

Research Items.

LIONS IN EUROPE.—It is known that lions inhabited Europe in historical times; the fact is mentioned by both Herodotus and Aristotle. Herodotus (480 B.C.) even determines the area in Macedonia inhabited by lions, and recounts that during the march of Xerxes through Macedonia, lions attacked and destroyed the Persian carrying camels. Aristotle (384–322) speaks of the same area, but mentions that lions are rare there. There are no later indications of their occurrence. Some investigators (O. Keller) do not attribute much value to this ancient information, supposing the group of lions to have been brought by Persians during their previous campaigns, which had lingered for more than a hundred years in the wild mountains of Macedonia, whilst the majority holds that the Macedonian lions were the last of lions, spread throughout Europe during the Pleistocene age, which later, under the oppression of man and deteriorating conditions of life, trekked south. Whatever may have happened, the existence of lions in Europe in historical times is not affirmed by any palaeontological discoveries, and in this sense the discovery to which we are referring is unique. V. Gromova, in *Priroda* No. 10, mentions that among the rich palaeontological materials collected by the Russian Academy of History of Material Culture between the years of 1901–1927, in the district of the rich ancient Greek city Olvia in S.W. Russia, a piece of the upper jaw of a lion, together with the upper canine tooth, was found. The tooth differs greatly from the canine tooth of a tiger by its shape, and from that of the other members of the cat family by its large size. However, as there was only one such discovery, its explanation should be approached with great care. It is quite probable that the lion was brought from Asia Minor, where the existence of lions, even up to the Mediterranean, in ancient times, is confirmed by a series of literary notes and discoveries of bones. It is well known (O. Keller, "Die Antike Tierwelt," pp. 29–31) that people of distinction and their wives kept lions as domestic pets, which accompanied them during walks, campaigns, etc. Above all, lions played a prominent part in the circus fights. It is quite probable that such is the origin of the Olvian lion; moreover, the solitary tooth is of the small size, such as is found in lions kept in zoological gardens only, and probably denotes a sign of degeneration. Thus the palaeo-zoographical value of the discovery remains doubtful.

FRESH-WATER EELS OF NEW ZEALAND AND AUSTRALIA.—In the course of his work on the fresh-water eels of the genus *Anguilla* throughout the world, Prof. Johs. Schmidt has now come to those of New Zealand (*Trans. N. Z. Inst.*, vol. 58; 1927) and of Australia (*Records Aust. Museum*, vol. 16, No. 4; 1928). In both papers the author emphasises the necessity of employing numerical characters, such as the number of vertebrae and of fin rays, in the identification of species. In the case of the New Zealand eels, however, he finds that the number of vertebrae is not such a good distinctive character as in most other cases. The distance between the front of the dorsal fin and the vent ($a-d$), expressed as a percentage of the total length (t), is the most important distinguishing feature. Two valid species of *Anguilla* are thus found in New Zealand—*A. aucklandi*, in which the average value $\frac{a-d}{t} \times 100 = 11.05$, and *A. australis* with an average value of 2.41. The former is distributed mainly in the south and west, the latter mainly in the north and east, but further data are required on this point. On the continent of

Australia four species of eel are recorded—*A. australis*, *A. reinhardti*, *A. obscura*, and *A. bicolor*. Of these, the last named is an Indian form found in north-west tropical Australia. The three others are Pacific forms found on the east coast, one of which, *A. obscura*, is represented by only one specimen from the Burdekin River in the tropical part of Queensland. Between the *A. australis* of Australia and New Zealand there is an average difference of one vertebra, which in the author's opinion indicates a difference in their life history and breeding places. These two papers on *Anguilla* are of particular interest and value, not only as further contributions to our knowledge of that genus, but also as examples of the application of variational statistical methods to the identification of species.

INHERITANCE OF WEIGHT IN RABBITS.—In former crosses between large and small rabbits by Punnett and Bailey and Castle, the large size was not recovered in F_2 , and it appeared that inheritance of weight might not conform to ordinary Mendelian behaviour. But the numbers of animals bred were not very large. Mr. Michael Pease (*Jour. of Genetics*, vol. 20, No. 2) has since repeated these experiments on a larger scale. He crossed a Polish doe with a Flemish buck and bred an F_2 numbering 309 animals. The complete range of adult weights was obtained, from the mean of the small Polish stock to beyond the mean of the large Flemish stock. It thus appears that weight in rabbits can be explained on the multiple factor hypothesis. The mean weight for the Polish stock was about 50 oz. and for Flemish twice as much. The F_1 was intermediate and showed no sign of hybrid vigour. Only a few F_1 animals gave the whole range of weights in F_2 , the majority giving a much more restricted range. Some of the light F_2 animals bred true in F_3 , but no heavy animals bred true. It is not decided whether there is one predominating weight factor; but it is concluded that the weight factors act in a logarithmic manner. The Polish stock appeared to contain a simple factor for sterility, but there was also a slowly diminishing fertility which must be otherwise explained. The growth curve and times of maturity of these rabbits has also been carefully studied, as well as the relation of weight to sex, colour, and size of litter. From the F_2 population one strain was selected which matured in 172 days, and another in 300 days. In many of these rabbits there is no correlation between heavy weight and slow maturity.

CHROMOSOMES OF THE EARTHWORM.—L. Monné (*Bull. Int. Acad. Polonaise Sc.*, B; 1928) has investigated the chromosomes of the earthworm *Allolobophora foetida* and finds that in the cells of the epidermis, nervous system, gut epithelium, and the developing muscles, nephridia, and septa, the number is 22, 11 pairs. The oogonia are known to have 22 (Foot and Strobell) and the author finds the same number in the spermatogonia.

PAIRING AND OVIPOSITION IN THE INDIAN APPLE-SNAIL.—Prof. K. N. Bahl (*Mem. Ind. Mus.*, 9, pp. 1–11; 1928) records observations on pairing and oviposition in the Indian apple-snail, *Pila globosa*. After a prolonged period of aestivation underground during the dry months, these snails come to the surface at the outset of the rains and at once pair in water on the ground at the edge of a pool. Pairing may last three hours, during which time the copulating animals may be handled and the principal relations of the male and female ducts ascertained. Prof. Bahl found that by electrocution he was able suddenly to kill a

couple of pairs, and by subsequent dissection to make out the precise details of the copulation. The vas deferens of the male terminates in a papilla lying in the mantle cavity close to the rectum. The penis-sheath and penis are outgrowths of the mantle and are independent of the male opening. Transference of the sperms from the vas deferens to the penis after the latter has been inserted into the mantle cavity of the female is effected by the genital papilla at the end of the vas deferens being directed into a depression at the proximal end of the penis. The sperms then pass along the penis into the aperture of the vagina of the female. Deposition of eggs takes place a day or two later in some sheltered hollow in the ground. Each egg, after passing out of the vaginal opening, travels down an oblique tube formed by two temporary folds on the right side of the foot and is delivered into a dome-shaped cavity under the foot formed by the arching of the creeping sole. Each egg has a sticky covering, so the eggs, from 200 or 300 to 800 in number, adhere to form a mass. When egg-laying is completed the snail leaves the egg-mass; there is no incubation of the eggs.

CROSSES BETWEEN WHEAT AND RYE.—Successful reciprocal crosses between wheat and rye are reported from the Saratov Experiment Station by Miss Nina Meister and Mr. N. A. Tjumjakoff (*Jour. of Genetics*, vol. 20, No. 2). The variety of wheat used was *Triticum vulgare* var. *erythrosperrum*, and the rye was a local Russian form, 'Jelissejev.' It was found that the reciprocal hybrids were alike, both resembling wheat and both sterile. This is to be expected, since the wheat supplies 21 chromosomes and the rye but 7. No F_2 could be obtained, but the F_1 plants were crossed back with wheat or rye. The pollination of rye by wheat appears now to be accomplished for the first time. It is much more difficult than the reciprocal, giving only 2.5 per cent of successful fertilisations, as against 60 per cent for wheat and rye. These results are very different from those obtained by Gaines and Stevenson in 1922, and it is suggested that the rye-plants obtained by them from rye and wheat were not true hybrids.

BOTANICAL CARTOGRAPHY OF EUROPEAN RUSSIA.—The geo-botanical department of the Leningrad Botanical Garden started some years ago, under the general editorship of Prof. N. I. Kusnezow, and with the co-operation of a number of Russian botanists, the compilation of a botanico-geographical map of European Russia on the scale 1:1,050,000, that is, approximating closely to the scale 1:1,000,000 suggested for the maps of this kind by the International Botanical Congresses. The whole map will be on twenty sheets. Ten of these are ready, and three are already published covering the south-eastern provinces, that is, the regions adjoining the middle and lower course of the Volga and the Caspian steppes. The map is produced in colour and shows the distribution of different types of vegetation and partly even of the various associations. As admitted in the explanatory pamphlet (such pamphlets, containing a brief description of the vegetation of the respective areas, will be published with each sheet), the map is not equally exact in all details, since it is based on numerous disconnected local vegetational maps, reports of expeditions, etc. Some corrections will therefore be necessary after more detailed studies, and one of the main purposes of the map is to get together all results of previous botanico-geographical explorations, so that the gaps will be obvious and may be filled. Thus, the map is regarded as only the preliminary to another on the international scale. Apart from the vegetational map, an additional sheet,

on transparent paper, has been published with the fourteenth sheet (middle Volga region), showing some floristic data (limits of distribution of various typical plants) and the boundaries of the glacial deposits. A general map of the vegetation of European Russia, on the scale 1:4,000,000, on a single sheet prepared by Prof. N. I. Kusnezow, has also been just published by the Leningrad Garden.

MARINE MOLLUSCA OF THE CHATHAM ISLANDS.—Collections of shells were early made from the Chatham Islands, and Capt. Hutton in his "Catalogue of the Marine Mollusca of New Zealand," 1873, was the first to give a connected account of their fauna. Collections from several sources have now been studied by Dr. H. J. Finlay (*Trans. New Zealand Inst.*, vol. 59), who is able to record the occurrence of 202 species, of which 30 appear to be endemic. The author considers that the present fauna is not a remnant, or evolution of the Tertiary faunas found there, but a repopulation from the mainland in post-Pliocene times, yet still long enough ago for characteristic regional species and subspecies to have evolved. The active factor in this repopulation has been ocean currents, acting from both north and south, but predominantly the latter. In this list Dr. Finlay treats all group names equally as full genera, this being in his opinion the handiest method for future reference, a course which those who have to consult the list, however, will scarcely agree with him is a matter of "no inconvenience." A more serious drawback to the list is that Dr. Finlay has followed the order of families and genera given in Hedley's "Check List of the Mollusca of New South Wales." He has fortunately reverted to the usually adopted order of the classes, but a very cursory inspection would have shown him that the whole of Hedley's MS., confessedly sent off to the printer at short notice, must have got badly disarranged ere it reached the compositor, and never have been submitted in proof to the compiler. How else to account, amongst other lapses, for the presence of the *Gymnoglossa* and the *Architectonicidae* in the *Opisthobranchia*? It is a great pity that further currency should now be given to this unfortunate jumble. Nevertheless, Dr. Finlay's list will prove of great use to students of antipodean mollusca.

SUBMARINE WAVES IN GIBRALTAR STRAITS.—An upper lighter layer of variable depth lies upon denser water below; this upper, less saline, layer streams from the Atlantic into the Mediterranean, while the more saline water below runs out into the Atlantic, a certain amount at the boundary between the two layers mixing with the water above and being carried back into the Mediterranean. G. Schott, in the *Journal du Conseil International pour l'Exploration de la Mer* (vol. 3, No. 2, September 1928), reviews the available data bearing upon undulations which have been observed to occur in the boundary between the two layers. This rises and falls twice a day with a well-marked tidal period, the rise taking place in the Straits while the tide is falling at Gibraltar. The amplitude of these submarine waves is considerable, water at 14° C. with a salinity of 37.4 per mille in the trough at 180 metres below the surface, rising to 100 metres below the surface when on the crest of the submarine wave some 7 h. 40 m. later. It is shown that the boundary between the two layers is nearer the surface in the area over the ridge between Gibraltar and Africa than on either side. The explanation of these movements of the boundary layer advanced by R. de Buen, as 'injections' of water from below into the upper stratum, is disproved.

THE DIFFRACTION OF ELECTRONS BY MICA.—A note published by S. Kikuchi in the October number of the

Proceedings of the Imperial Academy of Tokyo contains a remarkable reproduction of an electron diffraction pattern. It was produced by passing a pencil of cathode rays—rendered homogeneous by magnetic sorting—through a very thin sheet of mica, and more than one hundred and fifty spots appear on it. They are arranged in an equilateral triangular pattern, from the dimensions of which the spacing of the molecules in the mica was calculated to be 5.11 Å., the corresponding value obtained by an X-ray analysis being 5.18 Å. The author has also had under investigation the relative intensities of other types of diffraction beams that are produced when electrons pass through thicker pieces of mica, and finds that there is a close parallelism between the distribution of intensities in electron beams and in the analogous beams of X-rays. The same is true of beams reflected from the cleavage faces of crystals, and electron diffraction has now been observed in this way with calcite, mica, topaz, zincblende, and quartz.

ELECTRON WAVES.—A very simple and convincing demonstration of the undulatory properties of electrons has been given by E. Rupp, who has described in a recent paper in the *Zeitschrift für Physik* (vol. 52, p. 8) how they may be diffracted by a ruled metal grating, with rather more than a thousand lines to the centimetre. His apparatus was essentially a spectrometer of the type used for obtaining X-ray spectra at grazing incidence under similar conditions, the electromagnetic waves being replaced by slow cathode rays moving with speeds corresponding to between 70 volts and 300 volts. The set of spectrum photographs which has been reproduced shows distinctly that the cathode ray pencil passes away from the grating in certain privileged directions, as many as three orders of interference being apparent in one instance. The quantitative agreement of the results with the de Broglie wave theory is also satisfactory, the predicted and measured wave-lengths of the electrons agreeing to within a few per cent, whilst there seems to be no need to invoke the presence of an internal potential of the solid in this case. No evidence was found that the electron waves were polarised, the author's conclusions in this connexion being confirmed by some new experiments by Drs. Davisson and Germer which are mentioned in a recent *Bulletin* (No. 5) of the American Physical Society.

RADIUM AND GEOLOGY.—A short account by C. S. Piggot of the relationship of radioactivity to geological phenomena is given in the *Journal of the American Chemical Society* for November. There are three aspects of the problem, namely, the determination of the amount and distribution of radium throughout the lithosphere; the heat energy made available and the part it plays in mountain building; and, lastly, the estimation of geological time from the uranium-lead ratio. The amount of radium present in a rock may be determined by decomposing it by fusion with a flux and measuring with an electroscopie the radium emanation thus liberated. The estimation of the age of a mineral from the uranium-lead ratio cannot be entirely trustworthy until further data are available concerning the disintegration of the thorium series. A measure of the relative amount of the lead derived from uranium would remove further uncertainty, and the author describes a method by which it is hoped to determine this by using Aston's mass-spectrograph.

AUTOMATIC SUBSTATIONS IN INDIA.—The development of automatic electric substations with supervisory control is making rapid progress. In the

Metropolitan Vickers Gazette for October there is a full description of the use made by the Bombay, Baroda, and C.I. Railway of automatic stations. The economic value of these automatic stations is now widely recognised. By their use the capital expenditure on buildings is reduced and there is a large saving in wages. Complete and immediate information is given to the engineers at the generating station by means of suitable visible and audible signals. There is no loss of time in receiving telephone reports and transmitting instructions to operators. Should any machine become overheated, the fact is automatically signalled to the control office. A red lamp glows on the symbol for the machine on the control panel and an alarm bell rings. The supervisor then starts another set and the red lamp glows until the overheated machine cools to its working temperature. Blue lamps indicate when fuses blow, and when the fuse is replaced all the lamp signals are automatically checked. Yellow lamps glow intermittently when selecting impulses are being sent out from the panel. These and similar devices make supervisory control very effective. Owing to the lack of skilled operators, it is particularly useful abroad. The B.B. and C.I. Railway is claimed to be the largest and busiest in India, and the electrified section has the heaviest traffic. All the electric power is got from the Tata hydro-electric station situated in the Western Ghats, about 100 miles distant from Bombay. It is transmitted by three-phase alternating currents at a pressure of 110,000 volts. It is transformed to 22,000 volts, and then transmitted by underground cables and overhead transmission lines.

PERMALLOY ON SUBMARINE CABLES.—In a paper communicated to the Royal Society in 1855, Lord Kelvin laid the foundation of the theory of submarine telegraphy. This theory has since been greatly developed by mathematicians, and recently the discovery of magnetic alloys of constant permeability has enabled the theory of Heaviside to be utilised in practice. Notwithstanding these great developments, comparatively little attention has been devoted to familiarising electrical engineers outside the small circle of submarine cable engineers with these advances. The paper read to the Institution of Electrical Engineers by A. E. Foster, P. G. Ledger, and A. Rosen on Dec. 6 was the first paper on the subject for about thirty years. The discovery of permalloy made possible the loading of telegraph cables and greatly increased the speed of signalling. They explained the precautions that have to be taken during manufacture and the subsequent process of annealing. A full description of the annealing furnace through which the cable passes is given. The inductance of the cable varies largely with the annealing temperature. Further experimental investigation seems necessary to determine the best cycle of temperatures for heating and cooling. The inductance also varies with the hydrostatic pressure. The troubles introduced into cable working by the presence of electric power cables near their ends are not serious. It is more difficult to overcome the interference due to natural causes. These causes seem to be of the same nature as 'atmospherics' in radio communication. Electromotive forces are set up and disturbances travel in both directions along the cable. These may originate anywhere along the line, but the evidence shows that the disturbances are very small when the depth of the cable is 500 feet. In order to get over interruptions due to natural phenomena, the earthing core is connected with the sheath at a point where the depth is at least 500 feet. In several cases, however, these situations are unfortunately several miles from the shore.