

Research Items.

MALAYO-POLYNESIANS IN AMERICA.—Dr. Paul Rivet again attacks the question of the migrations of Malayo-Polynesians to America in vol. 18, No. 5, of the *Journal de la Société des Américanistes de Paris*. He briefly reviews the evidence of physical anthropology and ethnography with which he has dealt previously. The form of certain types of skull in lower California shows a Melanesian affinity, while the Lagoa-Santa skull is of a type of wide distribution in South America and presents affinities with the hypsistenocephalic type of Melanesia and Australia. In the material culture a large number of objects of typical Polynesian or Melanesian character, of which a detailed list is given, are also found in America. The linguistic evidence—a detailed examination of grammatical structure and comparison of vocabularies—shows a close affinity between the Hoka family which extends, though not continuously, from Oregon to Salvador, and the Malayo-Polynesian family. If we accept Uhle's classification and dating of pre-Inca pottery in Peru, and put the first wave of immigration as contemporary with the proto-Nasca ware, this would give a date at about the beginning of our era, but Uhle's dates are too low and allow an inadequate period for the evolution of the stone age in America. These immigrants met and were to a great extent overwhelmed by the migrations of peoples from Asia who were responsible in the main for the general physical character of the American Indian; but it would be a mistake to regard the part played by the Malayo-Polynesian element in the racial make-up of America as negligible.

INDIVIDUAL DIFFERENCE IN ACCIDENT RATES.—The problem of accidents is still challenging attention. Some time ago a report by Miss E. M. Newbold was reviewed in this journal: in this report a statistical study of the human factor in the causation of accidents was made, and it appeared that, quite apart from the objective causes of accidents, there was a personal factor operating that rendered some people more liable than others to accidents. Since then the problem has been studied from another point of view by E. Farmer and E. G. Chambers, and their findings are published by the Industrial Fatigue Research Board in Report No. 38 (London: H.M.S.O. 2s. 6d. net). The writers tested workers in various occupations for æsthetic-kinetic co-ordination, intelligence, and nervous instability. The results of these tests were correlated with the accident records of the same subjects. While the authors draw but tentative conclusions from a very interesting piece of work, yet, however tentatively expressed, the results are valuable. It appears that it can be definitely asserted that inequality in accident liability is not solely determined by external factors or by chance, but is due to measurable individual differences. A relationship can be shown to exist between accidents and poor æsthetic-kinetic co-ordination, but there is no relationship between accidents and the higher intellectual processes. These results afford confirmation of the earlier work as well as adding fresh knowledge. It is perhaps not going too far to hope that the time will come when it will be possible to estimate an individual's accident liability with mathematical accuracy.

ULTRAMICROSCOPIC ORGANISMS AS SYMBIONTS.—In an article entitled "Ultramicroscopic Life," published in the Nov. issue of the *Rivista di Fisica, Matematica e Scienze Naturali* (Naples), Prof. Umberto Pierantoni gives an account of those ultramicroscopic organisms which are used by higher organisms as

factors of their normal functions. These so-called ultramicrosymbionts occur at least as frequently as the microsymbionts, and the functioning of organs and tissues by means of such protoplasmic inclusions must be regarded as a normal phenomenon and not as analogous to pathogenic ultramicrobic symbiosis, which constitutes an abnormality of only a few individuals of a species. The penetration of ultramicrosymbionts into the egg of an insect may immediately determine a change in the direction of embryonal morphogenesis leading to the formation of new organs. Investigations on luminous animals have demonstrated that the presence of such ultramicroorganisms in many animals, especially cephalopods, is accompanied by the appearance of highly complicated structures—lenses, reflectors, refractors, analysers of light—due to stimuli exerted by them in the cells in which they become located. The effects which these organisms exert on the cell plasma undoubtedly tend to modify and regulate the activity, and indeed to determine the specific activity, of the plasma. Bioluminescence, with the many indisputable cases in which it is due to symbiosis, has entered a new field of study, and, if it could be proved that luminous ultramicrosymbionts exist, the phenomenon would admit of a definite explanation.

LIFE-HISTORY AND DISTRIBUTION OF LIMNÆA.—Dr. C. L. Walton and W. Norman Jones (*Parasitology*, 18, No. 2, 1926) report the results of observations in North Wales on the life-history of *Limnæa truncatula*, the usual intermediate host of the liver-fluke of the sheep. The average number of eggs in 20 egg-masses of this snail, collected in March 1925, was 9.75, and the hatching period (in the laboratory) was 12–26 days, with an average of 20–21 days for the spring generation. The young snails were isolated and reared, and they deposited eggs during the first week of July, which hatched in the first week of August. *L. truncatula* is therefore self-fertile. Data were obtained which show that two and probably three generations occur between March and October. Dr. Walton and W. Rees Wright (*op. cit.*, No. 4, 1926) find that, in North Wales, *L. truncatula* occurs over a range of pH 6.0 to 8.6, *L. peregra* pH 5.8 to 8.8, and *L. palustris* pH 7.4 to 8.0 (three readings only), and they express the opinion that the hydrogen-ion concentration is not of vital importance to these snails or, on the evidence available, to mosquito larvæ. The differential distribution of *truncatula* and *peregra*—for these species are seldom found together though they may be abundant in contiguous environments and some overlapping may occur—is accounted for by the relatively broader foot and shell of *peregra*, which enables it to travel over the surface of soft mud in which *truncatula* would sink.

FORESTRY RESEARCH IN SOUTH AFRICA.—The Research Station of the Forest Department of South Africa, situated at Deepwalls, Knysna, has made remarkable progress and carried out some important investigation work during the comparatively few years which have elapsed since its inauguration on up-to-date lines. One of the troublesome factors in connexion with forestry work in the Dominion is the restricted area and size of the indigenous forest. The department is seeking to rectify Nature's deficiencies in this respect by the artificial cultivation of conifers, with the view of the gradual reduction of imports of soft woods and the saving of expenditure in this direction. The opinion is held by a section of forest officers that in every country efforts should be made

to safeguard the future of, and even extend when necessary, the indigenous forests; that a total reliance on forests of exotic species is, economically, a mistake. Those holding such views will be interested in the paper by Mr. John Phillips, of the Deepwells Research Station (*Ecology*, vol. 7, No. 3, July 1926), dealing with the biology of the flowers, fruits, and young regeneration of *Olinia cymosa* Thunb. This is one of the South African forest trees and is known as 'hard pear.' The tree plays an important part in forest succession in the Knysna forest region, and also produces a most excellent timber for constructional purposes. Little has been known of the power of reproduction or facilities for propagation either of this or other important species of these curious indigenous forests. By his close study into the habits of *Olinia cymosa*, Mr. Phillips discloses an extraordinary state of affairs which, if equally true of other species, furnishes a reason for the poor condition of growth of the forests. In spite of an extravagant production of flowers and fruits season by season, by one individual or another, the production of fertile seeds is small, and only a very few natural seedlings actually result from a heavy crop of flowers. The problem of how to assist and increase the natural regeneration of the species is dealt with in some detail, as also the main factors, which require further elucidation.

RUSSIAN EXPLORATION IN MONGOLIA.—Expeditions of the Russian Academy of Sciences were working in Mongolia in 1925 and 1926, studying mainly soils, vegetation, and partly also the fauna of the country. The so-called Gobi 'Desert' has been crossed twice, and this enabled the expedition to state that the whole north-western part of Gobi does not represent a desert, but is a flat steppe, with brown soil with some pebbles, and populated by nomad Mongolians; there occur locally some low ridges and stationary sand-hills; underground waters are everywhere near the surface and the grass cover was generally good. In remarkable contrast with the present steppe landscape of the Central Gobi are groups of large trees (elms) which apparently mark some old valleys now filled in. A special party of the expedition was occupied in detailed studies of local soils, and special attention has been paid to the study of processes of origin and accumulation of soluble salts in the soils.

VOLCANIC ROCKS OF CENTRAL AMERICA.—In the *Journal of Geology* for Nov.-Dec. 1926, P. C. Putnam describes the petrography of the lavas of Central America. In an arcuate zone concave to the Pacific, vulcanism began in the late Cretaceous and Eocene, languished during the succeeding period when folding and intrusion were going on, and broke out afresh with explosive fury in the Miocene. The lava basements of the present volcanoes are thought to be of Pliocene age, while the cones themselves are of later age and have been built mainly of ejectamenta with only occasional lava-flows. Throughout this region half a dozen rock types are widely distributed, both in space and time, ranging from olivine-basalt through latite to rhyolitic pumice. Partial analyses show that all the types are simply related, the most characteristic feature of the province being the richness of the basalts in potash and the complementary abundance of soda at the rhyolite end of the series. This feature suggests that the basalts are not representatives of the layer which gives rise to plateau-basalts, but are rather differentiation products of an intermediate latite magma. The weighted silica percentage is 62, and that of other circum-Pacific provinces ranges from 58 to 63. The explosive phase of eruptivity that followed the Oligocene intrusions gives strong support to Dr.

Day's recent recognition of the importance of the gases given off during the crystallisation of an underlying cauldron, and their bearing on local volcanic phenomena.

THE *ELPHAS ANTIQUS* OF PIGNATARO.—A large fossil elephant's skull, found at a depth of 8 m. at Fontanarosa, on the southern slopes of the hills commanding Pignataro Interamna, near Cassino, is described by G. De Lorenzo, *Rivista di Fisica, Matematica e Scienze Naturali* (Dec.). The old quaternary soil in which the skull was found has previously yielded fossil mammoths, but the latest find is one of importance as it represents a complete skull of enormous dimensions, measuring 3.50 m. from the frontal protuberance to the apex of the tusk. Moreover, it appears to have been found in its original, and not in a secondary, position, the animal having sunk in muddy ground and been submerged by a further deposition of alluvium. Consequently it is hoped that the whole of the remainder of the skeleton may be found, although difficulties may be expected owing to the decalcification of the bones, possibly as a result of infiltration of water charged with carbon dioxide.

OIL IN BURMA.—An important contribution to the petroleum geology of Burma was made by Dr. L. Dudley Stamp at the meeting of the Institution of Petroleum Technologists on Jan. 11. Since the publication of Pascoe's well-known memoir on "The Oilfields of Burma" in 1912, very little information has appeared concerning work on oilfield developments, much remaining hidden in the archives of the companies responsible for the intensive geological surveys carried out for this purpose. Oil in Burma is not confined to the Peguan beds but, according to the author, may be found at all horizons from the middle of the Eocene to the top of the Peguan (Oligo-Miocene); such petroliferous horizons are definitely associated with intermediate conditions, *i.e.* phases in the history of the Burmese gulf when neither freshwater nor deep marine environments are implied; a clear understanding of the distribution of oil in the Tertiary rocks follows from a consideration of this gulf as the recipient of river-borne sediment from the north, and marine sediment from the south, and a good case is made out for proving the fallacy of one stratigraphical oil-bearing horizon in Burma. This stressing of essential *facies* rather than essential structure in oil accumulation constitutes a principle often overlooked in other countries than Burma; structure is necessary, but without the right type of rocks being involved, its testing makes an unprofitable and discouraging task. Evidence is adduced in support of the contention that mother- and re-ervoirs in Burma are identical, *i.e.* that vertical migration is precluded by the rapid alternation of porous sand and impervious clay; lateral migration may have been operative. "Oil is always found in strata in which the majority of fossils are marine, but of shallow water type." This statement naturally leads the author to discuss the coal-oil relationship, which he is inclined to regard as accidental, rather urging that one essential to the formation of petroleum is a concentration of salts in the water of a land-locked lagoon or lake, or on the seaward side of a delta.

LOW TEMPERATURE CARBONISATION.—The Department of Scientific and Industrial Research has issued a report of a test of another process for the carbonisation of coal at low temperatures, in accordance with the scheme in vogue (*NATURE*, Sept. 20, 1924, p. 441). This report of the Director of Fuel Research deals with the 'Freeman' Multiple Retort of British Oil and Fuel Conservation, Ltd., Willesden. In this plant the coal is fed into the top of a tower built up of

circular compartments separately heated by external gas burners. The coal is mechanically stirred and moved downwards from one compartment to another until it leaves as a mixture of breeze and dust, which is therefore not directly available for use as domestic fuel but might serve for powdered fuel. The striking result was the high yield of tar, 21.1 gall./ton, which is the highest yet observed with any plant tested by the Fuel Research staff. This high yield may be due to the fact that the gas is removed immediately from the plant, each compartment having an offtake. The yield of gas was low, and of ammonia negligible. Considerable mechanical trouble occurred with the plant, and it may be inferred that the process is not technically mature.

THE THERMAL IONISATION OF ELEMENTS.—In their earlier attempts to obtain experimental evidence of the thermal ionisation of elements, the experimental arrangements of Saha and his collaborators have always been open to the criticism that the ionisation potentials of the vaporised elements were less than the potential differences actually existing between various regions in the vapour. In their latest arrangement (*Zeit. für Physik*, vol. 40, p. 648, 1926) Saha, Sur and Mazumdar have used a vacuum oven, similar to King's design, and have heated the elements under investigation in an auxiliary oven made of quartz. The latter was kept at a temperature lower than that of the vacuum oven, and served to regulate the vapour pressure of the elements. The degree of thermal ionisation was determined by measuring the electric current between two parallel graphite plates, which were mounted on molybdenum rods insulated from the oven, when a potential difference of only 1 volt was applied to them. The temperature of the vacuum oven was measured by a Wanner pyrometer, and that of the auxiliary oven by means of a thermocouple. With this arrangement no current was recorded when mercury, zinc, or cadmium were heated up to 2000° C.; heated magnesium gave only a small current, but heated potassium and sodium gave large currents of the order of some milli-amperes. These results are in complete agreement with the magnitude of the ionisation potentials of the elements investigated.

THE FLUORESCENCE OF IODINE VAPOUR.—It is well known that iodine vapour may be caused to fluoresce by illumination with light of suitable wave-length, and that this fluorescence is markedly decreased by the addition of foreign gases to the vapour. G. Ramsauer (*Zeit. für Physik*, vol. 40, p. 675, 1927) has recently made experiments to determine whether this decrease depends on the wave-length of the light which produces the fluorescence. Pure iodine vapour and iodine vapour containing air were simultaneously illuminated with light from the same source, and the intensities of the fluorescent light from the two samples of vapour were compared by means of a polarisation photometer. Within the limits of experimental error no difference was found when green or yellow light was used to produce the fluorescence. The vapours were also excited by light from an arc of which the anode consisted of an alloy of sodium and cadmium, and the lines of the fluorescent spectra produced by the cadmium and sodium lines respectively were photographed and compared. There was a faint indication that the molecules of air produced a slightly greater effect on the fluorescence caused by the sodium lines than on that caused by the cadmium lines. On the quantum theory it would be expected that the intensity of all the terms of a fluorescence series would be decreased in the same proportion when molecules of a foreign gas are added to the vapour. This was proved to be untrue in the case of measurements carried out on iodine vapour containing oxygen,

when the cadmium, copper, mercury, and sodium lines were used to produce the fluorescence. It is suggested that the presence of molecules of a foreign gas causes a change in the probability of transition of the excited iodine molecules.

MICRO-CRYSTALS IN ELECTROLYTICALLY DEPOSITED SILVER.—An X-ray examination of the micro-crystals in electrolytically deposited silver, carried out by H. Hirata and H. Komatsubara, is described in the *Memoirs of the Kyoto College of Science*, Series A, Nov. 1926. The X-ray photographs show that the micro-crystals of silver have a tendency to deposit in a fibrous form, and that the diagonal axis of each cubic lattice is parallel to the axis of the fibre. These results contradict those of Glocker and Bozorth, who suggest that electrolytically deposited silver has no regular orientation.

INSTRUMENTS FOR MEASURING ALTERNATING CURRENTS.—An interesting paper, by Lieut.-Col. K. Edgumbe and F. E. J. Ockenden, on recent improvements in the design of measuring instruments for alternating current work, was read to the Institution of Electrical Engineers on Feb. 3. Except for radio frequency measurements, the 'hot-wire' type of instrument, once so popular on the Continent, is now 'antiquated.' For measuring electric currents and moderate voltages, the 'moving-iron' type of instrument is coming into general use. For very high voltages electrostatic instruments are employed, and for measuring power, electrodynamic instruments. Practically every scale now used subtends an angle of 120° at the pivot instead of 90° as formerly. But this merely improves the ease with which they can be read. It has little effect on their accuracy. The range of electrostatic condensers can be multiplied to any extent by putting condensers in series with them. It is now also of importance to measure the peak value of the high voltage wave so as to be able to calculate the maximum value of the electric stress on the insulating material. The simplest method of doing this is by means of a neon tube. It is known that a neon tube, if exhausted to the point of minimum impedance, breaks down at a peak voltage which is practically independent of the frequency of the supply and the temperature. The neon tube, shunted by a variable condenser, is put in series with a high-pressure air-insulated electrostatic voltmeter. The 'striking' of the neon tube can be detected in the dark by the luminous effect produced, but it can always be detected by means of a head telephone in series with the neon tube. The accuracy of hot-wire ammeters at high frequencies is sometimes questioned as the 'skin effect' comes into operation. It is stated that the error due to this cause in a good instrument when measuring 3 amp. at a frequency of 5,000,000 does not exceed 1 per cent.

PREPARATION OF HYDROGEN PEROXIDE.—A simple method of preparing concentrated solutions of hydrogen peroxide is described by M. L. Kilpatrick, O. M. Reiff, and F. O. Rice in the *Journal of the American Chemical Society* for Dec. 1926. A 20 per cent. solution of sulphuric acid, cooled in ice, is treated with small quantities of sodium peroxide until nearly neutralised. The crystals of sodium sulphate which form on standing are filtered off, and the adhering hydrogen peroxide washed into the filtrate. Vacuum distillation at 60°-65° yields a 20 per cent. solution which is treated with silver sulphate to remove chloride. After further distillation the solution is concentrated at room temperature over sulphuric acid in a vacuum desiccator for three days. By this means an excellent yield of approximately 90 per cent. hydrogen peroxide is obtained.