the shrine called Shâh Shahîd contains a tomb bearing in Roman characters the following inscription :—"*Here lyes the body of* Joseph Hicks, *the son* of Thomas Hicks *and* Edith, *who departed this lyfe the eleventh of October* 1666." An annual day in spring is appropriated to visiting the tombs, as in continental Europe. The graves are sprinkled, garlands placed, and small repairs executed.

Many sacred shrines are interspersed among the cemeteries and gardens. The gardens are often on acclivities, formed into terraces, supplied with springs, and abounding in song-birds. Both shrines and gardens are greatly resorted to by the Cabulis, who are passionately fond of this kind of recreation. Most of the roads are bordered by running waters, and shadowed by mulberry, willow, or poplar trees. The tomb of the illustrious Sultan Baber stands about a mile to the west of the city in a singularly charming spot, on a slope spreading before the sun. The grave is marked by two erect slabs of white marble. Near him lie several of his wives and children ; the garden has been formerly enclosed by a marble wall ; a clear stream waters the flower-beds. From the hill that rises behind the tomb there is a noble prospect of his beloved city, and of the all-fruitful plain stretching to the north of it.

The geographical position of Cabul, in a tolerably open country intervening between the passes which lead to India on the one side, and those which lead to Turkestan on the other, is highly favourable to trade. Baber exalts the importance of its traffic in his day, saying that the products of Khorasan, Rûm (Turkey), Babylonia, and China were all to be found there. People in easy circumstances are numerous. The presence of a court and a considerable military force contributes to the bustle of the place, and imparts animation to many trades. But the people do not excel in any handicraft or manufacture.

Cabul is believed to be the *Ortospanum* or *Ortospana* of the geographies of Alexander's march, a name conjectured to be a corruption of *Urddhasthâna*, "high place." But the actual name is perhaps also found as that of a people in this position (Ptolemy's *Kabolitæ*), if not in the name of a city apparently identical with Ortospana, *Carura*, in some copies read *Cabura*. It was invaded by the Arabs as early as the thirty-fifth year of the Hegira, but it was long before the Mahometans effected any lasting settlement. In the early Mahometan histories and geographies we find (according to a favourite Arabic love of jingle) *Kâbul* and *Zâbul* constantly associated. Zâbul appears to have been the country about Ghazni. Cabul first became a capital when Baber made himself master of it in 1504, and here he reigned for fifteen years before his invasion of Hindustan. In modern times it became a capital again, under Timur Shah (see AFGHANISTAN), and so has continued both to the end of the Durrani dynasty, and under the Barakzais, who now reign. (H. Y.)

CABUL (Kâbul), is also the name of the province including the city so called. It may be considered to embrace the whole of the plains called Koh-daman and Beghram, &c., to the Hindu Kush northward, with the Kohestan or hill country adjoining so far as it is in actual subjection to the Amir's authority. Eastward it extends to the border of Jalâlâbâd at Jagdalak ; southward it includes the Loghar district, and extends to the border of Ghazni ; north-westward it includes the Paghman hills, and the valley of the upper Kâbul River, and so to the Koh-i-Baba. Roughly it embraces a territory of about 100 miles square. Wheat and barley are the staple products of the arable tracts. Artificial grasses are also much cultivated, and fruits largely, especially in the Koh-daman. A considerable part of the population spends the summer in tents. The villages are not enclosed by fortifications, but contain small private castles or fortalices. The revenue of Cabul province has been stated at £180,000.

For the CABUL RIVER, see fully under AFGHANISTAN.

CACAO. See COCOA.

CACERES, the capital of the province of the same name in Estremadura, in Spain, 20 miles south of the Tagus, and 24 miles west of Truxillo, on a ridge of hills which stretch from east to west. It is the residence of the bishop of Corias, and contains a handsome episcopal palace, as well as a public school, a college, and several charitable institutions. The monastery and college of the Jesuits was one of the finest in the kingdom, but has been secularized and converted into a hospital. In the neighbourhood are large gardens, well-cultivated fields, and extensive pasture grounds ; while in the town are oil and fulling mills, soap-works, tanneries, and lime-kilns. There is also some trade in wool. Caceres occupies the site of the ancient *Castra Cæcilia*, and was a place of some importance both under the Romans and under the Moors. There are several fine specimens of the domestic architecture of the Middle Ages, such as the houses of the duke of Abrantes, the count de la Torre, and the count de los Carbajales. The bull-ring, a modern structure of granite, is one of the most remarkable buildings of its kind in Spain. Population, 13,466.

CACHAO, or, as it is variously spelled, KACHO, KECHO, HECHO, or KESHO, formerly known as Donk-king and now officially as Bacthian or Bac-king, is the largest city of Anam, and the capital of the province of Tonquin. It is situated on the west side of the Tonquin River, about eighty miles from the sea, in 105° 35′ E. long., 21° N. lat. It is of great extent. The principal streets are wide and airy, and for the most part are paved with bricks and small stones, but the others are narrow and ill paved. Most of the houses are constructed of mud or sun-burned bricks and timber, and thatched with leaves, straw, or reeds, and are generally one story in height. The public edifices are spacious, particularly the royal palace, which is several miles in circuit, and is surrounded by high walls. Besides this palace there are to be seen the ruins of one still more magnificent, said to have been six miles in circumference. Cachao is a place of some commercial resort ; its imports are long cloths, chintz, arms, pepper, and other articles, which are exchanged for gold and manufactured goods, namely, beautiful silks and lackered ware, which last is generally reckoned superior to any in the East. The English factory, which stood on the banks of the river north of the city, and that of the Dutch, south of it, have long been withdrawn. Cachao is peculiarly liable to fires ; and to prevent or extinguish these, the city is governed by a rigid police, and divided into wards. Fires for domestic use are only permitted during certain hours of the day. About the middle of the 18th century the city was nearly burnt to the ground by a conflagration, which was the work of incendiaries. In 1873 François Garnier, the famous French explorer, with an expedition of two hundred men and two ships, having come into collision with the authorities, took possession of the city after capturing the fort of Hanoi, which was constructed on European principles and defended by a large garrison. Not long after he was assassinated by the natives ; but his victory led to a treaty between the French Government and the Anamese, by which the port is declared open to the flags of all nations.

CACHEO, or CACHAO, a town of Western Africa in Senegambia, in the land of the Papels, a few miles inland from the mouth of the River Cachao or San Domingo. It is a fortified post of the Portuguese, and carries on a trade in gold dust and ivory. Population 15,000.

CACHOEIRA, a town of Brazil, in the province of Bahia, and 62 miles N.W. from the city of that name, is situated on the River Paraguassu, which is subject to heavy floods. It contains a town-house, a prison, a convent of Carmelites, and some five or six churches, and carries on an active trade in tobacco, coffee, and sugar. Population 15,000.

CACONGO, a small kingdom of Western Africa, separated from Congo by the river Zaire. The surface is mountainous but fruitful, the climate healthy though unsuited for Europeans. A strong tendency to adopt European customs and conveniences is displayed by the inhabitants, who carry on a considerable trade at the seaport towns of Mallemba and Cabinda. The capital is Kinguela.

CACTUS. This word, applied in the form of κάκτος by the ancient Greeks to some prickly plant, was adopted by Linnæus as the family title of a group of curious succulent or fleshy-stemmed plants, most of them prickly and leafless, some of which produce beautiful flowers, and are now so popular in our gardens that the name has become familiar. As applied by Linnæus, the name *Cactus* is almost conterminous with what is now regarded as the natural order *Cactaceæ*, which embraces several modern genera. It is one of the few Linnæan generic terms which have been entirely set aside by the names adopted for the modern divisions of the group.

The *Cacti* may be described in general terms as plants having a woody axis, overlaid with thick masses of cellular tissue forming the fleshy stems. These are extremely various in character and form, being globose, cylindrical, columnar, or flattened into leafy expansions or thick joint-like divisions, the surface being either ribbed like a melon, or developed into nipple-like protuberances, or variously angular, but in the greater number of the species furnished copiously with tufts of horny spines, some of which are exceedingly keen and powerful. These tufts show the position of buds, of which, however, comparatively few are developed. The stems are in most cases leafless, using the term in a popular sense ; the leaves, if present at all, being generally reduced to minute scales. In one genus, however, that of *Pereskia*, the stems are less succulent, and the leaves, though rather fleshy, are developed in the usual form. The flowers are frequently large and showy, and are generally attractive from their high colouring. In one group, represented by *Cereus*, they consist of a tube, more or less elongated, on the outer surface of which, towards the base, are developed small and at first inconspicuous scales, which gradually increase in size upwards, and at length become crowded, numerous, and petaloid, forming a funnel-shaped blossom, the beauty of which is much enhanced by the multitude of conspicuous stamens which with the pistil occupy the centre. In another group, represented by *Opuntia*, the flowers are rotate, that is to say, the long tube is replaced by a very short one. At the base of the tube, in both groups, the ovary becomes developed into a fleshy (often edible) fruit, that produced by the *Opuntia* being known as the prickly pear or Indian fig.

The principal modern genera are ranged under two subdivisions, which are separated by the differences in the flower-tube just explained. Those with long-tubed flowers, the *Cactæ tubulosæ*, form the genera *Melocactus*, *Mammillaria*, *Echinocactus*, *Cereus*, *Pilocereus*, *Echinopsis*, *Phyllocactus*, *Epiphyllum*, &c. ; while those with short-tubed flowers, the *Cactæ rotatæ*, are referred to *Rhipsalis*, *Opuntia*, *Pereskia*, and one or two of minor importance. These plants, whether viewed as the *Cactus* family or the natural order *Cactæ* or *Cactaceæ*, belong almost entirely, if not exclusively, to the New World ; but some of the Opuntias have been so long distributed over certain parts of Europe, especially on the shores of the Mediterranean and the volcanic soil of Italy, that they appear in some places to have taken possession of the soil, and to be distinguished with difficulty from the aboriginal vegetation. The habitats which they affect are the hot dry regions of tropical America, the aridity of which they are enabled to withstand in consequence of the thickness of their skin, and the paucity of evaporating pores or stomates with which they are furnished,—these conditions not permitting the moisture they contain to be carried off too rapidly. Occurring thus as they do in situations where ordinary vegetation could not exist, they may be considered as one of the means which nature has provided for the support of man and animals where other means of subsistence fail. The stems are filled with wholesome though insipid fluid, and the succulent fruit are not only edible but agreeable. In fevers the fruits are freely administered as a cooling drink, and when bruised are regarded as a valuable remedy for the cure of ulcers. The Spanish Americans plant the Opuntias around their houses, where they serve as impenetrable fences.

MELOCACTUS, the family of Melon-thistle or Turk's-cap Cactuses, contains, according to Labouret, a monographer of the order, about thirty species, which inhabit chiefly the West Indies, Mexico, and Brazil, a few extending into New Granada. The typical species, *M. communis*, forms a succulent mass of roundish or ovate form, from 1 foot to 2 feet high, the surface divided into numerous furrows like the ribs of a melon, with projecting angles, which are set with a regular series of stellated spines,—each bundle consisting of about five larger spines, accompanied by smaller but sharp aculei or bristles,—and the tip of the plant being surmounted by a cylindrical crown called a cephalium, 3 to 5 inches high, composed of reddish-brown acicular bristles, closely packed with cottony tomentum. At the summit of this crown the small rosy-pink flowers are produced, half protruding from the mass of wool, and these are succeeded by small red berries. These strange plants usually grow in rocky places with little or no earth to support them ; and it is said that in times of drought the cattle resort to them to allay their thirst, first ripping them up with their horns and tearing off the outer skin, and then devouring the moist succulent parts. The fruit, which has an agreeably acid flavour, is frequently eaten in the West Indies. The *Melocacti* are distinguished by the distinct cephalium or crown which bears the flowers.

MAMMILLARIA.—This group, which comprises nearly 300 species, mostly Mexican, with a few Brazilian and West Indian, is called Nipple Cactus, and consists of globular or cylindrical succulent plants, whose surface instead of being cut up into ridges with alternate furrows, as in *Melocactus*, is broken up into teat-like cylindrical or angular tubercles, spirally arranged, and terminating in a radiating tuft of spines which spring from a little woolly cushion. The flowers issue from between the mammillæ, towards the upper part of the stem, often disposed in a zone just below the apex, and are either purple, rose-pink, white, or yellow, and of moderate size. The spines are variously coloured, white and yellow tints predominating, and from the symmetrical arrangement of the areolæ or tufts of spines they are very pretty objects, and are hence frequently kept in drawing-room plant-cases.

ECHINOCACTUS is the name given to the group bearing the popular name of Hedgehog Cactus. It comprises some 200 species, of which more than half are natives of Mexico, and the rest are scattered through South America, extending as far south as Buenos Ayres. They have the fleshy stems characteristic of the order, these being either globose, oblong, or cylindrical, and either ribbed as in *Melocactus*, or broken up into distinct tubercles, and most of them armed with stiff sharp spines, set in little woolly cushions occupying the place of the buds. The flowers, produced near the apex of the plant, are generally large and showy, yellow and rose being the prevailing colours. They are succeeded by succulent fruits, which are exserted, and frequently scaly or spiny, in which respects this genus differs both from *Melocactus* and *Mammillaria*, which have the fruits immersed and smooth. One of the most interesting species is the *E. Visnaga*, of which some very large plants have been from time to time imported. A specimen weighing one ton, and measuring 9 feet high, and 3 feet in diameter, was received at Kew some years since, but owing to injuries received during transit, it did not long survive. These large plants have from forty to fifty ridges, on which the buds and clusters of spines are sunk at intervals, the aggregate number of the spines having been in some cases computed at upwards of 50,000 on a single plant. These spines are used by the Mexicans as toothpicks, whence the name Visnaga.

CEREUS.—This group bears the trivial name of Torch Thistle. It comprises about 150 species, scattered through South America and the West Indies. In one series, numbering between twenty and thirty species, sometimes separated under the name of *Echinocereus*, the stems are short, branched or simple, divided into few or many

ridges, all armed with sharp formidable spines; but in the greater number of species the stems are columnar or elongated, some of the latter creeping on the ground or climbing up the trunks of trees, rooting as they grow. One of the former group, *C. pectinatus*, produces a purplish fruit resembling a gooseberry, which is very good eating; and the fleshy part of the stem itself, which is called Cabeza del Viego by the Mexicans, is eaten by them as a vegetable after removing the spines. To the latter group belongs *C. giganteus*, the largest and most striking species of the genus, a native of hot arid desert regions of New Mexico, growing there in rocky valleys and on mountain sides, where the tall stems with their erect branches have the appearance of telegraph poles. The stems grow to a height of from 50 feet to 60 feet, and have a diameter of from 1 foot to 2 feet, often unbranched, but sometimes furnished with branches which grow out at right angles from the main stem, and then curve upwards and continue their growth parallel to it; these stems have from twelve to twenty ribs, on which at intervals of about an inch are the buds with their thick yellow cushions, from which issue five or six large and numerous smaller spines. The fruits of this plant, which are green oval bodies from 2 to 3 inches long, contain a crimson pulp from which the Pimos and Papagos Indians prepare an excellent preserve; and they also use the ripe fruit as an article of food, gathering it by means of a forked stick attached to a long pole. The Cereuses include some of our most interesting and beautiful hothouse plants.

Pilocereus, the Old Man Cactus, forms a small group with tallish erect fleshy angulate stems, on which, with the tufts of spines, are developed hair-like bodies, which, though rather coarse, bear some resemblance to the hoary locks of an aged man. The plants are nearly allied to *Cereus*, differing chiefly in the floriferous portion developing these longer and more attenuated hair-like spines, which surround the base of the flowers, and form a dense woolly head or cephalium. The most familiar species is *P. senilis*, a Mexican plant, which though seldom seen more than a foot or two in height in greenhouses, reaches from 20 feet to 30 feet in its native country.

Echinopsis is another small group of species, separated by some authors from *Cereus*. They are dwarf, ribbed, globose, or cylindrical plants; and the flowers, which are produced from the side instead of the apex of the stem, are large, and in some cases very beautiful, being remarkable for the length of the tube, which is more or less covered with bristly hairs. There are about thirty species known, their geographical range extending from Mexico and Texas to Brazil, Bolivia, and Chili.

Phyllocactus, the Leaf Cactus family, consists of about a dozen species, found in Mexico and Brazil. They differ from all the forms already noticed in being shrubby and epiphytal in habit, and in having the branches compressed and dilated so as to resemble thick fleshy leaves, with a strong median axis, and terete woody base. The margins of these leaf-like branches are more or less crenately notched, the notches representing buds, as do the spine-clusters in the spiny genera; and from these crenatures the large showy flowers are produced. As garden plants the *Phyllocacti* are amongst the most ornamental of the whole family, being of easy culture, free blooming, and remarkably showy, the colour of the flowers ranging from rich crimson, through rose-pink, to creamy white. They are often called *Epiphyllum*, which name is, however, properly restricted to the group next to be mentioned.

Epiphyllum.—This name is now restricted to two or three dwarf branching Brazilian epiphytal plants of extreme beauty, which agree with *Phyllocactus* in having the branches dilated into the form of fleshy leaves, but differ in having them divided into short truncate leaf-like portions, which are articulated, that is to say, provided with a joint by which they separate spontaneously; the margins are crenate or dentate, and the flowers, which are large and showy, magenta or crimson, appear at the apex of the terminal joints. In *E. truncatum* the flowers have a very different aspect from that of other *Cacteæ*, from the mouth of the tube being oblique and the segments all reflexed at the tip. The short separate pieces of which these plants are made up grow out of each other, so that the branches may be said to resemble leaves joined together endwise.

Rhipsalis, a genus of about thirty tropical American species, contains some of the plants once referred to *Cactus*. It is a very heterogeneous group, being fleshy-stemmed with a woody axis, the branches being angular, winged, flattened, or cylindrical, and the flowers small, short-tubed, succeeded by small, round, pea-shaped berries. *Rhipsalis Cassytha*, when seen laden with its white berries, bears no inconsiderable resemblance to a branch of mistleto. All the species are epiphytal in habit.

Opuntia, the Prickly Pear, or Indian Fig Cactus, is a large typical group, comprising some 150 species, found in North America, the West Indies, and warmer parts of South America, extending as far as Chili. In aspect they are very distinct from any of the other groups. They are fleshy shrubs, with terete woody stems, and numerous succulent branches, composed in most of the species of separate joints or parts, which are much compressed, often elliptic or suborbicular, dotted over in spiral lines with small fleshy caducous leaves, in the axils of which are placed the areoles or tufts of glochidiate or hooked spines of two forms. The flowers are mostly yellow or reddish-yellow, and they are succeeded by pear-shaped or egg-shaped fruits, having a broad scar at the top, furnished on their soft fleshy rind with tufts of small spines. The sweet juicy fruits of *O. vulgaris* and *O. Tuna* are much eaten under the name of prickly pears, and are greatly esteemed for their cooling properties. Both these species are extensively cultivated for their fruit in Southern Europe, the Canaries, and Northern Africa; and the fruits are not unfrequently to be seen in Covent Garden Market and in the shops of the leading fruiterers of the metropolis.

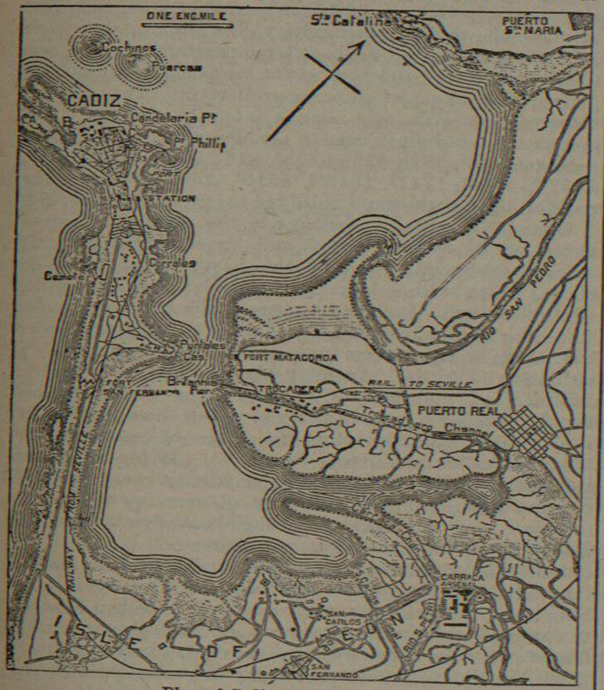
The cochineal insect is nurtured on a species of *Opuntia* (*O. coccinellifera*), separated by some authors under the name of *Nopalea*, and sometimes also on *O. Tuna*. Plantations of the nopal and the tuna, which are called nopaleries, are established for the purpose of rearing this insect, the *Coccus Cacti*, and these often contain as many as 50,000 plants. The females are placed on the plants about August, and in four months the first crop of cochineal is gathered, two more being produced in the course of the year. The native country of the insect is Mexico, and it is there more or less cultivated; but the greater part of our supply comes from New Granada and the Canary Islands.

Pereskia aculeata, or Barbadōs Gooseberry, the *Cactus Pereskia* of Linnæus, is the only remaining generic type; and this differs from the rest in having woody stems and leaf-bearing branches, the leaves being somewhat fleshy, but otherwise of the ordinary laminate character. The flowers are subpaniculate, white or yellowish. This species is frequently used as a stock on which to graft other *Cacti*. There are about a dozen species known. (T. MO.)

CADAHALSO, Jose de (1741–1782), a Spanish poet and writer, was born at Cadiz in 1741. He was educated at Paris, and before completing his twentieth year had travelled through Italy, Germany, England, and Portugal, and had studied with care the languages and literatures of these countries. On his return to Spain he entered the army, and rose to the rank of colonel. He was killed at the siege of Gibraltar, 27th February 1782. His first published work was a tragedy after the French model, *Don Sancho Garcia*, printed in 1771. In the following year he published his *Eruditos á la Violeta* (Fashionable Learning), a satire on superficial knowledge, which was very successful. In 1773 appeared a volume of miscellaneous poems, and after his death there was found among his MSS. a series of fictitious letters, somewhat after the style of the *Lettres Persanes*, or the *Citizen of the World*, which were published as *Moorish Letters*, and have been frequently reprinted. The complete edition of his works, with life by Navarrete, appeared at Madrid, in 3 vols., 1818.

CADIZ (in Latin *Gades*, and formerly called Cales by the English), the capital of a province of the same name in Spain, is built on the extremity of a tongue of land projecting about five miles into the sea, in a direction N.W. from the Isla de Leon, in 36° 31′ N. lat., 6° 18′ W. long., 94 miles by rail south of Seville, and 13 from Xeres. The city, which is six or seven miles in circumference, is surrounded by a wall with five gates, one of which communicates with the isthmus. Seen from a distance off the coast, it presents a magnificent display of snow-white turrets rising majestically from the sea; and for the uniformity and elegance of its buildings, it must certainly be ranked as one of the finest cities of Spain, although, being hemmed in on all sides, its streets and squares are necessarily contracted. Every house in the city annually receives a coating of whitewash, which, when it is new, produces a disagreeable glare in the streets. The most characteristic feature of Cadiz is the marine promenades, fringing the city all round between the ramparts and the sea, especially that called the *Alameda* on the eastern side, commanding a view of the shipping in the bay and the ports on the opposite shore. The principal square is the Plaza de San Antonio, surrounded by handsome houses with elegant façades, the centre pleasantly shaded with trees, and furnished with numerous seats of marble. Communicating with it is the principal street (Calle Ancha), in which are the exchange and houses of the nobility. The houses are generally lofty

and well-built, with open central courts, surmounted by turrets and flat roofs in the Moorish style. The principal public buildings are the two cathedrals (one built in the 13th century, the other begun in 1720, but not completed till 1840); the Hospicio or Casa de Misericordia, adorned with a marble portico, and having an interior court with Doric colonnades; the bull-ring, with room for 12,000 spectators; the two theatres, the prison, the custom-house, and the lighthouse of San Sebastian on the western side, rising 172 feet from the rock on which it stands. Besides the Hospicio already mentioned, which sometimes contains 1000 inmates, there are numerous other charitable institutions, such as the women's hospital, the foundling institution, the admirable Hospicio de San Juan de Dios for men, and the lunatic asylum. Gratuitous instruction is



Plan of Cadiz and its environs.

A. Fort San Sebastian.
B. Fort Santa Catalina.
C. The Alameda.
1. Hospital.
2. Academy of Fine Arts.
3. Custom-House.
4. Capuchinos
5. Old and New Cathedrals.
6. Sta. Marta.

given to a large number of children, and there are several mathematical and commercial academies, maintained by different commercial corporations, a nautical school, a school of design, a theological seminary, a flourishing medical school, an *Academia de Nobles Artes* (founded in 1789, principally by the exertions of Governor O'Reilly), an excellent observatory, and a hydrographic depôt. There are several public libraries attached to the various educational establishments, but none of any note. The museum is filled for the most part with wretched copies of ancient masterpieces, but in the church of the Capuchinos, which was formerly a monastery, is an unfinished picture of the marriage of St Catherine by Murillo, the last effort of his pencil, as he met his death by falling from the scaffold on which he was painting.

Cadiz is the see of a bishop, who is suffragan to the archbishop of Seville, but its chief conventual and monastic institutions have been suppressed. Its noble bay, more than 30 miles in circuit and almost entirely land-locked by the isthmus and the headlands which lie to the N.E., has principally contributed to its commercial importance. The outer bay stretches from the promontory and town of Rota to the mouth of the Guadalete; and the inner bay, protected by the forts of Matagorda and Puntales, affords generally good anchorage, and contains a harbour formed by a projecting mole, where vessels of small burden may discharge. The entrance to the bays is rendered somewhat dangerous by the low shelving rocks (Cochinos and Las Puercas), which encumber the passage, and by the shifting banks of mud deposited by the Guadalete and the Rio Santi Petri. On the mainland, at the mouth of the latter river, is the village of Caracca, which contains about 6000 inhabitants, and possesses a naval arsenal and dockyard; and on the isthmus are situated the well-frequented sea-bathing establishments.

The commercial greatness of Cadiz is no longer what it was in the 17th and 18th centuries. At one time it was the great focus of intercourse between Spain and the Spanish colonies; and from 1720 to 1765 it enjoyed a monopoly of the traffic with Spanish America, which had previously been in the hands of Seville. Its prosperity began to decline when the trade of San Domingo, Cuba, Porto Rico, and the other islands was opened up to the greater ports of Spain, and decayed almost entirely in the beginning of the present century, when the colonies achieved their independence. An attempt was made by the Spanish Government in 1828 to restore its former greatness, by making it a free warehousing port, but this valuable privilege was withdrawn in 1832. Since the opening of the railway to Seville and the improvements effected in the harbour, the commercial activity has greatly increased; and in spite of the disturbing influences of political revolutions, Cadiz is still one of the most important ports in Spain. It is the European terminus of many of the principal mail-lines from the colonies both in the east and west. Besides the Xeres wine, for which it received in 1872 no less than £2,458,487 from Britain alone, it exports quicksilver, brandy, oil, provisions, flour, and wool. The salt trade, which was formerly of considerable extent, is almost extinct. The imports consist chiefly of sugar and coffee from Havana and Porto Rico, English coal from Cardiff, cocoa, hemp, flax, linens, dried fish, hides, cotton and woollen manufactures, rice, spices, indigo, staves, and timber. The total number of vessels that entered in 1873 was 1140, of which 494 were steamships; and the total tonnage was 287,850. Of the sailing vessels 179 were British and 136 Italian, of the steamships 127 British and 281 Spanish. The manufactures of Cadiz are unimportant, though a considerable stimulus to industry is given by the *Sociedad economica de Amigos del Pais*, which introduced the cochineal plant, and grants medals for improvements in manufactures.

Cadiz is strongly fortified with ramparts and bastions and defended by the forts of San Sebastian, Santa Catalina, Matagorda, and Puntales Castle. On the neighbouring coast the isthmus is protected by an intrenchment called the Cortadura, or Fort San Fernando.

From its almost insular position it enjoys a mild and serene climate, the mean annual temperature being about 64° Fahr., while the mean summer and winter temperatures vary only about 10° above and below this point. From the same cause it labours under a great deficiency of water, which must either be collected in cisterns from the tops of the houses or brought at great expense from Santa Maria on the opposite coast. Population in 1845, 53,922, and in 1860, 71,521.

Cadiz is identical with the ancient Agadir, Gadir, or Gaddir (in Greek *Gadeira*), which was a flourishing Phœnician colony long before the beginning of classical history, and continued in the hands of the Carthaginians, though somewhat disaffected to them,

till after the Punic wars, when Spain became a Roman province. C. Julius Cæsar conferred the *civitas* of Rome on all its citizens in 49 B.C.; and not long after L. Cornelius Balbus Minor built what was called the "New City," constructed the harbour which is now known as Puerto Real, and erected the bridge across the strait of Santi Petri, which unites the Isla de Leon with the mainland, and is now known as the Puente de Zuazo, after Juan Sanchez de Zuazo, who restored it in the 15th century. Under Augustus, when it was the residence of no fewer than 500 *equites*, it was made a municipium with the name of Augusta Urba Gaditana, and its citizens ranked next to those of Rome. Some remains of the ancient city, and particularly of the temple of Hercules, are said to be visible below the sea. After the fall of Rome it was destroyed by the Goths, and remained in obscurity under the Moors, from whom it was retaken by Alphonso the Wise in 1262, but it emerged again when the discovery of America made it valuable as a market for colonial produce. In more recent contests Cadiz has been subjected to several disasters. It was taken and pillaged in 1596 by the British fleet, under Essex and Howard, in revenge for the Spanish Armada. It was attacked, but without success, by Lord Wimbledon in 1626, and by the duke of Ormond and Sir George Rooke in 1702. It was bombarded by Nelson in 1800. In 1808 the Spanish patriots in Cadiz brought the French fleet, which lay in the bay blockaded by Admiral Collingwood, to a surrender; and they were in turn subjected to a protracted siege of two years by Marshal Victor, from which they were relieved by the successes of Wellington in the Peninsula. It was once more reduced by the Duke d'Angoulême in 1823, and remained in the hands of the French till 1828. In 1868 the city was the centre of the revolution which effected the dethronement of Queen Isabella.

CADMIUM, a metal closely allied to zinc. It was discovered in 1817 by Stromeyer and Hermann, independently, but in a similar manner. The former chemist, in the execution of his duties as inspector of pharmaceutical products in Hanover, found a substance, sold as oxide, to be really carbonate of zinc, and, applying to the manufacturer for explanation of the reason of the substitution of the latter product for the former was informed that, although the best zinc, in which no iron could be detected, was employed, the oxide could not be produced without a slight discoloration from oxide of iron. On investigation by Stromeyer, it was found that the discoloration was due not to iron but to the oxide of a new metal, which he succeeded in isolating, and named cadmium, from the old chemical name for zinc oxide (*Cadmia fossilis*). About the same time, the sale of an oxide of zinc supplied by Hermann, a chemical manufacturer, who produced it from the waste of the Silesian zinc furnaces, was stopped in Prussia as being contaminated with arsenic,—the reason obviously being that the acid solution of the substance in question gave a bright yellow precipitate when heated with sulphuretted hydrogen. The erroneous character of this inference was, however, soon demonstrated by Hermann, who made a careful investigation of the subject, and discovered the nature of the new metal, but not before Stromeyer had published the results of his observations.

Cadmium does not occur in the metallic state in nature, and there is only one definite mineral known which contains it in quantity, namely, the sulphide, or greenockite, which occurs at Bishopstown, in Renfrewshire, in small isolated crystals of a bright orange-yellow colour, belonging to the hexagonal system, in a doleritic rock associated with prehnite. This contains 77·7 per cent. of cadmium and 22·3 per cent. of sulphur, corresponding to the formula CdS, and is isomorphous with voltzite, the rhombohedral form of sulphide of zinc. Although an extremely rare mineral in the pure state, being confined to the single locality mentioned above, sulphide of cadmium is often present in zinc blende, the richest varieties containing 3 per cent. of cadmium. Among these are the yellow radiated blende of Przibram in Bohemia, Eaton in New Hampshire, and Engis and Corfali in Belgium. It is also found in the carbonates and silicates of zinc from most of the localities producing these ores, but in what state of combination is doubtful, as it is not generally found in quantity sufficient to be appreciated by the analysis of samples,—being only discoverable when the ore is treated for zinc on the large scale, in the first products of the reducing processes.

Cadmium is a white metal with a slight bluish tinge by reflected light; it is whiter than lead or zinc, but less so than silver, has a high lustre when polished, and breaks, under a gradually increasing strain, with the fibrous or scaly fracture characteristic of a soft tough metal. It may be readily crystallized in octohedra, differing in this respect from the allied metal zinc which is rhombohedral. It is somewhat harder than tin, but less so than zinc, and like the former metal it emits a peculiar crackling sound when bent. It is malleable, and may be rolled into thin sheets. The specific gravity after fusion is 8·604, which is increased by hammering to 8·694. The specific heat is 0·05669 (Regnault), or 0·0576 (Dulong and Petit). The electric conductivity is 22·10, or somewhat lower than that of zinc; the thermal conductivity does not appear to have been determined. It melts at a temperature below redness (315° to 320° C.), and boils at the temperature of 860° C., giving off a vapour of an orange-yellow tint. The principal coloured lines with their relative intensity observed in the spectrum of cadmium vapour are, according to Huggins's notation, 502^4, 639^1, 656^8, $889^{5\cdot5}$, 918^1, 953^1, 986^1, 1473^{10}, 1517^{10}, 1536^1, 1747^1, 1843^{10}, 2315^8, 2562^6, 3239^4. The most brilliant of these are chiefly in the green and blue field.

Chemically cadmium belongs to the diatomic group of elements; its symbol is Cd, and its equivalent 58. It unites readily with most of the heavy metals, forming alloys, which with gold, copper, and platinum, are brittle, while those with lead and tin are malleable and ductile. The alloy of $\frac{2}{3}$ silver and $\frac{1}{3}$ cadmium is very tenacious; but that, in the reverse proportion, of $\frac{1}{3}$ silver and $\frac{2}{3}$ cadmium is brittle. An alloy of two parts of cadmium, two of lead, and four of tin, known as Wood's fusible metal, melts at a somewhat lower point than the similar alloy where bismuth takes the place of cadmium, or Darcet's fusible metal (see BISMUTH). It forms several amalgams, among which those containing equal parts of mercury and cadmium and two of mercury to one of cadmium are remarkable for their cohesive power and malleability; whereas that containing 22 per cent. of cadmium is hard and brittle. The amalgams of the former class have been proposed at different times for use in stopping teeth, but are not now so employed. When exposed to damp air cadmium becomes rapidly covered with a dull film of suboxide, but as with zinc the oxidation is only superficial, the crust formed protecting the metal below from further change. When heated to a redness in air it burns, forming a yellowish brown oxide. It also, when in a state of vapour, decomposes water at a red heat, with the formation of oxide of cadmium, hydrogen being evolved. It is soluble with evolution of hydrogen, in sulphuric, hydrochloric, nitric, and even acetic acid, forming colourless salts. When treated with an aqueous solution of sulphurous acid, it dissolves without evolution of hydrogen, sulphite and sulphide of cadmium being found in the liquid.

Oxide of cadmium, CdO, is a yellowish brown powder of the specific gravity 6·95, varying in depth of tint according to the temperature at which it is prepared. It may be produced by burning the metal in air or by calcining the nitrate or carbonate. It is readily reducible by hydrogen or carbon, at a high temperature, but below that necessary for the reduction of zinc oxide. If a mixture of the oxides of the two metals be heated in a current of hydrogen in a glass tube, the oxide of cadmium is reduced, volatilizes, and condenses in the cooler part of the tube, while the oxide of zinc remains unchanged. Oxide of cadmium is a strong base, forming salts similar in constitution to those formed by oxide of zinc, and those of the earthy and alkaline metals. The most important of these is the sulphate, $CdSO_4$, which is produced when the metal or its oxide is dissolved in sulphuric acid, forming crystals containing either one or four atoms of water, the former being deposited from a boiling solution, and the latter at the ordinary temperature of the air. The uses of cadmium salts are very limited; the sulphate is employed to a small extent as a lotion in inflammation of the eyes, similarly to the sulphate of zinc, and the iodide in photography and in medicine for the same purposes as iodide of potassium. The only compound of any real importance is the sulphide, CdS, which produces several brilliant yellow and orange colours. These are quite permanent, unlike the yellow produced by lead, chromium, or other metals, which are all more or less subject to discoloration when exposed to the action of sulphuretted hydrogen in the atmosphere. It is produced when sulphuretted hydrogen, or an alkaline sulphide, is added to the solution of any cadmium salt, as an orange-red powder, which becomes carmine-red when heated. At a white-heat it melts, and solidifies on cooling in lemon-yellow scales of a micaceous structure. When the precipitated sulphide is heated in hydrogen it is decomposed, forming cadmium vapour and sulphuretted hydrogen, which reunite in the cooler part of the tube, producing crystals exactly similar to the native mineral greenockite.

The best test for cadmium is afforded by the colour of the deposit formed on charcoal when it is volatilized and oxidized before the blowpipe flame. This is of a reddish brown colour, and usually shows the colours of thin plates from the tenuity of the film; whereas zinc under the same conditions gives a deposit which is bright yellow while hot, but becomes white on cooling. The precipitation as a yellow sulphide from an acid solution is another distinguishing character, as sulphide of zinc does not separate except from neutral or alkaline solutions. In quantitative analysis it is always estimated as oxide, being separated from solution as carbonate by precipitation with carbonate of sodium, which is converted into oxide by calcination. Cadmium, like lead, may also be separated from its solution in acids by means of zinc, which precipitates it in a dendritic form, like the well-known lead tree.

The production of cadmium is restricted to a very few localities. At Engis in Belgium it occurs in zinc blende to the extent of about 0·2 per cent. The oxide formed, together with oxide of zinc in the calcination of the blende, is in the subsequent reducing process in the ordinary Belgian zinc furnace (see ZINC), reduced and volatilized in the first period of the operation, before the heat is raised sufficiently to produce much zinc vapour, and the vapour, on coming in contact with the air, burns with a characteristic brown flame as distinguished from that of zinc, which is bluish green. The deposit formed in the condensing tubes, and in the nozzles (*allonges*) in front of the retorts, during this part of the process is comparatively rich in cadmium oxide, averaging about 1½ per cent. It is put aside until a sufficiency is collected, when it is enriched by a second distillation up to about 6 per cent., this second product being finally reduced by a third distillation with carbon at a dull red heat. The furnace contains fifteen retorts, four of which are reserved for the reduction of the enriched oxide. Cast-iron tubes are used, as the vapour of the metal readily penetrates clay retorts. The loss on the process is very considerable, only 30·12 per cent. of the whole amount of cadmium contained in the material treated being recovered; 21·17 per cent. is left in the residues, and 48·71 per cent. escapes condensation. The total produce of cadmium is very small; about one-half of the amount is produced at Engis, and the remainder in Silesia. In 1874 the production of cadmium in Lower Silesia amounted to 25 cwt., valued at £990 or about £800 per ton; but owing to the small demand many works had given up the manufacture. (H. B.)

CADMUS, in Greek Legend, was the founder of the town of Thebes originally called Cadmeia, and according to the tradition was a son of Agenor, king of Phœnicia, whence he had proceeded to Greece in search of his sister Europa, but failing to find her had, in obedience to an oracle, settled at Thebes. He there founded a town over which he in time became king, received from the gods Harmonia, a daughter of Ares and Aphrodite, as his wife, by her had a family on whom fell heavy misfortunes, and finally retired with her to Illyria, where they both died in peace, and were transformed into snakes which watched the tomb while their spirits were translated to Elysium. At the marriage all the gods were present, and the muses sang. Harmonia received a dress (*peplos*) worked by Athena, and a necklace made by Hephæstus. Their offspring were Semele, Ino, Autonoë, Agave, and a son Polydorus. On his first settlement at Thebes, Cadmus had slain a dragon, which guarded a spring, and at the orders of Athena had sown its teeth in the ground, from which there sprang a race of fierce armed men (Spartoi). By throwing a stone among them Cadmus caused them to fall upon each other till only five survived, and they became the founders of the noblest families of Thebes. Cadmus, however, because of this bloodshed, had to do penance for a long year (*i.e.*, eight years). Such is the legend. When Greek writers came to explain it they identified Cadmus as a Phœnician hero who had introduced into Greece the Phœnician writing, mining, and other arts or institutions of civilization. But his name is Greek rather than Phœnician, and like Cadmilus in Samothrace appears to mean "order," and to indicate a person who has instituted order in a state. He may have adopted much from the early Phœnician traders; but from the fact of Thebes having been one of the seats of the primitive Pelasgi, and from the occurrence of Cadmilus in Samothrace, also a seat of the Pelasgi, it is very probable that Cadmus was originally a purely Greek hero.

CADUCEUS (κηρυκεῖον), the symbol of office carried by public heralds, by Mercury (Hermes), as herald or messenger of the gods, and by Iris, Victory, and Eirene. It consisted of a staff round which two serpents were twined in a knot, their heads meeting at the top of the staff. Mercury, it was said, had seen two serpents fighting and knit together so, and had chosen this as a symbol of the quarrels which it was his duty to assist in settling. Sometimes a pair of wings are attached to the staff to indicate the speed of Mercury as a divine messenger. In the British Museum there is a bronze caduceus, found in a tomb in Sicily, which appears, from the inscription engraved on it in early Greek letters, to have belonged to a public herald of the town of Longena.

CÆDMON, or CEDMON (the former way of spelling is that of Bede, the latter that of Florence of Worcester), is the name of the earliest Anglo-Saxon or Old English poet of whom we have any knowledge. The meaning of the name has been much disputed. Sir Francis Palgrave, despairing of finding a native derivation, suggested (*Archæologia*, vol. xxiv.) that the poet might have been so called from the Chaldaic name for the book of Genesis, which is "b' Cadmin," in the beginning, or "Cadmon," beginning, from the opening words of the first chapter of Genesis. He thought that he might even have been an "Eastern visitor," who had arrived in Britain from the East, mastered the language, and come out as a vernacular poet. A hypothesis so fanciful as this last may be at once rejected. Another suggestion of the same lively writer connects the name with the Adam Cadmon (the primitive and ideal man) of the Cabalists. It is true that Cabalistic speculations cannot be traced back with certainty beyond the 9th century, but it is quite possible that the word may have