

## Research Items.

**LOVELOCK CAVE.**—In 1911, during mining operations for bat guano, numerous ancient Indian objects were discovered in the Lovelock Cave in the Humboldt Valley of West Central Nevada. Further excavations were carried out under more favourable conditions in 1924 by Mr. M. R. Harrington and Mr. Loud, which are now described in a fully illustrated monograph issued as No. 1 of Vol. 25 of the *University of California Publications in American Archaeology and Ethnology*. To the description of the recent excavations Mr. Loud adds an account of the objects obtained in 1912. Originally Lovelock Cave was a long shed-like rock shelter about 150 feet in length and 35 feet wide. Earthquakes and other natural agencies caused masses of rock to fall from the roof blocking the opening in front, converting it into a cave. The local Indians, the Northern Paiute, have a legend that the inhabitants were Pit River Indians whom they drove out. The cave had undoubtedly been used as a dwelling-place, and not solely as a cemetery and place of ceremonial deposit, as has been suggested. The earliest horizon of occupation belongs to the Basket-Makers of possibly three to four thousand years ago, with possibly sixty burials in the cave, and as the cave refuse lies directly on the lacustrine deposits it begins possibly within a hundred years of the subsidence of Lake Lahontan. The deposits of human origin show no bones of the sabre-tooth tigers, horses, or camels found in the lake-shore gravels. The culture of the earliest occupation resembles, but is poorer than, that of the Basket-Makers, nor was there any knowledge of agriculture. It resembles the hypothetical 'basic culture' of the south-west. After a deposit of five feet, a foreign influence creeps in, forming a transition period, and finally, as it grows stronger, the bow and arrow appear. Then begins a 'Later Period,' possibly about A.D. 1000, containing many articles which have their counterpart among the modern Paiute. The cave dwellers would thus appear the cultural, if possibly not the linguistic, kinsfolk of the Northern Paiute.

**THE AUSTRALIAN ABORIGINAL BRAIN.**—Prof. Woolard (*Jour. Anat.*, vol. 63, pt. 2, pp. 207-223) gives an account of four brains of aboriginal Australians. He finds that the aboriginal Australian brain is a small brain, extremely dolichocephalic, in which the insula tends to be exposed and the primitive features in the organisation of the striate area to be retained. His observations offer no ground for supposing that the aboriginal brain discloses any peculiar simian features or that it resembles microcephalic brains of European origin, or that it retains any special features of the foetal human brain. He finds that the variations in the indices of the aboriginal brain present no peculiar features, and the differences between it and the European brain are adequately accounted for by the extreme dolichocephaly. The proportion of grey to white matter in the hemispheres is the same as in the European brain, and there are no significant differences between the right and left hemispheres. The total weight of the brain and the weights of the hemispheres are smaller than in the European brain.

**NERVOUS SYMPTOMS AND VOCATIONAL SELECTION.**—In the *Revue de la Science du Travail* (Tome I, No. 1), Dr. Toulouse directs the attention of students of vocational selection to the problem of the nervous person in the industrial world. He maintains that slight nervous troubles are infinitely more common than any one is aware of, and that their action on the output of the worker is disastrous. He contrasts the

limited and ascertainable effect on output of an organic disease, with the irregular and incalculable effect of nervous symptoms. There is here no question of the intelligence, which might be of the highest order, but of an emotional or temperamental instability, over which the person has little control, leading to erratic work curves and long sickness absenteeism. He pleads for a greater recognition of this factor by those doing mental testing and for a periodic examination of employes during their industrial career. The nervous condition which in the typist may involve an unusual number of errors may in a signalman lead to a disaster. It is probable that behind an accident is an emotional instability and not a defective sense organ or intellectual weakness. A similar conclusion was reached by the Industrial Fatigue Research Board after an investigation of telegraphist's cramp: it was shown that those who suffered from that disorder, which essentially involved even in the earlier stages a diminished output, were of the temperament popularly called 'nervous.'

**SEA-TROUT IN SCOTTISH WATERS.**—In his paper "Sea-trout of the River Ailort and Loch Eilt, Part 2, 1920 and 1925-27. With an Appendix on Ailort Salmon" (Fishery Board for Scotland. Salmon Fisheries, 1928, No. 9), Mr. G. Herbert Nall continues his work based on scale reading, the first part of which was published in 1926. The present part embodies the results obtained by analysing both the old and the new material, a résumé being made of the whole. The sea-trout of this district, like most of those of the west-coast rivers, have a more uniform type of life than those of the east-coast rivers, the chief features in the river Ailort being the big runs, beginning as early as March and mainly composed of fish which have spawned in the previous winter, and the high average size of the fish, a few of which attain a great weight. The size is mainly due to good feeding and favourable conditions both for the parr and the sea-fish, giving rise to a vigorous stock. The Ailort fish survive to a greater age and weigh more than do those of the east-coast rivers, and maturity is reached rather later. Early spawners seldom survive the tenth year from hatching, whilst amongst those which spawned later in life some exceed fourteen years, and the percentage of survivors rises with the increase in the number of sea years before maturity is attained. Spawning retards growth, but to a less degree than in the salmon. Salmon smolts usually migrate after two years of river life, those of the sea-trout after three years. Salmon smolts at migration are about two inches shorter than those of the salmon-trout of the same age. During this river life the salmon parr grow more slowly than those of the sea-trout, but after migration the growth-rate of the salmon is by far the larger. It has often been suggested that some of these large Ailort sea-trout are hybrids between salmon and sea-trout, but although experiment has proved that salmon eggs can be fertilised by sea-trout milt and vice versa, the author is of the opinion that there is no indication of hybridisation between salmon and sea-trout, nor are there two or more distinct races of the latter in the Ailort.

**PARASITES AND PREDATORS IN BIOLOGICAL CONTROL OF INSECT PESTS.**—In the *Bulletin of Entomological Research*, vol. 19, March 1929, Dr. W. R. Thompson discusses this important subject. As he points out, both predaceous and parasitic insects practically always kill their hosts. The question of their relative

value as controlling factors is, however, somewhat obscure. That insect predators are numerous and beneficial is generally acknowledged, but that they are as valuable in these respects as parasites is not by any means universally believed. This subject is ably discussed by Dr. Thompson, who advances theoretical conclusions, partly based upon calculations of the length of time necessary for the annihilation of a given host population by given populations of gregarious parasites, solitary parasites, and predators. His theoretical conclusions indicate that the value of predators has been underestimated by practical entomologists, and they are supported by the history of the practical application of biological control. As examples, he quotes the efficiency of such predators as Coccinellidæ in controlling certain scale insects and mealy bugs: the utilisation of the carabid beetle *Calosoma* in controlling the gipsy moth in New England and the extraordinarily valuable results attained by the introduction of the capsid, *Cyrtorhinus mundulus*, in controlling the sugar-cane leafhopper in the Hawaiian Islands. He concludes that predators are worthy of more careful attention than has so far been accorded them, but that the relative values of parasites versus predators in any given case can only be decided by critical investigation in the field.

**PRE-CAMBRIAN LIFE.**—Some months ago it was announced in the daily Press that a pre-Cambrian fauna had been discovered in South Australia. Some details of this have now been given by Sir T. W. Edgeworth David in "Notes on newly discovered fossils in the Adelaide Series (Lipalian?), South Australia" (*Trans. Roy. Soc. S. Australia*, 52, pp. 191-209, pls. xiii-xviii; 1928). He considers that he has found the remains of Algæ, polychætous annelids, brachiopods, and eurypterids in the Adelaide Series at horizons ranging from 2000 to 12,000 feet below the oldest rocks in which undoubted Lower Cambrian fossils have been traced. The age may be (1) basal Lower Cambrian or (2) Lipalian, that is, belonging to the time represented in North America by the unconformity between the Keeweenawan and the base of the Cambrian, or (3) Proterozoic (Algonkian). Without seeing the specimens on which Sir Edgeworth David's views are based, it is almost impossible to express an opinion as to their nature. The figures which he gives are not convincing. If he has really found eurypterids in beds of pre-Cambrian age, it is difficult to account for the fact that scarcely any undoubted representatives of that group of arthropods have been discovered in the Cambrian.

**TROPICAL AGRICULTURE.**—The Imperial College of Tropical Agriculture, Trinidad, has issued its report for 1927-1928 together with the prospectus for 1929-1930. Developments have been made in all directions, and further extensions are hoped for in the near future. An estate is specially needed for research, principally into biological problems, as the existing grounds are required for the instruction and training of students. The power station is now in use and the new building for low temperature research and cold storage is completed, although the interior fittings of the latter are not yet finished. The construction of a new chemical block is proceeding, and alterations and additions have been made in the sugar factory. In research work good progress has been made. With regard to bananas, the main objects are to secure good marketable varieties immune from Panama disease (a problem which necessitates a study from both the pathological and physiological point of view), and further to investigate the ripening process in order that the fruit may be successfully marketed overseas. The new cold storage chamber will prove of special benefit

in these problems. Soil research with reference to the sugar-cane crop has been successfully carried out. The lime content of the soil, and particularly the proportion of adsorbed calcium ions, has been shown to be correlated with the resistance of the plant to frog-hopper blight. A practical outcome of this work is that the College is now able to advise growers as to the amount and kind of lime to apply to their fields, and the methods of application to employ. On the other hand, insecticide work has also proved successful, and the frog-hopper pest can now be kept under control if the proper executive arrangements are made at the right time, the cane growers acting collectively. The main objects of research in the coming year are problems dealing with tropical fruits such as bananas and citrus, biological investigations of cacao, and genetical and fertiliser trials with sugar-cane.

**ISO-ELECTRIC POINT OF CELLS AND TISSUES.**—In a recent number of *Biological Reviews* (4, p. 1) H. Pfeiffer has contributed a comprehensive review of the now voluminous literature bearing on this subject, in which he points out that the original conceptions of the iso-electric point (IEP) are tending to develop both in physical chemistry and in biology. Cells and tissues of plants, and perhaps of animals, show many analogies with ampholytes, probably owing to the presence of these substances at the cell surfaces, and at the internal boundaries of the protoplasm. From the observed effects, attempts have been made to determine the IEP in the case of a given tissue, and also to explain the regulatory effects of the cells upon external solutions. Pfeiffer points out that most biological work has been concerned not with the *true* IEP, which is given by the stationary phase in electro-cathoresis, but with the *apparent* IEP (as found, for example, from minima of swelling, viscosity, and osmotic pressure), which depends primarily on the reaction at which there is a maximum of neutral molecules. The apparent IEP determined in this way may be displaced owing to salt formation, and this is particularly likely to happen in the case of protoplasmic ampholytes. Further, the presence of two or more ampholytes in protoplasm does not, on present conceptions, necessarily lead to the establishment of a collective IEP as it may tend to do *in vitro*. There may, in cases known, be signs of a number of apparent iso-electric points. The relation of the apparent IEP to growth and physiological functions of the organism is discussed, and the author emphasises the view that further work is required on the effect of these phenomena on ion movement and the electro-histological behaviour of protoplasm, and on the mechanism of such functions as protoplasmic streaming.

**CYCLONES AT MAURITIUS.**—Mr. R. A. Watson, Director of the Royal Alfred Observatory, Mauritius, is to be congratulated for producing "The Cyclone Season 1927-8 at Mauritius," which is to be the first of an annual series of publications summarising the information collected at that Observatory about the cyclones occurring in the neighbourhood during each cyclone season. The cyclone season in Mauritius extends normally from November to May; the one under discussion was one of the stormiest on record, and was remarkable also for the fact that the tracks were farther west than usual, to which peculiarity the absence of gales at Mauritius itself is to be referred. The weather reports from neighbouring islands were supplemented by information supplied by ships calling at the island. In two instances enough observations were available to allow of the construction of diagrammatic systems of wind arrows in which the wind represented is the wind relative to the moving centre, the isobars being shown in the usual way. It is interesting to

find some evidence of a discontinuity of wind along the actual track in front of the centre, and not, as was found by Cline in the case of West Indian hurricanes (NATURE, Dec. 24, 1927, p. 909), between the winds of the two quadrants on one side of the track. Allowing for the reversal of the circulation as between storms of the northern and southern hemispheres, the analogue for Mauritius of the 'right rear' and 'right front' quadrants, between which the discontinuity was found by Cline, would be the 'left rear' and 'left front' quadrants. These diagrams are of interest also in that they show some flattening of the isobars in a direction parallel with that of the track, and constitute additional evidence of a lack of that symmetry of wind circulation usually attributed to the tropical cyclone in meteorological text-books.

**THE AURORA.**—The investigation of conditions in the upper air which has been made by E. O. Hulbert and H. B. Maris in connexion with their theory of the aurora and of magnetic storms (*Physical Review*, vol. 33, pp. 412-431; see also NATURE, Nov. 24, 1928, p. 807) is remarkable for the importance which is attached to the influence of the ultra-violet radiation from the sun. The wave-lengths which are absorbed at heights above about 450 kilometres are supposed to produce indirectly, by processes of excitation and ionisation, a kind of spray of highly rarefied matter which extends outwards for upwards of forty thousand kilometres. Collisions are very infrequent at the low pressures involved, and the molecules can describe practically free orbits in the earth's gravitational field. If one is ionised by further absorption of ultra-violet light, both the liberated electron and the residual positive ion will return to the lower air in helical paths, the axes of which are determined by the earth's magnetic lines. The aurora is associated with the downward currents, and its distribution over the surface of the earth can be predicted immediately from the magnetic field of the latter. This theory, which has been developed on quantitative lines, seems to account adequately for the main phenomena both of auroræ and of the complicated changes which occur in the magnetic elements during a magnetic storm, and the greatest difficulty in its further development is likely to arise from incomplete knowledge of the precise nature of the atomic processes of excitation and ionisation. The authors mention incidentally that good direct short-wave communication was maintained between the U.S. Naval Research Laboratory at Washington and the Byrd Antarctic expedition.

**EFFECT OF HEAT ON THE SENSITIVITY OF PHOTOGRAPHIC PLATES.**—The results of an investigation of the effect of heat on the sensitivity of photographic plates are described in two papers by O. Masaki in the *Memoirs of the College of Science, Kyoto*, Series A, vol. 12, No. 1. It was found that the sensitivity of panchromatic and other slow emulsion plates increased with rise of temperature, the sensitisation being greatest towards the red part of the spectrum. In the case of high-speed plates, rise of temperature produced a decrease in sensitivity, especially in the violet region. For all kinds of plates, heating increased the contrast, and in panchromatic and orthochromatic plates this change was particularly marked for rays of long wave-lengths. The sensitising action of heat was retained for some hours after the temperature had been reduced to normal and was much greater than that produced by mere drying of the plates. An expression giving the relation between the density of the developed image and temperature was obtained and holds from 10° C. to 80° C.

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**FLAME- AND SPARK-SPECTRA FROM SALT SOLUTIONS.**—In the *Chemiker-Zeitung* of Mar. 16, Dr. W. Hirschel describes some quantitative results which he has obtained with the apparatus first described by him in 1916, in which minute amounts of salt solutions are pulverised by means of a spark before being introduced into the Bunsen flame. The resulting flame can be maintained for an hour with the consumption of only a few milligrams of salt, and the flame is so intense that its spectrum can easily be photographed. The apparatus has hitherto been used for the visual examination of spark spectra, but it has now been found possible to photograph the latter. This has necessitated the use of much stronger sparks than were possible in the original apparatus. A device for cooling the anode with cold water has been introduced, and instead of a large induction coil and battery of cells, a simple Wehnelt-Simon-Caldwell interrupter is used with an alternating current at 115-220 volts and a small coil.

**ATOMIC WEIGHT OF COPPER.**—A communication by T. W. Richards and A. W. Phillips in the February number of the *Journal of the American Chemical Society* describes experiments on the atomic weight of copper from different sources. No difference was found in the atomic weights of specimens of copper from mines in the Lake Superior region and from Chile. The ratio of the atomic weights of copper and silver was found by analysis of pure cupric chloride. On the basis of  $Ag=107.880$  the atomic weight of copper was found to be 63.557. Copper is known to have at least two isotopes and its atomic weight was in need of confirmation. The Lake Superior material was not later than Cambrian; that from Chile was from lodes intrusive in Jurassic strata.

**SIZE LIMITS OF TURBO-GENERATORS.**—During the last few years there has been a remarkable increase in the size of the turbo-generators used in electric power stations. The size of the machines which run at 25 revolutions per second is now only limited by the transport facilities available to their destination. The desirable size of the machines which run at the standard speed of 50 revolutions per second is about 60,000 kilovolt-amperes at the present time, but in a few years machines of double this capacity will probably be running. The uncertain factors are the strength of the forgings forming the rotating part and whether the journals for such heavy machines would be safe. The centrifugal forces and the consequent enormous stresses in the rotating parts at these high speeds make it necessary to use only forgings of the greatest mechanical strength. In a paper read by J. A. Kuyser to the Institution of Electrical Engineers on Mar. 21, it was stated that a steel containing about 2 per cent nickel with a very small percentage of chromium, when properly annealed, has the necessary tensile strength. On the Continent the alloy used for high-speed machines has a much larger percentage of nickel and chromium, and is hardened in oil. However, experiments carried out by Metropolitan Vickers led to the conclusion that the oil hardening of this steel produces a high radial stress which when the machine is running is added to the centrifugal stress. A significant fact is that on the Continent during the last three years there have been four explosions, with several fatalities, of high-speed machinery made of this steel. It was stated that several of the older types of machines are operating with parts of their core at 200° C. These high temperatures cause relative displacements of the copper and the mica insulation, as the temperature coefficient of copper is 50 per cent greater than that of mica.