

driver knows well the value of this natural storehouse, and takes care before starting on a lengthened journey to have the humps of his beasts well distended. In its native deserts, however, the camel is more liable to suffer from lack of water than of food, and accordingly the stomach is so modified as to allow of a certain quantity of water being stored for future use. On the walls of the paunch or first stomach, little pouches with narrow mouths are developed; these are the so called "water cells," the biggest of which in an adult camel measures when dilated about three inches in width and depth, and these serve to strain off a considerable quantity of water from the contents of the paunch, retaining it for future use by means of powerful sphincter muscles. The upper divided lip of the camel is slightly extensible, and is used as a feeler with which to touch and examine its food before turning the same into its mouth. The animal is further characterized externally by its long neck, the dusky colour of its fur, the shaggy masses of long woolly hair on certain parts of its body, and the disproportionate shortness of its legs. These, together with the peculiarities already mentioned, combine to make it one of the most ungainly of known animals, and almost justify the recent description given of it by Dr Russell, the *Times* correspondent, as "an abominably ugly necessary animal." Nevertheless, it is as indispensable where great deserts are to be traversed as is the ship on the ocean highway, and this fact seems to have completely blinded the Arab to its undoubted deficiencies in form, for in his poetry allusion is sometimes made to the motions of the camel as to a recognized standard of elegance.

The camel is one of the oldest mammals now living, and fossil remains have been found in the Miocene of the Sevaik Hills of a species (*Camelus-sivalensis*) somewhat larger, but otherwise scarcely distinguishable from recent forms.

The difference is so slight," says Andrew Murray, "it pleases us to think that we may have here, in this most ancient animal, a species which saw the Miocene epoch, and which has survived all the chances and changes which have taken place since then." That it was one of the earliest of domesticated animals is evident from the frequent allusions made to it in the oldest written records of the human race. Six thousand camels are said to have formed part of the wealth of the patriarch Job; they also formed part of the present which Pharaoh gave to Abraham, and it was to a company of Ishmaelites travelling from Gilead to Egypt on camels, laden with spices, such as their Arabian descendants do at the present day, that Joseph was sold by his brethren. Naturalists are able to indicate with more or less certainty the wild progenitors of most of the domestic animals, but they have hitherto failed to obtain any reliable evidence of the existence, at the present day, of the wild ancestor of the camel. In the eastern hemisphere it stands alone, sole representative of the family to which it belongs, its only allies, the llamas, being confined to the slopes of the Andes and the southern parts of South America. Palæontologists, however, by the discovery of several fossil forms, have been able to bridge over the geographical gap which at present separates the two branches of the Camelidae.

During the rutting season the male camel becomes exceedingly savage and dangerous, and engages in fierce contests with its fellows. The gravid female carries her young for fully eleven months, and produces only one calf at a time, which she suckles for a year. Eight days after birth the Arabian camel stands three feet high, but it does not reach its full growth till its sixteenth or seventeenth year. It lives from forty to fifty years. The flesh of the young camel resembles veal, and is a favourite food of the Arabs, while camel's milk forms an excellent and highly nutritious beverage, although, according to Layard, it does not furnish butter. The woolly hair, which grows to a great length on

the under side of the neck, the upper part of the legs, and on the humps, is shorn every summer, and is woven into a variety of stuffs used by the Arab for clothing himself and his family, and in covering his tent. It was in raiment of camel's hair that John the Baptist appeared as a preacher. The hair imported into this country is chiefly used in the manufacture of small brushes used by painters, while the thick hide is formed into a very durable leather. The dung is used as fuel, and from the incinerated remains of this sal-ammoniac is extracted, which was at one time largely exported from Egypt.

But it is as "the ship of the desert," without which vast tracts of the earth's surface would probably have remained for ever unexplored, that the camel is chiefly valuable. In its fourth year its training as a beast of burden begins, when it is taught to kneel down and to rise at a given signal, and is gradually accustomed to bear increasing loads. These vary in weight from 500 to 1000 lb, according to the variety of camel employed, for of the Arabian camel there are almost as many breeds as there are of the horse in more temperate regions. When crossing a desert the camels are expected to carry their load 25 miles a day for three days without drink, getting a supply of water, however, on the fourth; but the fleet varieties will carry their rider and a bag of water 50 miles a day for five days without drinking. When too heavily laden the camel refuses to rise, but on the march it is exceedingly patient under its burden, only yielding beneath it to die; relieved from its load it does not, like other animals, seek the shade, even when that is to be found, but prefers to kneel beside its burden in the broad glare of the sun, seeming to luxuriate in the burning sand. When overtaken by the deadly simoom it falls on its knees, and stretching its snake-like neck along the sand, closes its nostrils, and remains thus motionless till the atmosphere clears; and in this position it affords some shelter to its driver, who, wrapping his face in his mantle, crouches behind his beast. Of still greater service is it, when, the whole caravan being on the point of perishing for want of water, the acute sense of smell which the camel possesses enables it to perceive the presence of water more than a mile off; then it will break its halter and make an unerring track for the well. The food of the camel consists chiefly of the leaves of trees, shrubs, and dry hard vegetables, which it is enabled to tear down and masticate by means of its upper incisors and powerful canine teeth. It is, however, fond of luxurious living when such is to be had, and, according to Sir Samuel Baker, when it arrives in good pasture, after several days of sharp desert marching, it often dies in a few hours of inflammation caused by repletion; but when other animals are starving, the camel, according to the same authority, thrives "on the ends of barren leafless twigs, the dried sticks of certain shrubs, and the tough dry paper-like substance of the dome palm, about as succulent a breakfast as would be a green umbrella and a *Times* newspaper." The docility of the camel has become well-nigh proverbial throughout Europe, but recent travellers who have studied the animal in Arabia and Africa have said much to lessen, if not to extinguish, its reputation in this particular. "If docile means stupid," says Palgrave, who had ample opportunity of observing the camel during his romantic sojourn in Arabia, "well and good; in such a case the camel is the very model of docility. But if the epithet is intended to designate an animal that takes an interest in its rider so far as a beast can, that in some way understands his intentions, or shares them in a subordinate fashion, that obeys from a sort of submissive or half-fellow feeling with his master, like the horse or elephant, then I say that the camel is by no means docile—very much the contrary. He takes no heed of his rider, pays no attention whether he be on his back or not, walks straight on when

once set agoing, merely because he is too stupid to turn aside, and then should some tempting thorn or green branch allure him out of the path, continues to walk on in the new direction simply because he is too dull to turn back into the right road. In a word, he is from first to last an undomesticated and savage animal rendered serviceable by stupidity alone, without much skill on his master's part, or any co-operation on his own, save that of an extreme passiveness. Neither attachment nor even habit impress him; never tame, though not wide-awake enough to be exactly wild." So also Sir S. Baker, in his recent work *The Albert Nyanza*, bears testimony to its extreme dullness, for while other ruminants in feeding select wholesome herbs, the camel is stupid enough to eat indiscriminately every green vegetable; it is thus often poisoned through eating a plant known to the Arabs as "camel poison," and on this account it is customary to set watchers over them while grazing in districts where this plant is found. The camel, however, is revengeful, and in satisfying this passion is said to display a far-thoughted malice scarcely consistent with the extreme stupidity attributed to it by Palgrave. Of this vindictiveness the camel driver is well aware, and of the certainty that sooner or later it will seek revenge; accordingly it is customary for the person who has reason to fear its malice to throw his clothes before the camel, meanwhile concealing himself until the infuriated animal has expended its rage in tossing and trampling upon them, when the injury, real or supposed, is immediately forgotten.

The camel is probably a native of the desert countries of the south-west of Asia, whence it has spread into most of the arid regions of the eastern hemisphere, carrying with it wherever it goes a mark of its desert origin in the antipathy which it shows to cross a stream of water. It has lately been introduced into Australia, the great central desert of which was recently crossed by Warburton with a caravan of camels. It has now also obtained a footing in the New World, ten camels having been landed at New York some years ago, all of them, however, with the exception of a single male and female, dying soon after. The surviving pair were transferred to Nevada, where the soil was sandy and sterile, producing abundance of prickly shrubs which no other animal would touch, but on which the pair of camels flourished and bred. This female has already given birth to twenty-four young, all of which are still (1875) alive, and some of these having also bred, there are now ninety-six camels, all, with the exception of the original couple, born in Nevada. In Europe the camel is only reared in the neighbourhood of Pisa, having been introduced there by one of the dukes of Tuscany, and is employed as a beast of burden, but is said to be gradually deteriorating.

There are two species of camel—the Arabian and the Bactrian. The former or single-humped species (*Camelus dromedarius*) is found in greatest perfection in Arabia, whence it has spread eastwards to India, where it is now extensively used, although the stony nature of much of the ground it has to pass over does not give it in India that superiority over other beasts of burden, which it undoubtedly possesses in desert countries. It seems to have spread westwards with the Koran along the North African shores, and to have been introduced by the Moors into Spain, where, however, it did not succeed in establishing itself. It also accompanied the followers of Mahomet into European Turkey. In Arabia several breeds, each possessing special qualities, are carefully cultivated. The chief of these are the thick-built, heavy-footed, and slow-paced variety, used for carrying heavy loads, and the dromedary—a name often applied to all the members of the single-humped species, but properly belonging only to a thin, comparatively elegant, and fine-haired breed, celebrated for its fleetness, carrying its rider when necessary 100 miles a day. The

dromedary, says Palgrave, "is the race-horse of its species," and the difference between it and the heavy variety is exactly the same "as between the race-horse and hack." Another breed, belonging to a tribe of Arabs who dwell near the western shores of the Red Sea, is specially adapted for journeying with loads over mountainous districts, and Baker, who made use of them, states that they accomplished feats in mountain climbing which would have been impossible to any other domestic animal so loaded. The Bactrian or two-humped camel (*Camelus bactrianus*) is a somewhat larger and more robust species, and is much rarer than the Arabian. It is found throughout the region lying to the north and east of that inhabited by the dromedary, from the Black Sea to China and northward to Lake Baikal, where in winter it sustains severe cold, subsisting meanwhile upon the leaves and twigs of the willow and birch. The pads on its feet are harder than in the other species, and are thus better fitted to bear the changes wrought on the soil by the frequent alternations of rain and drought, while its fur is also thicker and more plentiful. In Central Asia both species occur, and hybrids are not uncommon, the latter being, it is alleged, occasionally fertile among themselves. (J. GL.)

CAMELLIA, the name of a genus of *Ternstroemiaceæ*, remarkable for its evergreen laurel-like foliage, and its handsome rose-like flowers, whence the common species, *C. japonica*, is sometimes called the Japan rose. This is an evergreen shrub of remarkably hardy constitution, so that in our climate it flourishes perfectly in a cold greenhouse; indeed, in the south and west of England, and in other favourable situations, the plant itself is hardy, and only suffers from frost in regard to the damage done to its flowers, which are naturally developed very early in the spring, and are therefore liable to suffer injury from spring frosts. The plant had been cultivated by the Japanese and Chinese long previous to its introduction to our gardens from China in 1739, and, in consequence, numerous double-flowered varieties were at that time known, of which about two dozen sorts were introduced from China, chiefly between 1806 and 1824, some two or three others having been obtained so early as 1792-4. This number of varieties has now been very considerably increased by the production of European seedlings, so that several hundreds are figured in a publication called *Nouvelle Iconographie des Camellias*, specially devoted to their illustration. The plant seeds freely in the climate of Italy and the south of Europe, and thence many first-rate sorts have been obtained.

The original type of *C. japonica* forms a dense bushy evergreen, abundantly clothed with ovate acuminate glossy leaves, and decorated with sessile single red flowers composed of from five to seven (nominally five) broadly obovate rosy carmine petals, which expand into a cup-shaped flower, and surround a circlet of numerous monadelphous stamens, within which a few free stamens, two to each petal, are produced. These stamens afford a fine contrast to the broad spreading petals. This form, or one but slightly removed from it, is still cultivated in gardens, as a stock on which to graft the double-flowered sorts, these only, in a general way, being now prized. There are, however, some few exceptions, as, for example, the single white, whose large flowers, with their conspicuous stamens, are extremely handsome when associated with the rich-looking dark green foliage.

The name *Camellia* was given to these plants by Linnæus in honour of George Joseph Camellus or Kamel, a Moravian Jesuit, who travelled in Asia, and wrote a history of the plants of the island of Luzon. In Japan, its native country, the *Camellia* attains to the size of a large tree, and it is held in high estimation by the Japanese on account of the extreme beauty of its large, showy, and



various-coloured flowers, which, however, have this drawback, that they have no scent. It appears to have been cultivated by the Chinese from time immemorial, and all our earlier introductions were obtained from that country. According to the *Hortus Kewensis*, it was introduced into England by Robert James, Lord Petre, before the year 1739; and the Waratah, or anemone-flowered variety, which has broad outer petals and a crowd of smaller central ones, is said to have been introduced at the same time. The double white, a variety as yet unsurpassed in beauty, its flowers being so pure in colour, and so full and symmetrically imbricated in form, was introduced in 1792; as also was the double striped, a free blooming hardy kind, with rosy red flowers irregularly blotched with white, which though surpassed in size and richness of colouring by more modern European varieties, is still too useful to be altogether discarded. The latest direct importations are probably the hexangular-flowered *Camellia* (*hexangularis*), introduced from China by Mr Fortune in 1846, a variety which, like that called Lady Hume's Blush (*incarnata*), has the pointed petals laid directly over each other, so that the face of the flower becomes six-angled; and the fish-tailed *Camellia*, introduced in 1861, a variety in which the leaves are sharply serrated at the margin and forked at the apex, so that they resemble in form the tail of a fish.

To be seen in their full perfection *Camellias* should be planted out in borders of properly prepared soil under glass; but these borders should be very effectually drained, and of such a mechanical composition as never to become soddened, for the plants require to be almost deluged with water when making their growth, and when developing their blossoms. The borders, moreover, when the plants have become well established, and the soil is full of roots, will require to be assisted by top-dressings, such as sheep or deer dung, and by applications of liquid manure. They by no means require a heated structure, nor too much sunlight, but when well established in a cool and somewhat shaded conservatory, may become a source of infinite delight to those who have a love for flowers. As instances of the great esteem in which the *Camellia* is held, it is only necessary to refer to the immense number of cut blooms sold during the season in Covent Garden market, and the high prices which they realize while yet comparatively scarce.

The genus *Camellia* is limited to some six or seven species, natives of India and Japan. Of these, besides *C. japonica*, another named *C. reticulata*, a native of the island of Hong-Kong, is highly prized in gardens for its very handsome blossoms. It differs from *C. japonica* in its downy branches, and reticulated, not glossy leaves, and also in its much larger flowers. The double-flowered variety of this plant has a most gorgeous appearance, specimens of the flowers having been measured which were as much as twenty inches in circumference.

Both *C. Sasanqua* (= *oleifera*), and *C. drupifera* (= *Kissii*), the former inhabiting Japan and China, the latter Cochinchina and the mountains of India, are oil-yielding plants. The oil of *C. Sasanqua* (of which *Sasankwa* is the native Japanese name) has an agreeable odour, and is used for many domestic purposes; it is obtained from the seeds by subjecting them to pressure sufficient to reduce them to a coarse powder, and then boiling and again pressing the crushed material. The leaves are also used in the form of a decoction by the Japanese women, for washing their hair; and in a dried state they are mixed with tea on account of their pleasant flavour. The oil of *C. drupifera*, which is closely allied to *C. Sasanqua*, is used medicinally in Cochinchina, its flowers also are odoriferous, all the other known species, except the Indian *C. lutescens*, being inodorous.

The genus *Camellia* is very closely allied to that of the tea-plant (*Thea*); indeed so close is the affinity that some botanists have proposed to unite them. Dr Seemann, however, in a memoir published in the *Transactions of the Linnean Society* (xxii. 337), points out their distinctions, from which it appears that while in *Camellia* the flowers are erect and sessile, the calyx many-leaved with deciduous sepals, the interior stamens (those within the monadelphous ring) twice the number of petals, and the styles five in number, the flowers of *Thea* are pedunculate and nodding, the calyx five-sepaled with persistent sepals, the interior stamens equalling the petals in

number, and the styles three. So close, however, is the agreement between them that the red-flowered *Camellia Sasanqua*, as it was for a long time called in gardens, has, as a result of more intimate acquaintance with its structure, to be referred to *Thea*, under the name of *Thea maliflora*. Bentham and Hooker, in their new *Genera Plantarum*, have again united *Thea* with *Camellia* under the latter name, preferring to regard the teas as forming a section of the genus *Camellia*, which conclusion has been adopted by Professor Dyer in the *Flora of British India* (i. 292), where the *Thea assamica* of authors is referred to as the possible wild stock of the tea-plant, and the name of *Camellia theifera* adopted for the combined form called *T. chinensis* by Linnaeus and Seemann. (T. MO.)

CAMEO, a term of doubtful origin, applied to engraved work executed in relief, on hard or precious stones, on imitations of such stones in glass called "pastes," or on the shells of molluscous animals. A cameo is thus the converse of an intaglio, which consists of an incised or sunk engraving executed in the same class of materials. The word cameo is generally regarded as being derived from the Arabic *camea*, a charm or amulet; but a number of other derivations have been suggested, among which a highly allegorical origin of the word from the Arabic *camaut*, the camel's hump, implying any object in relief, has been maintained by an eminent authority. Cameo-cutting is an art of much more recent introduction than the sister art of intaglio-engraving. The earliest known traces of any attempt at cutting gem-figures in relief are seen in certain Phœnician and Etruscan scarabei, in which the back of the beetle has been utilized for the faint delineation of another and quite different figure. One of the most ancient known cameos, of which the date can be fixed with certainty, consists of a sardonyx of three layers with portrait heads of Demetrius Soter and his wife Laodice, which must have been engraved between the years 162 and 150 B.C.

The materials which ancient artists used for cutting into cameos were chiefly those siliceous minerals which, under a variety of names, present various strata or bands of two or more distinct colours, and properly the name cameo should be restricted to work executed in relief on such banded stones. The minerals, under different names, are essentially the chalcidonic variety of quartz, and the differences of colour they present are due to the presence of variable proportions of iron and other foreign ingredients. These banded stones, when cut parallel to the layers of different colours, and when only two coloured bands—white and black, or sometimes white and black and brown—are present, are known as onyxes, but when they have with the onyx bands layers of carnelian or sard, they are termed sardonyxes. The sardonyx, which was the favourite stone of ancient cameo-engravers, and the material in which their masterpieces were cut, was procured from India, and the increased intercourse with the East by the way of Egypt after the death of Alexander the Great had a marked influence on the development of the art. Cameo-cutting attained the zenith of its pristine perfection in Rome during the first two centuries of the Christian era, the chief works being portraits of the reigning families, and allegorical illustrations of their glories. Contemporaneously with the production of the finest works in Oriental precious stones, pastes or imitations in glass were made in incredible numbers to meet the requirements of the classes who could not afford the other necessarily rare and costly luxuries. Both in perfection of material and in artistic merit these imitations were, in the best period, of extraordinary merit. The Barberini or Portland vase in the British Museum is a rare example of the skill of both the glass-worker and engraver on glass of ancient times.

The two most famous examples of this art which have come down to the present day are the Great Agate of the Sainte Chapelle in the Bibliothèque Nationale, Paris, and the Augustus Cameo in the Vienna collection. The former

was pledged among other valuables in 1244 by Baldwin II. of Constantinople to Saint Louis. It is mentioned in 1344 as "Le Camahien," having been sent in that year to Rome for the inspection of Pope Clement VI. It is a sardonyx of five layers of irregular shape, like all classical gems, measuring about 13 inches by 11 inches. During the Middle Ages the subject was supposed to be the triumph of Joseph in Egypt; but it is now known to represent on its upper part the apotheosis of Augustus, the centre being occupied with the reception of Germanicus on his return from his great German campaign by the Emperor Tiberius and his mother Livia. The lower division is filled with a group of captives in attitudes expressive of woe and deep dejection. The Vienna gem (*Gemma augustea*), an onyx of two layers measuring 9 inches by 8, is a work of still greater artistic interest. The upper portion is occupied with an allegorical representation of the coronation of Augustus,—the emperor being represented as Jupiter with Livia as the goddess Roma at his side. In the composition Neptune and Cybele, with several members of the family of Augustus, are introduced, and on the exergue or lower portion are Roman soldiers preparing a trophy, barbarian captives, and female figures. The history of this inestimable treasure has been traced from the time of the Crusades, and it came into the possession of the Emperor Rudolph II. in the 16th century for the enormous sum of 12,000 gold ducats.

While these and other similar monuments of antiquity, which have come down to us only mellowed and not injured by time, have intrinsically a priceless value as the expression of the most perfect artistic culture and feeling of the age to which they belong, they possess at the same time equally great significance to the student of the history, civilization, morals, and manners of the period. They supply the most authentic means of confirming the inferences to be drawn from classical sources as to beliefs, usages, dress, domestic and public habits, and pursuits of the people with whom they deal, and by means of such gems not only are the prevailing features of an ancient race accurately delineated, but the actual portraits of many of the most prominent personages in the world's history have been faithfully preserved, and can be identified beyond the shadow of a doubt.

The art of cameo-engraving waned in the early part of the 3d century, after the death of the Emperor Severus, but under the first Christian Emperor Constantine it enjoyed a brief period of revival. Many very beautiful cameo portraits of Constantine are extant; and it was during or shortly after his reign that Christian Scripture subjects began to appear on cameos. That class of subjects constituted the staple of such work—generally rude and artistically debased—as continued to be cultivated under the Byzantine empire down to nearly the epoch of the Renaissance. From the Byzantine period downward one peculiarity of gem-engraving becomes noticeable. Cameo-work as compared with intaglios in classical times was rare and infrequent, but now and onwards the opposite is the case, intaglio-sinking having almost died out, and cameos being chiefly produced. Commercial intercourse with the East still secured for the engravers a supply of magnificent sardonyxes, although blood-stone and other non-banded stones were very commonly used for works in relief. Cameos during the long dark ages were used chiefly for the decoration of reliquaries and other altar furniture, and as such their designs were purely ecclesiastical or scriptural. To this period also belongs the class of complimentary or motto cameos, which, containing only inscriptions and an ornamental border, executed in nicolo stones, were used as personal gifts and adornments.

In mediæval times antique cameos were held in peculiar

eneration on account of the belief, then universal, in their potency as medicinal charms. This power was supposed to be derived from their origin, of which two theories, equally satisfactory, were current. By the one they were held to be the work of the children of Israel during their sojourn in the wilderness (hence the name *Pierres d'Israel*), while the other theory held them to be direct products of nature, the engraved figures pointing to the peculiar virtue lodged in them.

The revival of the glyptic arts in Western Europe dates from the pontificate of the Venetian Paul II. (1464–71), himself an ardent lover and collector of gems, to which passion, indeed, it is gravely affirmed he was a martyr, having died of a cold caught by the multiplicity of gems exposed on his fingers. The cameos of the early part of the 16th century rival in beauty of execution the finest classical works, and, indeed, many of them pass in the cabinets of collectors for genuine antiques, which they closely imitated. The Oriental sardonyx was not available for the purposes of the Renaissance artists, who were consequently obliged to content themselves with the colder German agate onyx. The scarcity of worthy materials led them to use the backs of ancient cameos, or to improve on classical works of inferior value executed on good material, and probably to this cause must also be assigned the introduction of shell cameos, which are not supposed to have been made previous to this period.

Among the means of distinguishing antique cameos from cinquecento work, the kind of stone is one of the best tests, the classical artists having used only rich and warm-tinted Oriental stones, which further are frequently drilled through their diameter with a minute hole, from having been used by their original Oriental possessors in the form of beads. The cinquecento artists also, as a rule, worked their subjects in high relief, and resorted to undercutting, no case of which is found in the flat low work of classical times. The projecting portions of antique work exhibit a dull chalky appearance, which, however, fabricators learned to imitate in various ways, one of which was by cramming the gizzards of turkey fowls with the gems. Another index of antiquity is found in the different methods of working adopted in classical and Renaissance times. The tools employed by the Renaissance engraver were the drill and the wheel, both fed with oil and diamond or emery dust. The drill was simply the common instrument known by that name, and the wheel was a small metallic disc, which cut by its periphery being made to rotate in a vertical plane. Antique gems of the best period were cut or scratched (*γλύφειν, sculperé*) with the diamond point (splinters either of corundum or sapphire), with the aid of the drill, which the artists possessed in common with their modern successors.

In the early part of the 18th century great confusion was introduced into the study of this department of art, by the fraudulent insertion on a wholesale scale of names in Greek, purporting to be those of the engravers of the gems bearing them. In reality the insertion of his name by any artist, on cameos especially, was an exceedingly rare occurrence. An invariable and unfailing test of the authenticity of any signature on a cameo is "that it be always in relief, which is a sure evidence that it was cut at the same time with the rest of the composition." Another fraud practised in Italy during the revival consisted in engraving on unnamed portrait gems a name supposed to suit the aspect of the individual.

In our own day the engraving of cameos has ceased to be pursued as an art. Roman manufacturers cut stones in large quantities to be used as shirt-studs and for setting in finger-rings; and in Rome and Paris an extensive trade is carried on in the cutting of shell cameos, which are



largely imported into England and mounted as brooches by Birmingham jewellery manufacturers. The principal shell used is the large bull's-mouth shell (*Cassis rufa*), found in East Indian seas, which has a sard-like underlayer. The black helmet (*Cassis tuberosa*) of the West Indian seas, the horned helmet (*C. cornuta*) of Madagascar, and the pinky queen's conch (*Strombus gigas*) of the West Indies are also employed. The famous potter Josiah Wedgwood introduced a method of making imitations of cameos in pottery by producing white figures on a coloured ground, this constituting the peculiarity of what is now known as Wedgwood ware.

(J. PA.)  
CAMERA LUCIDA, an instrument invented by Dr Wollaston for drawing in perspective.

If a piece of plane glass be fixed at an angle of  $45^\circ$  with the horizon, and if, at some distance beneath, a sheet of paper be laid horizontally on a table, a person looking downwards through the glass will see an image of the objects situated before him; and as the glass which reflects the image is also transparent, the paper and pencil can be seen at the same time with the image, so that the outline of the image may be traced on the paper. The image is an inverted one. This is the simplest form of the instrument, and may be constructed extemporaneously by fixing on a stand a plane transparent glass, with its surfaces ground parallel, or a piece of Muscovy glass, at an angle of  $45^\circ$  with the horizon. A card with a small hole in it will serve as a sight for keeping the eye steady in one situation whilst the pencil is tracing the image.

Let a plane mirror, *cb* (Plate XXXIV. fig. 1), be inclined at an angle of  $22\frac{1}{2}^\circ$  with the horizon, and let *ba*, a piece of plane transparent glass, be so placed as to make an angle of  $22\frac{1}{2}^\circ$  with the vertical, then rays *fg* from an object will be twice reflected before they reach the eye at *e*, and, consequently, on looking down through the transparent glass, an erect image is seen, and the pencil may be drawn over the outlines of this image, so as to leave a perspective representation on the paper.

As the image and pencil are at different distances, they cannot be both seen in the same state of the eye. To remedy this inconvenience, a convex glass is used, of such focus as to require no more effort than is necessary for seeing the distant objects distinctly. By means of this lens, the image will appear as if it were placed on the surface of the paper. In fig. 1, *bd* is a convex glass of 12 inches focus. Instead of using a convex lens, short-sighted persons will require a concave glass to be placed at *f*, in the course of the rays from the object to the reflecting surface. In fig. 2, *ik* is a concave glass so placed that it may be turned at pleasure into its place, as the sight of the observer may require. Persons whose sight is nearly perfect may use either the concave glass placed before the reflecting surface, or the convex placed between the paper and the eye.

In the actual construction of the instrument, a prism is used instead of a mirror and plane glass. The rays from the object fall upon the surface *bc* of the prism, fig. 3. This surface *bc* is inclined  $22\frac{1}{2}^\circ$  to the horizon. The refractive power of the glass allows none of the rays in this situation to pass out; they are all reflected from the surface *bc* to the surface *ab*, and from that to the eye. *ab* makes an angle of  $135^\circ$  with *bc*, and  $22\frac{1}{2}^\circ$  with the vertical. The eye cannot see the pencil through the prism as it does through a plane glass; therefore, in order that the pencil may be seen, the eye must be so placed that only a part of the pupil may be above the edge of the prism, as at *e*, fig. 3; and then the reflected image will be seen at the same time with the paper and pencil. There is a small piece of brass perforated with a hole *c* (fig. 2), and moving on a centre; this serves to keep the eye in one position, as it must be that the image may be steady, and also to regulate the

relative quantities of light to be received from the object and from the paper.

The instrument, being near the eye, does not require to be large. The smallest size which can be executed with accuracy is to be preferred, and is such that the lens is only three-fourths of an inch in diameter. Fig. 4 shows the instrument on its stand, and clamped to a board. The joint by which the prism is attached to the stand is double.

This instrument serves for drawing objects of all forms, and consequently also for copying lines already drawn on a plane surface. If it is required that the copy shall be of the same size as the original drawing, the distance of the drawing from the prism should be the same as the distance of the paper from the eye-hole. No lens will be necessary in this case, because the image and the paper, being both at the same distance from the eye, coincide without the aid of a glass.

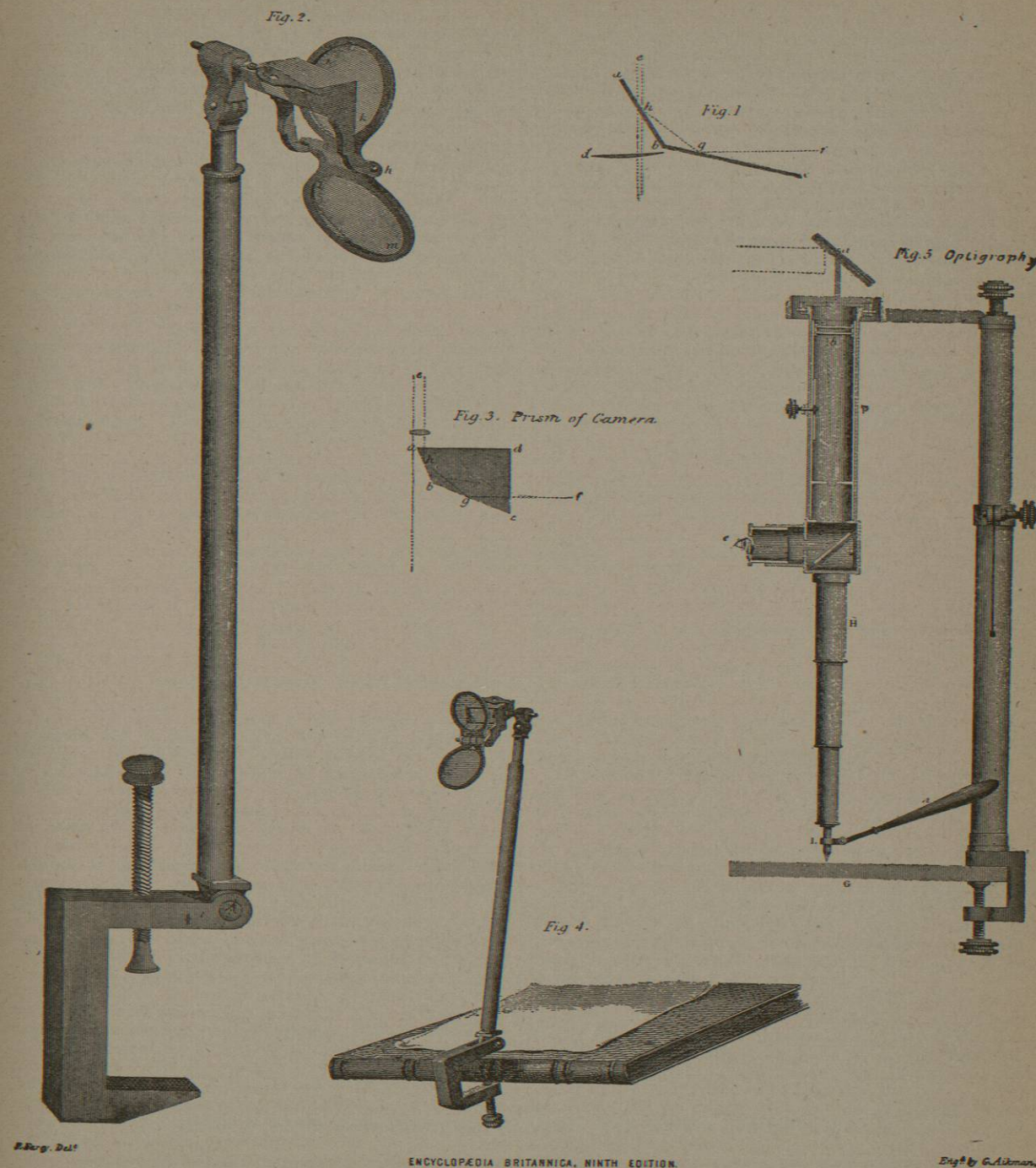
In order to have a reduced copy of a drawing, the drawing is to be placed at a distance from the prism greater than the distance of the paper from the eye-hole. If the distance is twice as great, a copy will be obtained in which the lines are of one-half the size of the lines in the original, and so in proportion for other distances. A lens is necessary, that the eye may be enabled to see at two different distances; and, in order that one lens may serve, the distance between the eye-hole and the paper should be variable; to that effect the stand is susceptible of being lengthened or shortened at pleasure.

The length of the stem is adjusted upon optical principles. When a distant object is to be delineated, the rays coming from it, and reflected by the instrument to the eye, are parallel, and it is required that the rays proceeding from the paper to the eye should also be parallel. This is accomplished by interposing a lens between the paper and the eye, with its principal focus on the paper. When the object to be delineated is so near that the rays which come from it to the eye are divergent, then it is required that the rays from the paper should likewise be divergent in the same degree, in order that the paper and the image may both be seen distinctly by the same eye; for this purpose the lens must be placed at a distance from the paper less than the distance of its principal focus.

The advantage of this instrument as compared with the camera obscura are,—1st, That it is small and easily carried about; 2dly, That no lines are distorted, not even those most remote from the centre; and 3dly, That in the field of the camera lucida  $70^\circ$  or  $80^\circ$  may be included, whilst the distinct field of the camera obscura does not extend beyond  $30^\circ$  or  $35^\circ$  at most. See *Repertory of Arts*, vol. x., 1807, p. 162; and *Nicholson's Journal*, vol. xvii.

If the camera lucida be fixed at the eye-glass of a telescope, it will reflect to the eye the image of the objects in the field of the telescope, so that a drawing of the image may be made. See Brewster's *Account of some Philosophical Instruments*. A plane reflecting glass fixed at an angle of  $45^\circ$  with the horizon, and placed so as to receive the rays from the eye-glass of a telescope, will also give an image of the objects in the field, so situated that the image may be traced with a pencil. Varley's patent graphic telescope is upon this principle. In order that the field may be large, the magnifying power of the telescope should be small.

The optigraph of Ramsden and Thomas Jones, described in the *Philosophical Magazine*, vol. xxviii., 1807, p. 67, is an instrument of a similar kind. The image of the object is seen in a telescope. There is a piece of plane glass near *c*, in the focus of the eye-glass of the telescope *F*, Plate XXXIV. fig. 5. On the centre of this piece of glass is a dot; *a* is a plane mirror, inclined so as to reflect the image of the object into the telescope. This mirror remains fixed, while





the telescope is movable on a universal joint at its object-glass *b*. Near *c* is another plane mirror, which reflects the rays to the eye-glass. The eye being placed at the eye-glass at *e*, the telescope is to be moved by the handle *h* so that the dot in the focus of the eye-glass shall pass over the outlines of the image seen by the eye, and the pencil at *L* performing a similar motion to that of the dot, and sliding freely in its sheath, presses with its weight on the paper; a drawing of the object is the result. If the stand and slider *H* be lengthened, an enlarged drawing will be obtained.

CAMERA OBSCURA, an optical apparatus, consisting of a darkened chamber, at the top of which is placed a box or lantern, containing a convex lens and sloping mirror, or a prism combining the lens and mirror. The rays of light from surrounding objects are received by the lens, and the mirror reflects images of the scenery downwards on a table placed underneath. This ingenious contrivance is said to have been invented by Baptista Porta in the end of the 16th century. For the camera obscura used by photographers see PHOTOGRAPHY.

CAMERARIUS, JOACHIM (1500-1574), whose family name was Liebhard, one of the most learned classical scholars of his time, was born at Bamberg on the 12th April 1500. He studied at Leipsic, Erfurt, and Wittenberg, and in the last-mentioned town he enjoyed the friendship of Melancthon. For some years he was teacher of history and Greek at the Gymnasium, Nuremberg. In 1530 he was sent as deputy for Nuremberg to the Diet of Augsburg, where he rendered important assistance to Melancthon. Five years later he was commissioned by Duke Ulrich of Würtemberg to recognize the university of Tübingen; and he subsequently rendered a similar service at Leipsic, where the remainder of his life was chiefly spent. He translated into Latin Herodotus, Demosthenes, Xenophon, Homer, Theocritus, Sophocles, Lucian, Theodoret, Nicéphorus, and other Greek writers. He published upwards of 150 works, including a *Catalogue of the Bishops of the principal Sees*; *Greek Epistles*; *Accounts of his Journeys*, in Latin verse; a Commentary on Plautus; *Euclid*, in Latin; and the Lives of Helius Eobanus Hessus and Philip Melancthon. He died at Leipsic in 1574.

CAMERARIUS, JOACHIM (1534-1598), a learned physician, son of the preceding, was born at Nuremberg, 6th November 1534. After having finished his studies in Germany he visited Italy, where he graduated as doctor of medicine. On his return he was invited to reside at the courts of several princes; but he was too much devoted to the study of chemistry and botany to accept their offers. He settled in his native town of Nuremberg, where he practised as a physician, and was the chief agent in founding a medical school. He wrote a *Hortus Medicus*, and several other works. He died on the 11th October 1598.

CAMERINO, formerly the capital of a delegation of the same name in the States of the Church, and now the chief town of a district, in the province of Macerata, in Italy, is situated on a height at the foot of the Apennines, 41 miles W. of Ancona. It is the seat of an archbishop, and possesses a small university founded in 1727, a theological seminary, nineteen conventual buildings, and a bronze statue of Pope Sixtus V., dating from 1587. Its cathedral, Sansovino, is built on the site of an ancient temple to Jupiter, and contains a number of excellent paintings. The culture and manufacture of silk is by far the most important branch of industry; to which may be added the preparation of leather. Camerino occupies the site of the ancient *Camerinum*, an Umbrian city, whose inhabitants, the *Camertes*, are mentioned as an important people at a very early date. About the beginning of the Christian era its lands were bestowed on military colonists; but it continued

to enjoy considerable prosperity. In the Middle Ages it originally formed part of the duchy of Spoleto; but it passed in the 13th century to the Varani family, and in 1520 was made an independent duchy by Leo X. About seventy years afterwards it was incorporated by the Papal States. The painter Carlo Maratta, the last of the so-called Roman school, was a native of the city. Population, 11,880.

CAMERON, JOHN (1579-1623), a learned theologian, was born at Glasgow about 1579, and received his early education in his native city. After having taught Greek in the university for twelve months, he removed to Bordeaux, where he was soon appointed a regent in the College of Bergerac. He did not remain long at Bordeaux, but accepted the offer of a chair of philosophy at Sedan, where he passed two years. He then returned to Bordeaux, and in the beginning of 1604 he was nominated one of the students of divinity who were maintained at the expense of the church, and who for the period of four years were at liberty to prosecute their studies in any Protestant seminary. During this period he acted as tutor to the two sons of Calignon, chancellor of Navarre. They spent one year at Paris, and two at Geneva, whence they removed to Heidelberg, where they remained nearly twelve months. In this university, on the 4th of April 1608, he gave a public proof of his ability by maintaining a series of theses, *De triplici Dei cum Homine Fœdere*, which were printed among his works. The same year he was recalled to Bordeaux, where he was appointed the colleague of Dr Primrose; and when Gomar was removed to Leyden, Cameron, in 1618, was appointed professor of divinity at Saumur, the principal seminary of the French Protestants.

In 1620 the progress of the civil troubles in France obliged Cameron to seek refuge for himself and family in England. For a short time he read private lectures on divinity in London; and in 1622 the king appointed him principal of the university of Glasgow in the room of Robert Boyd, who had been removed from his office in consequence of his adherence to Presbyterianism. His successor appears to have been more favourably inclined to Episcopacy,—a circumstance that may have tended to diminish the cordiality of his reception in his native city. Here he also taught divinity with great reputation, but he resigned his office in less than a year. Calderwood says that "Cameron was so disliked by the people that he was forced to quit his place soon afterwards."

He returned to France, and fixed his residence at Saumur; and after an interval of a year he was appointed professor of divinity at Montauban. The country was still torn by civil and religious dissensions; and as Cameron maintained the doctrine of passive obedience, he excited the indignation of the more strenuous adherents of his own party. He withdrew to the neighbouring town of Moissac; but he soon returned to Montauban, and a few days afterwards he died at the age of about forty-six. Cameron left by his first wife several children, whose maintenance was undertaken by the Protestant churches in France. All his works were published after his death.

His name has furnished a designation to a party of Calvinists in France, who asserted that the will of man is only determined by the practical judgment of the mind; that the cause of men's doing good or evil proceeds from the knowledge which God infuses into them; and that God does not move the will physically, but only morally, by virtue of its dependence on the judgment of the mind. This peculiar doctrine of grace and free-will was adopted by Amyraut, Cappel, Bochart, Daillé, and others of the more learned among the Reformed ministers, who judged Calvin's doctrines on these points too harsh. The Cameronites are moderate Calvinists, and approach to the opinion of the Arminians. They are also called