrong, 'ARCHIE' (d. 1672), a well-known Eskdale sheep-stealer, who became official court jester, and was notorious for his freedom of speech, an example of which was the grace he said in Archbishop Laud's presence: 'Great praise be given to God, and little *laud* to the devil.' But having ridiculed Laud once too often, he was banished from court, and spent his closing years in luxury in London and in Cumberland. He is introduced by Sir W. Scott into *The Fortunes of Nigel.* See Archie Armstrong's *Banquet of Jests* (ed. 1872); Doran's *Hist. of Court Fools* (1858); Chambers's *Book of Days*, vol. i. pp. 180–5.

Armstrong, JOHN (1709–79), physician, poet, and miscellaneous writer, was born at Castleton manse, Roxburghshire. He practised in London, writing several medical treatises. In 1746 he became physician to the Hospital for Sick and Lame Soldiers, and from 1760 to 1763 was an army doctor in Germany. He published in 1736 a rather objectionable poem, *The Economy of Love*, which hurt his reputation; but in 1744 he atoned for this in his *Art of Preserving Health*, one of the best didactic poems in the language. He was a friend of Thomson, Wilkes, Mallet, and Fuseli.

Armstrong, WILLIAM GEORGE, first Baron Armstrong (1810–1900), was the son of a Newcastle merchant. As a boy he took considerable interest in mechanical devices, and learned the use of tools. After leaving school he was articled to a Newcastle solicitor, with whom he afterwards entered into partnership. He early began investigations on

electricity. In 1845 he invented the hydraulic crane—which procured him the fellowship of the Royal Society—and soon afterwards the hydraulic accumulator. He next applied hydraulic power to hoists, machines for opening and closing dock gates and spring bridges, capstans, turn-tables, wagon-lifts, etc. The Elswick Engine Works, near Newcastle, were founded for the manufacture of the rifled ordnance gun that bears his name. It was adopted by the government, and in 1859 he was appointed government chief engineer of rifled ordnance. The English government introduced 3,000 Armstrong guns into the service between 1859 and 1862. In 1863, however, it ceased to use the gun, which requires expert handling, and practically returned to the simpler muzzle-loading type, which it retained until 1880. Armstrong, resigning his appointment, returned to Elswick, where he developed his works, which were now free to supply heavy ordnance to foreign countries. When president of the British Association meeting in 1863, Armstrong's speech on the probable early exhaustion of our coal fields led to the appointment of a royal commission on the subject. He also founded the Elswick shipyards. He was created a peer in 1887. See his *Electric Movement in Air and Water* (1897).

Armstrong, William (fl. 1596), or Kinmont Willie (from the name of his castle), 'the starkest man in Teviotdale,' and the dread of the English border, is known to fame through the ballad of *Kinmont Willie*, which records his rescue by Scott of Buccleuch, the Scottish warden, from Carlisle Castle (1596), in which he had been imprisoned by the irritated English borderers. See Scott's *Minstrelsy of the Scottish Border*, ed. T. F. Henderson (1902).

Army. An army, in its broadest sense, signifies a body of armed and trained men organized for warfare. The term is applied to national, regular or standing, and field armies. A national army is the total available force of men trained (or partially trained) in the use of arms which a nation can call upon to fight in time of war. A regular or standing army is the trained portion of the national army which is actually serving with the colours. Field armies are those portions of the national army which are engaged in a campaign, and are chiefly composed of regulars. The military requirements of a people depend mainly on its geographical situation and national wealth; they may vary from time to time according to the international situation. Expenditure on an army may therefore be regarded as a national insurance, and the premium to be paid will naturally vary with the amount to be insured and with its relative security. Thus the territories of continental powers are open to sudden invasion by land, and can be effectively safeguarded only by a nation in arms. Great Britain, isolated and surrounded by the sea, hopes for time to prepare for hostilities, and while her navy remains intact, is content with a relatively insignificant land force. So also the geographical situation of the United States renders great military strength at present superfluous. Consequently, the national army of a continental power far exceeds those of England and America, who follow a system of voluntary enlistment.

The strength of a field army depends chiefly on the nature of the operations to be undertaken, and on the character and numbers of the enemy's forces. For example, the four German armies which invaded France in 1870 consisted of

45,000, 136,000, 118,000, and 70,000 men respectively. On the other hand, the British-Egyptian army which completed the conquest of the Sudan in 1898 was only 22,000 strong. In the one case the enemy consisted of a large and, it was supposed, well-organized modern army; in the other they were merely savage tribesmen. Though a field army varies in numbers, it is divided into certain parts—battalions, batteries, brigades, divisions, etc.—each of fixed strength. It consists chiefly of infantry, with cavalry, artillery, engineers, and commissariat and medical corps. The whole is under the command of one man, who, with the aid of various staffs, feeds, transports, and manœuvres his troops.

Infantry forms the bulk of a field army; the proportions of the other arms depend on circumstances, the chief of which are the nature of the country in which the campaign takes place, and the special character of the operations. In a mountainous country horse and field artillery and cavalry are at a disadvantage, and their proportion to infantry is smaller than if the ground were flat and open. In the former case the engineers are increased for improving communications. In a country devoid of railways, the army service corps is increased for the extra transport required; where lines exist, the engineers are increased for their repair and maintenance, and for working the traffic. For siege operations, the heavy artillery and engineers are increased for carrying out bombardments and constructing siege works respectively, and the mounted troops are decreased. When fighting an unusually mobile enemy, the mounted

Comparison of the World's Armies.

Country.	National Army.	Regular Army (in peace).
Austria-Hungary	2,250,000	400,000
Belgium	170,000	40,000
United Kingdom*	807,611	260,084
China	400,000	200,000
Denmark	100,000	15,000
France	3,500,000	600,000
Germany	4,000,000	600,000
Greece	82,000	22,000
Italy	1,200,000	250,000
Japan	1,000,000	200,000
Netherlands	150,000	30,000
Norway	150,000	12,000
Portugal	250,000	30,000
Russia	4,000,000	1,200,000
Servia	353,122	35,000
Spain	500,000	80,000
Sweden	450,000	50,000
Switzerland	500,000	500,000
Turkey	1,000,000	300,000
United States	200,000	80,000

* Excluding the Indian native army and the forces of the self-governing colonies.

branches are increased—*e.g.* at the beginning of 1901 the cavalry and mounted infantry in the British army in S. Africa amounted to nearly half the infantry.

Historical Sketch.—1. Ancient armies. The military forces of the earliest times were little better than armed multitudes, possessed of a certain amount of rough organization, but unable to travel great distances, or carry out any very serious operations. In the 16th century B.C., the Egyptian forces under Sesostris, numbering, according to tradition, over half a million men, conquered and laid waste all the country as far east as India. Chariots and horsemen were important factors in the Egyptian method of fighting; but victory depended on the infantry, which formed the bulk of the army. The reverse was the case with the well-organized Persian armies which existed about a thousand years later, the horsemen far exceeding the foot-soldiers. The Spartans, Athenians, and Macedonians were the first European nations to possess good armies. The general Greek military organization was on a militia basis, and no standing army was maintained. Every freeman was bound to take up arms at the age of eighteen. For the first two years he served at home, but after that, until he was forty, in any foreign country where the state was at war. The most important element in the army was infantry, which was divided into two main branches, the *hoplitai* and *psiloi*. The former were heavy troops, and in action were arranged in the favourite Greek fighting formation, the phalanx—a body of 4,000 men drawn up in lines from eight to sixteen deep. The *psiloi* were lightly-armed troops, who carried out the skirmishing duties of the army, harassed the enemy, and hung round the flanks and rear of the phalanx with the cavalry in time of battle. The Greek army reached the zenith of its efficiency under Alexander. The recruiting, transport, and provisioning branches were all well organized.

The Roman armies which ruled the world from about the 3rd century B.C. to the 8th A.D. were probably the finest, comparatively, that have ever existed. They were at first formed entirely of militia. Every one between the ages of seventeen and forty-six—except the very lowest and poorest class—could be called on to bear arms in the service of the state. Consular armies were raised every year for some expedition or campaign, at the end of which they returned home and were disbanded. This course was found impracticable for some armies which were employed in very distant lands, and so they were often kept under arms for several years, a fact that eventually led to the formation of a standing army distinct from the militia, by which it was augmented for the prosecution of great foreign wars. The legion was the chief feature of Roman armies. It was composed of about 4,000 infantry and 300 cavalry, and was lighter and more extended in formation than the Greek phalanx. It was consequently superior in mobility, and better adapted for offensive operations. The infantry of the legion were divided into four classes—*hastati*, young men lightly armed, forming the first line; *principes*, heavily-armed men of great strength, forming the second line; *triarii*, the oldest men, heavily armed and armoured, in the third line; and *velites*, or light troops, corresponding to the Greek *psiloi*. The first three classes were each divided into ten *manipuli*, commanded by centurions. After the adoption of standing armies the legion was increased to over

6,000 men, and was divided into ten *cohorts*.

Infantry was still the main element in an army throughout the long period during which the Frank and German armies ruled Europe, after they had overthrown the Roman power. All freemen bore arms, and in war were obliged to follow and obey the rulers of their respective tribes. No standing army was kept up, but the warlike spirit of the nation was so strong that it was considered the highest honour to bear arms, and every man was practically a trained soldier.

2. Mediæval armies. About the 9th century, the 'feudal system,' of these feudal bands, supplemented by a levy of militia from the freemen of the nation. The chief arm of the feudal armies was cavalry. It was divided into two classes—the knights and their retainers, the men-at-arms; and the hobilers, or light horsemen. In the former the horses were protected by armour. The riders were armed with lance, sword, and mace, and were covered from head to foot with very heavy armour, which rendered them quite helpless when unhorsed. The foot-soldiers were also divided into two classes—archers, with bucklers and steel caps, and armed with longbows, swords, battle-axes, and brown-

Table showing the relative Proportions of the various Arms in an Army, 1800–1900.

Date.	Infantry.	Cavalry.	Artillery.	Engineers.	Train.
Napoleon's armies, 1802.	1	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{40}$	$\frac{1}{30}$
Second German army, 1870	1	$\frac{1}{5}-\frac{1}{6}$	$\frac{1}{7}-\frac{1}{8}$	$\frac{1}{22}$	$\frac{1}{13}$
A British army,* 1910 .	1†	$\frac{1}{12}$	$\frac{1}{3}$	$\frac{1}{20}$	$\frac{1}{7}$

* The expeditionary force of 6 divisions and a cavalry division has been taken as an example.

† Including mounted infantry.

which had been slowly developing for some time past, finally established itself as the basis of European army organization. It arose originally through the young men of a nation gathering round the nobles, serving under their banners in war time, and garrisoning their castles during peace. Each of these bands practically formed a small standing army, being paid for their services by gifts of booty or land. The profession of arms came to be regarded in time as an honourable and profitable calling, and the bands grew stronger and more numerous. The nobles owed allegiance to the king, and when the latter required an army it was formed bills; and the light infantry, with iron gloves and long knives. The infantry branch of the army was greatly neglected, its training uncared for, and its fighting power regarded with contempt by the leaders and mounted soldiers.

The events which led to the downfall of the feudal system were as follows:—(1.) The success of the English archers against the French at Creçy in 1346, at Poitiers ten years later, and at Agincourt in 1415, England having practically abandoned the feudal system under Edward III. (See ARMY, BRITISH, *Historical Sketch.*) (2.) The victories of the Swiss infantry, which was armed with sword and halberd, wore no ar-

mour, and fought in wedge-shaped masses, at Morgarten (1315), Sempach (1386), Granson (1476), Morat (1476), and Nancy (1477). (3.) The introduction of standing armies, chiefly infantry, and at first largely composed of foreign mercenaries, but later assuming more of a national character. Charles VII. of France was the initiator of this movement, which he originally started with the idea of rendering himself independent of the barons. The *compagnies d'ordonnance* in 1445, the *francs-archers*, and, later, the pikemen and *landsknechte*, proved completely the superiority of a standing army to a feudal militia.

3. Armies after the introduction of gunpowder. The rise of standing armies and the development of the use of gunpowder proceeded contemporaneously, but it was long before firearms superseded bows and pikes. Although a small cannon was used at Crecy, the musket did not become the recognized arm of the foot-soldier until over two hundred years later. During this period every improvement in firearms gave increased value to infantry, which gradually took the place of cavalry as the principal arm. The feudal militia of the middle ages was followed by a system of voluntary enlistment in time of peace; if necessary, the standing army was increased by compulsory levies in time of war. Armies were raised by contract, the king paying a fixed annual sum for this purpose to certain of his nobles. The latter commanded the regiments which they enlisted, and selected captains, who usually raised and commanded the companies under a further contract with the nobles. Regiments were at first very strong, often mustering 3,000 men; but as the use of firearms increased, a more open fighting formation was adopted to avoid severe loss. The old company, 500 or 600 strong, became thereby too extended for efficient control by its captain, and was reduced in number, with the consequent reduction in strength of the regiment.

The 18th century practically witnessed the foundation of present-day army tactics and organization. Under Frederick the Great the Prussian army gained a high reputation among European nations for manœuvring power; and the efficacy of a combination of rifle and bayonet in fighting was firmly established by the experiences of the Seven Years' war (1756-63). The armies of the French revolution a few decades later were organized on Frederick's system of brigades and divisions, and at first were raised entirely by voluntary enlistment. The extraordinary success of Napoleon's arms attracted recruits, and for some time no difficulty was experienced in raising enormous armies. But the long-continued wars with almost every nation of Europe eventually drained the country of the class willing to volunteer for service, and compulsory enlistment became necessary. In 1798 a law was made authorizing conscription, by which every able-bodied man was compelled, if called out, to serve for at least five years. To keep pace with France, other nations were forced to adopt the new system, until, finally, England was the only European exception to the rule of compulsory service. A further development of the scheme occurred later, when Prussia originated the idea of short service in the regular forces, followed by a long period in the reserve, every man in the latter being liable to service in an emergency, and being obliged to go through an annual training. In this way the whole manhood of a nation became trained in the use of arms. The system was copied by other powers, with the result that now

the principle of 'compulsory enlistment, short service, and reserve' is in universal vogue among the continental nations of Europe. See Jerram's *Armies of the World* (1900); *Armies of To-day* (various writers, 1893); Köpper's *Armies of Europe* (trans. by Count Gleichen, 1897).

Army, BRITISH. It has been stated, under ARMY, that England, relying on her navy, is content with a comparatively insignificant land force. The varied duties which this force may be called upon to perform render its organization and distribution different from those of any other military power. The defence of the United Kingdom is but one of the problems which must ever confront so large an empire. Egypt requires a strong garrison; South Africa required one until recent years. Last, and most important, India must be held by a strong force, which requires regular reinforcement and relief. This latter is the stumbling-block to almost every scheme of army reform, and would remain so even were universal service introduced to-morrow. India renders impossible a short term of colour service; for, apart from the expense of frequent reliefs, the climatic conditions are too severe for raw or immature recruits. In addition to these hindrances to economy of *personnel*, it was until recently the practice to call upon the army to garrison the numerous coaling stations, and the more important ports of even the great self-governing colonies. To-day, a saner view prevails, and it is now recognized that, however distant it may be, a fleet in being is the surest safeguard for our oversea possessions. This decision has set free considerable numbers of troops, and the army can now be organized on the following basis. Assuming India to require a garrison of some 76,000 regular troops, and another 45,000 to be necessary for Egypt and the Colonies (including some 6,000 for Egypt and 11,000 for both South Africa and the Mediterranean), the regular army at home must be sufficiently large to keep these forces constantly up to strength. It must also permit of the organization of an expeditionary force of six divisions, a cavalry division, and army troops; and it must furnish staff for headquarters, for the various military institutions, and for the territorial force. For these purposes 140,000 is considered a sufficient number, so that the regular army is distributed as follows:—

Regimental Establishments (Home and Colonies) . .	178,663
Staff of Territorial Force . .	2,937
Staff	1,152
Miscellaneous	1,448
India	75,884
Total Regular Army .	260,084

The regimental establishments, including India, are of the following proportions:—

Cavalry	20,716
Artillery	49,183
Engineers	9,906
Infantry	151,261
Army Service Corps . . .	6,316
Medical Corps	4,041
Total	241,423

The above figures, however, include 8,604 Colonial and Indian troops, and they provide for the maintenance at approximate war establishment only of the units in India, Egypt, and the more important colonies. For purposes of economy the remaining units are kept lower in numbers, or on what is termed the peace establishment. It is, therefore, necessary to make provision for bringing them up to war strength on a national emergency, and this is effected by the formation of a reserve. It has been shown that the term of service for which a man is enlisted is governed in great measure by the claims of

India. India calls for a long term, so as to avoid too frequent reliefs. On the other hand, the shorter the term of colour service, the larger will be the numbers passing annually to the reserve. A compromise between the two has been effected by adopting a normal term of seven years with the colours and five years with the reserve. (See RECRUITING.) This has resulted in a reserve of 138,000 men. (See RESERVE, ARMY.) This number is, however, deemed insufficient to bring the regular army up to war strength, and a special reserve, consisting mainly of the old militia, has been organized. It has a present establishment of 86,539. (See RESERVE, SPECIAL.) Behind these regular forces are the remnants of the old Militia and the Territorial Force. (See TERRITORIAL FORCE.) They are available only for home or local defence unless they volunteer for service abroad, and they are subject to military law only when training, or when serving with regular troops. The national army may therefore be summarised as follows:—

Regular Troops	260,084
Army Reserve	138,000
Special Reserve	86,539
Territorial Force	315,408
Militia, etc.	7,580
Total	807,611

These figures take no account of the 250,000 men of the native Indian army, nor of the forces of the great, self-governing colonies (see COLONIAL FORCES), which amount to over 100,000, and which, on emergency, could be raised to many times that number.

Organization.—The Sovereign is the head of the army, his constitutional adviser being the Secretary of State for War, who is responsible for the efficiency of the army, and for the proper expenditure of public money. (See also WAR OFFICE.) Under him is the Army Council, which has replaced the old commander-in-chief. It is theoretically responsible for all questions of military policy; but, in practice, it is dominated financially by the Treasury, and, to some extent, by the Committee of Imperial Defence, in matters of foreign policy and strategy. The United Kingdom is divided into seven commands and the London District. These commands, with their headquarters in brackets, are as follows: Aldershot (Aldershot), Southern (Salisbury), Eastern (London), Irish (Dublin), Scottish (Edinburgh), Northern (York), and Western (Chester). At the head of each, and directly under the Army Council, is a General Officer Commanding-in-Chief, who, with a Major-General in charge of Administration to assist him (see

	Regulars.		Territorials.	
	Cavalry. Brigades.	Divisions.	Mounted Brigades.	Divisions.
Aldershot	1	2	—	—
Eastern	2	1	2	2
Ireland	1	2	—	—
London District	—	—	1	2
Northern	—	—	3	3
Scottish	—	—	2	2
Southern	—	1	4	2
Western	—	—	2	3

STAFF), is responsible for the training of all regular and territorial troops within the command. The distribution of the regular and territorial brigades and divisions is shown in the table on the preceding page. The coast fortresses and ports are divided into groups under commanders, who are responsible to the local General Officer Commanding-in-Chief for training, but correspond direct with headquarters on technical matters.

For purposes of recruiting the United Kingdom is, with the exception of the insignificant area of the Aldershot command, divided up on the territorial system into 67 regimental districts. (See DEPOT.) One of these is allotted to each territorial regiment of the line. The districts are grouped, in turn, into 12 army districts, each under a colonel, who is responsible for the training and administration of the depôts, for the reservists of his group, and for the preservation of documents and records. Details of the various branches and units are given under the appropriate headings.

Historical Sketch.—The history of the British army is broadly divisible into two periods—viz. before and after the introduction of standing armies.

1. *The period before the introduction of standing armies.*—In early days Britain had no good military organization. Armies, of course, existed, such as those of Cassivelaunus and Caractacus, the former of which fought so well against Julius Cæsar in 54 B.C. as to excite the admiration of that famous soldier. Their organization, however, was of the crudest description, and it was not until the 8th century A.D. that steps were taken to put the defensive forces of the country on a sound basis. Under the Anglo-Saxons the militia system was adopted, by which every man was compelled to present himself armed and equipped for service when required. The fighting men of a family were commanded by the head, or ealdorman, who, with the thanes (the wealthier class of landowners), was obliged to appear mounted. About the time of Alfred the knights and earls became the leaders of the army. Under Canute, mercenary forces in the form of *hus-carles* were introduced as part of the king's household and the establishment of every great noble. At the time of the Norman invasion the army was in a fairly efficient condition, well armed and experienced in warfare. Its defeat at Hastings and the subsequent Norman rule in England led to the introduction of the feudal system of raising armies. The manner of its application to England was as follows:—William the Conqueror confiscated the lands of the Anglo-Saxon nobility and divided them into 60,000 *feuds*, *fiefs*, or *fees*, as they were variously called, and apportioned them as rewards to the Normans who had accompanied him on his expedition. Such rewards carried with them the condition that every tenant of a fee was liable to forty days' service annually in the king's army, completely armed and equipped. Holders of half-fees served for twenty days, and so on in proportion. Many of William's chief nobles received upwards of a hundred fees. Each could only represent one as regards attendance for military service, and was obliged to find substitutes for the others. The majority of the large grants were divided by their owners into several small *tenements*, and the tenant-in-chief exacted from his sub-tenants the same service he rendered to the king. Sixty thousand men were thus available free of cost for forty days in every year.

In addition to this feudal army a militia force existed in England, called the *posse comitatus*, which acted under the county sheriffs, and in which was enrolled every man between the ages of fifteen and sixty. This force was available for upholding the law in the various counties, and also in case of public danger, such as an invasion by the Scots. In the reign of Henry II. an assize of arms was enacted, constituting the *posse comitatus* an armed force, every man being compelled to provide himself with, and to keep in good condition, a certain quantity of arms and armour in proportion to his estate. This act was confirmed by the Statute of Winchester in 1285, which further established periodical inspections of arms.

Forfeiture of fee was the penalty for non-compliance with the conditions of tenure; but this gradually gave place to a system of *scutage* or *escuage*—payment instead of personal attendance. With the money thus obtained it was possible to prevail upon certain of the feudal bands to prolong their service, and also to engage mercenaries. The system thus initiated grew year by year; the English armies became almost entirely composed of hired troops, and the principles of feudalism in their organization less and less marked.

As in the armies on the Continent, cavalry remained for long the chief arm. The foot-soldier, however, had never been so neglected as in other countries, on account of the firm hold which archery had taken on the people. Every king from the time of William I. had recognized the value of this art, with the result that the longbow—carrying a 'clothyard shaft' from ten to twenty score yards—had become an efficient weapon in the hands of the English archer. In 1298 and 1314 the value of the foot-soldier compared with the horseman was clearly proved. At Falkirk, William Wallace's spearmen and archers, drawn up in hollow squares, resisted for hours the charges of the English cavalry. It was not until King Edward withdrew his horsemen, and brought his bowmen into action, that the Scots were defeated. Again, at Bannockburn, Bruce's Scottish foot completely routed an English army of nearly 30,000 horse. Thirteen years later, Edward III. saw the mistakes of the English military system, and took immediate steps to remedy them. He founded the system of raising armies by indenture, contracting with the prelates and barons for the supply of soldiers. The pay was good, and no difficulty was experienced in raising sufficient numbers. Archery was fostered, and the foot-soldier well drilled and equipped. The wisdom of this procedure was shown at Crecy, where the English army, with 20,000 infantry out of a total strength of 30,000, completely routed a French force of nearly four times that number mainly composed of cavalry.

2. *The standing army period.*—Charles I. was always ambitious of establishing a standing army, and both the Royalist and Puritan forces partook of this nature. Cromwell's troops were practically, though not by law, the first of England's standing armies. They were disbanded on the restoration, a small portion—two regiments of horse and six of foot—being retained as a standing army by Charles II. The militia had suffered from great neglect; so it was reorganized in 1662, on the principle of landowners supplying fully-equipped horsemen or foot-soldiers according to their means. In 1689 the Bill of Rights was passed, by which the troops of William III. became the first standing army of England recognized

by Parliament. A portion of this act is read and passed annually to this day. The army was still raised by contract, but the system had developed into an arrangement between the crown and the colonel. The latter was given the regulation amount of money for the upkeep of the regiment, and managed everything connected therewith, from recruiting to discharge. After all expenses had been paid, what was left of the 'stock-purse' was divided annually amongst the captains of the regiment. Being thus closely identified with them, regiments came to be called by the names of their colonels. The contract system was ended in 1783 by Burke's Act, which established the responsibility of the Secretary for War to Parliament in all army matters.

The first standing army was badly organized. Enlistment was for life, except in time of war, when recruits for two or three years' service, or until the end of hostilities, were accepted. Bounties were given, and enlistment was, as a rule, voluntary; but the requirements of the army were so great during the French wars (1793–1815) that recourse was had to impressment and to volunteering from the militia. The latter had been reorganized in 1757 on the principle of the ballot (with substitution allowed) and three years' service; and it was then illegal for militiamen to enlist in the regulars. In 1799 a bounty of ten guineas was offered to militiamen enlisting in the regular army. The effect was immediate, over 26,000 men volunteering for service within a year, and an average of 25,000 such volunteers formed part of the army annually until the end of the war. Thus the militia, contrary to principle, developed into the feeder of the army, a system which was greatly fostered by the policy of Pitt. In the period of ten years ending 1813, out of a total of nearly 250,000 recruits enlisted in the regulars, about 100,000 came from the auxiliary force. In 1803 the volunteer force was greatly increased to resist Napoleon's threatened invasion, and in the following year reached the enormous total of 463,000. In 1806 short-service enlistment was introduced, a system modified two years later by making it optional with life engagement. Bounties had been steadily growing in amount, and by 1805 had risen as high as £40. A new force, called the 'local militia,' was constituted by Act of Parliament in 1808. This was in addition to the regular militia —ballot without substitution, and service for four years, being the ruling principles. On the return of the army of occupation from France in 1818, Great Britain entered on the long period of peace which lasted until the outbreak of the Crimean war in 1854. Although the army was, as usual, greatly reduced in strength, a higher proportion was retained between peace and war establishments than had ever previously been the case. Military matters were, however, seriously neglected. No militia were enrolled, and the volunteers ceased to exist. In 1829 the system of life enlistment only was reintroduced, but was abolished again in 1847, when a period of 'ten years, with permission to re-engage to complete twenty-one,' was established. The Crimean war found the army in a very inefficient condition, the general organization being conspicuously bad. Great difficulty was experienced in getting recruits to bring the establishment up to war strength. Bounties, short terms of enlistment, even foreign mercenaries (for the last time in British history), were all tried ineffectually. The militia, however, once more proved its value as an aux-

iliary force. Fortunately it had been remodelled in 1852, this time on a system of voluntary enlistment, the ballot having been suspended, but not abolished. Commissions in the army were given as a reward to militia officers who induced a certain number of men to enlist in the regulars, and by this means 32,000 recruits were obtained. Regiments of militia also garrisoned the Mediterranean and home stations. That the war closed successfully was due to the splendid qualities of the soldiers. The lessons of the Crimea were not lost, and led to a series of military reforms. In 1859 the volunteers were revived, and an army reserve created for service at home in time of war. In 1867 bounties on enlistment were abolished, and the Reserve Forces and Militia Reserve Acts were passed. In 1870 three important military reforms were made. First, the reserve was rendered a strong and efficient force by the introduction of the present system of 'short service with the colours, and balance of engagement with the reserve.' Secondly, the gradual withdrawal of the strong garrisons quartered in the self-governing colonies was commenced, a step needed in view of the increased strength at which it had been found necessary to maintain the army in India since the mutiny. Thirdly, the crown was authorized to embody the militia in time of great emergency. In the following year the system of commissioning the cavalry and infantry by purchase was abolished, and the regular and auxiliary forces were combined in one organization. In 1872, infantry regiments, except the 60th and the Rifle Brigade, were allotted to territorial recruiting districts. At this time the 1st to 25th regiments each consisted of two battalions, the 26th to 59th and 61st to 109th of one battalion, and the 60th and Rifle Brigade of four battalions. By the new system, 82 of the single-battalion regiments were linked together in pairs—the 79th (Cameron Highlanders) was the exception—and, with the first 25 regiments, formed 66 'brigade sub-districts.' To these were also attached the local regiments of militia and volunteers. In 1881 the two battalions of regulars and two of militia in each sub-district were combined in a 'regiment,' which was given a territorial title. In 1898 the Special Army Reserve and the Special Service Section of Militia were established, by which a large number of men were rendered available for war service abroad. For more recent developments, see *ante;* also Goodenough and Dalton's *Army Book for the British Empire* (gov. pub., 1893), Richard's *Her Majesty's Army*, and Fortescue's *History of the British Army*.

Army Act, The (1881), is part of the statute law of England, but with this considerable difference that it is administered by military courts and not by civil judges. It is construed in the same manner and carried into effect under the same conditions as to evidence and otherwise as the ordinary criminal law. The act has of itself no force, but requires to be brought into operation each year by an Army Annual Act, thus securing the constitutional principle of the control of Parliament over the discipline requisite for the government of the army. It deals with military crimes and their punishment, and embodies the law as to enlistment, billeting, and impressment of carriages.

Army Agents. Government appoints a private bank as financial agent to each regiment or corps. A monthly estimate of the moneys required is sent in to the Treasury, and the sum credited to the agent quarterly in advance.

The agent, as a rule, permits the officer to draw it monthly in advance. A commission of one per cent. was formerly allowed, but this has been discontinued. The employment of these bankers enables officers to draw their pay by convenient instalments, and at the same time relieves the Army Pay Department from the necessity of keeping complicated private accounts. As a rule, army agents have nothing to do with the pay of non-commissioned officers and men, which is issued by the Treasury to the Army Pay Department, and audited by paymasters and their sub-accountants.

Army and Navy Club was founded in 1837; its membership, confined to officers of the regular army and the navy, is limited to 2,400 home members. The entrance fee is £40, with an annual subscription of 7 or 10 guineas. Address, 36 Pall Mall, London.

Army and Navy Gazette, the leading organ of the two British services, was founded in 1860 by Sir (then Dr.) Wm. Howard Russell, with Messrs. Bradbury and Evans as publishers. This journal advocates the interests of all ranks, and the accuracy of its service details is generally acknowledged.

Army and Navy Stores. See CO-OPERATION.

Army Chaplains. See CHAPLAINS.

Army Corps. The army corps is the largest formation in a continental army. This organization, first adopted by Napoleon in 1803, has, with certain modifications, been retained in all large armies. In Prussia the territory of the kingdom is divided into army corps districts, and the corps commanders are not only the leaders of these units in war, but the superintendents of their recruiting, training, and equipment in time of peace. The advantage of this arrangement is obvious, and after the Franco-German war of 1870 the system of territorial localization was adopted by all continental nations. The German army corps may be taken as a type. Its component parts are the general staff, 2 infantry divisions (to which cavalry and artillery are attached), 1 battalion of rifles, 1 telegraph section, 1 corps bridge train, 1 division machine guns, 1 company pioneers, 6 supply columns, 7 supply parks, 12 ammunition columns, 2 field bakery columns, 12 field hospitals, 2 horse depôts; or a total of 41,000 men, 13,000 horses, 144 guns, and 2,000 vehicles. In Great Britain the army corps has never hitherto existed as a permanent fighting unit, and the largest formation is the division (see DIVISION). An organization of 6 army corps was proposed in 1902–3, but was abandoned in favour of the present system.

Army Council was created in 1904, when the office of commander-in-chief was abolished. It consists of three civil and four military members (see WAR OFFICE). Of the latter, the Chief of the General Staff is *primus inter pares*. The council decides all questions of general policy; but each member is in absolute control of his own department.

Army Enlistment Acts, 1867 and 1870. By the Enlistment Act of 1867 the regulations made in 1847 and during the Crimean war were somewhat modified. First, engagements were to be for twelve years for all branches of the service, with power to re-engage up to twenty-one years; and the provision as to a soldier continuing in the service after twenty-one years, until he gave three months' notice of his wish to be discharged, was re-enacted. In accordance with the Act of 1870, no recruit can enlist for more than twelve years; but he can engage either to serve the whole time with the colours,

or partially with the colours and partially in the reserve. For modern practice see RECRUITING. A soldier now serves, as a rule, for a limited time in the active army, and then passes into the reserve, with the obligation to return to the army if called up within the period of his original enlistment.

Army Examinations. See MILITARY EDUCATION and PROMOTION.

Army Hospital Corps. The great loss of life in the Crimean war, incurred by defective medical administration, led to the formation of an organized military body, called the Army Hospital Corps. The ranks were filled, for the most part, by the transfer of men of good character from regiments after a certain term of service, usually two years. Each man had to pass a probationary period of three months in a military hospital before he was permanently appointed to the corps. The abolition of regimental hospitals led eventually to the system by which the Army Hospital Corps, the patients in military hospitals, and all soldiers attached to them, are placed under the direct command of medical officers. Merged for some time into the Medical Staff Corps, the original Army Hospital Corps is now represented by the warrant officers, non-commissioned officers, and men of the Royal Army Medical Corps.

Army in the Field. Before entering upon field operations, it is necessary to have a secure *base of operations*. The movement across the seas of any large body of troops, with their attendant equipment and stores, necessitates a disembarkation on a seashore, and a preliminary collection and organization of *matériel*. A maritime base is, therefore, in many cases a necessity—as, for example, Cape Coast Castle during the Ashanti war, Ismailia for the Egyptian campaign of 1882, Cape Town and Durban for wars in S. Africa, etc. Where the theatre of war is far from a seaport, the base is necessarily inland—as, for example, Peshawar and Kohat during campaigns in Afghanistan. The selection of a base in a friendly country has obvious advantages, as it gives time for preparations being made before the actual arrival of the troops. It may often happen that the situation of a base can only be secured by force, as in the case of Balaklava in the Crimean war; or by stratagem, as in the case of Ismailia in the Egyptian campaign. As an army moves forward, a *line of communications* becomes necessary, along which the *personnel* and *matériel* collected is forwarded, and by means of which sick, wounded, prisoners, etc., are removed from the theatre of actual hostilities. The length of this line may vary from a few miles, as in the Crimean war, to hundreds of miles, as in the Nile expedition or the S. African campaign of 1899–1902. The line consists of a chain of military stations connected by a route traversed by rail, road, or river transport, or a combination of all three. With an unfriendly population, such as that in the Orange State and the Transvaal, a large force is necessary to guard the line. Each station or depôt becomes a defensive fort, blockhouses protect vulnerable points such as defiles or bridges, and flying columns have to keep the enemy at a distance. As the army advances the length of the line of communications increases, and it is necessary to organize it into sections. Wherever there is a break in bulk in the conveyance of stores, a depôt is necessarily formed; and in each section at important points there must be hospitals, rest stations, and accumulations of commissariat and ordnance stores. The

elaborate and detailed regulations of the great military powers are adapted only to continental and civilized warfare, but the main principles underlying them are in force in our foreign expeditions. The organization of the base of operations and the various sections of the line of communications is under one head, and the staff of the entire supply arrangements is independent of the troops utilizing them. The usual method by which an army is supplied is an adaptation of the magazine and requisition systems. Arms, ammunition, accoutrements, clothing, harness, tools, and stores in general, are forwarded to troops from the nearest magazines; but ordinary transport, and a large portion of the daily food for men and horses, are drawn from the theatre of war. In a civilized country the inhabitants may be forced to supply lodging as well as food, and requisitions may be made for staple commodities. As a general principle, everything is paid for in cash or by promissory notes, and the forcible taking of goods is limited as far as possible. Purchase in the open market is an essentially British custom, and, by establishing good relations between the natives of a country and the army, often enables supplies to be obtained which would otherwise be concealed. The object of an efficient supply system is to keep full the knapsack reserve (the food which the soldier actually carries with him) and the supply column reserve (which is carried for him on wagons which closely follow up the troops). Food has to be issued as a rule daily, and the unexpended portion of a ration can be carried on the person. In addition, each soldier is supplied with a reserve or emergency ration of biscuit, pemmican, preserved meat, etc., which may only be opened by order of a superior officer. In European warfare, railways and roads have alone to be considered; but in the Himalayas, the Sudan, the plains of India, or the forests of Burma, vastly different conditions arise. The details of transport may vary. A *general transport* of a semi-military character is worked from the base of operations to the advanced depôt in rear of an army, or to the magazines nearest to the troops to be supplied. The labour, carts, animals, etc., are mainly procured from the country, while the supervision is of a military character, and drawn from the staff of the line of communications. *Departmental transport* is of a more highly organized description. The military wagons of the Army Service Corps convey food and stores from the magazines to the vicinity of the troops that are to be supplied. The circumstances of each particular case will determine whether the actual distribution to the units is made direct by the Army Service Corps, or indirectly through the medium of the *regimental transport*, or wagons which always accompany troops on the march. Under suitable conditions, troops should be able to move on emergency for two or three days by utilizing the resources of the country, their regimental transport, and their reserve rations. The supply columns and supply parks of the departmental transport carry three to four days' provision for ordinary use, and thus extend the area in which troops can act. As soon as the limit of time is exceeded, fresh depôts must be formed, or opportunity given to allow stores to be brought up from the nearest magazines. Under favourable circumstances water transport may become as valuable as railway transport. In addition to the collection and distribution of supplies, the staff of

the line of communications has to utilize and often create postal and telegraph services. The collection and dissemination of information, and preventing information reaching an enemy, is a task for special officers of the Intelligence Department; but the bulk of the work and the censorship of the press will be associated with the main centres that lie on the line of communications. The advantage of keeping up communication by telegraph, heliograph, or other means, along the route between its various magazines and depôts, is obvious, and the post of director of telegraphs in a campaign is an important one.

Army List, a monthly distribution list of officers on the active list of the army, the royal marines, militia, yeomanry, and volunteers, together with the promotions, appointments, etc., and army orders, since the last issue. Once a quarter, it contains, in addition, the names of officers who have retired from the service. A bulky quarterly Army List gives the seniority, appointments, and war services of officers in detail.

Army Medical College, ROYAL, is the school for the instruction of army medical officers in technical subjects, on their joining, and again before promotion to the rank of major. It was formerly situated at Netley, but has now been removed to the new College at Millbank. It works in conjunction with Queen Alexandra's Military Hospital, Millbank. The commandant and director of studies is a colonel of the Royal Army Medical Corps. He is the responsible head of the college. The courses of instruction are directed by the director-general and advisory board for Army Medical Services. The professors are officers of the Royal Army Medical Corps. For the purposes of the secondary course of instruction to captains, clinical teachers are appointed from the staffs of the London hospitals to which these officers have access.

Army Ordnance Department and ARMY ORDNANCE CORPS have to do with the administration of stores. (See STORES.) The Ordnance Department consists of officers only. Its headquarters staff, under the Quartermaster-General, includes a director of Equipment and Ordnance Stores with a staff of 5, and an inspector of Army Ordnance Services. The principal ordnance officer is an honorary major-general at Woolwich Arsenal. Under him are 9 ordnance officers of the first class, with the rank and title of colonel; 18 second class (lieutenant-colonels), 29 third class, and 60 fourth class. Many of these officers belong to other corps, but, having passed the ordnance course, are temporarily attached. They retain their army rank until permanently transferred, but their seniority in the department is regulated by their position on its list. The department also includes commissaries of ordnance and inspectors of ordnance machinery, who, for the most part, have been promoted from the Ordnance Corps and hold honorary rank. The total of the department amounts to 237. Its duties consist of the command of the Ordnance Corps, and of the issue of all arms, equipment, ammunition, etc., to the troops. There is also a small inspection staff for stores and clothing; but the inspection of all weapons, ammunition, etc., is carried out by the Inspection and Experimental Staff of the Master-General of the Ordnance.

The Army Ordnance Corps comprises the warrant officers, non-commissioned officers, and men. It is organized into 22 companies and a depôt company. The total number of the corps is 2,363. Of these, 1,632 are included in the

companies, which are in charge, not only of the ordnance stores, but also of the large mobilization stores which are maintained in various parts of the country; 381 belong to the armourer section, which consists almost entirely of sergeants, one of whom is attached to each regular regiment and battalion. The remaining 350 belong to the Armament Artificers' Section, and are all staff-sergeants. In the field the corps is employed mainly along the lines of communication. An ordnance depôt unit consists of 2 officers and 69 men. An ordnance depôt consists of one or more such units.

Army Pay Department. This department was established in 1878, and, with the Army Pay Corps, is under the Financial Secretary (see WAR OFFICE). Under the Army Accounts Department, it is responsible for the issue of pay and allowances, and for the examination and audit of all military accounts. The Army Accounts Department is a purely civil branch at the War Office, and is the final examination and audit office. Two of its members are attached to the administrative staff of each command as financial advisers and auditors.

The Army Pay Department consists of officers who are selected from every branch of the army, and join the department after a period of probation. It comprises 183 paymasters, one of whom is on the staff of each command, while the others are distributed amongst the numerous district and regimental pay offices. These officers are directly responsible for the issue and audit of regimental pay and allowances.

The Army Pay Corps consists of 719 warrant officers and men, who perform the minor clerical duties in the pay offices. These three branches were, until 1910, amalgamated into a large Army Accounts Department, but have now been divided in the manner just described.

Officers commanding squadrons, companies, etc., pay their men weekly, obtaining cash from the local paymaster, and accounting for it at the end of each month by a claim called the pay list, which is forwarded to the pay office. The local paymaster, after a preliminary examination, forwards the pay lists of all corps to the War Office, together with a monthly 'general state' of his accounts, which summarizes all disbursements and receipts made on behalf of the War Office.

Army Purchase Commission. Prior to the abolition of purchase in 1871, every commission in the cavalry and infantry had its recognized money value, and every step in promotion not caused by a death vacancy had to be purchased. In addition to the ordinary price or difference that had to be paid, a sum 'over regulation' was in most cases added, and, by reason of the vested right of money sunk in commissions, the army was virtually 'in pledge' to the officers. The system could not be put an end to without compensating the persons concerned, and the adjustment of claims was placed in the hands of commissioners, of whom the deputy judge-advocate-general was one. The work of the commissioners is now practically finished.

Army Sanitary Committee. Officers of the Engineers and the Medical Corps sit from time to time as a committee on all matters connected with sanitation. They report on sites and plans for new barracks and hospitals, and visit and report on existing buildings when necessary.

Army Schools. At nearly every camp and garrison, and at most depôts, are established army schools, for the purpose of affording to non-commissioned officers and men and their chil-

dren, and to the children of warrant officers, the opportunity of acquiring a sound and useful education. For the administration and inspection of the schools a director is appointed at the War Office, and under him are inspectors for each school district. First and second-class certificates are necessary for promotion to the higher non-commissioned ranks; and a soldier must secure a third-class certificate before he can draw proficiency pay. The attendance of soldiers is not compulsory, but commanding officers are enjoined to give them every facility for joining the classes. In order to obtain a first-class certificate a soldier must pass a qualifying examination in dictation, arithmetic, geography, English history, and copying rough drafts of correspondence. For the second and third class certificates the examination is confined to writing from dictation and arithmetic of a less advanced character. A school attendance lasts, as a rule, about an hour and a half, and the times of the lessons are arranged as far as possible to suit the convenience of the men. The examinations take place twice a year, under rigid supervision. Any soldier may apply to be examined in foreign languages, shorthand, tactics, military topography, and fortification. The course of instruction given to the elder children and infants is similar to that adopted in public elementary schools.

Army Service Corps. Prior to 1870 the Commissariat Department was responsible for the purchase and issue of provisions, forage, fuel, lights, etc., and all matters in connection with supply; while the Military Train—a successor of the Land Transport Corps raised during the Crimean war—was charged with transport duties. The duties both of supply and transport are now performed by the Army Service Corps. This consists of 473 officers and 6,368 men. It is organized into 71 transport companies, 7 mechanical transport companies, 5 supply companies, and 4 remount companies. The higher peace establishment of a transport company is 58 men and 34 horses. Such a company is stationed at most garrisons, and performs the heavier transport services. The supply companies are stationed only at large garrisons, such as Aldershot, and work the bakeries and abattoirs. One or two men of these companies are, however, detached to nearly every military station, where they superintend the weighing, storage, and issue of forage and rations. The remount companies are in charge of the government farms and depôts. The men are recruited mainly by transfers from the mounted branches. The corps is administered, under the quartermaster-general, by the director of transport and remounts and the director of supplies. In war, it finds drivers for the second-line transport of regimental units, and is organized into transport and supply columns and parks. See SUPPLY.

Arnaboldi, ALESSANDRO (1827), Italian poet, born in Milan; was secretary to the town council at Milan until 1873. In 1872 he published a volume of *Versi*, which put him in the front rank of the modern poets of his country. In 1888 he published a new collection, *Nuovi Versi*.

Arnaud, HENRI (1641–1721), Waldensian clergyman and patriot, pastor of La Tour in Piedmont, was forced, in the persecution of the Vaudois by Victor Amadeus of Savoy, to retire to Switzerland in 1686. In 1689 he led the 'glorious return of the Vaudois to their valleys,' in spite of the attacks of the French and Savoyards. The Duke of Savoy granted religious liberty to the Vaudois; but on his reconciliation

with France the concession was withdrawn, and the Vaudois had to find a retreat in Würtemberg. Arnaud's expedition is described in his *Histoire de la Glorieuse Rentrée des Vaudois dans leurs Vallées*, printed in 1710, with a dedication to Queen Anne. See also Muret's *Histoire de Henri Arnaud* (1853).

Arnauld, ANGÉLIQUE (1624–84), distinguished religieuse, born in Paris, and educated by her aunt, Marie Angélique Arnauld. She became prioress (1653) and abbess (1678) of Port-Royal, and was persecuted by the Jesuits. She was principal author of *Mémoires..... de Port-Royal* (1742). See Sainte-Beuve's *Port-Royal* (1878), and Beard's *Port-Royal* (1861).

Arnauld, ANTOINE (1560–1619), French advocate, born in Paris. He became *procureur-général* in 1585. He is remembered for his defence of the University of Paris against the Jesuits, which resulted in their temporary banishment. He was the father of 'le grand Arnauld,' and had six daughters who took the veil at Port-Royal.

Arnauld, ANTOINE (1612–94), Jansenist theologian, was born in Paris, and educated at the Sorbonne. Retiring to Port-Royal monastery, he became the strenuous adversary of the Jesuits. He was expelled from the society of the Sorbonne for his support of the Jansenists. To avoid the persecutions of the Jesuits, he became an exile in 1679, thereafter residing in Flanders and Holland. He gave assistance to Pascal with his *Lettres Ecrites à un Provincial de ses Amis*, and to Lancelot with his *Grammaire*. He was a devout Catholic, believing in 'the corruption of human nature and the depravity of the will,' and one of the profoundest metaphysicians of his century. His great work, the *Logique de Port-Royal*, was written in conjunction with Nicole (1st ed. 1662; Eng. ed. 1881). See Larrière's *Vie* (1783); Sainte-Beuve's *Port-Royal* (1878); Varin's *Vérité sur les Arnaulds* (1847).

Arnauld, MARIE ANGÉLIQUE (1591–1661), Jansenist abbess, became abbess of Port-Royal when fourteen years old, and reformed her abbey at seventeen, reviving the discipline of St. Bernard. Later she introduced Jansenism into her convent. See *Life* by Frances Martin (1873), and *Mémoires* by Angélique Arnauld.

Arnault, ANTOINE VINCENT (1766–1834), French poet and *littérateur*, born in Paris. He went with Napoleon to Italy, became secretary to the University of Paris on his return, and was elected to the Academy in 1799. He was exiled by the Bourbons (1816–19), but afterwards returned to France; was appointed (1833) secretary to the Academy, and died at Goderville. His dramas, of which the best are *Blanche et Montcassin, ou les Vénitiens* (1798), and *Germanicus* (1817), show the worst faults of the classicists. He is better known by his short moral poems, *Fables et Poésies* (1812; better ed. 1825), containing the famous '*La Feuille*,' and his *Souvenirs d'un Sexagénaire* (1833).

Arnaut OF MAREUIL (in the diocese of Périgueux), Provençal troubadour (fl. *c.* 1150–1200). He frequented the court of Alazais (Adelaide), the wife of Roger II. (Taillefer), Count of Béziers, and there he devoted himself to the service of the countess, whom he celebrated in many songs, though always, as was usual, under some disguised name, such as *Gent conquis*. His poems are instinct with passion—real, not feigned, like the ordinary expressions of love generally to be found in the poetry of the troubadours. The audacity shown in his poems at length gave offence to the countess, who dismissed him from her service. Arnaut withdrew, heartbroken, to the court of his friend and patron,

Guilhem of Montpellier, where he bewailed his lot in several touching songs. As Alazais died in 1199 or 1200, and as Arnaut never refers to her death, he is supposed to have died before that date. Petrarch calls him the less famous Arnaut as compared with Daniel Arnaut; but this is not the verdict of modern criticism. About thirty of his poems have come down to us. The three epistles in verse, *Saluts d'Amour*, are among the best of their kind. See J. H. Smith's *Troubadours at Home* (1900).

Arnaut, DANIEL (middle 12th century to beginning of 13th), Provençal troubadour, born at Ribérac (dep. Dordogne). He lived some time at the court of Richard Cœur de Lion. He left eighteen lyric poems. These are in many places obscure, owing to his penchant for rare rhymes and complicated verse structures; but by reason of the refinement of their style they won the admiration of Dante, who imitated his *sestina*, a form of verse invented by Arnaut. A good critical edition, with Italian translation, was published by Canello, *La Vita e le Opere del Trovatore Arnoldo Danielo* (1883).

Arndt, ERNST MORITZ (1769–1860), German poet and patriot, born in the island of Rügen. After travels in France and Germany he became (1805) professor of history at Greifswald. The son of a serf, he was instrumental in the abolition (1806) of serfdom by his work, *Geschichte der Leibeigenschaft in Pommern* (1803). In 1818 he exchanged his professorship of history at Greifswald for that at Bonn, from which, two years later, he was suspended for twenty years on account of his radical political opinions. Arndt is chiefly known by his patriotic poems and songs, which include *Was ist des Deutschen Vaterland? Was blasen die Trompeten?* and *Der Gott, der Eisen wachsen liess.* He is familiarly called 'Father Arndt' by the German people. He was a German chauvinist, detesting everybody and everything French. The best edition of his works, by H. Meisner, in 6 vols., was published in 1892–5. See Meisner and Geerds's *E. M. Arndt* (1898).

Arne, THOMAS AUGUSTINE (1710–78), musical composer, was born in London. He gave his sister—celebrated as Mrs. Cibber, the tragic actress—lessons in singing, enabling her to appear in Lampe's opera *Amelia* (1732), and to play heroine in Arne's first opera, *Rosamond*, produced in 1733. In 1738 he wrote the music for Dr. Dalton's adaptation of Milton's *Comus*. He was the first to introduce—in his *Judith* (1773)—female voices into oratorio choruses. Besides oratorios and operas, Dr. Arne composed a large number of glees, catches, and canons; but he is best known by his musical settings of such songs as *Rule Britannia*—the finale of *The Masque of Alfred* (1840)—*Where the Bee Sucks, Under the Greenwood Tree.*

Arneth, ALFRED, COUNT OF (1819–97), Austrian historian and statesman, born at Vienna; was a member of the German Assembly of 1848–9 at Frankfort-on-the-Main, and from 1869 a member of the Austrian Upper House. In 1868 he was appointed director of the national archives, and in 1879 president of the Austrian Academy of Sciences. His principal work is *Die Geschichte der Maria Theresa* (10 vols. 1863–79). Among other works are *Prinz Eugen von Savoyen* (3 vols. 1858–9), and the Letters of Maria Theresa and Joseph II., in 12 vols. (1866–91).

Arngrim ('The Learned'), otherwise ARNGRIMUR JONSSON (1568–1648), a student of the ancient literature of Iceland. As the priest of Mel, he wrote

Brevis Commentarius de Islandia (1593); the *Supplementum*—never printed (1596)—on the lives of the kings; the *Crymogœa* (1610), a Constitutional History of Iceland; and *Specimen Islandiœ*, chiefly from the *Landnamabok* (1643). See Vigfusson and Powell's *Corpus Poeticum Boreale* (1883).

Arnhem (anc. *Arenacum*), tn., cap. of prov. Gelderland, Netherlands; stands on the Lower Rhine, 35 m. by rail E. of Utrecht; is one of the most pleasant towns in the country. The 'large church' contains a monument to Charles, the last Duke of Gelderland (d. 1538). Paper, furniture, glass, printers' type, etc., are manufactured. Pop. 65,000.

Arnhem Land, the most northerly part of the N. Territory of S. Australia, between the Gulf of Carpentaria and Anson Bay.

Arnica, a genus of plants belonging to the natural order Compositæ, of which the most important species is *Arnica montana*, a perennial herb found on the mountains of middle and southern Europe. From the dried acrid and aromatic rootlets and rhizome of this plant a tincture is prepared which, diluted with water, serves as a remedy for bruises. Applied too freely to the skin, it may produce erysipelas.

Arnim, BETTINA VON (1788–1859), whose real name was Elisabeth; sister of Clemens Brentano and wife of Ludwig von Arnim, the German novelist and poet; born at Frankfort; is noted for her alleged correspondence with Goethe, published in 1835, under the title of *Goethe's Briefwechsel mit einem Kinde*. See L. Geiger, *Dichter und Frauen* (1896).

Arnim, HARRY KARL EDUARD, COUNT VON (1824–81), Prussian diplomatist, was born in Pomerania. In 1870 he was ambassador at Rome, and supported the anti-infallibilists at the Vatican Council. In 1871 he took part in the negotiations which resulted in the peace of Frankfort. In 1872 he became ambassador at Paris. Recalled, owing to his hostility to Bismarck, in 1874, he was sent to Constantinople. Charged with having stolen state documents in Paris, he was imprisoned, and on appeal his sentence was increased. In 1876 he published a violent pamphlet against Bismarck and others, and was prosecuted for high treason and libel, and sentenced to five years' penal servitude. By living in exile he escaped the penalty. He died at Nice. See Lowe's *Prince Bismarck* (new ed. 1898).

Arnim, JOHANN GEORG VON (1581–1641), general of the Thirty Years' war, was successively in the service of the Swedes, the Poles, the emperor, and the Saxons. Besieged Stralsund under Wallenstein (1628); co-operated with Gustavus Adolphus at Breitenfeld (1631); occupied Prague (1631); carried on negotiations with Wallenstein (1633–4); defeated the imperialist general Colloredo at Liegnitz (1634), and captured Zittau and Glogau; and in 1637 was arrested by the Swedes and carried to Stockholm, but contrived to escape in 1638. See Irmer's *Hans Georg von Arnim* (1894), and works cited *s.v.* WALLENSTEIN.

Arnim, LUDWIG ACHIM VON (1781–1831), German poet, born in Berlin. In 1806 he met his lifelong friend, Clemens Brentano, in Heidelberg. Together they edited (1806–8) many old German songs (*Des Knaben Wunderhorn*—see BRENTANO). Arnim married Brentano's sister, Bettina, in 1811. His first novel (*Hollins Liebeleben*, 1802) was an imitation of Goethe's *Werther;* the second (*Ariel's Offenbarungen*, 1804) was a poor specimen of the romantic school. His best work is *Die Kronenwächter* (1817), based on extensive historical research, and representing German life in the

renaissance period. Arnim also wrote some unsuccessful plays. An edition of his works in 22 vols. was published by his wife in 1853–6. See *Goethe und die Romantik* II., in *Schriften der Goethe Gesellschaft*, vol. xiv. (1899).

Arno, riv., Italy, rises at an altitude of 4,445 ft. in the Central Apennines, 23 m. E. by N. of Florence. As a mountain torrent it flows at first nearly due S. almost to Arezzo, then sweeps round to the N.W., and flows back nearly parallel to its former course as far as Pontassieve, where it turns to the W., and flowing through Florence enters the Mediterranean 7 m. below Pisa. Length, 140 m. Pisa stood originally on the seashore, but the Arno and Serchio together have brought down so much alluvium that the sea has been thrust back four and a half miles since the beginning of the Christian era.

Arnobius, also called AFER, rhetorician of Sicca in Numidia, wrote, about 295 A.D., an apology for Christianity (*Adversus Nationes*, lib. vii.). There is a good edition of his work by Reifferscheid (Vienna, 1875). English trans., vol. xix. of the *Ante-Nicene Christian Library* (1871).

Arnold, tn. and par., Nottinghamshire, 4 m. N.E. of Nottingham. Lace and hosiery are manufactured. Pop. (par.) 8,800.

Arnold OF BRESCIA (*c.* 1100–55), an Italian monk, studied under Abélard at Paris. For an attack on the worldliness of the higher clergy he was cited by the bishop of Brescia before the second Lateran Council (1139) as a heretic, and banished. He took refuge with Abélard, but his preaching brought upon him the hostility of St. Bernard, who denounced him. He found refuge (1142) in Switzerland; but in 1145 he proceeded to Rome, and endeavoured (1147) to establish a republic. In 1155, being expelled by the senate of Rome at the instigation of Pope Adrian IV., he fled to Campania, but was brought to Rome, crucified, his body burnt, and the ashes cast into the Tiber. See *Lives* by Giesebrecht (1873), Bonghi (1885), and Hausrath (1892).

Arnold, SIR ARTHUR (1833–1902), assistant-commissioner of public works in Lancashire (1863–66), resided in Lancashire during the cotton famine. First editor of the *Echo* till 1875; M.P. for Salford (1880–3); chairman of London County Council (1895–7); president of Free Land League, which he established in 1885; created a knight in 1895. Published *Hist. of the Cotton Famine* (1865); *Through Persia by Caravan* (1876); *Social Politics* (1881); *Free Land* (1880).

Arnold, BENEDICT (1741–1801), American general, born at Norwich, Connecticut. During the war of independence he assisted at the capture of Fort Ticonderoga; and after the siege of Quebec he commanded the flotilla at the battle of Valcour I., in Lake Champlain (1776). Embittered by the promotion over his head of five inferiors, he agreed with General Clinton to betray into his hands West Point and other important posts. On the capture of the British officer André, his fellow-conspirator, he went over to the British. He died in London. See *Lives* by Jared Sparks (1838) and Isaac N. Arnold (1880).

Arnold, SIR EDWIN (1832–1904), English poet, born at Gravesend. With a poem on *The Feast of Belshazzar* he gained the Newdigate prize (1853). He was principal of the Government Sanskrit College at Poona (1856–61). After his return to England he was employed on the editorial staff of the *Daily Telegraph*. His works include *Poems* (1853); *Hero and Leander* (1874); *The Indian Song of Songs* (1875); *Light of Asia*

(1879), an epic on the life and work of Buddha, which has gone through numerous editions; *Indian Poetry* (1881); *Pearls of the Faith* (1883); *With Sa'di in the Garden* (1888); *The Light of the World* (1891); *Seas and Lands* (1891); *Adzuma, a Japanese Tragedy* (1893); and *East and West* (1896).

Arnold, GEORGE (1834-65), American author and poet, was born in New York. His *Mc-Arone Papers* (1860, *et seq.*) were published in *Vanity Fair*. His poems, some of which are characterized by great sweetness and pathos, were edited by William Winter, with a memoir (1870; new ed. 1889).

Arnold, HANS (pseudonym of BABETTE VON BÜLOW), was born in Warmbrunn in 1850. Her tales, mostly published under the title of *Novellen* (1881–1903), treat mainly of the small vexations and worries of life. Among her best works are *Geburtstagsfreuden* (1884) and *Aprilwetter* (1893).

Arnold, ISAAC NEWTON (1815-84), American abolitionist and legislator, was born at Hartwick, New York. He was intimate with Abraham Lincoln, of whom he wrote an excellent biography (1866); he also wrote a good life of Benedict Arnold. He was a Republican representative from Illinois to the thirty-seventh and thirty-eighth Congresses, and was sixth auditor of the United States Treasury in 1865–6.

Arnold, MATTHEW (1822–88), poet, critic, and educationist, was the eldest son of Thomas Arnold, headmaster of Rugby. He was born at Laleham, Middlesex. In 1847 he became private secretary to Lord Lansdowne, by whom he was appointed in 1851 to a lay inspectorship of schools. On three occasions he drew up valuable reports of continental systems of education. Two of them have been reprinted as *The Popular Education of France* (1861) and *Schools and Universities on the Continent* (1868). Meanwhile Arnold steadily devoted his leisure to literature, and achieved a twofold reputation as poet and critic. From 1857 to 1867 he was regius professor of poetry at Oxford. His home was for a time in London, then at Harrow, and finally, from 1873, at Cobham, Surrey. In 1883, and again in 1886, he undertook lecturing tours in America. In 1885 he resigned his inspectorship. He died suddenly at Liverpool in 1888.

Matthew Arnold's literary work presents three phases. The ten or twelve years following his Oxford career were mainly devoted to poetry. Two early volumes—*The Strayed Reveller* (1849) and *Empedocles upon Etna* (1852)—were anonymously issued under the initial 'A.' The best of their contents were reprinted in the *Poems* of 1853, on the title-page of which the author's name appeared, and to which he added such masterpieces as *Sohrab and Rustum* (a narrative poem in the Homeric vein) and *The Scholar Gipsy*. A second series of *Poems* appeared in 1855, *Merope* (a tragedy in the Greek manner) in 1858, and *New Poems* in 1867.

Hardly less remarkable than the *Poems* of 1853 was the preface—dwelling on the importance of structure and unity in poetry—that accompanied them. Although the monody on his friend Arthur Hugh Clough, printed as *Thyrsis* in the 1867 volume, is one of his finest single pieces, and he continued to write poetry at intervals until the end of his life, for a decade from 1857 it was in literary criticism that his strongest work was done. The Oxford lectures, *On Translating Homer* (1861, 1862) and *On the Study of Celtic Literature* (1867), are models of sympathetic, lucid, and graceful discussion of literary prob-

lems; and some scattered studies of no less interest were collected as *Essays in Criticism* in 1865. Arnold took Sainte-Beuve as his model, and aimed at establishing a scientific system of criticism.

Literary criticism, like poetry, Arnold never wholly dropped. But his educational experience, and a constant study of the workings of the English mind when brought into contact with ideas, had led him into a profound dissatisfaction with the current ideals of the day. Towards the end of the 'sixties it became evident that the aim of his criticism was shifting from letters to life. There followed a period of active battle, during which, with a serious purpose beneath a mist of raillery, he attacked the social and educational prejudices of his countrymen in *Culture and Anarchy* (1869), their political prejudices in *Friendship's Garland* (1871), their religious prejudices in a series of works of which *Literature and Dogma* (1873) was the most startling and the most disputed. Arnold had the gift of crystallizing his views in memorable phrases. His plea for 'sweetness and light,' his division of English society into 'Barbarians,' 'Philistines,' and 'Populace,' have become household words. His message proved no inconsiderable factor in forming the ideals and habits of thought of a younger generation. Stimulating as his critical works are, it is probably by his poems that Arnold will live in English literature. He is one of the truest, if not one of the greatest, of nineteenth-century singers. Other works: *Higher Schools and Universities in Germany* (1874); *God and the Bible* (1875); *Last Essays on Church and Religion* (1877); *Mixed Essays* (1879); *Irish Essays* (1882); *Essays in Criticism*, 2nd series (1888). Editions: *Burke's Letters, Speeches, etc.* (1881), etc. Collected Works: Edition for America only (1884). Collected Poems, in 2 vols. (1869, 1877); 3 vols. (1885); 1 vol. (1890). Selections: *Passages from the Prose Writings* (1880); *Selected Poems* (1878); and recent editions since the partial expiration of copyright by W. Sharp, R. Garnett, H. B. Forman, and others. Biography: *Letters of Matthew Arnold*, ed. G. W. E. Russell (1901). Monographs, by A. Galton (1897); G. White (1898); G. Saintsbury (1899); H. W. Paul (1902). Bibliography, by T. B. Smart (1892). Editions of *Culture and Anarchy* and *Literature and Dogma* are included in 'Nelson's Shilling Library.'

Arnold, SAMUEL (1740–1802), born in London; composed oratorios, operas, and miscellaneous music. From 1783 to 1793 he was organist and composer to the Chapel Royal, till he became organist of Westminster Abbey. He is best known as the compiler of an excellent collection of music by English composers, entitled *Cathedral Music* (1790).

Arnold, SAMUEL GREENE (1821–80), American historian, was born at Providence, Rhode I.; was lieutenant-governor of that state in 1852, 1861, and 1862, and in 1862–3 was a member of the United States Senate. His published works include *The Spirit of Rhode Island History* (1853), and a valuable *History of Rhode Island and the Providence Plantations* (1859).

Arnold, THOMAS (1795–1842), historian, divine, and greatest of English schoolmasters, was born at East Cowes, Isle of Wight. In 1828 he was chosen headmaster of Rugby School, which he raised to a level second to that of none in England. He widened the conventional public school curriculum, and developed the 'prefect' and 'fagging' system. But his secret lay less in any system than in the profound religious and moral force of his own character,

together with a sense of justice which inspired respect. He had an acute insight into character, and influenced his pupils by stimulus, moral and intellectual, without subjecting them to needless rules. The 'Rugby' type of men obtained the reputation of holding an unusually serious and ethical view of life—perhaps also of not being wholly free from priggishness. The chief difficulty in Arnold's way was the prejudice excited in the Tory and High Church classes of society by his liberal views on politics and religion. Although a contemporary of Keble, he was a strong opposer of Tractarianism, which he attacked with an intolerance and a controversial vigour equal to its own. An article in the *Edinburgh Review*, championing the claims of the 'heretical' Dr. Hampden, nearly lost him his headmastership. For some time he was the chief representative of active 'Broad' churchmanship in the Anglican communion. By 1841 Arnold had conquered public opinion, at least as to the merits of his methods at Rugby. In that year he was appointed regius professor of history at Oxford. His contributions, under the influence of Niebuhr and other German writers, to a more scientific treatment of ancient history were not inconsiderable. While at Laleham he had written articles on Roman history for the *Encyc. Metropolitana*, and at Rugby he undertook an edition of *Thucydides*. In 1832 he bought Fox How, Ambleside, as a vacation home. He died suddenly at Rugby. His eldest son was Matthew Arnold the poet. Works: Edition of *Thucydides* (1830–41); *Hist. of Rome*, to Punic wars (1838–43); 'History of the Later Roman Commonwealth,' from *Encyc. Metropolitana* (1845); *Miscellaneous Works* (ed. A. P. Stanley, 1845), with *Sermons* (1878). There is an excellent biography by Dean Stanley in *Arnold's Life and Correspondence* (1844; new ed. 1890). See also Sir J. Fitch's *Thomas and Matthew Arnold: their Influence on English Education* (1897); *cf.* M. Arnold's *Rugby Chapel* and T. Hughes's *Tom Brown's School Days* (1856).

Arnold, Thomas (1823–1900), second son of Dr. Arnold of Rugby, and younger brother of Matthew Arnold, was born at Laleham, Staines. He went to New Zealand in 1847, and in 1850 became inspector of schools in Tasmania. Becoming a convert to Roman Catholicism and an associate of Cardinal Newman, he was appointed professor of English literature in the Catholic University, Dublin (1856–62); from 1862 until 1865 was classical master in Birmingham Oratory School; in 1882 was appointed professor of English literature at University College, Dublin. His eldest daughter is Mrs. Humphry Ward the novelist. Besides his well-known *Manual of Eng. Lit., Hist. and Crit.* (1862; 7th ed. 1897), he was the author of *Chaucer to Wordsworth* (1868; 2nd ed. 1875); editions of English classics including *Select Eng. Works of John Wycliffe* (3 vols. 1869–71); *Beowulf, with a Trans.* (1876); *Eng. Poetry and Prose* (1879; new ed. 1882); and *Dryden: an Essay of Dramatic Poesy* (1889). He published an autobiographical volume, *Passages in a Wandering Life*, in 1900.

Arnold, Thomas Kerchever (1800–53), educational writer, rector of Lyndon in Rutlandshire, devoted himself (after 1838) to the writing of books of classical extracts, antiquities, and grammars. His work was of unequal merit, and was subjected to severe criticism; but his *Greek Prose Composition* (1838) and *Latin Prose Composition* (1839) are still in extensive use as text-books. See *Athenæum*, 1853, i. 353; Arnold's *Few Words in Answer to the At-*

tack on my Classical School Books (1853).

Arnold-Forster, Right Hon. Hugh Oakeley (1855–1909), adopted son of the Right Hon. W. E. Forster, entered Parliament as member for W. Belfast in 1892, and sat for the constituency until 1906. In 1906 he was elected for Croydon. He was parliamentary secretary to the Admiralty (1900–1903), and Secretary for War (1903–6). He was the author of *The Citizen Reader; The Laws of Everyday Life; This World of Ours; In a Conning Tower; Things New and Old; A History of England* (1897); *Army Letters* (1898); *Our Great City* (1900); *The Army in 1906* (1906); *A Policy and a Vindication* (1906); and *English Socialism of To-Day* (1908). See *Memoir* by his wife (1910).

Arnoldi, Wilhelm (1798–1864), bishop of Trèves, born at Bitburg in the Eifel; elected bishop (1839). In 1844 he drew many pilgrims to Trèves by exhibiting the 'holy coat,' which led Ronge to establish German Neo-Catholicism.

Arnolfo di Cambio (? 1232–1310), Florentine architect and sculptor, a pupil of Niccolo Pisano; examples of his work are the Duomo, Palazzo Vecchio, and the churches of Santa Croce and San Michele in Florence.

Arnot, Hugo (1749–86), historian, was an Edinburgh advocate, unsuccessful owing to his intolerable temper. He was interested in municipal politics, and was author of a *Hist. of Edin.* (1779; 2nd ed. 1817), and of a *Coll. of Celebrated Criminal Trials in Scot.* (1785). See Kay's *Edinburgh Portraits*, Nos. 5, 8, 66, 132.

Arnott, Neil (1788–1874), physicist and hygienist, native of Arbroath. After making physical and meteorological experiments while a ship's doctor, he settled in London in 1811, where he acquired a large practice, especially among foreigners. Arnott is remembered for his work on *Physics* (1827; 7th ed. 1876), for his inventions of scientific and sanitary appliances (*e.g.* Arnott's stove, Arnott's ventilator, and Arnott's water-bed), and for his benefactions to the London and Scottish universities. See *Proceedings of the Royal Society*, vol. xxv., 1877.

Arnould, Sophie (1744–1802), French operatic singer, created the principal parts in Rameau's operas, and in Gluck's *Iphigénie* and *Eurydice*. After a brilliant career she retired at the age of thirty-five. She was renowned for her sarcastic humour, and many of her *bons mots* were published in 1813, under the title *Arnouldiana*. She was a friend of D'Alembert, Diderot, Mably, Duclos, and J. J. Rousseau. See Goncourt's *Sophie Arnould* (1857).

Arnprior, tn., Renfrew co., Ontario, Canada, 37 m. N.W. of Ottawa; has marble quarries and iron mines in the vicinity. Pop. 4,200.

Arnsberg, tn., prov. Westphalia, Prussia, 50 m. by rail E.N.E. of Barmen; railway workshops and paper and cellulose factories; a centre of the Vehmgerichte, and for long the capital of Westphalia. Pop. 10,000.

Arnstadt, tn., cap. of prin. Schwarzburg-Sondershausen, Germany, 14 m. by rail S. of Erfurt: manufactures gloves, beer, and pottery, and has saline springs and baths. Pop. 16,500.

Arnswalde, tn., dist. Frankfort, prov. Brandenburg, Prussia, 44 m. by rail S.E. of Stettin, with iron foundries, sawmills, match factories. Pop. 9,000.

Aroa, tn., Venezuela, 145 m. W. of Caracas; has copper mines.

Aroideæ. See Araceæ and Arum.

Arokszallas, or Jászárokszállás, mrkt. tn., co. Jász-Nagykun-Szolnok, Hungary, 44 m. E.N.E. of Budapest. Pop. 12,000.

Arolla, some chalets near the foot of the glacier of the same name (the local term for the *Pinus cembra*), at the head of the S.W. fork of the Val d'Hérens, Valais, Switzerland. They are three hours by mule path from Evolena, which is 16 m. by carriage road from Sion. It is now one of the most frequented of all Swiss summer resorts, especially for climbers.

Arolsen, cap., prin. Waldeck, Germany, 20 m. N.W. of Kassel. The prince's residence contains a collection of antiquities from Herculaneum and Pompeii, and a good library. Pop. 2,800.

Aromatics (Gr. 'spice'), substances which possess a spicy, fragrant smell, and a warm, pungent taste. Several orders of plants yield aromatics, such as rosemary, mint, cinnamon, eucalyptus, and camphor. Among aromatics yielded by animals are musk, from the glands of the musk deer; and civet, from the glands of the civet cat. The aromatics, generally speaking, are insecticides and antiseptics, and may be used internally on account of their flavour or carminative action. Some, such as orange, are used to cover the nauseous flavour of drugs; others, such as asa-fœtida, are used in nervous disorders to act through the strong impression produced by their intensely disagreeable taste and odour.

The name AROMATIC SERIES is given to those hydrocarbons and their derivatives which contain a benzene nucleus or other closed chain of carbon atoms. They often have an aromatic odour, and are distinguished from other carbon compounds by many characteristic reactions—*e.g.* by yielding nitro derivatives when acted on by nitric acid.

Aroostook, riv. rising in Maine, U.S.A., and flowing through Aroostook co. into the St. John R., New Brunswick, Canada; 140 m. in length; formed the subject of a boundary dispute between the States and Canada, settled by the Ashburton treaty, 1842.

Aros, African tribe inhabiting the Cross River region, N. of Old Calabar. A British punitive expedition suppressed their turbulent and slave-hunting proclivities in 1901–2.

Arosa, at the head of the Schanfigg valley, E. of Coire, in the Swiss canton of the Grisons, and between Coire and Davos. It is 19 miles by road from Coire; a very rising resort for consumptives (alt. 5,600–6,000 ft.). Pop. 1,100.

Arouet. See VOLTAIRE.

Arpad, or ARPHAD, city of Biblical times, N.W. of Aleppo, Syria; destroyed after a three years' siege by Tiglath-pileser III. in 741 B.C. (2 Kings 18:34); now a ruin called Tell Erfad.

Arpad (? 860–907), the national hero of the Magyars, and the founder of the Arpad dynasty (1000–1301) of Hungary. His history still lives in the national songs and legends.

Arpeggio, in musical score a chord of which the constituent notes are sounded consecutively from below upwards, instead of simultaneously. The sign is usually an upright wavy line placed before a chord.

Arpent, or ARPINE, an old French measure of area still in use in Louisiana and Lower Canada. It varied in extent from 54,900 sq. ft. (royal arpent) to 45,425 sq. ft. (common arpent) and 36,800 (arpent of Paris), and thus measured from about 1¼ to ⅘ acre. The original form is the Low Lat. *arpendus*, as in Domesday.

Arpino, tn., prov. Caserta, Italy, 88 m. by rail (*viâ* Roccasecca) S.E. of Rome; represents the ancient Volscian town of Arpinum, still in part enclosed within cyclopean walls, with ancient gates and other relics. Vipsanius

Agrippa (63 B.C.), Marius (157 B.C.), and Cicero (106 B.C.) were born in the vicinity, and the town is the birthplace of the painter Giuseppe Cesari (*c.* 1568). Pop. 11,000.

Arqua Petrarca, vil., prov. Padua, Italy, among the Euganean Hills, 12 m. S.W. of Padua. Here Petrarch spent the last four years of his life (1370–4); his house is still shown. Pop. 1,600.

Arquata del Tronto, vil., Italy, prov. of and 17 m. S.W. of Ascoli. Pop. 6,500.

Arquebuse (more properly HARQUEBUS), an early form of hand firearm; an improvement on the first simple tube, with its touch-hole and hand-applied match. The arquebuse had a match-holder, which fell on the priming pan when the trigger was pulled; and, later, other devices were added. Larger weapons, mounted on swivels and throwing heavy balls, were used for defence of fortified places.

Arracan. See ARAKAN.

Arrack, or RAKI, the name given in the East (India, Siam, Malay Peninsula and Archipelago) to any ardent spirit distilled from the sweet sap of certain palms, rice, and molasses. The fermented sap is toddy, which when distilled yields arrack. The method of preparation varies.

Arragon. See ARAGON.

Arrah, munic. tn., Shahabad dist., Bengal, India, 33 m. W. of Patna. During the mutiny it was gallantly held for eight days by fifty sepoys and a dozen Englishmen. Pop. 46,000.

Arraignment consists in calling a prisoner to the bar of a court of criminal jurisdiction to answer the matter charged against him in the indictment. It is derived from *ad rationem—i.e.* calling the prisoner to reason. See INDICTMENT, JURY, PLEA, and TRIAL.

Arran, the largest island of the Firth of Clyde, Scotland; part of the county of Bute and Arran; length, N. to S., 20 m.; breadth, E. to W., 10 m.; area, 165 sq. m. The N. parts are mountainous, intersected by narrow glens, the scenery magnificent. Goatfell ('hill of wind'), 2,866 ft., is the highest peak. To the S. the land is lower, undulating, and cultivated. The principal villages are Brodick, the castle a seat of the dukes of Hamilton; Lamlash, with a sheltered bay formed by Holy I., 2 m. off; Whiting Bay; Corrie; Lochranza, with fishing industry; Pirnmill; and Blackwaterfoot—all favourite summer resorts. Temperature is mild and equable; rainfall heavy in the N. There are numerous stone circles and standing stones, and the antiquities include Lochranza Castle, dating before 1380, and Kildonan Castle, a royal stronghold in the 15th century. The Norse held the island till the 13th century; later (1306) it sheltered Robert the Bruce. Pop. 5,400. See Bryce's *Geology of Arran* (4th ed. 1875); Landsborough's *Arran Topography* (1875); MacBride's *Arran of the Bens and Glens* (1910); and *The Book of Arran: Archæology*, ed. by J. A. Balfour (1910).

Arran Islands, Ireland. See ARAN.

Arrangement, in music the transcription or adaptation of compositions to suit other instruments (or voices) than those for which they were composed. A common kind of arrangement is that of adapting orchestral compositions for the piano, in which branch Franz Liszt was notably successful. Many of the great composers—among them Bach, Beethoven, and Mendelssohn—have made arrangements of their own compositions.

Arras (*Nemetacum*), tn., former cap. of Artois, now of dep. Pas-de-Calais, France, 40 m. by rail N.E. of Amiens. It is the seat of a bishop; one of the principal grain

markets of France, with soap, oil, cast iron, salt, sugar refining, lace, and agricultural implement industries. The Hôtel de Ville, of the 16th century, with a belfry (240 ft.), and the cathedral, of the 18th century, are the chief architectural features. Before the Roman invasion Arras was the cap. of the Atrebates. The town has had many troubles, having been destroyed by the Vandals in 407 and by the Normans in 880; besieged in 1414 and 1479; taken in 1578 by the Prince of Orange; besieged again in 1640 and 1654 by Condé, and rescued by Turenne. Robespierre was born here. Pop. 25,000.

Arras, a name given to large tapestries used as wall-hangings. See TAPESTRY.

Array. See JURY.

Arrebo, ANDERS CHRISTENSEN (1587–1637), Danish poet, born in Ærö; was (1618) appointed bishop of Trondhjem, but was deposed in 1622, and afterwards reinstated as preacher of Vordingborg. He was styled 'the father of Danish poetry' for his innovations of the renaissance. He published *Hexaemeron* (1641–61), a description of the six days of creation, and a metrical translation of the Psalms of David. See *Life* by Rördam (1857).

Arrest, in criminal cases seizing a man's person to bring him to justice. Every one is liable to arrest. It may be on warrant or without warrant. Any justice may issue a warrant for the arrest of any person for any offence upon a sworn information being laid before him. Without warrant a private person may, by common law, arrest any one committing a felony or breach of the peace in his presence, or any one whom he reasonably suspects of committing a felony, if a felony has in fact been committed. He may not arrest for a misdemeanour except under special statutory authority. Thus, in England, under the Prevention of Offences Act, 1851, any person may arrest a person found committing an indictable offence during the night (9 p.m. to 6 a.m.); and powers of arrest without warrant are given by the Coinage Offences Act, the Larceny Act, the Vagrancy Acts, and many other statutes. A constable may arrest without warrant upon reasonable suspicion that a felony has been committed, and that the person he arrests is guilty of it, even though no felony has been committed, and whether the grounds of his suspicion are facts within his own knowledge or stated to him by another. He is not generally justified in arresting without warrant for a misdemeanour, but he may do so if a breach of the peace is committed in his presence, or in the presence of some one who gives the prisoner in charge, and there is danger of immediate renewal. Constables have also statutory powers of arresting without warrant in a number of special cases. The law of Scotland with regard to arrest (or apprehension) with and without warrant is much the same as in England, but the powers of private persons to arrest without warrant appear to be rather more extensive. The English division into felonies and misdemeanours corresponds generally to the Scottish division into high crimes and offences, and offences. In civil cases arrest is practically obsolete. Debtors are arrested only for what are really criminal offences, or contempt of court. But see NE EXEAT REGNO.

Arrestment, in Scots law, a legal diligence by which payment of a debt is prohibited until the creditor in that debt shall make payment of another debt to his own creditor. The debt must be movable, and the arrestment can be made only by order of the court. Certain movables are excluded from the operation of

arrestment—viz. debts due by bills, debts which will not be due till a future date, alimentary debts, and wages which do not exceed 20s. a week. The arrestment is made effectual to the arrester by an action of furthcoming, by which the subject arrested is converted into money and paid to him. It corresponds to the English garnishee order. Goods of a foreigner may also be arrested by the Scottish courts to found jurisdiction.

Arrest of Ships. Ships, except King's ships and those of foreign governments, may be arrested in Admiralty proceedings either on the ground of a maritime lien or for a claim against the ship—*e.g.* for damage done by collision. The ship is arrested by a marshal of the Admiralty Court upon a warrant, and remains in his custody. The arrest extends to the sails, rigging, etc., and in some cases to the cargo and freight. Arrested ships may be released on bail which is security for the value of the property arrested to the extent of the claim and costs. See Williams and Bruce's *Admiralty Practice* (3rd ed. 1902).

Arretium, Italy. See AREZZO.

Arrhenius, SVANTE AUGUST, Swedish chemist and physicist, was born in 1859 near Upsala. He became teacher of physical chemistry at Upsala in 1884, and of physics at Stockholm in 1891, and professor in 1895; director of the physico-chemical dept. of the Nobel Institute (since 1905). His most fruitful work has been in putting the dissociation theory of electrolysis on a sound experimental basis, and in the field of cosmic physics he has been very fertile in fresh and suggestive ideas. He received the Davy medal in 1902, and was given the Nobel prize for chemistry in 1904. His principal books (apart from papers) are *Text-book of Electro-chemistry*, trans. M'Crae (1902); *Leitung durch heisse Salzdämpfe* (1891); *Lehrbuch der kosmischen Physik* (1903); in conjunction with Madsen, *Physical Chemistry applied to Toxins and Anti-Toxins* (1902); *Anwendung der physikalischen Chemie auf die Serumtherapie* (1904); *Immuno-chemistry* (1906); *Theories of Chemistry* (1906); *Worlds in the Making* (1908); and *Life of the Universe* (1909).

Arrhythmia. See HEART.

Arrianus, or ARRIAN (*c.* 90–170 A.D.), Greek historian, born at Nicomedia, in Bithynia; pupil and friend of Epictetus. In 137, as prefect of Cappadocia, he defeated an invading horde of Alani. In 147 he was archon in Athens. He was best known for his *Expedition of Alexander*, but he also wrote *Discourses of Epictetus*, and *Enchiridion Epicteti*, containing the fullest account of the Stoic doctrine. Another work is the *Cynegetica*, a treatise on hunting. In all these writings his style is marked by an equal ease and simplicity. As a critical historian he deserves still greater credit; he makes the best use of authorities which are now lost, and his practical experience as a soldier makes his account of Alexander's campaigns and his work on *Tactics* of considerable value. He also wrote *Histories* of the successors of Alexander, of the Parthian empire, and of Bithynia, which are lost. There is an edition of his works in the Teubner series; also in Didot's series, by Dübner and Müller (1846); the fifth book of the *History* has been edited by Moberly (1875); and there is an English translation of the *History* by Chinnock (1893).

Arriaza y Superviela, JUAN BAUTISTA DE (1770–1837), Spanish poet. His early poems are erotic; but, like Quintana and Nicasio Gallego, he found his opportunity in the enthusiasm aroused by the invasion of Spain by Napoleon.

His *Poesias Patrioticas*, published in London during his exile in 1810, are full of fire and eloquence. On the return of King Ferdinand after the war, Arriaza sank to the position of a court poet.

Arris, the sharp edge formed where two surfaces meet: usually applied to the edges of dressed stone or brick, and specially the sharp ridges between the channels of a Doric column.

Arroba, AROBA, or AROBE, a measure for liquids, varying, according to locality and liquid, from $2\frac{3}{4}$ to $6\frac{7}{10}$ imperial gallons. Used in Spain, Portugal, Mexico, Chile, etc. Also a weight used in Central and S. America, equivalent to 25·35 lbs. avoirdupois (in Brazil, 32·38 lbs.). The Spanish *arroba* = $3\frac{1}{2}$ imperial gals. for wine and $2\frac{1}{2}$ for oil, and the old Portuguese weight = about 32 lbs.

Arrol, SIR WILLIAM (1839), head of the firm of Wm. Arrol and Co., began business in 1868, and rapidly rose to a foremost place as an engineer. His firm were contractors for the second Tay Bridge, the Forth Bridge, the London Tower Bridge, and the Manchester Ship Canal. He was knighted on the opening of the last in 1890. Was M.P. for S. Ayrshire (1895–1906).

Arrondissement, chief civil division of the department in France. It is divided into cantons, and each canton into communes. Every arrondissement is governed by a sub-prefect and council.

Arrow, a wooden shaft tipped with stone, metal, or bone, and notched and feathered at the butt, discharged by hand from a bow. Prehistoric flint arrow-heads display numerous forms, and range in length from half an inch to three inches. The Egyptians favoured a chisel-like arrow-head, while those of early Greece were made of bronze. Obsidian and slate arrow-heads also occur. Certain tribes of Guiana and Africa (*e.g.* the Akka) used to dip the tips of their arrows in poison to make them more deadly. For curious superstitions regarding the origin of arrow-heads as elf bolts, fairy darts, etc., see *Folklore of the Northern Countries.* See also Evans's *Stone Implements of Great Britain* (2nd ed. 1897), and J. Anderson's *Scotland in Pagan Times* (1886).

Arrowgrass, two small, erect, grasslike plants of the genus Triglochin; one is found in wet meadows, and the other in marshes overflowed by the tide.

Arrowhead, a British plant (*Sagittaria*) of the order Alismaceæ, found in streams and ponds; it has arrow-shaped leaves.

Arrowroot, the prepared starch obtained from various plants. The finest is the W. Indian, which is got from the rhizomes of *Maranta arundinacea*, of the order Marantaceæ. The starch is extracted by macerating and washing the rhizomes, the fibrous portion being then removed, and the milky liquor allowed to settle. It is then dried and packed for use. E. Indian arrowroot, or 'Curcuma starch,' is less pure than Maranta, and is obtained from various species of *Curcuma*, belonging to the ginger order. Florida starch, or arrowroot, is obtained from species of *Zamia*, belonging to the order Cycadaceæ. English arrowroot is the starch obtained from potatoes. Portland arrowroot, or sago, is the starch of the corms of *Arum maculatum.* See STARCH.

Arrowsmith, AARON (1750–1823), an English geographer and maker of maps, all of great merit. His chief maps are those of the World (1790), of North America (materials chiefly the MSS. of the Hudson's Bay Co.), of Scotland in 1807 (materials chiefly large MS. *Military Survey of Scotland*, 1745–55, made at instance of Duke of Cumberland), and of S. India. See *Ocean Highways* (1873–4), p. 124, and *Indian Surveys* (2nd ed. 1878), both ed. by C. Markham.

Arrowsmith, JOHN (1790–1873), one of the founders of the Royal Geographical Society (1830); succeeded to the map-publishing business founded by his uncle Aaron. He published (1) large maps and charts—*e.g.* his *London Atlas*, for the third edition of which (1858) 10,000 sheets were examined; (2) smaller maps (illustrative of expeditions) in books of travel, and in the Royal Geographical Society's journals; (3) after 1861, improvements of older maps, and illustrations of other geographical works. See *Ocean Highways* and *Indian Surveys*, ed. by Markham.

Arrow-worms, small, transparent creatures, often found in enormous numbers at the surface of the sea. The common genera are Sagitta and Spadella.

Arroyo del Puerco, comm., Estremadura, Spain, prov. of and 11 m. W. of Caceres. Pop. 7,000.

Arroyo Molinos, vil., Estremadura, Spain, 40 m. N.E. of Badajos; scene of defeat of French by Lord Hill on Oct. 28, 1811. Pop. 2,000.

Arru Islands. See ARU.

A.R.S.A., Associate of the Royal Scottish Academy.

Arsaces, the founder of the Parthian empire. He raised a revolt among the Parthians against Antiochus II. of Syria, and was the first king of Parthia, about 250 B.C., reigning two years. His name was borne by all his successors, of whom the last was Arsaces XXXI. (Artabanus IV.), whose power was overthrown by the Persians in 226 A.D. A branch of the dynasty ruled over Armenia from 147 B.C. to 430 A.D. See Rawlinson's *Parthia* (1873).

Ars an der Mosel, tn., Alsace-Lorraine, Germany, 5 m. by rail S.W. of Metz; manufactures champagne, and has ruins of a Roman aqueduct built by Drusus. Pop. 4,000.

Arsenal, a government establishment for the receipt, storage, and issue of ordnance and warlike stores. Large arsenals are usually provided with factories and workshops for purposes of manufacture and repair. In England the term is almost exclusively applied to the factories and magazine at Woolwich, from which the army and navy obtain the bulk of their guns and ammunition. The policy of having only one great arsenal in the vicinity of an unfortified capital has often been questioned, and schemes have frequently been mooted for forming another in an inland district. But the tendency of modern times is to restrict the output of government factories and encourage great private firms, such as those of Armstrong, Vickers Maxim, etc. Arsenals in the Indian dependency and in our colonial possessions are usually stores with sufficient workshops attached to deal with minor repairs. The manufacturing establishments for the navy, and the storehouses at places like Plymouth, Portsmouth, Pembroke Dock, and Chatham, are arsenals as much as Toulon and Cherbourg, but it has long been the custom to speak of them as dockyards. The principal naval arsenals on the Continent are Brest, Cherbourg, Toulon, in France; Spezia and Venice, in Italy; Cartagena, in Spain; Ludwigshafen and Kiel, in Germany; Kronstadt, with naval yards at St. Petersburg, Libau, Revel, Sebastopol, and Nicolaieff, in Russia; Horten, in Norway; Karlskrona, in Sweden; and Antwerp, in Belgium: in the United States, Watertown, Mass.; Watervliet, N.Y.; Springfield, Mass.; Rock Island, Ill.; the Proving Ground at Sandy Hook, N.J.; and the Powder Depots at Dover, N.J.

Arsenic (As, 75·0) is a semi-metallic element very widely distributed in nature. It rarely occurs native, but usually combined with sulphur, iron, and

other elements, as in realgar, As_2S_2, arsenical iron, and particularly as mispickel or arsenical pyrites, FeSAs. The element is prepared by heating mispickel, upon which the arsenic sublimes, and ferrous sulphide is left. Arsenic is a steel-gray, very brittle crystalline solid that sublimes when heated, being deposited partly in crystals and partly as a black, amorphous solid. It tarnishes in air, and is rapidly oxidized if heated with it, giving off a garlic smell, and forming arsenious anhydride, As_4O_6. It is hardly poisonous, and is chiefly used to harden and improve the sphericity of sporting shot, for bronzing, and in pyrotechny. Arsenic forms two oxides, As_4O_6 and As_2O_5, both of which are acid anhydrides. Arsenious anhydride, or white arsenic, As_4O_6, is by far the most important compound of arsenic, and is obtained by roasting arsenical pyrites in air and condensing the fumes in large chambers. As many metallic ores are contaminated with arsenical pyrites and similar compounds, white arsenic is commonly obtained as a by-product in their preliminary preparation by roasting. This is notably the case with tin ores. Arsenious anhydride is a white solid, which crystallizes, as a rule, in brilliant octahedra, but if sublimed under pressure it is glassy and amorphous. It is very volatile, and only slightly soluble in water. It is extremely poisonous; though, if taken habitually, a considerable tolerance may be acquired. Acute cases of poisoning are caused by doses of two or more grains, and are marked by violent vomiting and diarrhœa, followed by collapse. The best antidote, following the emptying of the stomach, is freshly-prepared ferric hydroxide. Chronic poisoning of a milder nature is apt to follow the inhalation of dust and fumes, and the use of arsenic in medicine; while long-continued use, even in minute quantities, may set up peripheral neuritis. The use of Scheele's green and Schweinfurth green in the printing of wall papers has led to cases of arsenical poisoning. Arsenic anhydride, As_2O_5, is more acid and less poisonous than the arsenious oxide, from which it is obtained by oxidation. It and its salts are used in dyeing calico printing. The sulphides of arsenic, orpiment, As_2S_3, and realgar, As_2S_2, are used as paints and in pyrotechny. Arsine, or arseniuretted hydrogen, AsH_3, is evolved as an intensely poisonous gas whenever hydrogen is set free in presence of arsenic or its compounds, being decomposed again on heating. Its formation and decomposition are the basis of Marsh's test for arsenic. which is carried out as follows:— Hydrogen is evolved in a small flask fitted with a thistle funnel, by the action of arsenic-free diluted sulphuric acid on arsenic-free zinc—the gas, after filtration through cotton-wool, being passed through a fine, hard glass tube slightly turned up at the end. As soon as the hydrogen burns quietly after collection the tube is heated; and if, after the lapse of a sufficient time, no mirror forms on it, the materials may be considered pure. A suitable solution of the substance suspected to contain arsenic is then added through the funnel, whereupon the formation of a mirror shows the presence of arsenic. This can be confirmed by heating the mirror with air in the tube, when, if of arsenic, microscopic octahedra of As_4O_6 will be formed. Another test for arsenic is that of Reinsch. It consists in heating the suspected liquid with pure copper foil and hydrochloric acid, when the copper receives a gray deposit, which on sublimation yields octahedra if arsenic is present.

Medicinally, arsenic is one of the many metals brought into special prominence through its frequent use in criminal poisoning. Therapeutically, arsenic is of value as an alterative, by which is meant a drug which acts favourably on the tissues in a manner which is not understood. It is used especially for anæmia, malaria, neuralgia, chorea, and in skin diseases. It is chiefly used in the form of Fowler's solution (liquor arsenicalis). See MATERIA MEDICA and TOXICOLOGY.

Arsenical Poisoning. See TOXICOLOGY.

Arsenius. (1.) Surnamed THE SAINT (*c.* 354–450), an Egyptian monk; was tutor to Arcadius and Honorius, sons of Theodosius the Great. He is honoured in the Greek Church on May 8, and in the Latin on July 19. (2.) Surnamed ANTORIANUS, appointed (1255) patriarch of Constantinople by Theodorus Laskaris II., who also made him, with George Muzalon, guardian of his son, John IV. When Michael VIII. (Palæologus), who had deposed and blinded John IV., demanded absolution, Arsenius refused it, and excommunicated him. Michael VIII. deprived him of his rank, and banished him (1267). He died in 1273.

Arsie, comm., Italy, prov. Belluno, 4 m. S.W. of Fonzaso. Pop. 7,500.

Arsinoë, anc. city of Egypt. See MEDINET-EL-FAYÛM.

Arsinoë. (1.) Daughter of Ptolemy I. of Egypt, and wife successively of Lysimachus, king of Thrace, Ptolemy Ceraunos, and Ptolemy II. (Philadelphus). Several ancient cities were named after her. (2.) Daughter of Ptolemy XIII.; carried captive to Rome by Julius Cæsar, and murdered by Antony to please Cleopatra.

Arsinotherium, a peculiar subungulate found by Beadnell at the end of 1900 in the Fayûm deposits of Egypt. Practically the whole skeleton is now known, especially in the case of the species *A. Zitteli*. It differs so much from all other ungulates that a new sub-order, the Barypoda, has been made for it. In its general appearance arsinotherium was like a large and heavily-built rhinoceros; on the head were two pairs of horns, a pair of great anterior nasal horns projecting forwards and upwards, and a much smaller pair situated over the orbits. Both these horns, unlike those of the rhinoceros, were bony outgrowths of the skull. The animal browsed on low bushes and herbage, grasping its food by means either of a prehensile tongue or possibly of a mobile upper lip. The limbs were very massive. The ancestors of this highly-specialized form are unknown. See *Catalogue of the Tertiary Vertebrata of the Fayûm of Egypt*, British Mus., N.H., 1906.

Arsis and **Thesis** (Gr. 'elevation' and 'depression'). In prosody, *arsis* signifies the strong or primary accent in a word, *thesis* the weak or secondary accent. In music, they denote respectively the strong and the weak beat in a bar; the reverse of the Greek usage, as, in the choric dances, the *arsis*, or upward movement of the foot, was the weaker.

Arson, in English law, consists in unlawfully and maliciously setting fire to property. The property must be actually fired; and, except where there is an intention to injure or defraud some person (*e.g.* an insurer), it must not be the property of the offender. Arson of ships of war and military or naval stores or works is a capital offence. Arson of places of worship, public buildings, or dwelling-houses, if any one is in them; of private buildings, with intent to injure or defraud some person; of stations, etc., belonging to railways, ports, docks, harbours, or

canals; of stacks of grain, peat, wood, etc.; of ships, and of coal mines, is felony, punishable with penal servitude for life. Arson of other buildings, and of growing or cut crops, is felony, punishable with fourteen years' penal servitude. Attempts to commit arson in the case of buildings, mines, and ships are punishable with fourteen years' penal servitude, and in the case of crops or stacks with seven years. Threats to commit arson are punishable with ten years' penal servitude. In Scotland the offence is called fire-raising. See Malicious Injuries to Property Act, 1861; Russell, *On Crimes* (6th ed. 1896).

Ars Poetica (also called EPISTLE TO THE PISOS), a poetic epistle by the Roman poet Horace (1st century B.C.), in which he tried to determine the laws of poetic composition. Subsequent works, written with a similar view, include Vida's *Ars Poetica* (1527); Sir Philip Sidney's *Apology for Poetry* (1595); Boileau's *Art Poétique* (1674); Pope's *Essay on Criticism* (1711); Louis Racine's *Réflexions sur la Poésie* (1752).

Art has been defined as 'the manifestation of emotion obtaining external interpretation, now by expressive arrangements of line, form, or colour, now by a series of gestures, sounds, or words governed by particular rhythmical cadence' (Véron). Each of these different ways of expression is described as an art, and in virtue of the organs through which they severally appeal to the mind, they are usually grouped as (1) 'arts of the eye,' and (2) 'arts of the ear.' Architecture, sculpture, and painting, with the minor arts of taste associated with them, are the former; literature and music are the latter. The drama and the music drama, with the ancient and symbolic dance, appealing to both sight and hearing, are composite. Excluding the minor arts, the function of which is to give pleasure by adorning articles of use, all the arts have a common origin in the desire to reproduce the feeling awakened in the artist by the contemplation of life and nature. But each art is better suited to the presentation of certain emotions than the others, and the range of the expressive power of each is determined by the limitations of its medium.

The Fine and the Decorative Arts.—Popular usage, however, usually limits the term 'art' to architecture, sculpture, and painting, and such handicrafts as goldsmith's work, enamelling, pottery, and wood-carving, related to them by skill of workmanship and display of taste. In this sense art may be said to be the materialized expression of man's delight in beauty. It is not until something has been added to adorn an article already adapted for its purpose that art can be said to begin. But the instinct for adornment is practically a primal passion. There are traces of it in the earliest known works of man, and among races the least developed. In the bone and ivory remains found in prehistoric cave dwellings in France, the representation of animal and other forms points to a desire to record observation, or simply to make objects of daily use more beautiful; while the same is true of the curious and even beautiful forms and decoration of the wooden cups and vessels which the *Challenger* expedition found in use amongst the Admiralty Islanders, at that time in the Stone Age state of civilization. Thus the two tendencies—one decorative, the other expressive—which mark all developed art are found even in its beginnings. The decorative element appeals to the senses alone, and it is the essential, if not the sole, characteristic of the applied arts. On the other hand, the expressive arts—

architecture, sculpture, and painting—appeal vividly to the senses, and through the senses to the intellect and the imagination. At the same time, certain of the decorative arts approach closely to the expressive; and in some cases, as in fine decorative sculptures and mural decoration, including tapestry, they possess many of the qualities of the latter. As a rule, decoration has to forego something of expressiveness to conform to the conditions of its own highest beauty. But the expressive arts are freer, for their aim is the embodiment of the mental and emotional impressions received from reality.

Art as an Expression of Social Conditions.—Architecture has been called the 'mother of the arts;' but the earliest known efforts in art partake, as we have seen, of the nature of sculpture. But as soon as men commenced to erect huts and temples, the art of architecture, thus originated, provided a great and suggestive field for the exercise of the arts of sculpture and painting. At first, and for centuries, the three arts were closely related. In Egypt and Babylonia, in which they earliest developed, and in Greece, among the northern peoples, who evolved Gothic art, and during the renaissance, the three arts worked together, while in some cases one artist is known to have practised all. The complete separation of the arts which exists to-day is comparatively modern. The art of every epoch and of every great school is, in a wide sense, the outcome of social conditions, and the expression of national or racial aspirations. Thus, religion had much to do with shaping the course of the arts—in Egypt and in Greece originating temple and tomb architecture, sculpture, and painting, and even supplying decorative motives for the lesser arts; in France and England, during the middle ages, producing the Gothic cathedral and wonderfully beautiful ecclesiastical furniture in metal and enamel, ivory and textiles. But if the most important works were inspired by the religious instinct, desire for beauty expressed itself in domestic and warlike furnishings also. With the renaissance and the reformation other elements came into play. Both of these movements, although they took such different directions north and south of the Alps, originated in a revival of learning and a renewed interest in life: the Italians found in the arts and mythologies of the classic peoples a new source of artistic impulse, leading on to the grafting of an almost pagan delight in sensuous beauty upon the art of the earlier Christian artists; the northern peoples, cut off from their religious past by a renewed religious life, left the old traditional subjects and turned to contemplate the world around them. So realism, in its modern sense, rises in the pictures of the 17th century Dutchmen. But as if to reveal how independent of environment and tradition artistic genius may be, Velazquez in Catholic Spain is simultaneously producing those marvels of atmosphere painting and impressionistic concentration which, two centuries later, were to influence painting profoundly.

Art as a Personal Expression.—All works of art are more or less coloured by the individuality of the artist. Even among the Greeks, the scope of whose sculpture was largely controlled by religious considerations, and who had as a general ideal the perfect beauty of the human form, the masters are distinguished from one another by individual treatment of common motives, and Phidias and Praxiteles have given their names to epochs of sculpture. During the earlier renaissance, also, although the principal works of art were

wrought for the church, and deal with a clearly-marked range of subjects in a technique common to all, the individuality of the artist displays itself in the way in which any particular subject—be it a Crucifixion, a Holy Family, or a saintly legend—is conceived, and is marked by preferences in types or accessories, form or colour. It is, however, in the painting of the matured schools of the 16th and 17th centuries that personality, combined with a great but flexible technical tradition, first asserts itself fully. And it is towards greater individual freedom that art has since tended to move. But art is not constantly progressive: there are periods in which it flourishes, and periods in which it declines and almost dies, neither convention nor freedom being a guarantee of excellence.

As painting and sculpture deal with facts or ideas more or less familiar to all, the personal element in them is easily recognized. Architecture, however, is necessarily more a collective than a personal expression. In a great building it is the religious, social, or governing instincts and aspirations of a community, rather than the personal preferences and imagination of the architect, that are expressed; for architectural form is clearly determined by the utilitarian destination of the work. At the same time, considerable play is permitted to the fancy of the designer, particularly in variety of proportion, combination of material, and decoration.

Convention and Tradition.—Convention exercises a great influence in the arts. Indeed, to practise an art at all, it is necessary to conform to its conventions. Thus, in painting, the artist must express his impression of the visible world, or his dreams and imaginings, in colour and form (or in black and white, as in etching) upon a flat surface, in terms conformable to the laws and habit of vision, at the same time giving due consideration to the decorative or merely pleasing aspect of the result. In sculpture, again, in which real form is imitated in its three dimensions, or suggested as in relief, the nature of the imitation is controlled and determined by the material characteristics of the medium—stone or marble, bronze or silver—which, in its turn, ought to be used so as to bring out its inherent beauty as that is affected by mass and the play of light upon the modelled surfaces. Finally, architecture is largely conditioned by the utilitarian destination of buildings, by the structural possibilities of the building materials available, and by the necessity of providing against the prevailing weather.

Tradition also influences artistic form. It serves to preserve sound technical methods, and transmits from one generation to another the experience gained in experiment with new subjects or new processes. More often, however, under the form of academicism, it sets up an arbitrary ideal of subject and style, founded upon past achievements, and tends to stereotype and conventionalize art. Thus tradition is the enemy of self-expression and of experiment. Tradition and belief in personal impressions divide the world of art into two hostile camps. But while academic influence still controls much modern art, painting and (in lesser degree) sculpture have largely freed themselves from the shackles of tradition. To-day, in every capital in Europe, there is a strong body of 'seceding' artists; and one of the most notable features in art during the past century has been an ever-increasing disposition to regard every kind of subject as possible of treatment in one or other

of the arts. In architecture, however, tradition remains exceedingly powerful, and no style has yet been evolved adequately expressive of contemporary life.

The Function of Technique in Art.—Some would draw a distinction between the manner and the matter of art, and restrict the use of the word 'art' to the former. In reality, however, these two elements are so closely knit that to separate them, except in theory, is impossible. In all fully-developed art the technique, or manner of expression, is the direct outcome of the spirit in which the subject is conceived. Hence it is only in academic art that a definitely formulated method is possible. Of course, certain methods of using, let us say, oil-paint, or of carving marble, are more productive of beauty than others; and if it is possible to combine this sensuous element with the effects aimed at, it should be done. Art cannot exist without technique, but technique does not exist for itself; and if a man, by breaking through the tradition of the past, can express himself more fully, he is justified by the result. This is at once the explanation and justification of the methods of impressionist painters, and of such sculptors as Rodin and Meunier. Technique has, however, a fascination and legitimate charm of its own quite apart from its expressive power. But these appeal to the artist as craftsman, and to the connoisseur rather than to the general public. Art consists of a combination of fine emotion and skilful expressive technique. The greatest art is that which appeals with the greatest force to both the intellectual and the æsthetic emotions.

Of the many books treating of the origin and theory of the arts, most deal with them either as a branch of philosophy or metaphysics, or as so much archæology or history. Among those written from a more purely artistic standpoint, the following may be named:—Lessing's *Laocoön* (trans. by Sir R. Phillimore, 1874); Victor Cousin's *Du Vrai, du Beau, et du Bien* (1818; 7th ed. 1858); Véron's *Æsthetics* (trans. 1879); Chesneau's *Education of the Artist* (trans. by Clara Bell, 1886); Sir J. Reynolds's *Discourses* (new ed. 1884); Hunt's *Talks about Art* (1875 and 1883); Whistler's *Ten o'Clock* (1888); Ruskin's, Fergusson's, and Hamilton's writings; Baldwin Brown's *The Fine Arts* (2nd ed. 1902); R. A. M. Stevenson's *Velazquez* (1899); D. S. MacColl's *Nineteenth Century Art* (1902); Worsfold's *Judgment in Literature* (1900); Croce's *Æsthetic* (Eng. trans., 1909).

Art, or ARTH-GOLDAU. See ARTH.

Arta. (1.) Province or nomarchy of Greece and a div. of Thessaly; 395 sq. m. in area; pop. 42,000. (2.) Capital of above, on l. bk. of Arta R., near its mouth in the Gulf of Arta, at entrance to which the battle of Actium was fought (B.C. 31). Manufactures cotton and woollen goods, and has considerable trade. Near it the Turks defeated the Greeks in 1822. Pop. 8,000. (3.) Tn. in N.E. of Majorca, Balearic Is., 40 m. from Palma; manufactures coarse linen, and has dyeing and fishing. Near by is the magnificent stalactite cavern of La Hermita. Pop. 5,800.

Artaxerxes, a name borne by four ancient Persian kings. (1.) Surnamed LONGIMANUS, a son of Xerxes, who reigned from 464 to 425 B.C., and is mentioned in the Book of Nehemiah. (2.) Surnamed MNEMON, reigned from 405 to 358 B.C. The chief events of his reign were the defeat of Cyrus and his 10,000 Greeks at Cunaxa (401 B.C.); the war with Archelaus, king of Sparta (401–394); the

conclusion of the peace of Antalcidas (387); and struggles against his rebellious satraps—Evagoras of Cyprus, Ariobarzanes of Phrygia, and Datames of Cappadocia—and wars with Egypt. (3.) Surnamed OCHUS; reigned from 358 to 338 B.C., and revived for a time the decaying power of his dynasty; by Greek aid he reconquered Cyprus, Egypt, and Phœnicia. (4.) The founder of the dynasty of the Sassanidæ, after the overthrow of the Parthian empire; he reigned from 226 to 240 A.D., and waged war with the emperor Severus. See Rawlinson's *Persia* (1873), and Duncker's *Hist. of Antiq.* (1877–82).

Artel, the Russian co-operative organization of artisans or skilled workmen. The fundamental principle is equal remuneration and equal shares of work. See Stähr's *Ursprung, etc., der Russischen Artelle* (1890), and Sir D. M. Wallace's *Russia* (1877). The Russian word *artél* means a gang.

Artemidorus. (1.) Of Ephesus (*c.* 100 B.C.), a Greek geographer, who made voyages in the Mediterranean and Red Seas, to Iberia and Gaul, and as far as the Southern Ocean. His work, called *Periplus*, is not extant. Some fragments are collected in Hudson's *Geographi Græci Minores* (1826), vol. i. (2.) Also of Ephesus, but surnamed DALDIANUS, from Daldis, a town in Lydia, his mother's birthplace. He lived in Rome from about 140–180 A.D., and wrote a work on dreams, which is extant. Ed. by Hercher (1864).

Artemis, called DIANA by the Romans, one of the chief divinities of the Greeks, and twin sister of Apollo, was the daughter of Zeus (Jupiter) and Leto (Latona). She was born in the island of Delos, and was worshipped under a variety of aspects. (1.) The earliest Greek conceptions of Artemis regard her as a goddess of the fields and wild country, unmarried certainly, but not a virgin goddess; indeed, she is closely connected with childbirth, and is worshipped particularly by women. (2.) The Artemis or Diana of Ephesus, whose worship was widely extended by colonists on the coasts of the Black Sea, in Sicily, in Massilia (Marseilles), and other Greek-speaking lands, was probably a nature-goddess of the Phrygians or other inhabitants of Asia Minor, whose worship was adopted by the Greek settlers. A goddess of fertility and wild life, her image represented her with many breasts, and attended by wild animals. (3.) The general conception of Artemis in Greek literature, beginning with Homer, is that of the virgin huntress, in close association with her brother Apollo. Later she was contrasted constantly with Aphrodite, the cold purity of the North, with the soft passion of the South. See Euripides's *Hippolytus.* (4.) She is sometimes confounded with Hecate, and (5) with Selene, or the Moon; also (6) with Britomartis (or Dictynna) and Eileithyia. See also DIANA.

Artemisia. (1.) Daughter of Lygdamis and queen of Halicarnassus, the birthplace of Herodotus, who tells her story. As a vassal of Xerxes, she accompanied his expedition against Greece, and fought at the battle of Salamis. (2.) Daughter of Hecatomnus, and sister, wife, and successor of the Carian prince Mausolus, who reigned from 352–350 B.C. Built the mausoleum at Halicarnassus to her husband's memory. Died 348 B.C.

Artemisia. See WORMWOOD.

Artemisium (anc. geog.), tract of country and a headland on N. coast of Eubœa, Greece. Off the coast the Greeks defeated the Persians under Xerxes, 480 B.C.

Artemus Ward. See BROWNE, CHARLES FARRAR.

Artesian Well in Australia.

Depth, 1,474 feet; flow, 1,000,000 gallons per day.

Arterial Sclerosis. See VESSELS, DISEASES OF.

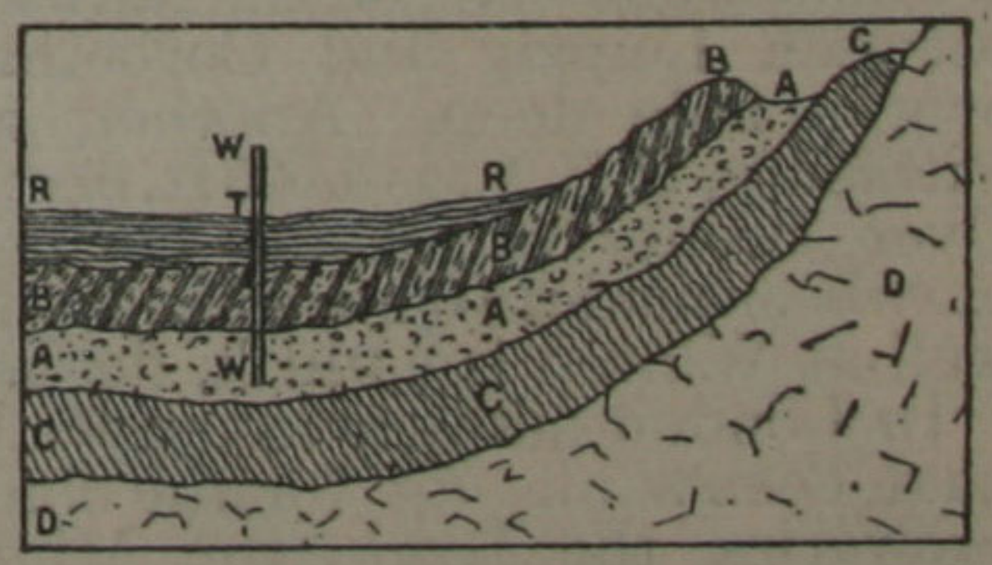
Arteriotomy, the operation of the division of an artery; often performed when the vessel has been punctured by accident. The artery is cut down upon, divided, and ligatured above and below.

Diagram showing the Principal Arteries.

1. Heart. 2. Aorta. 3. Left carotid. 4. Right carotid. 5. Temporal [6. Vena cava]. 7. Thoracic. 8. Brachial. 9. Intercostal. 10. Radial. 11. Ulnar. 12. Palmer arch. 13. Renal. 14. Cœlic axis and mesenteric. 15. Iliac. 16. Femoral. 17. Tibial. 18. Dorsalis pedis

Artery, a blood-vessel which conveys blood from the heart to every part of the body. The walls are composed of three coats—(1) the external coat, or *tunica adventitia*, an outer fibrous tunic; (2) the middle, or *tunica media*, of muscular, elastic tissue; and (3) the internal, or *tunica intima*, lined with endothelial cells. The muscular fibres are unstriped, predominating in *large* arteries; while the elastic fibres, predominating in *small* arteries, form a network intertwined with the layers of muscular fibre. The arteries are capable of extension and distension—a power of great service in securing the maintenance of the necessary circulation. When there is rigidity, as in the case of old people, the result is dangerous, as also is excessive elasticity, as in fevers. (See PHLEBOTOMY, BLEEDING, HÆMORRHAGE.) In *arterial* wounds the means of cure are: (1) immediate pressure; (2) cautery or hot iron; (3) ligature, after elevation of the limb. In *venous* wounds, simple pressure is generally sufficient to stop the flow of blood. See also VESSELS, DISEASES OF.

Artesian Wells derive their name from the French province of Artois (formerly *Artesium*), where the oldest one known in Europe was sunk in 1126. The wells are obtained by perpendicular borings into the ground, through which water that has



Artesian Well (section of strata).

percolated from a higher level rises in the boring tube from various depths to that level. The illustration shows the vertical cutting of half a valley or basin, where three layers of strata are seen, one (A) sandwiched between the other two (B and C). If A is a porous layer, such as gravel, and the other layers which enclose it

are non-porous, such as clay or impermeable rock, the intermediate layer A will accumulate water and form a subterranean reservoir, the water-surface of which is higher than the point at which the shaft is sunk. As soon as the upper impervious layer has been pierced, a continuous stream of water will therefore issue from the well (W).

A singular instance of this kind occurred at Paris, at the boring (1833–41) of the Grenelle artesian well. After many unsuccessful efforts, the authorities resolved to abandon the attempt; when Arago, trusting to the geology of the valley, recommended that the boring should be continued through the mass of chalk (1,000 ft. thick), and through other strata beneath, till the 'lower greensand' was reached. The work of sinking such a shaft (1,792 ft. deep) took seven years; but at last a column of water sprang up, rising 122 ft. above the surface of the ground, yielding 700,000 gallons a day. Owing to the sinking of another well at Passy, the height of the column is now only 32 feet, and the supply 70,000 gallons.

In Germany there are several artesian wells—one on the railway between Leipzig and Corbetha, over a mile deep. Another, at Pittsburg, U.S.A., is 4,625 ft. deep. Over twenty successful borings have been made in Queensland; one well at Winton is 4,010 ft. deep.

In London many artesian wells have been sunk—*e.g.* for the chief breweries, the Bank, the Mint, Trafalgar Square fountains, business houses, hotels, laundries, railway and electric stations, etc., some of which yield over 20,000 gallons per hour. See Prestwich's *Waterbearing Strata of London* (1851); Arago's *Annuaire du Bureau des Longitudes* (1834 and 1835); *Engineering*, ii., iii., viii.; Burnell's *Hydr. Engineering* (1881); Woodward's *Geology of Water Supply* (1910).

Artevelde, JACOB VAN (1285–1345), Flemish patriot, was a wealthy brewer of Ghent, who assisted the people in their struggle against Louis, Count of Flanders. He was chosen commander of the forces, and in 1335, with the assistance of the English, expelled Louis from Flanders. After having been ruler of Flanders for nine years, he was killed in a street disturbance at Ghent.

His son PHILIP (*c.* 1340–82) was placed at the head of the citizens of Ghent in 1381, and after defeating the Count of Flanders he became regent. He was slain at the battle of Roosebeke in 1382, fighting against the forces of Charles VI. of France. See Kervyn de Lettenhove, *Jacques d'Artevelde* (1863); Hutton, *James and Philip van Artevelde* (1882); Ashley, *James and Philip van Artevelde* (1883); also Sir Henry Taylor's drama, *Philip van Artevelde* (1834); and Conscience's historical novel, *J. van Artevelde* (1849).

Arth, vil., canton of Schwyz, Switzerland, at the s. end of the Lake of Zug, the starting-point of the Rigi Railway. Pop. 4,700.

Arthrectomy, the cutting away of diseased synovial membrane lining a joint. See JOINTS.

Arthritis. See JOINTS.

Arthropoda (jointed feet), the name of a series of invertebrate land and water animals, including such diverse forms as crustaceans, insects, and arachnids. Arthropods, considered by many zoologists to be only an artificial assemblage of animals, have bilaterally symmetrical, segmented bodies, some of the segments bearing jointed appendages; the body is covered by a tough cuticle made of chitin; the heart lies above the food canal, and the nervous system below it, except for the dorsal brain; there is no distinct body cavity between the food canal and the body wall. These are characteristic of the

Arthropoda.

INSECTA—1. Common Butterfly. PROTOTRACHEATA—2. P. Novæ Britanniæ. PALÆOSTRACA—3. King Crab; 4. Eurypterus, fossil; 5. Trilobite, fossil. MYRIAPODA—6. Centipede. ARACHNOIDEA—7. Scorpion. CRUSTACEA—8. Masked Crab. (King Crab one-twelfth natural size; all others two-thirds nature.)