

quantity, and under Caligula, Nero, Vespasian, and Domitian, coined pure copper coins; afterwards they reverted to the mixture of lead. So far the words *χαλκός* and *αἰθώς* may be translated as bronze. Originally, no doubt, *χαλκός* was the name for pure copper. It is so employed by Homer, who calls it *ἐρυθρός* (red), *αἰθώς* (glittering), *φαεινός* (shining), terms which apply only to copper. But instead of its following from this that the process of alloying copper with other metals was not practised then, or was unknown to the poet, the contrary would seem to be the case from the passage (*Iliad*, xviii. 474) where he describes Hephaestus as throwing into his furnace, copper, tin, silver, and gold, to make the shield of Achilles, so that it is not always possible to know whether when he uses the word *χαλκός* he means copper pure or alloyed. Still more difficult is it to make this distinction when we read of the mythical Dactyls of Ida in Crete or the Telchines or Cyclopes being acquainted with the smelting of *χαλκός*. It is not, however, likely that later Greek writers, who knew bronze in its true sense, and called it *χαλκός*, would have employed this word without qualification to objects which they had seen unless they had meant it to be taken as bronze. When Pausanias (iii. 17, 6) speaks of a statue, one of the oldest figures he had seen of this material, made of separate pieces fastened together with nails, we understand him to mean literally bronze, the more readily since there exist very early figures and utensils of bronze so made. The earliest employment of bronze for artistic purposes was to hammer it out in thin plates and fasten them together with nails. This process was called *sphyrelaton*. The next stage was casting, in connection with which the earliest Greek artists of fame are Theodorus and Rhœcus of Samos (Pausanias, viii. 14, 8, and x. 38, 5). It has been supposed that their merit consisted in introducing the process of casting statues hollow, that is, with an inner core of some material which could afterwards be removed and leave the figure light, less costly, and no less durable. There are remains of Assyrian bronze, probably older than the time of Theodorus and Rhœcus, cast with an inner core of iron; and there is also in the British Museum an early Etruscan statuette from Sessa on the Volturno, with a core of this metal, which from its being split down the side, owing to the expansion of the iron, shows how unserviceable the iron was for this purpose. Obviously the power of casting in bronze, whether solid or hollow, was a very great gain to sculptors, whose models worked in the clay with the rapidity of their inspiration could thus be accurately and at once reproduced. The difficulty and expense of the process must have been against it as compared with marble; yet it was frequently employed, and in the case of colossal statues it had no rival. Of these the Colossus of Rhodes—a figure of the sun-god Helios, said to have been 70 cubits high—was an example of the utmost that art could do with bronze. It was thrown down by an earthquake after standing fifty-six years. A statue of Zeus at Tarentum by Lysippus was 40 cubits high, and though it could be moved with a touch of the hand, yet it resisted the force of storms by means of a support at the point of the greatest stress. The oldest seat of bronze-founding, at least to any extent, was the island of Delos, and next to that the island of Ægina, and yet copper does not appear to have been found in either. Between the two there existed a rivalry in the time of the sculptors Myron and Polyclethus, of whom the former used the bronze of Delos, the latter that of Ægina. More celebrated than either was the bronze of Corinth, which some believed to have been first obtained by the melting together of statues of ordinary bronze, gold, and silver at the burning of that town. Pliny says that it consisted of gold, silver, and copper, and was considered more precious than silver and little less valuable than gold.

There were three kinds of it—one white, having almost the appearance of silver, in which silver predominated; another yellow, because of the great quantity of gold in it; and a third in which all three metals were equally represented. But the Corinthian bronze was used rather for drinking cups and utensils than for statues. The process of casting statues as given by Pliny was to bring the mass of copper to a liquid state, and then to throw into it a third part of old bronze and 12½ per cent. of *plumbum argentarium*, i.e., tin and lead in equal parts.

Of the vast number of bronze statues by ancient sculptors nothing beyond a few fragments remain; but if the colossal bronze head of Venus in the British Museum be taken as a typical example, it will show with what fineness and thinness those figures were cast; or, again, as an instance of the quality of Greek bronze we may take the bronzes of Siris, also in the British Museum, on which a very thin plate of bronze will be seen in some parts of the figures beaten out nearly half an inch till it reaches the thinness of note-paper. Works in relief (*τόρνεμα*), whether beaten out or chased, like those just mentioned, or cast, are comparatively rare, though this branch of art was largely practised even by the greatest sculptors. On the other hand, it does not appear to have been carried out by them to the extent in which it is found in Germany and Italy after the beginning of the 11th century,—for instance, in the reliefs on cathedral gates. The temple of Athene Chalkioikos in Sparta, with its walls covered with bronze reliefs, stands out as an exception. By the time of the Byzantine empire, when the power of modelling had declined, and a taste for glittering appearance took its place, the process of ornamenting bronze with reliefs was superseded by inlaying it with silver and other materials. As to the colour of the ancient bronzes little can now be said, because from lying so long in the earth they have become covered with what is technically called a *patina*, which is generally some shade of green, though sometimes also nearly blue, and at other times drab. This blue colour is very brilliant in bronzes from Herculaneum and Pompeii. A difference of soil very probably makes a different patina, but something may also be due to varieties in the alloy. Perhaps the finest examples of patina are to be found among the bronze mirrors, in which there seems to have been generally a considerable quantity of silver for the sake of obtaining a highly reflecting surface. It does not appear that the process of gilding bronze was carried to any extent in classical times, unless, perhaps, in the production of finger-rings, of which a considerable number remain. But if larger works in bronze fail, there is an abundance of statuettes, candelabra, mirrors, *cista*, and vessels of all kinds—Greek, Roman, and Etruscan. One fact to be noticed is that the great number of bronze mirrors which exist are nearly all Etruscan. A few may be Roman from the Latin inscriptions which they bear, and a few also come from Greece. But the general rule of their being Etruscan reminds us of the reputation which the Etruscans enjoyed for the production of works in bronze, not of high art, but of what might be called industrial art. They were celebrated also for modelling in clay; and that, as Pliny states, was the stage of art which immediately preceded casting in bronze, and went hand in hand with it.

The art of bronze casting, which had sunk with the Byzantine empire, was again revived with great vigour in Germany in the 11th century, from which period are the bronze gate of the cathedral at Hildesheim (1015) and the column decorated with reliefs on the model of the column of Trajan in Rome (1022). In the 12th century the art spread southward to Italy, and at first was taken up energetically in Lower Italy. But though many interesting works of this kind exist also from the 13th and 14th

centuries, it was not till the 15th that the art obtained its complete mastery under the Florentine artists. In the following century, again, it is found carried with extraordinary skill in Germany at Nuremberg, Augsburg, Munich, and Coburg. Since then, however, the higher order of sculpture in bronze may be said to have reverted to nearly its ancient limits, that is, the production of statues and groups in the round. (See Dr C. Bischoff, *Das Kupfer in der vorchristlichen Zeit*, Berlin, 1865; and L. R. v. Fellenberg, *Analysen von antiken Bronzen*, 1865.)

BROOCH, or BROACH, (from the French *broche*), an awl or bodkin. A spit is sometimes called a *broach*, and hence the phrase "to broach a barrel." The term is now used to denote a clasp or fastener for the dress provided with a pin, having a hinge or spring at one end, and a catch and loop at the other. Brooches were universally used among the more civilized nations of antiquity. They were made of many materials, and in innumerable varieties of ornamental design, the forms varying according to the period of their manufacture, or the taste and culture of the people using them. They are unknown in the Swiss Lake settlements of the Bronze Age, though pins and bracelets are abundant. Brooches of the Bronze Age are extremely rare in Britain, although they occur in considerable numbers and of elegant forms in North Germany and Scandinavia. The simplest is similar to that which has been reproduced in modern times as the "patent safety-pin," but having the ends prolonged into flat spirals and the clasp flattened and engraved with ornamental designs. Another characteristic form was produced by winding a long wire into a flat double-spiral, of which one end formed the pin and the other the catch. A third form consisted of two round ornamented plates connected by a bow-shaped centre piece. In the early Iron Age the brooches of Central Europe exhibit an immense variety of forms, which are for the most part bow-shaped or harp-shaped, with spring-pins, akin to the types found in the Etruscan cemeteries of Certosa and Villanova recently explored. The Frankish group exhibits three well-defined types, viz., an imitation of animal forms, a simple disc, and a cruciform type, of which there are innumerable varieties of form. The Merovingian brooches were made in gold, silver, or bronze, adorned with precious stones, filagree-work, or enamel; but whatever the richness of the brooch, the pin was always of iron. The Scandinavian or Northern group exhibits a similar cruciform variety more massive in form and richly chased, the terminating knobs fashioned into the similitude of animals' heads. This form occurs also in Anglo-Saxon graves in England. The Anglo-Saxon brooches were exquisite works of art, ingeniously and tastefully constructed. In Kent the circular form predominates. They are often of gold, with a central boss exquisitely decorated, the flat part of the brooch being a mosaic of turquoises, garnets on gold-foil, mother of pearl, &c., arranged in geometric patterns, and the gold work enriched with filagree or decorated with dragoon-like engravings. Sometimes the brooch was cruciform and ornamented with chased work and settings of paste or precious stones. The Scandinavian brooches of the Viking time were oval and bowl-shaped, formed of an under shell of impure bronze gilt on the convex side, and covered by an upper shell of open chased-work ornamented with bosses, or open crown-like ornaments, or animals' heads. The geographical distribution of these peculiar brooches indicates the extent of the conquests of the Northmen. They occur in northern Scotland, England, Ireland, Iceland, Normandy, and Livonia. The Celtic group is characterized by the penannular form of the ring of the brooch and the greater length of the pin.

They are usually of bronze or silver, chased or engraved with intricate designs of interlaced or dragoon-like work in the style of the illuminated Celtic manuscripts of the 7th, 8th, and 9th centuries. The Hunterston brooch, which was found at Hawking Craig in Ayrshire, is a well-known example of this style. Silver brooches of immense size, some having pins 15 inches in length, and the penannular ring of the brooch terminating in large knobs resembling thistle heads; are occasionally found in Viking hoards of this period, consisting of bullion, brooches, and Cufic and Anglo-Saxon coins buried on Scottish soil. In mediæval times the form of the brooch was usually a simple, flat circular disc, with open centre, the pin being equal in length to the diameter of the brooch. They were often inscribed with religious and talismanic formulae. The Highland brooches were commonly of this form, but the disc was broader, and the central opening smaller in proportion to the size of the brooch. They were ornamented in the style so common on Highland powder-horns, with engraved patterns of interlacing work and foliage, arranged in geometrical spaces, and sometimes mingled with figures of animals.

BROOKE, FRANCES, a clever novelist and dramatic writer, whose maiden name was Moore, was born in the earlier part of the 18th century. Of her novels, some of which enjoyed considerable popularity in their day, the most important were *The History of Lady Julia Mandeville*, *Emily Montague*, and *The Excursion*. Her dramatic pieces and translations from the French are now wholly forgotten. She died in January 1789, two days after her husband.

BROOKE, HENRY, novelist and poet, was born at Rantavan, county Cavan, in 1708. His father was rector of Killinkere; his mother was a daughter of the bishop of Elphin. At an early age he entered Dublin University, where he was noticed by Swift, who predicted great things of him. About 1724 he proceeded to London, where he managed to gain the affection and esteem of Pope. He studied law in the Temple, and in 1728 married his ward and cousin, Catherine Meares; a girl of fifteen. His first literary venture appears to have been the poem *Universal Beauty* (1730), in which there is exceedingly little that can be admired or even tolerated. A much more successful venture was the drama *Gustavus Vasa*. The prohibition of this play induced the author to publish it, and the sale of the printed copies was enormous. Brooke is said to have cleared 1000 guineas by it. In 1740 his health gave way; he retired to Rantavan, and never returned to his life in London. In 1745 he was made barrack-master at Mullingar, and his well-meant pamphlet, *Secret History and Memoirs of the Barracks of Ireland*, excited much ill-feeling against him. He spent the remaining years of his life in literary work. His dramas were numerous, and some of them kept the stage for a considerable length of time. The work by which he is best known, *The Fool of Quality*, began to appear in 1768. It is the product of the matured experience of the author, and though deficient in many of the qualities that go to form the excellence of a work of fiction, it is forcibly and clearly written, and contains much sound and advanced thinking on social problems. Brooke died in 1783. An edition of the *Fool of Quality* was published in 1859 by the Rev. Charles Kingsley, in whose extravagantly eulogistic preface will be found all the information we have with regard to the author's life and character.

BROOKE, SIR JAMES, Rajah of Sarawak, in the island of Borneo, and Governor of Labuan, was born at Coombe Grove near Bath, April 29, 1803. It is sometimes erroneously stated that he was born in Bengal, a mistake arising from the fact that his father a member of the Civil Service

of the East India Company, had long lived there. His mother was a woman of superior understanding, and to her care he owed his careful early training. He received the ordinary school education, entered the service of the East India Company, and was sent out to India about 1825. On the outbreak of the Burmese war, he was despatched with his regiment to the valley of the Brahmaputra; and, being dangerously wounded in an engagement near Rungpore, was compelled to return home (1826). After his recovery he travelled on the Continent before going to India, and circumstances led him soon after to leave the service of the Company. In 1830 he made a voyage to China, and during his passage among the islands of the Indian Archipelago, so rich in natural beauty, magnificence, and fertility, but occupied by a population of savage tribes, continually at war with each other, and carrying on a system of piracy on a vast scale and with relentless ferocity, he conceived the great design of rescuing them from barbarism and bringing them within the pale of civilization. His purpose was confirmed by observations made during a second visit to China, and on his return to England he applied himself in earnest to making the necessary preparations. Having succeeded on the death of his father to a large property, he bought and equipped a yacht, the "Royalist," of 140 tons burden, and for three years tested its capacities and trained his crew of twenty men, chiefly in the Mediterranean. At length, on October 27, 1838, he sailed from the Thames on his great adventure. On reaching Borneo, after various delays, he found the Rajah Muda Hassim, uncle of the reigning sultan, engaged in war in the province of Sarawak with several of the Dyak tribes, who had revolted against the sultan. He offered his aid to the rajah; and with his crew, and some Javanese who had joined them, he took part in a battle with the insurgents, and they were defeated. For his services the title of Rajah of Sarawak was conferred on him by Muda Hassim, the former rajah being deprived in his favour. It was, however, some time before the sultan could be induced to confirm his title (September 1841). During the next five years Rajah Brooke was engaged in establishing his power, in making just reforms in administration, preparing a code of laws, and introducing just and humane modes of dealing with the degraded subjects of his rule. But this was not all. He looked forward to the development of commerce as the most effective means of putting an end to the worst evils that afflicted the archipelago; and in order to make this possible, the way must first be cleared by the suppression, or a considerable diminution, of the prevailing piracy, which was not only a curse to the savage tribes engaged in it, but a standing danger to European and American traders in those seas. Various expeditions were therefore organized and sent out against the marauders, Dyaks and Malays, and sometimes even Arabs. Captain Keppel, and other commanders of British ships of war, received permission to co-operate with Rajah Brooke in these expeditions. The pirates were attacked in their strongholds, they fought desperately, and the slaughter was immense. Negotiations with the chiefs had been tried, and tried in vain. The capital of the sultan of Borneo was bombarded and stormed, and the sultan with his army routed. He was, however, soon after restored to his dominion. So large was the number of natives, pirates and others, slain in these expeditions, that the "head-money" awarded by the British Government to those who had taken part in them amounted to no less than £20,000. In October 1847 Rajah Brooke returned to England, where he was well received by the Government; and the Corporation of London conferred on him the freedom of the city. The Island of Labuan, with its dependencies, having been acquired by purchase from the sultan of Borneo, was erected into a British colony,

and Rajah Brooke was appointed Governor and commander-in-chief. He was also named consul-general in Borneo. These appointments had been made before his arrival in England. The university of Oxford conferred on him the honorary degree of D.C.L., and in 1848 he was created K.C.B. He soon after returned to Sarawak, and was carried thither by a British man-of-war. In the summer of 1849 he led an expedition against the Seribas and Sakuran Dyaks, who still persisted in their piratical practices and refused to submit to British authority. Their defeat and wholesale slaughter was a matter of course. At the time of this engagement Sir James Brooke was lying ill with dysentery. He visited twice the capital of the sultan of Sala, and concluded a treaty with him, which had for one of its objects the expulsion of the sea-gypsies and other tribes from his dominions. In 1851 grave charges with respect to the operations in Borneo were brought against Sir James Brooke in the House of Commons by Joseph Hume and other members, especially as to the "head-money" received. To meet these accusations, and to vindicate his proceedings, he came to England. The evidence adduced was so conflicting that the matter was at length referred to a Royal Commission, to sit at Singapore. As the result of its investigation the charges were declared to be "not proven." Sir James, however, was soon after deprived of the governorship of Labuan, and the head-money was abolished. In 1867 his house in Sarawak was attacked and burnt by Chinese pirates, and he had to fly from the capital, Kuching. With a small force he attacked the Chinese, recovered the town, made a great slaughter of them, and drove away the rest. In the following year he came to England, and remained there for three years. During this time he was smitten with paralysis, a public subscription was raised, and an estate in Devonshire was bought and presented to him. He made two more visits to Sarawak, and on each occasion had a rebellion to suppress. He spent his last days on his estate at Burrator in Devonshire, and died there, June 11, 1868. Notwithstanding differences of opinion with regard to some of Sir James Brooke's proceedings, it is not to be denied that he was a man of the highest personal character. In his public conduct he was undoubtedly actuated by a noble ambition, and he displayed rare courage both in his conflicts in the East and under the charges advanced against him in England. His *Private Letters* (1838 to 1855) were published in 1853. Portions of his *Journal* have also been edited by Captains Mundy and Keppel.

BROOKES, JOSHUA, English anatomist, was born in 1761. At a very early age he devoted himself to medical science, and attended the lectures of the most eminent surgeons in London and Paris. After he had completed his studies, he began to teach anatomy and physiology, and continued to do so during forty years of his life, training no fewer than 5000 students, many of whom afterwards became famous in different parts of the world. His museum, which contained specimens not only of human and comparative anatomy, but also of natural history in all its branches, was arranged on a system combined from the various methods of Cuvier, Blumenbach, Linnaeus, and other naturalists, and cost its proprietor about £30,000. Many of his treatises are printed in the *Transactions* of the various scientific societies of which he was a member. He died suddenly at London, January 10, 1833.

BROOKLYN; a city of the United States of North America, capital of King's County, New York, is situated on the western end of Long Island, immediately opposite the city of New York, from which it is separated by the East River, an arm of the sea, about three-quarters of a mile in breadth. Lat. 40° 41' N., long. 73° 59' W. The city now includes not only Brooklyn proper, but also by a