

## Research Items.

RECENT STUDIES OF PITHECANTHROPUS.—In *Natural History*, the journal of the American Museum of Natural History, Vol. 25, No. 6, Dr. J. H. M'Gregor summarises recent views on *Pithecanthropus erectus*, but in addition contributes to the discussion of the place of these remains in our knowledge of the phylogeny of man the conclusions at which he himself has arrived as the result of first-hand study of the bones themselves and of Dr. Dubois' endocranial cast. Owing to erosion of the outer bone by the action of sulphuric acid, casts of the calvarium give an erroneous impression which can only be corrected by examination of the actual bones. 3.5 millimetres and more must be added to the maximum length, making it 184 mm. Further, the nuchal surface of the occiput to which the powerful neck muscles were attached has also suffered. The original occipital slope was therefore more vertical and consequently more ape-like than the cast. The corrected breadth measurement, allowing for erosion, gives an index of 71.5. In the endocranial cast both the development of the so-called Broca's convolution and the marked expansion of the middle temporal convolution support the view that *Pithecanthropus* could produce and appreciate articulate speech. In a reconstruction of the size and form of the brain made by Dr. M'Gregor, the hominoid features outweighed the pithecoïd very decidedly and gave a volume of 940 cc. The general brain form is more like the gibbon than the gorilla, though in convolution it is more like the latter. In both size and form, however, the brain is distinctly closer to man than that of any ape.

THE SIGNIFICANCE OF THE CHARACTER OF THE HAIR IN MAN.—Dr. Fritz Sarasin has contributed a study of changes in the character of the hair in Melanesian and African children to *L'Anthropologie*, T. 35, pts. 5-6, in which he arrives at conclusions of no small importance in relation to the question of the significance of hair as a criterion of race. It has been stated by Martin that the form of hair characteristic of the different races is already to be observed in the newly-born, and the same or similar statements have been made by other anthropologists. Dr. Sarasin is unable to endorse this view as a result of his observations among the Melanesians and Africans. Among New Caledonians, infants up to the age of a year or a year and a half have almost straight or slightly wavy hair, of brown, light brown, or even blond. It does not begin to change until about five years, and does not become completely frizzy like that of an adult until about six years, when it is still slightly lighter in colour. This observation is supported by the records of observers in the New Hebrides (Speiser, Heim), in Africa (Collignon, Frédéric, Junod, Borel), and among the negroes of the United States (Schultz). Among negroes, however, the hair is black and not lighter in colour, and the change in form takes place rather earlier. It follows that frizzy hair must be considered a secondary character in man. No anthropoid or other ape has frizzy hair. Thus it must have been acquired at a later geological epoch, the straight or wavy hair being the primary character. Further, if it is a secondary character, it must be possible for it to have been acquired by the different races of which it is now a character at different times and in different ways. Frizzy hair, therefore, cannot be regarded as a possible basis for racial classification.

PREDICTIONS OF A MACKEREL FISHERY FROM SALINITY OBSERVATIONS.—In No. 8 *Medd. fra Komm. f. Havundersøg. Ser. Fiskeri*, Bind 7, 1925, Copenhagen,

Dr. A. C. Johansen deals with the occurrence of mackerel in the Kattegat and adjacent parts of the Skagerak. In the waters of the Kattegat and Belt Sea, two layers occur usually; a surface layer of relatively low salinity, and a lower layer with relatively high salinity. This stratification is due in the main to the outflow of relatively fresh water from the Baltic, and the inflow of relatively salt water from the Skagerak. In the upper layer, to a depth of about 10 m. to 25 m., the resulting current is directed towards the Skagerak and the North Sea, while in the lower layer it is towards the Baltic. Johansen advances evidence to show that there is a connexion between yearly catches of mackerel in the Kattegat, a strong ingoing current in the lower layer in April and May indicated by a high salinity, and a low temperature of the surface waters in June. He concludes that a prediction with a certain degree of probability whether it will be a good or bad mackerel year can be given so soon as salinity observations in March and April are to hand, or about one or two months before the fishery in the Kattegat begins. Dr. Johansen adds a footnote to the effect that predictions will be published in *Dansk Fiskeritidende*.

ENCYSTMENT IN DIDINIUM.—C. Dale Beers records (*Proc. Nat. Acad. Sci. U.S.A.*, vol. 11, Sept. 1925) the results of studies on encystment in the ciliate *Didinium nasutum* with the view of ascertaining the cause of the conflicting conclusions reached by Calkins and by Mast. Calkins picked out from each of ten pure lines of this ciliate a single individual and supplied it with nine specimens of *Paramecium* daily as food. As generations passed the fission-rate gradually decreased and the encystment rate increased, the latter reaching 100 per cent. in the 131st generation. Calkins concluded that in *Didinium* the passage of generations results in diminished vitality and ultimately in encystment with nuclear reorganisation and rejuvenescence, and that there are two types of encystment, one which protects against environmental adversity, and the other which occurs periodically and independently of the environment and results in rejuvenescence. Mast's experiments differed from those of Calkins in that at each isolation of *Didinium*, he placed with this ciliate enough *Paramecium* to ensure a surplus of food, and he found no evidence to indicate that encystment occurs periodically. The present author has carried out two series of experiments on *Didinium* descended from one individual—one series of four lines was cultivated according to the procedure of Calkins, *i.e.* each *Didinium* was supplied daily with nine *Paramecia*; the second series of four lines was supplied, as in Mast's investigations, with sufficient food to ensure a surplus. Except for this difference the two series were kept under the same conditions. The first series behaved like those in Calkins' experiments and the second like those of Mast. The encystment in the first series was due to the unfavourable condition—lack of food. The mere passage of generations does not result in encystment or in decreased fission-rate, provided the environment is favourable. The evidence indicates that all the cysts of *Didinium* are of one type—protection cysts.

EFFECT OF ULTRA-VIOLET RAYS ON THE GERMICIDAL ACTION OF THE BLOOD.—Colebrook, Hill, and Eidinow showed that when the skin is exposed to sources of ultra-violet rays the power of the blood to kill bacteria is greatly increased when tested *in vitro*—by so much as 65 per cent. in the rabbit



and 17 per cent. in man. Further work (A. Eidinow, *Brit. Journ. of Radiology* [B.I.R. Section], vol. 31, No. 306, 1926, p. 35) has shown that this increased germicidal power of the blood is evoked only when the rays produce erythema (reddening) of the skin—preferably a mild erythema that disappears within twenty-four hours. An excessive exposure of the skin to the sun's rays may cause a diminution of the bactericidal power of the blood. It is only ultra-violet rays shorter than 3100 Å.U. which produce erythema and likewise increase bactericidal function of the blood, and those derived from the mercury vapour lamp, the carbon arc, and sun's rays are equally efficient. The mechanism of the action is uncertain, for there is no experimental evidence to support the view that the irradiated skin cells form a bactericidal substance. If an animal is injected with bacteria so as to cause a septicæmia or blood-poisoning, the natural bactericidal power of the blood falls to a very low degree, and irradiation of the skin with ultra-violet rays during this stage does not increase the bactericidal power of the blood, so that acute infections of this kind cannot be treated by these means. Direct exposure *in vitro* of defibrinated blood to ultra-violet rays destroys such bactericidal power as it may possess, but injection of 10-20 cc. of this irradiated blood into a rabbit results in a marked rise in the bactericidal power of the blood of the animal after a latent period of two hours. The phenomenon appears to be due to some effect on the corpuscles, for it is not obtained with irradiated blood-serum without corpuscles.

A FLORA OF UTAH AND NEVADA.—Volume 25 of Contributions from the United States National Herbarium is a flora of Utah and Nevada, by Ivor Tidestrom. This area lies wholly within the arid region, but is very diversified in character with high mountains separated by dry desert valleys or by tablelands. The flowering plants and ferns are treated systematically, some 3700 species being included, with keys to the species and larger groups. In an interesting introduction the author draws a striking parallel between topography and vegetation of this corner of the United States and the Iberian peninsula in Europe. H. L. Shantz gives a brief summary of the main characteristics of the chief plant communities from the point of view of the ecologist, whilst Arthur W. Sampson deals with the environment of the flora of the alpine regions and foothills. Within this region the flora typical of the western United States meets the flora typical of northern Mexico, the line of demarcation being described by Tidestrom as conspicuous in south-western Utah and southern Nevada, where it coincides with the northern limit of *Covillia tridentata*, the creosote-bush.

TRAUMATROPIC CURVATURES IN PLANTS.—This conception of curvature in plants as resulting from the "stimulus" of a wound is perhaps of doubtful validity, and Adolph Beyer has recently completed an examination of the subject (*Biologisches Zentralblatt*, vol. 45, pt. 12), which leads him to an alternative interpretation. Such curvatures, he thinks, should be explained as due rather to an interference with the normal nutritional correlation as a result of the wound. He thus explains curvatures in seedling hypocotyls, coleoptiles, and roots as due to a disturbance of one of two correlations, namely: (i.) Growth-promoting substances moving from the apex of the coleoptile, or the epicotyl in the case of the *Helianthus* seedling; (ii.) food supplies moving to growing tissue from regions of storage.

THE OLD RED SANDSTONE FLORA OF SCOTLAND.—Prof. W. H. Lang contributes an interesting paper to the *Transactions of the Royal Society of Edinburgh* (vol. 54, Pt. 2, No. 2), in which he continues the important studies which he commenced with the late Dr. R. Kidston. He has studied the plant-remains from the fish-beds of Cromarty and finds evidence of the existence of a considerable bulk of vegetation of varied character. By extracting the remains of spores and sporangia from the rock, he has recognised nine distinct types of spores and two types of sporangia. Some of the spores have a very characteristic form and ornamentation, but the plants which bore them are as yet unknown, and they indicate that several more plants of the epoch remain to be discovered. The other plant remains are fragmentary, but under Dr. Lang's careful treatment have yielded valuable results. He has found that Thurstophyton had circinate buds like *Psilophyton*. The genus *Hostimella* has received further elucidation, and two new species with characteristic sporangia have been described. One, *H. pinnata*, shows a series of incurved pinna-like branch systems with sporangia at their tips. No suggestion is as yet made as to the systematic position of these forms, but their remoteness from the Lycopodiales is pointed out. To a less cautious observer they suggest a resemblance to some of the much dissected fronds of the Lower Carboniferous pteridosperms and ferns. Another organism described, *Hostimella racemosa*, is a sporangium bearing branch system; it was derived from the Stromness beds. This is a remarkable structure consisting of an axis bearing sporangium-like organs on either side, each sporangium being surrounded by a zone where the rock is stained a darker colour forming a sort of halo. There is no evidence as to the type of plant on which these branches were borne and it is provisionally placed in the genus *Hostimella*, but it is clear that this artificial genus, while possessing little vegetative differentiation, had reproductive organs of a varied character. The whole work is a valuable contribution to our scanty knowledge of the earliest known land flora of the world.

MOUNTAIN BUILDING AND IGNEOUS ACTION.—In the *Proc. Am. Phil. Soc.* vol. 64, 1925, p. 283, Prof. R. A. Daly returns to his geological exploration of the possibilities arising from the assumption that the Taylor-Wegener hypothesis of continental drift is correct. He conceives that the moving continents slide on a substratum of hot basaltic glass which, though rigid to stresses of short periods, is extremely weak. Mountain chains are then explained as structures that have been compressed on the downstream side of continental "landslides." Upstream, breaking tensions are necessarily developed, and mobile fractions of the substratum are forced up the abyssal fissures, the general type of magma generated being basaltic. Downstream, the granitic crust beneath a geosyncline is overridden by the sliding foreland, and part of it sinks down into the underlying basalt which is thus displaced, and tends to erupt along the soles of thrust-planes. The sunken crust then melts, and gives rise to secondary magmas that invade the crumpled sediments as batholiths and stocks with all their attendant dykes and lavas. The rise of magma is aided by gas pressure, the juvenile gases acting as fluxes in the development of volcanoes of the central type. A combination of the Joly and Wegener hypotheses may make this or some similar scheme workable, but it is difficult to believe in the glassy substratum, for seismology persistently fails to provide any evidence for the existence of a basaltic layer beneath the continents. A rock-layer of



density about 3.4 is indicated, and this may be eclogite, since the geological evidence is conclusively in favour of a basaltic composition. The possibilities thus seem to be eclogite during periods of solidity and basaltic magma during epochs of fusion, basaltic glass being completely ruled out.

**A GIANT CRATER IN ALASKA.**—During recent exploration of the country west of the Aleutian Mts. by a United States geological survey party, a gigantic crater was discovered, which, with its associated features, closes what was supposed to be a wide gap in the volcanic line of the Alaska Peninsula. Mr. W. R. Smith gives an interesting account of the crater in Prof. Paper 132-J of the U.S. Geological Survey, 1925. The rim is nearly circular and has an average diameter of more than six miles. The area of the crater thus exceeds that of Crater Lake, Oregon ( $5\frac{1}{2}$  miles in diameter), but is only about half the area of the craters of Ngorongoro in East Africa and Aso-san in Japan. These three craters are all examples of the type known as calderas and are due to subsidence. The newly discovered crater, named Aniakhak Crater (after the river that rises within it), belongs, however, to the explosive type, of which it is now the largest example known, Katmai Crater, also in Alaska, having previously held the record with a diameter of three miles. If the volcano had originally possessed a low cone, then about 15 cubic miles of material must have been blown away. Much of this can be accounted for by the great spreads of volcanic ash already known to the east and south. Within the crater is a large truncated cinder-cone, rising to 2200 feet above Surprise Lake, which occupies part of the north-eastern floor of the crater. The volcanic formations lie on a basement of Upper Jurassic sediments, and the inner wall of the crater is made up of layers of pink and black lava—probably obsidian—with quartz-diorite below. Black obsidian is also found ten miles away, though exposures of lava flows are rare owing to the thick covering of the surrounding country by fragments of glassy lava, pumice, and ash. The volcano is now completely quiescent, no fumarolic activity having been detected.

**CURRENTS IN THE UPPER AIR.**—The Meteorological Office, Air Ministry, in Professional Notes, No. 42 (London: H.M. Stationery Office, 1925, price 1s. 6d. net), gives the result of an "Investigation of the Winds in the Upper Air from Information regarding the Place of Fall of Pilot Balloons and the Distribution of Pressure," by Mr. J. Durward. This note discusses the horizontal movement of pilot balloons in relation to the distribution of pressure. The data used are obtained from post cards, on which the date, place, and time of origin are entered, attached to the pilot balloons. The finder of the balloon is requested to return the card after entering the place and time of finding. During 1923 more than 1000 cards were returned. The results throw some light on the direction of winds at high levels, but the method is attended by so many uncertainties that it is, on the whole, inferior to the careful observation of high clouds, although it is practicable in all weathers.

**VARIATIONS IN RADIO SIGNALS.**—In broadcasting it is well known that there are great variations in the quality of the reception. These variations are due to many factors, including sunlight, temperature, barometric pressure, humidity and human agencies. As they occur not only from season to season, but even from hour to hour, they are far too complex to permit of a simple analysis. The only satisfactory method of attacking this problem is the statistical

method, namely, to analyse similar observations taken over specified areas by a number of competent observers during a considerable period of time. A test of this nature was organised by the Bureau of Standards over a period of a year (1922-1923). Mr. C. M. Jansky has analysed the results in Paper No. 297 of the Bureau of Standards. The results shown by observations made of KDKA, the transmitting station of the Westinghouse Co. at Pittsburgh, prove that "fading" is most pronounced in September and October, and least in February and April. The atmospheric conditions were worst in August and September, and least in February and March. It has sometimes been stated that signals from distant stations are often of greater intensity than signals from stations of similar power but situated much nearer to the observer. The results obtained by two entirely different sets of observers on two different transmitting stations verify this. It is clearly indicated that somewhere between 100 and 200 miles the signals are less satisfactory than the signals received from much more distant stations. From the scientific point of view this is of importance.

**STRUCTURE OF GRAPHITE.**—In No. 3 of the *Scientific Papers of the Institute of Physical and Chemical Research, Tokyo*, G. Asahara has shown by means of measurements of the diffraction of X-rays that, however finely powdered, graphite possesses a crystalline structure. In the case of thirty-four different forms examined, amorphous carbon and graphite are essentially identical.

**SEPARATION OF INDIUM.**—Reprint No. 5 from the *Scientific Papers of the Institute of Physical and Chemical Research, Tokyo*, is a description of the detection and separation of indium. A method was devised of precipitating indium by means of ammonium sulphide from a dilute solution acidified with sulphuric acid, after the addition of a small amount of tartaric acid and neutralisation with ammonia. This proved satisfactory when tested with mixtures of several kinds.

**"KNOCK" IN INTERNAL COMBUSTION ENGINES.**—Report No. 979 (E. 15) of the Aeronautical Research Committee (London: H.M.S.O., price 2s. 6d. net) deals with closed vessel explosions of mixtures of air and liquid fuel (petrol, hexane, and benzene) over a wide range of mixture strength, initial temperature, and initial pressure. Attention was particularly directed to the production of detonation in internal combustion engines. The conclusions are too numerous to summarise, but a few points may be mentioned. At 100° C. the air-fuel ratio for maximum explosion pressure is considerably less than that required for complete combustion. Rich mixtures of all three fuels give rise to a knock, the intensity of which increases with decrease in the air-fuel ratio and is apparently preceded by high frequency vibrations. Raising the temperature sometimes eliminates the knock. With normal mixtures the explosion time diminishes with increase in initial temperature and increases with increase in charge-density. The addition of about 6 per cent. of exhaust gas to a normal air-hexane mixture has but little effect in suppressing knock at 230° C. initial temperature. Comparatively large percentages of water vapour can, apparently, be added to the charge without affecting appreciably the efficiency of the conversion of the chemical energy of the fuel into pressure energy, even when the explosion time is largely affected by these additions. The results connecting tendency to knock and the richness of the charge appear to contradict experience with actual engines. The report is fully illustrated.