SOME NEW ARRIVALS AT THE LONDON ZOO.

We publish on our title page some cuts of a selection of interesting animals recently added to the London Zoological Gardens. Two of the specimens belong to the highest among the natural orders, the primates. The one is a black-cheeked monkey, from West Africa. The other, the Indian macaque, presents some interesting peculiarities. This ape belongs to the sub-family of the *Cynopithecinae*, which are characterized among other things by the absence of the vermiform appendix, which in man is often a source of severe trouble. The Indian macaque is very light colored, almost white in great part. It is interesting to note that the few existing European ape species are closely allied to the macaque.

Five of the other specimens shown in our illustration belong to the order of reptiles. Two are snakes—the Robben Island snake hails from South Africa, while the other is a bull-snake from Mexico.

In the center of the page is depicted a Tigrine frog, native of North America. This is a very large representative of the order of Anura, to which the common frog and toad also belong. A full-grown individual will measure as much as eight inches from end to end, and his mouth is sufficiently large and strong to make him a formidable enemy to water-rats and young birds.

The remaining three specimens are lacertilia. There is a Gould's monitor from Australia, a fringed gecko from Madagascar, and a land iguana from the Galapagos Islands.

The geckoes are small lizard-like animals, lacking, however, that liteness and grace which is characteristic of the common lizard. Their movements are slow and awkward, the legs are short, and the body trails somewhat on the ground. The head is broad and flat and the eyes very large. In the countries where they occur an unfounded prejudice is commonly entertained against these animals, which are not only harmless, but quite on the contrary are extremely useful, as they destroy insects and worms, on which they feed. Some species of geckoes possess in a limited degree the power of changing their color in chameleon fashion.

The iguanas form a large family of lizards, which with one exception are found in the New World only, being specially characteristic of the neotropical regions, where they occur as far south as Patagonia, while extending as far north as California and British Columbia. The typical forms are distinguished by a large pouch under the head and neck and by a crest composed of slender, elongated scales and extending in gradually diminishing height from the nape of the neck to the tip of the tail.

These characteristics are more or less clearly shown in the land iguana from the Galapagos Islands, shown in our illustration. He is, however, distinguished from most other iguanas in that he lives in burrows which he makes in the ground.—Our pictures are taken from the Illustrated London News.

SPONGES—WHERE THEY LIVE, HOW OBTAINED AND THEIR USES.*

By ALBERT HART.

SPONGE belongs to the animal kingdom, and the principal ones used commercially are obtained on the coasts of Florida and the West Indies; the higher grades are from the Mediterranean Sea, and are numerous in variety.

A sponge in its natural state is a different looking object from what we see in commerce, resembling somewhat the appearance of the jelly-fish, or mass of liver, the entire surface being covered with a thin, slimy skin, usually of a dark color, and perforated to correspond with the apertures of the canals commonly called "holes of the sponge." The sponge of commerce is in reality only the skeleton of a sponge. The composition of this skeleton varies in the different kinds of sponges, but in the commercial grades it consists of interwoven horny fibers, among and supporting which are spicules of silicious matter in greater or less numbers, and having a variety of forms. The fibers consist of a network of fibrils, whose softness and elasticity determine the commercial quality of a given sponge. The horny framework is perforated externally by very minute pores, and by a less number of larger openings. These are parts of an interesting double canal system, an external and an internal, or a centripetal and a centrifugal. At the smaller openings on the sponge's surface channels begin, which lead into dilated spaces. In these, in turn, channels arise, which eventually terminate in the large openings. Through these channels or canals definite currents are constantly maintained, which are essential to the existence of the sponge. The currents enter through the small apertures and emerge through the large ones.

The active part of the sponge, that is, the part concerned in nutrition and growth, is a soft, fleshy mass, partly filling the meshes and lining the canals. It consists largely of cells having different functions; some utilized in the formation of the framework, some in digestion, and others in reproduction. Lining the dilated spaces into which different canals lead are cells surmounted by whip-like processes. The motion of these processes produces and maintains the water currents, which carry the minute food-products to the digestive cells in the same cavities. Sponges multiply by the union of sexual product. Certain cells of the fleshy pulp assume the character of ova, and others that of spermatozoa. Fertilization takes place within the sponge. The fertilized eggs, which are called larvæ, pass out into the currents of the water, and, in the course of twenty-four to forty-eight hours, they settle and become attached to rocks and other hard substances, and in time develop into mature sponges. The depth of the water in which sponge grows varies from 10 to 50 feet in Florida, but considerably more in the Mediterranean Sea, the finer grades being found in the deepest water, having a temperature of 50 deg. to 57 deg.

The method of obtaining sponges in the Mediterranean is by means of divers with apparatus, though this was prohibited by the Turkish government many years ago, but not adhered to, owing to the lack of sup-

port by the Greek government, and to excessive fishing, thus deteriorating the sponge beds, which require about three years to properly develop. As a consequence, these goods have become scarce, and greatly enhanced in value. A diver usually stays below the water a half to one minute, gathering what he can in the meantime, though, with apparatus, he can remain below the surface a considerable time. His work is very hard, owing to the pressure of the water. He is trained to his work when very young, and seldom lives more than thirty years. In the Florida and West India waters, the fishing is done in flat-bottom boats, called dingies. A tin or wooden pail with a glass bottom is used to help locate the sponges, by lowering it into the water, and looking down through it. When located, they are brought up by means of a long pole, about thirty feet long, with a sharp-curved, double hook, by which means they are detached and brought to the surface. After obtaining a boatload it is laid out to decompose, a process better observed from a distance, owing to the obnoxious odor. They are laid out in kraals on the beach, and so washed by the sea. After the cleaning process, they are taken to the market, and sold to the dealers, who are experts, the highest bidder becoming the purchaser. They are then sorted and packed into bales, according to size and quality. Of commercial sponges, there are many different varieties, namely: sheepswool, velvet, yellow, grass, glove, reef, hardhead, and wire, emanating from Florida and the West Indies, each variety having several different grades, the Mediterranean giving us honeycomb sponges, commonly called "Turkish bath," "Turkey sponges" (i. e., silk surgeon sponges), leather sponges (i. e., elephant ears or washrag sponges), there being also several different grades of each variety. Sheepswool are named Rock Islands; Key, Matcomby (obtained from Florida); Abaco, Cuba; and Nassau from the West Indies, their names being given in order as to quality, the most valuable being Rock Islands, which are of a strong fiber and best form, being most valuable for carriage washing and heavy work. This grade also makes fine bath sponges, either bleached with permanganate of potash, muriatic acid and oxalic acid, which makes them a white color, and then washed in a bath of sal soda or lime water, thus neutralizing the acid and changing the color yellow or lemon. This method, however, greatly weakens the fiber of the sponge, thus ruining it as regards durability. A better method, though not so pleasing to the eye, is to wash the natural sponge in a weak solution of oil of vitriol, say one part of acid to twenty of water, allowing them to remain in until the dark color is taken out of the sponge, then thoroughly washing in water. This process does not injure the sponge, and makes it look cleaner.

Key sheepswool is a good form, soft and close fiber, lacking strength, owing to the iron in the sponge, which is signified by a bright-red color at the root, and running entirely through the structure of the sponge. It is extensively bleached and looks nice, but wears badly, owing to the excessive use of acids necessary to abstract the iron from the sponge.

Abaco sheepswool somewhat resembles the Rock Island though lacking its strength.

The Cuba sheepswool resembles the Key variety, being lighter in color.

The Nassau is the coarsest grade and is irregular as regards the horny fibers, firmness and shape.

The velvet sponges, of which there are several varieties, i. e., Abaco, Cuba and Cay from the West Indies, also a hard variety from Florida, are much used as cheap carriage sponges, and for general purposes, being moderate in price. The Abaco and Cuba velvet are the best, and much resemble sheepswool. A large hole at the top of this sponge spoils its utility. The Cay variety is the one largely used, being more abundant. The Florida velvet is coarse and hard, and is not generally liked, except for certain manufacturing purposes. Owing to a hole in the top of this grade of sponge, many people prefer the cut sponges, i. e., the large sponges cut up and trimmed, thus obtaining a nice solid sponge minus the holes. The yellow sponge has also several varieties—Nassau, from the West Indies; Key and Matcomby, Florida, which are a good shape, but rather brittle, and are used chiefly among the painters, bricklayers, and for household purposes. The best of these are the Matcomby and Key. There is also a species of yellow sponge called "hard head," and this is what its name implies—a "hard" sponge. One variety, however, from Cuba, has a fine texture, and is soft, though somewhat brittle.

The grass sponge is of a very poor species, and very low in price. It is chiefly used for manufacturing purposes by painters, stone-masons, bricklayers, etc. The best quality and nicest shapes are bleached and sold on the market for a cheap bath sponge, and are as good in appearance as the higher grades, but give no satisfaction in wear.

The reef sponges are fine in texture, but lack strength, are extensively bleached for toilet purposes, and used by manufacturers and engravers.

Sponges from the Mediterranean Sea are superior in quality to either the Florida or West Indies. The horny fibers being far less pronounced, they do not develop to the same thickness. They are finer in texture, and more pliable, and grow in deeper water, having a surface temperature of 50 deg. to 57 deg. in winter, which is clearer and more free from impurities, and the more difficult to obtain. The various grades are called white Turkey, i. e., silk surgeon sponges; brown Turkish, i. e., Zinocha, being similar to the silk sponge, only coarser and darker in color; leather sponges, i. e., wash-rag or elephant's ears and honeycomb sponges; all of which have several different varieties. The best varieties are Mandruka Turkey cups, deriving their name from their formation, similar to a cup; Turkey solids, which are the same variety, only solid, as the name implies. The leather sponges are thin, flat, and fine in texture, used chiefly for manufacturing purposes, and used considerably in Europe by veterinary surgeons. Brown Turkey, i. e., Zinocha sponges, are similar in texture to a silk sponge, but brittle. It is chiefly used in Europe for a horse sponge, and also for manufacturing purposes. Honeycomb sponges are various in quality, these being known as Mandruka, and found in deep water, are perfect forms, and have a close fiber and no horny fibers protruding from the surface, and are

characteristic for their small root. This latter fact should be borne in mind in selling sponges. Many people object to large holes in the sponge, whereas, the root is the chief factor in determining its strength. The "catch" of this grade is diminishing yearly, thereby enhancing their value, consequently only a few dealers import them, the largest supply coming to Philadelphia.

Next in quality comes the Bengaza, a sponge similar to the Mandruka, though somewhat coarser, but a nice shape and strong, and is usually sold as a "Mandruka." This sponge grows in deep water. The cheaper varieties of honeycomb, i. e., Turkish bath, are found in shallow water, and are numerous in variety, quality varying according to depth at which they are found. They are chiefly bleached, only the finest selected being used in their natural color.

The question of propagating sponges has been discussed both as regards Florida and Mediterranean sponges, and the idea is believed to be feasible. The method is as follows: Sponges cut into small pieces will live and grow, if properly attached in suitable water (clear and free from impurities). They can be cut on a moistened board with a knife or a fine saw. Care must be taken not to express the soft matter. The preferred size of the cuttings is about one inch broad and similar in height. The outer skin should be retained as far as practicable. In cutting, the lines of the circulating canals should probably be considered, although pieces cut without any reference to the direction of the canals have lived and grown. Exposure is not injurious, unless exposed too long or in very warm weather. The clippings must then be made fast, care must be taken to use material that is not injurious to the sponge, and will not distort its growth. They must be fastened on the bottom in an upright position that can be maintained, and not smothered by mud, sand or sediment. The use of bamboo pegs seems to have given much satisfaction and good results attained in as short a time as a year.

Owing to the great advance in the cost of sponges during the last few years, due to the scarcity and the results of overfishing and increased demand, of which the European market has been a factor, the packers in Florida have resorted to loading sponges to keep down the price, so as to appear to continue asking the former prices, whereas in reality, the cost is 20 to 35 per cent higher. There are several methods of accomplishing this, such as injecting into the sponge sand and marble dust; also by washing the sponges in a salt solution and by injecting glucose and heavy syrups. In fact, so heavy do they endeavor to load them, that it is a wonder that the government did not contract for loaded sponges for their cannon in its late war with Spain. Dealers now offering pure sponges free from sand and foreign matter are practically ridiculed by retailers, when quoting \$1 and \$1.50 per pound higher than their competitors offering loaded sponges, though they are offering the better and cheaper article, and not likely to scratch or spoil a highly polished article. To compare the difference between a pure and loaded sponge, take a 2 ounce sponge of each grade, wetting them both up, and it will be found that the pure article will measure about nineteen inches in circumference, or thereabout. The loaded article in comparison will only measure about sixteen inches in circumference and less. Of course, this will largely depend upon the amount of foreign matter contained therein, the average herein given being taken from a bale of each kind and measured. Take a sponge of equal weight, say 2 ounces, costing \$4 a pound and pure, and a loaded sponge at \$3 per pound, and it will be seen that by washing them out, you are getting a larger sponge in the 2 ounce pure than in the 2 ounce loaded, and therefore the cost is practically equal, despite the fact of there being \$1 in difference per pound in the price. A bale of pure sponges averaging eight to the pound at \$4 a pound will be as large if not larger than a loaded bale about six to the pound, at \$3 per pound. The cost of both of these, per sponge, is 50 cents. The purchasing of loaded sponges should, therefore, be avoided, it being illustrated that as good value, if not better, can be obtained by paying the higher price.

Many dealers are now offering sheepswool by the piece, a stated number of sponges being packed in a bale, and this method is commended, saving the retailer the trouble of figuring the individual cost of each sponge, and sometimes unconsciously losing their profits by not taking into consideration the difference of gross weight at which the sponges are usually purchased, and the net weight, and even a possible loss from the sponge drying out. In this connection we would say that sponges in bales absorb the humidity in the summer time, and are usually more or less damp, whereas, in the winter time, they lose in weight, owing to the dryness of the air.

SOME PECULIAR ANIMAL PRODUCTS.*

By R. LYDEKKER.

OF animal wax other than spermaceti (the product of the sperm-whale and certain other allied species) the great producer is the familiar honey-bee, an insect which has been kept in a state of semi-domestication from time immemorial, and is now spread over the greater part of the habitable globe, existing in certain countries in the wild condition. Its original home is, however, quite unknown; and it is doubtful if any of the wild bees of this species are the descendants of primitively wild ancestors. In southern Europe, as well as in China and Africa, varieties of the honey-bee are met with characterized by the presence of well-marked transverse bands on the body.

As is well known, the wax is secreted by the neuters, or workers, from between the segments of the abdomen. When secreting—a process which occupies about twenty-four hours—the workers cling to one another so as to form long festoon-like masses; the wax exuding as thin plates from between the abdominal segments. These plates are detached by the bees, and conveyed in fragments to the mouth, where they are masticated, and from which they finally issue in the form of a narrow white ribbon. To describe the man-

* American Journal of Pharmacy.

* Knowledge.

ner in which the hexagonal-celled combs are built up from the wax thus formed, would be superfluous in the present article. Neither is it necessary to describe the collecting and melting down of the combs to form commercial wax. Nearly related to the honey-bee are certain smaller species inhabiting the warmer parts of South America, and referred to distinct genera, under the names of *Melipona*, *Trigona*, etc. These likewise build cells with wax, but whether in sufficient quantities to be of any commercial importance, we have not been able to ascertain.

The Chinese obtain a large quantity of excellent wax from an insect they term *pela*, which is a member of the order Rhynchota, and is technically known as *Ceroplastes sinensis*. This insect lives on trees, and is artificially propagated; its wax being employed for the manufacture of the candles used in the Buddhist temples of China and Japan, as well as for medical purposes. An allied species of wax-insect (*Ceroplastes ceriferus*) is found in Ranchi and other districts of India, clinging to the branches of certain kinds of trees, more especially the arjuse, a species of *Terminalia*. As is the case with the Chinese insect, it is the female alone which produces the secretion; this in the present case taking the form of small masses of pure white wax. The late Prof. V. Ball writes as follows concerning this species: "The Indian wax-insect has never, I believe, been propagated, nor has the wild product ever been collected in quantity. It seems to be—although undoubtedly of value—a substance which would scarcely repay an expenditure of European time and capital; but were the natives to take up its cultivation they might very possibly make it a profitable undertaking."

Of very considerable commercial importance is the resinous substance known as lac, since it forms the foundation of most varnishes, and is also employed in the manufacture of sealing-wax, etc. It is the product of the lac-insect (*Carteria lacca*), an inhabitant of India and other Oriental countries, and a near relation of the cochineal-insect, as well as a distant cousin of the plant-lice, or aphides. This insect gives rise to a resinous exudation from the bark of the trees it frequents, which, while still adhering to the twigs, is termed stick-lac. When pounded and freed from coloring matter, this substance forms the seed-lac and shell-lac of commerce; while the liberated coloring matter constitutes lac-dye. As neither the resinous matter nor the dye is obtained from the body of the insect, they are not, properly speaking, animal products. Nevertheless, as they are caused by the presence of the insect, and are always spoken of in connection with the latter, they should be considered with such products.

Owing to sudden and large fluctuations in the price of lac in the London market, the trade is a somewhat risky one; the profits made in one year being not unfrequently swallowed up by the losses of its successor. Here it may be mentioned that the word lac, or lakh, is the Hindustani term for 100,000, and is applied to the insect on account of its numbers, while it is also in general use to denote the sum of 100,000 rupees.

The following account of the collection and manufacture of lac in the Ranchi district, India, is given by the writer just cited.* After mentioning that the lac-insect frequents the twigs of various jungle trees, and more especially three particular species, Prof. Ball proceeds as follows: "To some extent the lac is found occurring, so to speak, spontaneously, and is collected by the forest tribes, and brought by them to the fairs and bazars for sale. Where, however, there is a regular trade in stick-lac, propagation of the insect is systematically carried on by those who wish for a certain and abundant crop. This propagation is effected by tying small twigs, on which are crowded the eggs or larvæ of the insect, to the branches of the trees. These larvæ are technically called 'seed.' The larvæ shortly after sowing spread themselves over the branches, and, taking up positions, secrete round themselves a hard crust of lac, which gradually spreads till it nearly completes the circle round the twig. At the proper season the twigs are broken off, and we must suppose them to have passed through several hands, or to have been purchased directly from the collectors by the agents of the manufacturer. On arrival at the factory, they are first placed between two powerful rollers which, by a simple arrangement, admit of any degree of approximation. The lac is then crushed off, and separated from the woody portions by screening; it is next placed in large tubs half-full of water and washed by coolies, who standing in the tubs, and holding a bar with their hands, stamp and pivot about on their heels and toes until, after a succession of changes, the resulting liquor comes off clear. . . . The lac, having been dried, is placed in long cylindrical bags of cotton cloth of medium texture, which are about ten feet long and two inches in diameter. These bags when filled have somewhat the appearance of an enormous bologna sausage. They are taken to an apartment where there are a number of open charcoal furnaces, before each of which there is one principal operator with two assistants. The former grasps one end of the long sausage in his left hand, and slowly revolves it in front of the fire; at the same time one of the assistants, seated as far off as the sausage is long, twists it in the opposite direction. The roasting before the glowing charcoal soon melts the lac in the portion nearest the operator's hand, and the twisting of the cloth causes it to exude and drop into a trough placed below. The troughs which I saw in use were simply leaves of the American aloe. When a sufficient quantity in a molten condition is ready in the trough, the operator takes it up in a wooden spoon and places it on a wooden cylinder some eight or ten inches in diameter, the upper half of which is covered with sheet brass. The stand which supports this cylinder gives it a sloping direction away from the operator. The other assistant now steps forward holding a strip of the aloe between his hands, and with a rapid and dexterous draw of this, the lac is at once spread into a sheet of uniform thickness which covers the upper portion of the cylinder. The operator now cuts off the upper edge with a pair of scissors, and the sheet is then lifted up by the assistant, who waves it about a moment or two in the air, until it becomes quite crisp. It is then held up to the light, and any im-

purities, technically 'grit,' are punched out of the brittle sheet by the finger. . . . The sheets are placed in packing-cases, and when subjected to pressure break into numbers of fragments."

Previous to the discovery and extensive employment of aniline colors the substance known as lac-dye formed an important and valuable item among Oriental animal products. As already mentioned, it is obtained by washing stick-lac in the course of its conversion into shell-lac. Unlike the latter substance it appears, however, to be of exclusively animal origin, being in fact the actual body of the lac-insect, and not a separate secretion.

In the manufacture of lac-dye in India the red liquor obtained from washing stick-lac is first of all strained through some textile fabric, in order to remove all portions of woody matter and other foreign substances. "It is then," to quote once more from Prof. Ball, "poured into large vats, where it is allowed to settle; the sediment is subjected to various washings, and at last allowed to settle finally, the supernatant liquor being drawn off. The sediment, when it is of the proper consistency, is placed in presses, from which it is taken out in the form of hard, dark, purple cakes, with the manufacturer's trade-mark impressed upon them. By the addition of mordants, this dark purple substance yields the most brilliant scarlet dyes, which are not inferior, I believe, to those produced by cochineal itself."

Of greater repute and of more importance than lac-dye is cochineal, which is the source of artists' carmine and carmine-lake, while when precipitated with a salt of tin, it also yields a splendid scarlet. The cochineal insect, of which the female, like that of the nearly allied lac-insect, alone yields the dye, is originally a native of Mexico, where it is parasitic on the leaves of the prickly-pear. The males of the *Coccus cacti*, as the species is called, are minute insects furnished with well-developed wings, feathered antennæ, and a long pair of hair-like processes at the hinder extremity of the body. On the other hand, the female is a repulsive-looking wingless creature, with very short posterior hairs, and nearly double the size of her partner. These insects adhere tightly to the smooth surface of the fleshy leaves of the prickly-pear; and are not unlike small purple wood-lice in general appearance.

The following account of the cochineal-harvest is extracted from the English edition of Figuier's "Insect World." "These insects are collected when the females are about to lay, that is, when a few young are hatched. It is when the females are pregnant that they contain the greatest amount of coloring matter. When the harvest-time has arrived, the cultivators stretch out on the ground pieces of linen at the foot of the plants, and detach the cochineals from them, brushing the plants with a rather hard brush, or scraping them off with a blunt knife. If the season be favorable, the operation may be repeated three times in the course of the year in the same plantation. The insects thus collected are killed by dipping into boiling water, by being put into an oven, or by being placed on a plate of hot iron. When withdrawn from the boiling water they are placed on strainers in an airy position, first in the sun, and afterward in the shade. During their immersion they lose the white powder with which they are covered in life. In this state they are called *ronagridas* by the Mexicans. Those that have passed through the oven they term *jaspeadas*; these are ashy gray in color, but those which have been placed on the hot plate become blackened, and are hence called *negras*. In commerce three sets of cochineal are recognized; first, the *mastique*, of a reddish color, with a more or less abundant glaucous powder; secondly, the *noir*, which is large, and blackish brown in color; and, thirdly, the *syvestre*, which is smaller and of a reddish color. The last description, which is gathered from wild cacti, is the most highly esteemed of all. Each year there are imported into France 200,000 kilogrammes of cochineal insects, which represent a value of about three million francs."

The cochineal trade is chiefly in the hands of the Spanish and the French. By the latter government these insects have been successfully introduced into Algeria, where they yield a large revenue. About the middle of the last century the government were accustomed to purchase the entire harvest at the rate of fifteen francs the kilogramme. At a still earlier date they were introduced into the Canaries, where they have also become well established; but the attempts to acclimatize them in Corsica and the south of France resulted in failure.

In the early days of civilization, long before America was dreamed of, carmine was furnished by two European insects belonging to the family *Coccidae*. The first of these is *Cermes vermillio*, the kokkos of the ancient Greeks, and the kermes or alkermes of the Arabs and Persians. The females of this species are found adhering to the twigs of the kermes oak (*Quercus coccifera*), which grows in dry districts throughout most of the Mediterranean countries of Europe. On their native oaks the insects form dry brittle masses, which were (and perhaps still are) collected by the peasants in the south of France. When separated and completely dried, they are known as *graines de kermes*. In appearance they may be likened to purple currants; and when subjected to suitable treatment they yield a splendid red dye.

The second species is the Polish kermes (*Porphyrophora polonica*), which once attained great celebrity under the name of the scarlet grains of Poland. The females of this insect frequent in great numbers the roots of a plant belonging to the genus *Scleranthus*, and are common in many parts of Poland and Germany, as well as in other districts of Central Europe. Toward the end of June the bodies of the females become greatly distended with a purple fluid; and it was at this time of the year that they were formerly collected in great numbers for the dyer. Now, however, they are superseded in commerce by cochineal and lac, although it is probable that their product is still employed to a certain extent locally.

An animal dye that has completely disappeared from use is the celebrated Tyrian purple of the ancients. Whether the dye, as originally manufactured, really had the splendid tint accorded to it by tradition, is unfortunately now impossible to determine. This dye

is yielded by the common dog-winkle (*Purpura lapillus*), and may best be obtained by crushing the shell carefully and extracting the fluid from a white vein situated near the head. When first applied to linen this fluid makes a green stain, which if exposed to sunshine gradually changes to deep purple red. If the linen be washed with soap in hot water a further change to bright crimson will take place, this being permanent, without the aid of any mordant. Owing to the mixture of mucus with the pigment, linen dyed with it has always a blotched appearance; but whether the ancients had means of making the color spread uniformly is not known. A purple dye may also be obtained from the posthorn pond-snail (*Planorbis cornuus*).

The dark pigment sepia, which consists of the dried contents of the ink-bag of various cuttle-fish and squids, is on the other hand, an article of considerable value. It was formerly used as a writing fluid, and appears to have been employed in painting by the Chinese from time immemorial. Some years ago it was stated that the sepia of the water-color artist was made of lamp-black; but although that substance may be employed for cheap imitations, the genuine article is still the product of the cuttle-fish and squid. Large quantities of the dried ink-bags of these mollusks are received by artists' colormen for manufacture into sepia. And some firms regularly send their agents among the fishermen on our southern coasts for the purpose of collecting the ink-bags. These are saved by the fishermen when cutting up squids and cuttles for bait; and it has been suggested that the Newfoundland fishermen, who annually destroy a large number of these mollusks, might make a considerable revenue by saving and selling their ink-bags.

ORIGIN OF THE FINS OF FISHES.

ONE of the most interesting problems in vertebrate morphology, and one of the most important from its wide-reaching relations, is that of the derivation of the fins of fishes. This resolves itself at once into two problems, the origin of the median fins, which appear in the lancelets, at the very bottom of the fish-like series, and the origin of the paired fins or limbs, which are much more complex, and which first appear with the primitive sharks.

In the process of development the median or vertical fins are doubtless older than the paired fins or limbs, whatever be the origin of the latter. They arise in a dermal keel which is developed in a web fitting and accentuating the undulatory motion of the body. In the embryo of the fish the continuous vertical fin from the head along the back and around the tail precedes any trace of the paired fins.

In this elementary fin-fold elementary supports, the rudiments of fin-rays, tend to appear at intervals. These are called ray-hairs. They are the prototype of fin-rays in the embryo fish, and doubtless similarly preceded the latter in geological time. In the development of fishes the caudal fin becomes more and more the seat of propulsion. The fin-rays are strengthened, and their basal supports are more and more specialized.

That the vertical fins, dorsal, anal, and caudal, have their origin in the median fold of the skin admits of no very serious question. In the lowest forms which bear fins these structures are dermal folds, being supported by very feeble rays. Doubtless at first the vertical fins formed a continuous fold extending around the tail, this fold ultimately broken by atrophy into distinct dorsal, anal, and caudal fins. In the lower fishes, as in the earlier sharks, there is an approach to this condition of primitive continuity, and in the embryos of almost all fishes the same condition occurs.

The question of the origin of the paired fins is much more difficult and is still far from settled, although the majority of recent writers have favored the theory that these are parts of a once continuous lateral fold of skin corresponding to the vertical fold which forms the dorsal, anal, and caudal. In this view the lateral fold is soon atrophied in the middle, while at either end it is highly specialized, at first into an organ of direction, then into fan-shaped and later paddle-shaped organs of locomotion. Finally, from the jointed paddle, which Gegenbaur has called the archipterygium, there has developed, on the one hand, the rayed pectoral and ventral fins of ordinary fishes, and on the other, in land-creeping animals, jointed legs and arms. As to this the evidence of paleontology is conflicting.

An early shark of the Devonian, *Cladoseleache*, has fan-shaped paired fins so formed and placed. Another shark almost as old, *Pleuracanthus*, of the carboniferous, has fins which fit best a totally different theory of origin. Its jointed or archipterygial fin has no resemblance to a fold of skin, but accords better with Gegenbaur's theory that the pectoral limb was at first a modified septum or gill arch. Sharks still older than either (*Heterodontidae*) in the Silurian, so far as we can judge by their teeth, are closely related to forms bearing the more specialized type of fin found in the typical sharks of to-day. Evidently none of these three, as seen in the rocks, represents the real beginning of paired fins in the life of the past.—David Starr Jordan in Popular Science Monthly.

AMERICAN PHOTOGRAPHIC EXHIBIT AT TURIN.

AMERICAN pictorial photography won another triumph recently at the Turin Exposition in a most gratifying and unexpected way. The New York Camera Club had been invited to participate in the Turin International Decorative and Fine Arts Exposition, but had failed to take action in the matter. Two months before the exposition opened Mr. Alfred Stieglitz made some efforts to gather a number of pictures from some of his friends, and also drew on his own collection. Altogether he succeeded in preparing an exhibit of sixty photographs, the work of about thirty men. After the close of the exposition Mr. Stieglitz was awarded the special prize of his Majesty the King of Italy—a valuable piece of bronze—for the best collection in the exposition. Not content with this mark of distinction, individual exhibitors were given two gold medals, four silver medals, and eight honorable mentions.

* "Jungle Life in India," p. 308 (1880).