

Research Items.

MAN'S SKULL IN THE LIGHT OF EVOLUTION.—The human skull is a product of evolutionary change, and this could not be more clearly shown than by tracing in a few clear-cut stages the history of the elements of which it is composed. Ten such stages are discussed by Dr. W. K. Gregory (*Internat. Jour. Orthodontia, Oral Surgery, and Radiography*, vol. 14, 1928). He shows how the gradual development of these stages is associated with improvements in the brain, enlargements of parts containing the sense organs, and modifications of the jaws and teeth, all accompanying or accompanied by changes in habits. Each and every one of the twenty-eight bones in the human skull is derived from bones present in the skull of certain Devonian air-breathing fishes. To the amphibians man owes the beginnings of his ear-drum, and the changes associated with it; to the first mammal-like reptiles his temporal fossa, zygomatic arch, and the dominance of the superior maxilla; to the higher mammal-like reptiles, the dominance of the dentary bone of the lower jaw, as well as the differentiation of his teeth into incisors, canines, premolars, and molars. The early mammals simplified the masticatory apparatus; the early primates increased the dominance of the eyes; the early anthropoids made the first serious success in shortening and deepening the face and pointed the way to an enlarged brain and cranium—on their account men walk the earth to-day with long faces and swelled heads. It is an interesting story made clearer by Dr. Gregory's series of text-figures.

NOOSE-TRAPS ON THE CONGO.—Some remarkable traps for catching fruit-eating bats from the northern bank of the lower courses of the Congo around Brazzaville and neighbouring districts are described and illustrated by Dr. Gerhard Lindblom in *Man* for June. These bats, known to the natives by the name of *n'gembo*, come out in swarms after sundown, habitually flying through forest glades and the depressions in mountain ridges, places which the natives accordingly choose as the sites of their traps. The trap consists of a framework of which the principal element is a long pole guyed with a rope, cross-pieces serving as rungs of a ladder for arranging the snares. Rows of supple lianas are attached to the frame-work with an arrangement of loops attached to a slanting pole. These loops serve as pulley blocks through which strings run down to a bottom cross-piece. By these strings the lianas are raised or lowered, and the arrangement is such that the lianas can be tightened up independently without entanglement. A specially interesting feature is that at the junction of the string and liana a bell is fixed which rings an alarm when a bat is caught. This bell consists of the shells of a large land snail (*kodia*) or of the nuts of the fan palm. The clapper is made of bone or hard wood. The bells of the different lianas are of different pitch, so that it is possible to distinguish in the dark by which of the lianas the catch has been effected. The snare is watched from a hut nearby, and the watcher hauls down the catch as soon as the bell sounds in order that the game may not be frightened away. The bats are eaten either roasted or boiled. Rites of magic import are performed both to secure an abundant catch and to scare away evil influence. At the beginning of each hunting season it is customary to crush between the teeth the skull of the animal first caught and then to eat the flesh—evidently a 'first-fruit' offering.

BIRDS OF BRAZIL.—Birds from Brazil find their way perhaps more frequently than birds of any

distant land to the museums of Great Britain, an indication of their attractiveness, but also of a considerable amount of collecting activity in the country. Nevertheless, it is true to say that the knowledge which modern ornithology demands of the avifauna is very scanty. In spite of the opportunities afforded by great variety of altitude, through which climatic conditions change from tropical to sub-tropical and temperate, scarcely any attempt has been made to define in detail the life-zones inhabited by the birds. Ernest G. Holt has made a substantial effort to right this omission with reference to the locality of the Serra Do Itatiaya (*Bull. Amer. Mus. Nat. Hist.*, vol. 57, pp. 251-326). In a period covering four months he collected 559 birds, comprising with previous records a total of 187 species for the district. These ranged almost from sea-level to a height of 7800 feet, and an analysis of their altitudinal distribution showed that the tropical zone, embracing the foothills, was inhabited by 187 species; the sub-tropical zone, the region of tall trees extending roughly from 3000 to 6000 feet, by 62 species; and the temperate zone, the ridges, slopes, and rocky peaks above 6000 feet, by 12 species. The apparently small number of tropical zone species compared with those of the temperate zone, was due to the fact that the great bulk of the Serra lies above the tropical area. The distribution of each species is discussed.

IRISH CEPHALOPODS.—The *Proceedings of the Royal Irish Academy* (vol. 38, sect. B, No. 2, 1928) contains a description by Anne L. Massy of "The Cephalopods of the Irish Coast." This is a supplement to Nichols' list of cephalopods which was included in his "List of the Marine Mollusca of Ireland" (*Proc. R.I.A.* (3), vol. 5, 1900). This list contained seventeen species of cephalopods. In the present supplement there are thirty-two species, most of which have already been recorded, but without the detailed notes now supplied. The commonest Irish cephalopods are *Alloteuthis subulata* (Lam.) = *Loligo media* L., and *Loligo Forbesi* Stn. The *Helga* in forty hauls trawled 1070 specimens of the latter species, and in ten hauls 500 *Alloteuthis* were taken. The author follows Joubin in considering the short-tailed form, formerly identified as *Loligo marmoræ*, as the female of *Alloteuthis subulata*. The true *Loligo marmoræ* of Verrill, now called *Alloteuthis media*, is apparently not to be found in northern European waters. Among other rarities, a Rhynchoteuthis larva is described, the name apparently only applying to a larval form which belongs to the Ommatostrephidae, but to what genus it belongs is not known. This larva, taken at 290 fathoms off County Kerry, measures 3 mm. in length, has only the dorsal arms developed, each with one sucker, and is possibly identical with one taken by the *Terra Nova* in the North Atlantic, described by Massy in 1916.

PHOSPHATE AND SILICATE CONTENT OF SEA WATER.—In a paper of general scope, Dr. W. R. G. Atkins brings up to date and adds much interesting detail to his previous well-known and valuable work (*Jour. Mar. Biol. Assoc.*, 15, 1; 1928). Spring sunshine appears to be the important factor in bringing about the spring diatom outburst. While the bottom is the most important source of phosphate, it is regenerated to some extent throughout the water column, and perhaps more rapidly at the surface than at intermediate depths. Phosphate may be completely exhausted in the surface waters in spring. Silicate tends to follow the same seasonal variation as phosphate, but differences occur, which are no

doubt correlated with the varying nature of the phyto-plankton and its varying demands. Dr. Atkins devotes much attention in this paper to technique and possible sources of error, and even for this reason alone the paper is important.

TRICHURIS AND ASCARIS EGG-COUNTS.—C. Manalang (*Philippine Jour. Sci.*, vol. 35, No. 1, 1928) records observations on the relations between the number of ova per gram of formed stool and the number of female *Trichuris* and *Ascaris* harboured by their hosts (man). *Trichuris* egg-counts were made in four clinical and eighteen post-mortem cases, and the average number of eggs per gram of random stool, reduced to 'formed basis' (using Stoll's factor of 1, 2, and 4 for formed, mushy, and diarrhoeal stools respectively) per female worm from the cæcum, transverse and sigmoid colon in cases with and without intestinal pathology, was 669 and 310 respectively. The number of eggs per gram of stool in the cæcum per female worm was about equal to that in the transverse and sigmoidal stools combined. The average number of *Ascaris* eggs per gram of stool (as above) per female was found to be about 1420 for the five normal cases, and in six cases with intestinal pathology about 1460.

RHABDOPLEURA IN NORTHERN REGIONS.—Dr. C. Jan Van Hast gives an account of *Rhabdopleura* in a recent part of "Die Tierwelt der Nord- und Ostsee" (Lieferung XI, Teil VII, a2, Pterobranchia): *Rhabdopleura Normanni* is the only member of the Pterobranchia found so far in the area described, but it has a wide range, occurring in many parts of the Atlantic as well as in South Polar regions. It is, however, most common in the north near Bergen, and in the Shetlands, preferably at fairly great depths (100 to 400 metres) although it has been found in shallow water of only 5 metres. It is usually taken on a stony bottom attached to mollusks, ascidians, and other animals, and is probably much more widely distributed than is at present known, as it is so easily passed over.

CHEMICAL COMPOSITION OF THE WHITING.—H. O. Bull (*Jour. Mar. Biol. Assoc.*, 15, 1; 1928) has studied this subject with special reference to the changes in the liver at different stages of maturity. The amount of fat is low in the immature fish, but increases with age, and reaches its maximum soon after the gonads begin to ripen. It then decreases, to reach a minimum when the fish are spent. No significant changes occur in the muscle substance. Work of this kind is of undoubted value in connexion with the study of condition in fish, and might be usefully supplemented by a study of the vitamin potency of the liver oil at different stages of growth and maturity.

SCANDINAVIAN PHYTOGEOGRAPHY.—After some delay, the results of the International Phytogeographical Excursion to Norway and Sweden in 1925 have been published (*Veröffentlichungen des Geobotanischen Institutes Rübel in Zürich*, 4 Heft). The interesting discussions during the excursion have caused many problems to be viewed at a new angle, and many correlations in plant ecology, formerly obscure, have been made clear. As we might expect, the various papers contributed deal with aspects and types of Scandinavian vegetation, though in places they are compared with foreign but similar associations. Papers of general interest in the volume are: Some Scandinavian vegetation problems, by Edward Rübel; comparison of the *Betula* associations in North Germany and Sweden by Friedrich Markgraf; contributions to our knowledge of the vegetation of

the Swedish lakes by Helmut Gams; the succession of plant associations in the Russian peat moors, and materials for the comparison of Scandinavian and Russian peat moors, by Wladimir Dokturovski; comparative considerations on the plant covering of the Scandinavian and Eastern Alps, by Friedrich Vierhapper.

PHYSICAL MAPS OF GREAT BRITAIN.—The Ordnance Survey has published two physical maps (price 1s. 6d. each), one of England and Wales, the other of Scotland, on a scale of one to a million. Each sheet is about 24 in. × 33 in. The network is a minimum error conical projection with rectified meridians and two standard parallels. The maps are layer tinted without contour lines. There are three tints of green up to 200 ft., and above that level browns, red, purple, and white. Altogether nine tints have been used for altitude. There are submarine contours in fathoms with a wide range of blue tints. Rivers and lakes and all names of water features are in blue. Other names are in black. Names have been used sparingly and confined entirely to physical features. The type is small but singularly clear. Numerous spot heights are given. The maps are beautiful examples of cartography and graphic and yet precise representation of the country.

TRIANGULATION IN EAST AFRICA.—A pamphlet, compiled by the Colonial Survey Committee and published by the Colonial Office, gives in collected form the triangulations carried out in East Africa, mainly as the work of various boundary commissions within the last thirty or forty years. The positions on the arc of 30th meridian have been recomputed. The data given are from Kenya, Tanganyika, Uganda, Nyasaland, and northern Rhodesia. A sketch map shows the present state of the triangulation of the 30th meridian in Africa. Between the Egyptian and Uganda arcs is a long stretch which is incomplete, and there is another gap between the Uganda and Rhodesian arcs. A second sketch map shows the state of East African triangulations.

THE JAPANESE EARTHQUAKE OF 1923.—Prof. A. Imamura, in a recent paper (*Japanese Journal of Astronomy and Geophysics*, vol. 5, No. 3; 1928), has studied the seismic history of the Kwanto district, in which the great earthquake of 1923 occurred. The earthquake record, which begins with the year A.D. 416, shows great non-local earthquakes occurred in nearly the same district in 818 and 1703. Further evidence is afforded by the existence of four beach-lines that are well marked by hundreds of deep narrow holes bored by the bivalve *Lithophaga nasuta*. Prof. Imamura connects the lowest beach-line with the earthquake of 1923 and the one above with that of 1703. Assuming the constancy of the rate of boring of the holes, the interval between the formation of the first and third beach-lines would be 1100 years, indicating that the latter was probably connected with the earthquake of 818. Similarly, the date of the fourth earthquake would be about A.D. 33. Thus, during the last two thousand years there appear to have been four great earthquake periods separated by long intervals of quiescence. Lastly, since the yearly number of earthquakes felt in Tokyo was 109 during the years 1903–22, 68 in 1926, and 65 in 1927, it is suggested that the Kwanto district is now approaching a dormant state that may last for a century or more.

ROCK PRESSURE AND FLOWING WELLS.—The Dakota Sandstone in the North Central United States is largely dependent for its water supply on

wells thought to discharge rainwater that percolated underground from the Rocky Mountains. This view is now rejected in contributions on the subject by W. L. Russell on "The Origin of Artesian Pressure," in *Economic Geology* (vol. 23, pp. 132-57; 1928), and O. E. Meinzer (*ibid.*, pp. 262-91). They both conclude that the water is discharged from isolated lenticular masses of sandstone in clay, and is forced to the surface by the weight of the overlying rocks. Under these conditions the future of the supply is less assured than on the theory of hydraulic migration, and the importance of maintaining the supply is leading to the proposal for laws to prevent waste. This case is of special interest, as the analogy with it was the main support to the theory that the flowing wells of East Central Australia are artesian wells. This view was rejected by Gregory ("The Dead Heart of Australia," 1906), who explained their discharge as due to rock pressure and to gas pressure due to the inflow of hot plutonic water into the water-bearing beds. American opinion is now supporting this interpretation, and Meinzer remarks that no one else appreciated the practical importance of rock pressure. The diminution in the flow of the Australian wells which was predicted on the rock and gas-pressure theory has happened, and has led to legislation to prevent the increase in the number of the wells or the waste of their water. It is now recognised that similar legislation is desirable in the United States.

PLIOCENE AND PLEISTOCENE TERRACES.—A Conference on the correlation of the Pliocene and Pleistocene terraces of north-western Europe has been arranged by the International Geographical Union now meeting at Cambridge. Attention has been directed to this question by the work of General Lamothe and Prof. Depéret. In preparation for this discussion a series of papers has been collected on Pliocene and Pleistocene terraces, and issued by the Commission of the Union dealing with this subject (Secretary to the Commission, University Museum, Oxford). The terraces of the Mediterranean basin, of the coasts of France and Spain, and of the British Isles are discussed, with contributions also on those of the Euphrates, Indo-China, Sierra Leone, and South Africa. If Prof. Depéret be correct, and the terraces are due to a general rise and fall of the sea, the terraces in different areas should be at the same levels. Prof. Depéret recognises that in parts of the Mediterranean the terraces have been tilted; but he claims that despite such exceptions the bulk of the raised terraces are due to the lowering of the sea and not to the rise of the land. The papers in this report show that the terraces are variable both in height and distribution. Thus a paper by Dr. Hume and O. H. Little points out the absence of modern raised beaches along the Egyptian-Mediterranean coast, though they are well marked at various levels on the Red Sea coast; a paper by Mr. V. A. Eyles shows the extent to which the Scottish terraces vary in height when followed along the coast. The nature and height of the terraces are still inadequately known. The studies included in the report give much detailed and precise information, and valuable summaries of the work that has been done on the coasts both of Europe and Africa.

THE COSMIC RAYS.—Some new measurements of the cosmic radiation are described by Prof. Millikan and Dr. Cameron in the June issue of the *Physical Review*, and are discussed by them in the *Proceedings of the National Academy of Sciences* for the same month. Improved experimental methods have been used at the Arrowhead and Gem lakes in California, and they now find that the absorption curves of the

rays in water indicate that at least three bands of frequencies are present, with absorption coefficients of 0.35, 0.08, and 0.04 per metre of water, the last corresponding to a wave-length of 8×10^{-5} A., or a generating potential of 150 million volts. Nothing important is present between the softest cosmic band and the hardest known gamma rays, and they conclude that there are no possible transformations capable of yielding rays of this enormous penetrating power except those accompanying the building up or creation of the abundant elements like helium, oxygen, silicon and iron out of hydrogen, or in the case of the last two, out of helium. Even then it is necessary to assume that the aggregation takes place in a single process, and not step by step, and by using Dr. Aston's recent accurate measurements of atomic weights in conjunction with the Dirac absorption formula, they show that the three bands, in order of decreasing frequency, agree closely with what would be expected on relativity theory from the annihilation of mass accompanying the formation of magnesium and silicon from hydrogen, oxygen and nitrogen from hydrogen, and helium from hydrogen, respectively; a small residual effect may be due to iron. "The whole work," in their opinion, "constitutes very powerful evidence that atom-building processes are continually going on, and that each event is broadcast in the form of the appropriate cosmic ray."

EXPERIMENTS ON TRANSMUTATION.—In 1907, Ramsay found that solutions of copper salts after exposure to radium gave spectroscopic evidence of the presence of lithium, and he suggested that transmutation of the copper had occurred. Repetition of these experiments by other workers using platinum apparatus failed to confirm this result, and it was thought that probably the lithium was derived from the glass apparatus originally employed. Further work on the effect of exposure to radium is described by J. N. Friend in the *Journal of the Chemical Society* for May. Barium sulphate, pure silver, and pure gold foil were exposed to radium, the spark spectra being afterwards examined and compared with those of an unexposed sample of the same material. No change was noticed except in the case of the gold, when two C calcium lines appeared and the copper lines of the blank became more intense. The experiments were repeated, using a silica tube instead of a glass one, but without consistent results. The changes in the spectra appeared to be due to the presence of impurities irregularly distributed in the original materials. (See also NATURE, July 14, p. 58.)

THE HEAT OF FORMATION OF MOLECULAR HYDROGEN.—The *Journal of the American Chemical Society* for May contains an account of an attempt made by F. R. Bichowsky and L. C. Copeland to determine the heat of association of atomic hydrogen by a direct calorimetric method. Hydrogen was admitted into a discharge tube, where it was partially dissociated into atoms, at a known rate of flow. It then passed through fine holes into a tube containing a platinum calorimeter on the surface of which the atomic hydrogen was catalytically associated, thus causing a rise of temperature. The mathematical theory for the rate of effusion of a gas through a small hole, previously given by Weide and Bichowsky, was used to deduce the percentage dissociation from the difference in pressure of the gas before passing through the holes, before and after the discharge. The value obtained for the heat of formation of molecular hydrogen was $105,000 \pm 3500$ calories. Previous values measured by indirect methods range from 90,000 to 107,000 calories.