

The commercial movement of the port has rapidly attained vast dimensions. While in 1851-52 the total exports and imports amounted to £5,739,556, they reached £10,371,300 in 1859-60, £18,292,180 in 1870, £23,050,943 in 1880, and £25,931,930 in 1883. There is no railway in the island; but in 1886 a steam tramway was opened from Tanjong Pagar to Elgin Bridge. Till quite recently the town was practically without defences; but since 1885 the colony has constructed a series of batteries at Serapong, Blakan Mati, Mount Palmer, &c., at a cost of £75,000, and the home Government has expended £90,000 on the ordnance.

The name Singapore or Sinhapura, i.e., Lion City, was originally given to a town founded by Hinduized Malay or Javanese settlers from Sumatra at an early date in the Christian era. The commercial importance of the place in the 14th century is attested by Barros, but the Sanskrit origin of the name had by his time been forgotten, and he was taught to derive it from Malay words. Not long afterwards the town must have fallen into decay, and at the beginning of the present century the only trace of its existence was certain rock-inscriptions in a very old character, and the whole island had not more than 150 inhabitants. Alexander Scott recognized the excellent position of the island in the 18th century, and Sir Stamford Raffles, whose attention was called to it by Captains Ross and Crawford of the Bombay marine, fixed on it as the site of the great commercial emporium which he determined to found for the encouragement of British trade in the East. In 1819 permission was obtained to build a British factory on the south coast; and in 1824 the island was purchased from the sultan of Johor for 60,000 Spanish dollars (£13,500) and a life annuity of 24,000 dollars (£5400). The city became the capital of the Straits Settlements instead of Prince of Wales Island in 1832.

See Belcher, *Voyage of the Samarang*; Collingwood's *Naturalist's Rambles in the Chinese Seas*; *The Directory of the Straits Settlements for 1886*; the *Journal of the Straits Branch of the Royal Asiatic Society*, published at Singapore; and other works quoted under the heading STRAITS SETTLEMENTS.

SINGBHUM, a British district in the lieutenant-governorship of Bengal, lying between 21° 59' and 22° 53' N. lat. and between 85° 2' and 86° 56' E. long. It has an area of 3753 square miles, and is bounded on the N. by the districts of Lohárdagá and Mánbhúm, on the E. by Midnapur, on the S. by the tributary states of Orissa, and on the W. by Lohárdagá and the tributary states of Chutiá Nágpur. Its central portion consists of a long undulating tract of country, running east and west, and enclosed by great hill ranges. The depressions lying between the successive ridges comprise the most fertile part, which varies in elevation above sea-level from 400 feet near the Subarnarekhá on the east to 750 feet around the station of Cháibásá. South of this an elevated plateau of 700 square miles rises to upwards of 1000 feet. In the west of the district is an extensive mountainous tract, sparsely inhabited by the wildest of the Kols; while in the extreme south-west corner is a still grander mass of mountains, known as "Saranda of the seven hundred hills," rising to a height of 3500 feet. From the Layadá range on the north-west of Singbhúm many rocky spurs strike out into the district, the more prominent of them attaining an elevation of 2900 feet. Among other ranges and peaks are the Chaitanpur range, reaching an elevation of 2529 feet, and the Kápargádi range, a conspicuous ridge rising abruptly from the plain and running in a south-easterly direction until it culminates in Tuiligár Hill (2492 feet). The principal rivers are the Subarnarekhá, which with its affluents flows through the eastern portion of the district; the Koel, which rises west of Ranchi, and drains the Saranda region; and the Baitarani, which touches the southern border for 8 miles. About two-thirds of Singbhúm district is covered with primeval forest, containing some valuable timber trees; in the forests tigers, leopards, bears, buffaloes, and several kinds of deer abound, and small herds of elephants occasionally wander from the Meghásani Hills in Morbhanj. The climate is dry, and the hot season is extremely trying, the thermometer frequently registering 106° F. in the shade; the average annual rainfall is about 57 inches.

The census of 1881 disclosed a population of 453,775 (226,681 males and 227,094 females); Hindus numbered 447,810, Mohammedans 2329, and Christians 2988. The only town containing a

population of more than 5000 is Cháibásá, the civil station and administrative headquarters of the district, with 6006 inhabitants. The staple crop of Singbhúm is rice, and the other chief crops are wheat, Indian corn, peas, gram, mustard, sugar-cane, cotton, and tobacco. The principal manufactures are coarse cotton cloths, brass and earthenware cooking utensils, and soapstone platters. Cereals, pulses, oil-seeds, stick-lac, and iron comprise the chief exports; and the imports include salt, cocten thread, English cloth goods, tobacco, and brass utensils.

Colonel Dalton, in his *Ethnology of Bengal*, says that the Singbhúm Rajput chiefs have been known to the British Government since 1803, when the marquis of Wellesley was governor-general of India; but there does not appear to have been any intercourse between British officials and the people of the Kolhán previous to 1819. The Hos or Larka Kols, the characteristic aboriginal race of Singbhúm district, would allow no stranger to settle in, or even pass through, the Kolhán; they were, however, subjugated in 1836, when the head-men entered into engagements to bear true allegiance to the British Government. The country remained tranquil and prosperous until 1857, when a rebellion took place among the Kols under Parahat Rájá. After a tedious campaign they surrendered in 1859, and the capture of the raja put a stop to their disturbances.

SINGING. See VOICE.

SINHALESE. See CEYLON.

SINIGAGLIA, or **SENIGALLIA** (the official form), a city of Italy, in the province of Ancona, in 43° 43' 16" N. lat., on the coast of the Adriatic, 17 miles by rail north of Ancona. It is well built, with broad and well-paved streets, and has the general appearance of a thriving commercial town. A modern cathedral, erected subsequent to 1787, a large Jewish synagogue, a theatre, the communal buildings, and the old palace of the dukes of Urbino are the more notable buildings. The communal library was founded by Cardinal Nicola Antonelli in 1767; and the principal hospital and one of the orphanages date from 1534. The port is formed by the lower reaches of the Misa, a small stream which flows through the town between solid embankments constructed of Istrian marble. Between July 20 and August 8 Sinigaglia annually holds one of the largest fairs in Italy, which dates originally from 1200, when Sergius, count of Sinigaglia, received from the count of Marseilles, to whose daughter he was affianced, certain relics of Mary Magdalene. The fair has diminished in importance since the opening of the railway, but formerly it used to be visited by merchants from France, Switzerland, Austria, Germany, and especially the Levant. The population, exclusive of the suburbs, was 10,501 in 1861 and 6634 (commune 22,499) in 1881.

Sinigaglia is the ancient *Sena* (Σήνη) or (to distinguish it from Sena Julia, i.e., Siena) *Sena Gallica*, a town of the Galli Senones (Σήνωνες), whose name appears as Senogallia as early as Pliny. Sena was made a Roman colony immediately after the conquest of the Senones in 289 B.C. It was the rendezvous of the consuls Lavius and Nero before the battle of the Metaurus, also known as the battle of Sena, in which Hasdrubal was defeated (207 B.C.). The sack of the town by Pompey, Sulla's lieutenant, in 82 B.C., is the only other notable fact in its ancient annals. Ravaged by Alaric, fortified by the exarch Longinus, and again laid waste by the Lombards in the 8th century and by the Saracens in the 9th, Sinigaglia was at length brought so low by the Gulf and Ghibelline wars, and especially by the severities of Guido de Montefeltro, that it was chosen by Dante as the typical instance of a ruined city. In the 15th century it was captured and recaptured again and again by the Malatesta and their opponents. Sigismond Malatesta of Rimini erected strong fortifications round the town in 1450-1455. The lordship of Sinigaglia was bestowed by Pius II. on his nephew Antonio Piccolomini, but the people of the town in 1464 placed themselves anew under Paul II., and Giacomo Piccolomini in 1472 failed in his attempt to seize the place. Sixtus VI. assigned the lordship to the Della Rovere family, from whom it was transferred to Lorenzo di Medici in 1516. After 1624 it formed part of the legation of Urbino.

SINKING FUND. See NATIONAL DEBT, vol. xvii. p. 245.

SINOPE, or in Turkish **SINÖB**, a town and seaport on the north coast of Asia Minor, on the isthmus and peninsula of Boztepeh, which forms part of the most northerly projection of the Anatolian seaboard. Though

it possesses the finest natural harbour save one in the Black Sea, defective communication with the interior, and the consequent rivalry of Ineboli (since about 1848), have prevented Sinope taking its natural position as a great commercial centre. But between 1882 and 1885 roads have been constructed which give direct access southward to Cæsarea and even to Tarsus, near the south coast. The town still bears the stamp of its former importance. On the isthmus stands a huge but for the most part ruined castle, originally Byzantine and afterwards strengthened by the Seljuk sultans; and the old town is surrounded by Byzantine walls. Of early Roman or Greek antiquities there is little trace; but the ancient local coinage furnishes a very beautiful and interesting series of types (see M. J. P. Six's paper in *The Numismatic Chronicle*, 1885). The population has not greatly changed since 1868, when it was found to be 9668 inhabitants, of whom 7299 were Mohammedans and 2369 Greeks and others.

Sinope (Σινώπη), whose origin was mythically assigned by its own ancient inhabitants to Autolyceus, a companion of Hercules, was colonized by the Milesians, and ultimately became the most flourishing Greek settlement on the coast of the Euxine. In the 5th century B.C. it received a colony of Athenians; and by the 4th it had extended its authority over a considerable tract of country and become itself the mother of several colonies—Cerasus (Kerasün), Trapezus (Trebizond), Cotyora, &c. Its fleet was practically dominant in the Euxine, except towards the west, where it shared the field with Byzantium. When in 220 B.C. Sinope was for the first time attacked by the king of Pontus, the assistance of the Rhodians enabled it to maintain its independence. But when Mithradates IV. failed Pharnaces succeeded; and the city, taken by surprise in 183 B.C., became the capital of the Pontian monarchy. Under Mithradates the Great, who was born in Sinope, it had just been raised to the highest degree of prosperity, with fine buildings, naval arsenals, and well-built harbours, when the Romans under Lucullus and Pompey effected the subjugation of Pontus. In 64 B.C. the body of the murdered Mithradates was brought home to the royal mausoleum. Under Julius Cæsar the city received a Roman colony. In the Middle Ages it became subject to Trebizond, and in 1470 it passed into the hands of the Turks. In November 1853 the Russian vice-admiral Nakhimoff destroyed here a division of the Turkish fleet and reduced a good part of the town to ashes.

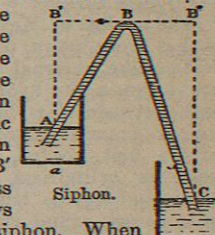
SIOUX CITY, a city of the United States, the capital of Woodbury county, Iowa, lies 156 miles north-west of Des Moines, on the sloping banks of the Missouri river. It is a great railway centre (Chicago, Milwaukee, and St Paul Railway, Sioux City and Pacific Railway, &c.), has an extensive trade, and contains an opera house, foundry and machine shops, pork-packing factories, and mills. The population of the city (which was laid out in 1854 and incorporated in 1857) was 3401 in 1870 and 7366 in 1880 (township 7845).

SIPHANTO, **SIPHENO**, or **SIPHNO** (ancient Greek Σίφνος), an island of the Greek Archipelago, in the nomarchy of the Cyclades, 30 miles south-west of Syra. It has an area of 28 square miles, and the population in 1879 was 5762. A ridge of limestone hills—whose principal summits, Mount Elias and St Simeon, are crowned by old Byzantine churches—runs through the island; for about 2 miles along the western slope stretches a series of villages, each white-washed house with its own garden and orchard. Apollonia, one of the five (so called because built on the site of a temple to Apollo), is the modern capital; formerly this rank belonged to Kastro (also called Seraglio), an "old-world Italian town" with mediæval castle and fortifications, and an old town-hall bearing date 1365. Inscriptions found on the spot show that Kastro stands on the site of the ancient city of Siphnos; and Mr Bent identifies the other ancient town of Minoa (see Stephanos) with the place on the coast where a Hellenic white marble tower is distinguished as the Pharos or lighthouse and another as the tower of St John. Churches and convents of Byzantine architecture are

scattered about the island. One building of this class is especially interesting—the school of the Holy Tomb or school of Siphnos, founded by Greek refugees from Byzantium at the time of the iconoclastic persecutions, and afterwards a great centre of intellectual culture for the Hellenic world. The endowments of the school are now made over to the gymnasium of Syra. In ancient times Siphnos was famous for its gold and silver mines, the site of which is still easily recognized by the excavations and refuse-heaps. A French company has started mining operations at Kamara. As in antiquity so now the potters of the island are known throughout the Archipelago.

The wealth of the ancient Siphnotes was shown by their treasury at Delphi, where they deposited the tenth of their gold and silver; but, says the legend, they once sent Apollo a gilded and not a golden bull, and he in his anger flooded their mines. That the mines were invaded by the sea is still evident; and by Strabo's time the inhabitants of the island were noted for their poverty. During the Venetian period it was ruled first by the Da Corogna family and after 1456 by the Gazzadini, who were expelled by the Turks in 1617.

SIPHON, or **SYPHON**, an instrument usually in the form of a bent tube for conveying liquid over the edge of a vessel and delivering it at a lower level, or in a position of less hydrostatic pressure. The principle on which it acts (see HYDROMECHANICS) may be understood from the accompanying diagram. ABC is a tube filled with liquid, the shorter limb dipping under the surface of the liquid in jar *a*, the longer in jar *b*. The pressure in the tube at A is atmospheric pressure minus that of the vertical column AB', while that at C is atmospheric pressure minus that of the column CB'. When CB' is longer than AB' the pressure at C is of course less than that at A, and a current flows in the direction ABC through the siphon. When AB' = B'C, that is, when the liquid stands at the same level, pressure is equal in the two limbs, and the current ceases. The siphon has practically a certain minimum diameter for each liquid, as capillarity prevents a fluid from flowing out of tubes of very small bore unless under the influence of electricity, heat, or great pressure. The instrument is largely employed for chemical work, both in the laboratory and in manufacturing processes; it is formed of glass, india-rubber, lead, or other substance, according to the purpose for which it is intended. The simple siphon (see fig.) is used by filling it with the liquid to be decanted, closing the longer limb with the finger and plunging the shorter into the liquid, and it must be filled for each time of using. Innumerable forms have been devised adapted for all purposes, and provided with arrangements for filling the tube, or for keeping it full and starting it into action automatically when required. The former purpose is usually effected by blowing into the vessel through a second opening in the stopper through which the siphon passes, or by means of a sucking or blowing tube attached to the longer limb, or by pouring in liquid through a flexible tube attached at the bend. The second plan is frequently realized by having a stopcock on the longer limb and a valve opening upwards on the shorter, or by having both limbs of equal length and each standing in a cup, in which case when the level changes in either cup the siphon tends to equalize it by conveying liquid from the higher to the lower. Many other forms are in constant use in the arts, and the siphon is also employed in some of its modifications in surgery, in engineering, and in other sciences.



SIRACHIDES. See JESUS, THE SON OF STRACH.

SIRAJGANJ, a town in the district of Pabna, Bengal,

and the most important river-mart in that province, is situated near the Jamuná or main stream of the Brahmaputra in 24° 26' 58" N. lat. and 89° 47' 5" E. long., with a population of 21,037 (11,213 males and 9824 females) in 1881. The business of Sirájanj is that of a changing station; the agricultural produce of the surrounding country is brought in in small boats and transferred to wholesale merchants for shipment to Calcutta in steamers or large cargo boats, and in return piece goods, salt, hardware, and all sorts of miscellaneous articles are received from Calcutta for distribution. Sirájanj is also the centre of the jute trade of Eastern Bengal.

SIR-DARIA. See SYR-DARYA.

SIREDON. At the end of last century specimens of a kind of branchiate tailed Amphibian were brought to Europe from the lakes of Mexico; they were examined by the zoologists of Paris and described by Cuvier in Humboldt's *Recueil d'Observations de Zoologie*, vol. i., and by Daudin in *Hist. des Reptiles* (Paris, 1802-1804), under their native name of "Axolotls." The animals were named *Siren pisciformis* by Shaw (*Zool.*, vol. iii.). Wagler, in his *Natürliches System der Amphibien* (Stuttgart, 1828-1833), separated the axolotl from the Linnæan genus *Siren* and called it *Siredon axolotl*, and later writers have often referred to the animal under the name *Siredon pisciforme*, Shaw.

The axolotl of Mexico is about 6 or 7 inches in length; it has four pairs of gill-slits and three pairs of long feather-like external branchiæ. The branchial apertures are between the hyoid arch and the first branchial arch, and between the first-second, second-third, and third-fourth branchial arches. The branchiæ are attached to the first, second, and third branchial arches. The body is cylindrical, and a median membranous fin extends along the trunk dorsally, is continued along the tail; passes round the end of the latter and terminates ventrally at the anus. It has four limbs, which are short and somewhat stout; the anterior terminate in four and the posterior in five digits. The colour of the axolotl is a uniform black.

The animal is therefore, except in size, very similar to the aquatic larva of *Triton*, or other Salamandroid, and Cuvier expressed the opinion that it was a larval form which for some unknown reason was unable to attain the adult condition. That it could not be considered simply as the larva of an unknown species of Salamandroid was evident from the fact that it possessed fully developed sexual organs in both sexes. There was every reason to believe that it bred freely in the branchiate condition in which it was discovered. The animal is so common in the lakes near the city of Mexico that it is brought regularly to market and used largely by the Mexicans as food (9).¹

If nothing more than the above were known about the axolotl it would be classed among the *Perennibranchiata*, in the family *Protetida*, having its nearest ally in the genus *Menobranchius*. Up till the year 1865 no actual observations had been made by zoologists on the breeding of the axolotl: all that was known was that the genital organs in many of the specimens examined were in perfectly mature condition. In that year, on January 18, 6 axolotls, 5 males and 1 female,—which had been living for a year in the menagerie of reptiles of the Musée d'Histoire Naturelle at Paris,—began to breed, and the deposition and hatching of the eggs was carefully studied by Prof. A. Duméril (1). The eggs were 2 mm. in diameter, and the period of development within the egg was 28 to 30 days; the larvæ were hatched in February, and were 14 mm. to 16 mm. in length. In the beginning of September, when the larvæ had almost reached the size of the parents, it was noticed that one of them was undergoing a metamorphosis similar to that of the larval *Triton* to the adult. In a short time yellow spots appeared on the skin, the branchiæ disappeared, the gill-slits closed up, the median fin disappeared, the animal began

¹ These numerals refer to the "Literature" infra.

to breathe air and permanently quitted the water. The same process of metamorphosis was repeated by several of the larvæ, until finally out of several hundred about thirty reached the salamandroid condition. The parents in the meantime were still alive, and had undergone no change. When the structure of the transformed specimens was examined, they were found to resemble in all generic characters the genus *Amblystoma*, of which several species were known, inhabiting various parts of North America.² The consideration of Duméril's discovery gives rise to several perplexing questions, which have been discussed by many zoologists experienced in the study of the *Amphibia*, and even now can scarcely be said to be completely settled. The first question is—To what species of *Amblystoma* did the transformed axolotls of Duméril belong? Duméril himself, in the full account (2) which he published concerning the animals and their metamorphosis, was unable to give a decided opinion concerning the identification of the species of his *Amblystoma*, but on a subsequent occasion he confirmed the suggestion of Prof. E. D. Cope (10) that the specific characters were those of *A. mavortium* Cope (described in *Proc. Ac. Philad.*, 1867).

The publication of Duméril's discovery excited a great deal of interest among European naturalists, and for a time experiments and observations on axolotls in captivity were carried on with great earnestness. The metamorphosis in the case of Duméril's specimens had taken place quite unexpectedly, but the case seemed to offer an opportunity for ascertaining the action of definite conditions in producing definite processes of growth. Marie von Chauvin (6), at Freiburg, at the instigation of Prof. Weissmann, attempted, and with perfect success, to transform young axolotls into the *Amblystoma* form by gradually bringing the animals from water into air.

The transformed axolotls observed by Duméril were kept alive in the Paris Museum, and for ten years showed no symptoms of breeding or sexual activity. It was currently believed that the *Amblystoma* derived from the metamorphosis of *Siredon* was sterile. This belief ultimately proved erroneous. In the autumn of 1874 the animals in the menagerie of reptiles were transferred to new premises, where they were all placed in more healthy conditions. Immediately after this the *Amblystoma* deposited fertilized eggs, and the fact was reported by M. Blanchard to the Académie des Sciences (4), with the comment that the *Amblystoma* was thus shown to be similar to other cold-blooded animals which were capable of reproducing in both the young and the adult condition.

Although at first Duméril believed and stated that his specimens of axolotl belonged to the species which bears that name in Mexico, he afterwards, in his more detailed work on the subject (2), explained that the grounds for his first opinion had been insufficient. American zoologists, especially Baird and Cope, had distinguished several species of *Siredon*, and Baird had separated the Mexican species, which alone was originally called axolotl, as *Siredon mexicanus*. Duméril came to the conclusion that the axolotls in the Paris Museum were identical with *Siredon tichenoides*, Baird (described in Stansburg, *Expéd. Gr. Salt Lake, Utah*). All the axolotls which were kept and studied and subjected to experiment by naturalists on the Continent after Duméril's discovery were descendants of the Paris specimens, so that the results obtained really did not necessarily prove anything with regard to the true Mexican axolotl, *Siredon mexicanus*, if that were really a distinct species. There is no evidence in literature to show whence the first axolotls in the Paris Museum were obtained. It was evident that *Siredon tichenoides* was capable of breeding in both the larval and the salamandroid condition, and that its metamorphosis in captivity in Europe was rare and to a certain extent controlled by definite external conditions. Prof. O. C. Marsh has recorded his experience of the metamorphosis of *S. tichenoides*. He obtained several specimens from alpine lakes 7000 feet above the sea in Wyoming Territory, and some of these metamorphosed into *Amblystoma mavortium*, Cope. Marsh does not say if the larvæ he obtained were sexually mature, nor did he ascertain if breeding of the species in the larval condition took place at all in the lakes he visited; he thinks it probable that the metamorphosis in that region was rare in the natural conditions.

The metamorphosis of the true axolotl, undoubtedly obtained from the Lake of Mexico, seems to have been observed only once—namely, by Tegetmeier in London. That naturalist had 5 specimens, and one of them underwent the metamorphosis. In 1871 Cope (10) stated that no one had seen the metamorphosis of the true *Siredon*, *Siredon mexicanus*, Baird, and that no *Amblystoma* had been obtained from Mexico south of the Tropic of Cancer, while

² The generic characters of *Amblystoma*, Tschudi, are, according to Boulenger—tongue subcircular or oval, with radiating plicæ, lateral borders free, anterior border slightly free; two transverse series of palatine teeth in same straight line, not separated by a wide interspace in the middle; toes five; tail more or less compressed.

the true axolotl is found south of that line. He was unaware of Tegetmeier's observation. He further declared that Prof. Baird was aware of the metamorphosis of all the North American species of *Siredon* so-called, excluding *S. mexicanus*, years before the observation of it by Duméril, though he had at first named one of them *Siredon tichenoides*, in the belief that it was adult. Cope considered the observation of Duméril important, as showing that *Siredon* reproduced as such.

Finally, according to Boulenger (7), the *S. tichenoides* and *mexicanus* of Baird are synonymous, the Paris axolotl is identical with the same species, and the perfect form into which it changed is identical with *A. tigrinum mexicanum*, and *mavortium* of Cope, *obscurum* of Baird, while the form named *Siredon gracilis* by Baird is probably the larva of *Amblystoma tenebrosum*. Boulenger adopts the name *A. tigrinum* of the synonyms given above, and gives as the distribution United States and Mexico; the specific diagnosis is—series of palatine teeth extending to external fissure of choanæ; plicæ of tongue radiating from behind; costal grooves twelve; head large; brown or blackish, with yellow markings.

It is therefore very probable that the Paris specimens were really Mexican axolotls, and there is no doubt that these animals do in captivity undergo metamorphosis. So far as is known, they never do so in their natural conditions. But the animals are specifically identical with *A. tigrinum*, which is found in many parts of the United States, from New Jersey to California, and normally breeds in the salamandroid condition. It is not known at present whether the larva of *A. tigrinum* ever attains sexual maturity in other regions where the species occurs besides Mexico. It is not improbable that it does so. De Filippi (8) found in a marsh on the shores of the Lago Maggiore 48 larvæ of *Triton alpestris* in the branchiate condition, which contained fully developed ova and spermatozoa, so that the occurrence of sexual maturity in the larvæ of *Amblystoma* is not unique. Prof. August Weissmann (5) has discussed at considerable length and with much thoughtfulness the true significance of the phenomena exhibited by the axolotl, and has concluded that its ancestors passed through the normal life-history of *Amblystoma*, the climate of the Mexican tableland having been at one time moist enough to permit of the existence of a terrestrial Salamandroid; that the climate has now become so dry and unfavourable to vegetation that no amphibian can live in it except in water; and that *Amblystoma* has become adapted to these conditions by ceasing to pass through its metamorphosis, and breeding entirely in the branchiate condition. Thus the metamorphosis which takes place occasionally in captivity is a case of what has been called since Darwin's epoch atavism; its peculiarity consists in the fact that the evolution of the animal has resulted in the arrest of development at a larval stage, and the occasional reversion is the continuation of the development to the higher condition of the ancestor. Atavism is the occasional resemblance of one individual to some remote ancestors instead of to its immediate parents. Another possible way of explaining the axolotl is to suppose that it has remained in the perennibranchiate condition while other members of the same species elsewhere have developed into the salamandroid condition. This explanation cannot be the true one. It would necessitate the belief that a metamorphosis lasting a few days or weeks, and induced often by the gradual removal of the animal from water into air, could produce the same specific characters as a gradual development which has occupied a great number of generations. The axolotl is an example of one of the most curious and interesting modes by which animals may be adapted to their conditions, and two species formed out of one. At present the disappearance of the metamorphosis from the life-history of the axolotl has taken place so recently that not even specific differences exist, according to some observers, between the metamorphosed axolotl and the natural *Amblystoma tigrinum*. At some future time slight differences are almost sure to occur, and then there will be two species or the tendency to metamorphosis in the axolotl will be lost. In the latter case some slight differences will probably be developed between the axolotl and the branchiate larva of *A. tigrinum* in other parts of America; and then the axolotl and *A. tigrinum* will be two species. Finally, it may be pointed out that it is possible that the axolotl could have reached its present locality and conditions without any change in the climate of Mexico. The lakes in the arid district might somehow occasionally be visited by breeding *A. tigrinum*, and of the larvæ so produced in them some might become sexually mature before metamorphosing, and so give rise to the present axolotls.

There is some reason to believe, according to the American zoologist Prof. Cope, that the perennibranchiate *Menobranchius lateralis*, Tschudi, of the Mississippi, which when full grown is over a foot in length, and has four branchial apertures, stands in the same relation to the genus *Batrachoseps*, Bonap., as *Siredon* to *Amblystoma*.

Literature.—(1) A. Duméril, *Comptes Rendus*, vol. ix., 1845, p. 765; (2) A. Duméril, *Nouv. Arch. Mus.*, ii., 1866; (3) A. Duméril, *Comptes Rendus*, vol. lxi.

p. 775; (4) M. Blanchard, *ibid.*, vol. lxxxii., 1876, p. 716; (5) A. Weissmann, *Zeitschr. f. Wiss. Zool.*, xxv., p. 297; (6) M. von Chauvin, *ibid.*, xxvii., p. 522; (7) G. A. Boulenger, *Brit. Mus. Cat.—Batrachia gradientia*, etc., 1882; (8) De Filippi, *Archivio per la Zoologia*, 1861; (9) De Saussure, *Verhandl. d. Schweiz. naturforsch. Gesellsch. Einsiedeln*, 1868; (10) E. D. Cope, "Metamorphosis of Axolotl," *Amer. Journal*, 1871; (11) O. C. Marsh, *Amer. Jour.*, [2], xiv., p. 364; (12) Tegetmeier, *Proc. Zool. Soc.*, 1870. (J. T. C.)

SIREN. *Siren lacertina*, Lin. (*Syst. Nat.*, i., Addenda), is an animal belonging to the class AMPHIBIA (*q.v.*). It forms the type of the family *Sirenidae*, called by Prof. Huxley *Trachystomata*, among the group *Perennibranchiata*. The body is elongate and eel-like, only the anterior limbs being present; the posterior are entirely wanting. The anterior limbs are short and feeble, and each is furnished with four digits pointed at the ends. The head is small; the snout is short and broad, and the nostrils are placed at its extreme end. The tongue is free anteriorly. The jaws are destitute of teeth and covered with a horny sheath like a beak. There are numerous teeth on the vomer, arranged in two large patches converging anteriorly. The eyes are very small. On each side of the neck are three branched external gills attached to the first, second, and third branchial arches; and below the gills are three reduced branchial apertures. The tail is shorter than the body, much compressed, and provided with a median membranous fin; the tail terminates in a point. The skin is smooth, and black in colour, sometimes sprinkled with white dots. *Siren* grows to a large size, some specimens measuring 3 feet in length; the largest example in the British Museum is 670 mm. or about 2 feet 3 inches. The animal inhabits the stagnant waters of marshes in South Carolina and Texas.

The only other member of the family *Sirenidae* is *Pseudobranchius striatus* (Gray, *Brit. Mus. Cat.—Batrachia*, 1st ed.). This animal resembles *Siren* in most respects, but has only a single branchial aperture on each side, and only three digits to the anterior limb. Its colour is dark-brown with a broad yellow band on each side and a narrower one inferiorly. It occurs in Georgia, but seems to be very rare; there are two specimens in the Paris Musée, none in the British Museum.

Figures of *Siren lacertina* are to be found in the following works:—Cuvier in Humboldt's *Obs. Zool.*, i. pl. 11; Daudin, *Reptiles*, viii. pl. 49; Holbr., *N. Amer. Herp.*, pl. 34. *Pseudobranchius striatus* is figured in Duméril and Bibron, *Erdpeltologie Générale*, pl. 96; Holbr., *loc. cit.*, pl. 36; Leconte, *Ann. Lyc. N. Y.*, 1824, pl. 4 (under name *Siren striata*).

SIREN, or SYREN. See ACOUSTICS, vol. i. p. 109.

SIRENS, fabulous creatures of Greek mythology, that, like the Loreley of German legend, lured mariners to destruction by their sweet song. In the *Odyssey* Ulysses sails past their island; but, warned by Circe, he had stopped the ears of his crew with wax and caused himself to be bound to the mast. In Homer they are two in number, but in later writers they are generally three, and are located on the coast of Italy, near Sorrento and Capri, or on the Straits of Messina. The tomb of one of them, Parthenope by name, was shown at Naples in Strabo's time. A sanctuary of the Sirens stood on a headland near Sorrento. According to Eratosthenes the Sirens were a three-headed rock separating the Bay of Naples from the Gulf of Salerno; but Strabo says they were three rocky islands on the southern side of the cape. The cape itself (now Cape Campanella) was sometimes called the Cape of the Sirens. When the Argonauts drey near the isle of the Sirens, Orpheus struck up and drowned their song. According to Hyginus the Sirens were daughters of the river Achelous and the muse Melpomene, and because they had not rescued Proserpine from Pluto they were turned by Ceres into winged creatures, who were to live only so long as no one passed by them as they sang. So, when Ulysses had eluded them, they flung themselves into the sea. According to another story, they were

instigated by Hera to vie with the Muses in singing; the Muses were victorious, and plucked the feathers from the Sirens and made crowns for themselves out of them. In art they are usually represented with the bodies of women and the legs of birds, with or without wings. More rarely they appear as birds with only the heads of women. They seem to have had a funeral significance, and were often represented on tombs. For representations of them see J. E. Harrison, *Myths of the Odyssey*.

SIRICIUS, pope from December 384 till November 398, was the successor of Damasus and was himself succeeded by Anastasius I. See **POPEDOM**, vol. xix. p. 491.

SIRMUR, one of the sub-Himalayan or Simla hill states under the government of the Punjab, lying between 30° 24' and 31° N. lat. and between 77° 5' and 77° 50' E. long. Its area is 1096 square miles, and it is bounded on the N. by the hill states of Balsan and Jubal, on the E. by the British district of Dehra Dun, from which it is separated by the rivers Tons and Jumna, on the S.W. by Ambala district, and on the N.W. by the states of Patiala and Keunthál. Except a very small tract about Nahan, the chief town and residence of the raja, on the south-western extremity, where a few streams rise and flow south-westward to the Saraswati and Ghaggar rivers, the whole of Sirmur lies in the basin of the Jumna, which receives from this tract the Giri and its feeders the Jalál and the Palúr. The Tons, the great western arm of the stream called lower down the Jumna, flows along the eastern boundary of Sirmur, and on the right side receives from it the two small streams Minus and Nairai. The surface generally declines in elevation from north to south; the chief elevations on the northern frontier (Chor peak and station) are about 12,000 feet above the sea. The valley of the Khiánda Dún, which forms the southern part of the state, is bounded on the S. by the Siwalik range, the hills of which are of recent formation and abound in fossil remains of large vertebrate animals. Though the rocks of Sirmur consist of formations usually metalliferous, the yield of mineral wealth is at present but small. The forests are very dense, so much so that the sportsman finds difficulty in making his way through them in search of wild elephants, tigers, leopards, bears, and hyænas, with which they abound. The climate of Sirmur varies with the elevation; the northern extremity has very little rain; but large and excellent crops are everywhere to be obtained by irrigation.

The population in 1881 was 112,371 (males 63,305, females 49,066), the great majority being Hindus. The only town of any importance is Nahan, with a population of 5253. The principal products of the state are opium, tobacco, and cereals, and its gross revenue is estimated at £21,000. Sirmur, which means "a crowned head," was the place of residence of the rajas who ruled over the state before the present dynasty entered the country. The reigning raja (Shamsher Prakash, K.C.S.I.) holds his possessions by a grant made on the expulsion of the Gurkhas by the British in 1815.

SIROHI, or **SEEROEE**, a native state in the Rajputána agency under the Government of India, with an area of 3020 square miles, lying between 24° 20' and 25° 20' N. lat. and between 72° 10' and 73° 10' E. long., and bounded on the W. and N. by Márwar or Jodhpur, on the E. by Mewár or Udáipur, on the S. by Pálanpur and the Mahi Kántha states of Edar and Dánta. The country is much broken up by hills and rocky ranges; the Aravalli range divides it into two portions, running from north-east to south-west. The south and south-east part of the territory is very mountainous and rugged, containing the lofty Mount Abu, an isolated mass of granite rock, culminating in a cluster of hills, enclosing several valleys surrounded by rocky ridges, like great hollows. The highest peak rises to 6553 feet above sea-level, and is one of the great trigonometrical stations. On both sides of the Aravallis

the country is intersected with numerous water channels, which run with considerable force and volume during the height of the rainy season, but are dry for the greater part of the year. The only river of any importance is the Western Banás. A large portion of the state is covered with dense jungle, in which wild animals, including the tiger, bear, and leopard, abound. Many splendid ruins bear witness to the former prosperity and civilization of the state. The climate is on the whole dry; in the south and east there is usually a fair amount of rain. On Abu the average annual rainfall is about 64 inches, whereas in Erinpura, less than 50 miles to the north, the average fall is only between 12 and 13 inches. The Western Rajputána Railway runs through the length of the state, passing just east of Mount Abu.

In 1881 the population numbered 142,903 (males 70,132, females 66,771), of whom 123,633 were Hindus, 2935 were Mohammedans, and 16,137 were Jains. The town of Siróhi, the capital of the state, is situated at the western base of the range of hills north of Mount Abu, and its population (1881) numbered 5699. Wheat and barley are the staple crops; pulses and cotton are also grown. The present ruling family of Siróhi are Deora Rajputs, a branch of the great Chauhán clan, and are said to be immediately descended from Deo Raj, a descendant of Pirthvi Raj, the Chauhán king of Delhi. During the early years of the present century Siróhi suffered much from wars with Jodhpur and the wild Miná hill tribes. The protection of the British was sought in 1817; the pretensions of Jodhpur to suzerainty over Siróhi were disallowed, and in 1823 a treaty was concluded with the British Government. For services rendered during the mutiny of 1857 the reigning "rao" received a remission of half his tribute.

SIRSA, a British district in the lieutenant-governorship of the Punjab, lying between 29° 13' and 30° 40' N. lat. and between 73° 57' and 75° 23' E. long. It has an area of 3008 square miles, and is bounded on the N. by Ferozepur district and the native state of Patiala, on the W. by the river Sutlej, on the S.W. by the native states of Baháwalpur and Bikaner, and on the E. by Hissar district. Lying as it does between the barren deserts of Bikaner and the comparatively fertile though sandy plains of the Cis-Sutlej states, Sirsa district in soil as well as position forms an intermediate link between the two. It forms for the most part a bare and treeless plateau stretching from the valley of the little river Ghaggar on the east to the main stream of the Sutlej on its western border. In the immediate neighbourhood of the Sutlej, however, is a fertile alluvial tract (*khádar*), intersected by numerous branches of the river, and flooded by their outflow during the rainy season. Eastward of the *khádar* lies the sandy central tableland, which is chiefly employed for purposes of pasturage. East of this plateau is the valley of the Ghaggar, a formidable torrent in the rainy months, but so entirely dependent on the rainfall of the lower Himalayas that it is usually dry from October to July. The Ghaggar expands into three jhils or marshy lakes, the largest of which is 5 miles in length by 2 in breadth. South of the Ghaggar spreads a sandy tract beyond the reach of its fertilizing influence, and of small agricultural value. Formerly the district was covered by an excellent grazing grass, known as *dháman*, but with the increase of cultivation it is fast disappearing. The climate of Sirsa is extremely dry, the average annual rainfall reaching only 15 inches. The Rewari-Ferozepore Railway passes through the district from south to north.

The population of the district, according to the census of 1881, was 253,275 (males 138,691, females 114,584), of whom 130,582 were Hindus, 93,289 Mohammedans, and 28,303 Sikhs. The only town with a population exceeding 10,000 is Sirsa, the administrative headquarters of the district, with 12,292 inhabitants. The modern town of Sirsa was founded in 1837, and the ruins of old Sirsa lie near its south-west corner. It is a considerable entrepôt for the trade of the wheat-growing countries to the north and east with Bikaner and Márwar. At the opening of the present century nearly the whole of Sirsa district was a barren almost uncultivated waste. Gradually, however, with more peaceful times

cultivation has again extended. Of the total area 1353 square miles are now cultivated and 1548 square miles are cultivable. The staple product is bajra, which in 1882-83 occupied 546,905 acres; the other principal crops are joar, barley, and wheat. The district has little trade except in agricultural produce, which goes chiefly to Bikaner; and the only manufacture of any importance is that of *sajji*, an impure carbonate of soda, used in washing and dyeing cloth. Sirsa was officially included in the territory conquered from the Mahrattas in 1803, when it was almost entirely uninhabited. It required reconquering from the Bhattis in 1818; but it did not come under British administration until 1837. During the mutiny of 1857 Sirsa was for a time wholly lost to British rule. On the restoration of order the district was administered by Punjab officials, and in the following year, with the remainder of the Delhi territory, it was formally annexed to that province.

SISKIN (Dan. *Sidsken*; Germ. *Zeisig* and *Zeising*), long known in England as a cage-bird, since, in 1544, Turner mentioned it in that character under this name,¹ and said that he had only once met with it at large—the *Fringilla spinus* of Linnæus, and *Carduelis* or *Chrysomitris spinus* of modern writers. In some of its structural characters it is most nearly allied to the **GOLDFINCH** (vol. x. p. 758), and both are often placed in the same genus by systematists; but in its style of coloration, and still more in its habits, it resembles the **Redpolls** (cf. **LINNET**, vol. xiv. p. 675), though without their slender figure, being indeed rather short and stout of build. Yet it hardly yields to them in activity or in the grace of its actions, as it seeks its food from the catkins of the alder or birch, regardless of the attitude it assumes while so doing. Of an olive-green above, deeply tinted in some parts with black and in others lightened by yellow, and beneath of a yellowish-white again marked with black, the male of this species has at least a becoming if not a brilliant garb, and possesses a song that is not unmelodious, though the resemblance of some of its notes to the running-down of a piece of clockwork is more remarkable than pleasing. The hen is still more soberly attired; but it is perhaps the Siskin's disposition to familiarity that makes it so favourite a captive, and, though as a cage-bird it is not ordinarily long-lived, it readily adapts itself to the loss of liberty. Moreover, if anything like the needful accommodation be afforded, it will build a nest and therein lay its eggs, but it rarely succeeds in bringing up its young in confinement. As a wild bird it breeds constantly, though locally, throughout the greater part of Scotland, and has frequently done so in England, but more rarely in Ireland. The greater portion, however, of the numerous bands which visit the British Islands in autumn and winter doubtless come from the Continent—perhaps even from far to the eastward, since its range stretches across Asia to Japan, in which country it is as favourite a cage-bird as with us. The nest of the Siskin is very like that of the Goldfinch, but seldom so neatly built; the eggs, except in their smaller size, much resemble those of the **GREENFINCH** (vol. xi. p. 165).

A larger and more brightly coloured species, *C. spinoides*, inhabits the Himalayas, but the Siskin has many other relatives belonging to the New World, and in them serious modifications of structure, especially in the form of the bill, occur. Some of these relatives lead almost insensibly to the **GREENFINCH** (*ut supra*) and its allies, others to the **GOLDFINCH** (*ut supra*), the **Redpolls**, and so on. Thus the Siskin perhaps may be regarded as one of the less modified descendants of a stock whence such forms as those just mentioned have sprung. Its striated plumage also favours this view, as an evidence of permanent immaturity or generalization of form, since striped feathers are so often the earliest clothing of many of these birds, which only get rid of them at their first moult. On this theory the Yellowbird or North-American "Goldfinch," *C. tristis*, would seem, with its immediate allies, to rank among the highest forms of the group, and the Pine-Goldfinch, *C. pinus*, of the same country, to be one of the lowest,—the cock of the former being generally of a bright jonquil hue, with black crown, tail, and wings—the last conspicuously barred with white, while

¹ It is also called by bird-fanciers "Abadavine" or "Aberdavine"—names of which the etymology is wholly unknown.

neither hens nor young exhibit any striations. On the other hand, neither sex of the latter at any age puts off its striped garb—the mark, it may be pretty safely asserted, of an inferior stage of development. The remaining species of the group, mostly South-American, do not seem here to need particular notice. (A. N.)

SISMONDI, JEAN CHARLES LEONARD DE (1773-1842), whose real name was SIMONDE, was born at Geneva on May 9, 1773. His father and all his ancestors seem to have borne the name Simonde, at least from the time when they migrated from Dauphiné to Switzerland at the revocation of the edict of Nantes. It was not till after Sismondi had become an author that, observing the identity of his family arms with those of the once flourishing Italian house of the Sismondi, and finding that some members of that house had migrated to France, he assumed the connexion without further proof and called himself De Sismondi. The Simondes, however, were themselves citizens of Geneva of the upper class, and possessed both rank and property, though the father was also a village pastor. The future historian was well educated, but his family wished him to devote himself to commerce rather than literature, and he became a banker's clerk at Lyons. Then the Revolution broke out, and as it affected Geneva the Simonde family took refuge in England, where they stayed for eighteen months. Disliking, it is said, the climate, they returned to Geneva, but found the state of affairs still unfavourable; there is even a legend that the head of the family was reduced to sell milk himself in the town. The greater part of the family property was sold, and with the proceeds they emigrated to Italy, bought a small farm at Pescia near Lucca, and set to work to cultivate it themselves. Sismondi worked hard here, both with his hands and his mind, and his experiences gave him the material of his first book, *Tableau de l'Agriculture Toscane*, which, after returning to Geneva, he published there in 1801. Two years later he published his *Traité de la Richesse Commerciale*, his first work on the subject of political economy, which, with some differences of view, continued to interest him to the end of his life (for his position and work in this respect the reader is referred to the article **POLITICAL ECONOMY**, vol. xix. p. 383). Meanwhile he began his great *History of the Italian Republics*, and was introduced to Madame de Stael. With her he became very intimate, and after being regularly enrolled in the society of Coppet he was invited or commanded (for Madame de Stael's invitations had something of the command) to form one of the suite with which the future Corinne made the journey into Italy, resulting in *Corinne* itself during the years 1804-5. Sismondi was not altogether at his ease here, and he particularly disliked Schlegel, who was also of the company. But during this journey he made the acquaintance of the countess of Albany, Louisa of Stolberg, widow of Charles Edward, and all her life long gifted with a singular faculty of attracting the affection (Platonic and other) of men of letters. She was now an old woman, and Sismondi's relations with her were of the strictly friendly character, but they were close and lasted long, and they produced much valuable and interesting correspondence. In 1807 appeared the first volumes of the above mentioned book on the Italian republics, which (though his essay in political economy had brought him some reputation and the offer of a Russian professorship) first made Sismondi prominent among European men of letters. The completion of this book, which extended to sixteen volumes, occupied him, though by no means entirely, for the next eleven years. He lived at first at Geneva, and delivered there some interesting lectures on the literature of the south of Europe, which were continued from time to time and finally published; and he held an official post,—that of secretary of the chamber of commerce for the then