Research Items

Palæolithic Site in Manchukuo

PALÆOLITHIC artefacts excavated at Ho-Chia-Kou in Ku-Hsiang-Tung in the environs of Harbin, Manchukuo, by the Japanese First Scientific Expedition to Manchukuo, 1933–34, have been described by Shigayasu Tokunaga and Nobuo Naora (Report: Section 6, Anthropology, Pt. 2. Waseda University, Tokyo). The deposits had been much eroded by river action, which had exposed clay, now being used for making bricks, and fossil mammalian remains. The site was excavated by members of the expedition in 1933 and 1934. At a depth of 1–3 m. below the surface were found numerous fossil mammalian and plant remains, as well as artefacts coeval with the fossil remains. This account deals only with the artefacts. A notable feature of the culture of the site is the great preponderance of bone artefacts; 262 artefacts were unearthed, of which 24 were stone, 217 bone, 4 horn, and 11 tusk. A large quantity of charcoal was found, which may have served for fuel. There were also hundreds of animal bone pieces. The types represented in the stone implements were the willow type, the triangular type and the scraper type. The workmanship is generally rough. Though there are indications that some of the implements may have been manufactured locally, there is no material available within fifty kilometres of Harbin. The implements resemble the Far Eastern series which has been found at the base of the loess at Ordos and Shansi, and belong to the culture of the Loess period, which Boule, Breuil and others regard as either Mousterian or Aurignacian. They are, however, decidedly oriental. The bone artefacts include sixteen forms, among which are spear-head shape, harpoon shape, chisel, chopper, bowl, spoon, arrow-head shape, axe, wedge, etc. There are edged tools made from an animal pelvis, and a bowl-shaped artefact made from a deer's cranium. The tusk implements are all of mammoth ivory. Several walnut fruits were found.

Physiological Effects of Pressure

A USEFUL review of the researches on the physiological effects of pressure is provided by McKeen Cattell (*Biol. Rev.*, Oct. 1936). It is restricted to hydrostatic pressure transmitted to a tissue or organism completely immersed. Pressure applied locally on a part or by means of a gas introduces further complications, and so is not considered. The principal effects are reduction in volume, alteration in the velocity of chemical reaction and changes in viscosity. Other effects include changes in solubility, ionic dissociation and surface tension. In view of the incompleteness of our knowledge, generalizations can scarcely be drawn. It does seem, however, that relatively small pressures speed up physiological processes, perhaps in part due to the fact that decrease in volume involves a diminution in the spaces between molecules and a consequent increase in the collision rate between the reactants. Higher pressures bring about depression of activities and finally an irreversible polymerization of proteins and allied substances, and also the inactivation enzymes, toxins, antibodies and viruses. There is apparently a pressure-time threshold varying widely with different tissues or organisms below which the changes induced by pressure are reversed with decompression but above which the changes are irreversible. It is suggested that pressure, because of the ease with which it can be applied and controlled, may be a valuable aid in attacking physiological problems.

Distribution of Coast Gorilla

IN describing four gorillas from the Sanga River region, collected by the George Vanderbilt African Expedition of 1934, Harold J. Coolidge, jun., discusses the question of the distribution of the species (*Proc. Acad. Nat. Sci. Philadelphia*, **88**, 479; 1936). In contrast to the opinion of Dr. A. H. Schulze, he regards the mountain gorilla as a race (*Gorilla gorilla beringeri*) distinct from the coast gorilla (*Gorilla gorilla*); and as collateral support of this point of view, he instances the discontinuous distribution of the two forms. There would appear to be a forest belt, 650 miles broad, stretching from long. 17° E., the eastern limit of the known range of the coast gorilla, and long. 28° E., the western limit of the mountain gorilla, in which gorillas are absent. For although various statements have been made of the presence of gorillas in this area, critical examination of the records shows that, with the exception of four skulls collected in 1908 from Bondo on the Uelle River, no great importance can be attached to the evidence. The lack of evidence is the more striking when account is taken of the fact that no record has been forthcoming during the last thirty-five years of active hunting and exploration in this part of the Congo.

Morphology of Coleoptera

IN the *Smithsonian Miscellaneous Collections*, **94**, No. 13 (1936) are two papers of special interest to students of this order of insects. Mr. W. H. Anderson, of the University of Maryland, contributes a comparative study of the labium in Coleopterous larvæ. In this paper special stress is laid upon the origins and insertions of the labial muscles and their importance in determining the homologies of the parts concerned. The composition of the labium is described in representatives of many of the more important families, and what is regarded as its typical formation is seen in the larvæ of *Byrrhus* and *Silpha*. The second paper is by Mr. Richard E. Blackwelder, of Stanford University, who discusses the adult morphology as displayed in the family Staphylinidæ. Practically all the exoskeletal parts are described and figured from representatives of ten out of the fifteen subfamilies. A comprehensive study within the limits of a single family, as in the present case, merits the attention of systematists as well as morphologists, and a number of anatomical parts are dealt with which present available characters of possible importance for taxonomic purposes. Both the above papers are well illustrated and provided with useful lists of the special literature concerned.

Genetical and Taxonomic Investigations in *Œnothera*

THE importance of combined cytological, ecological, genetical and taxonomic research is slowly but surely becoming recognized by botanists. A paper by Prof. R. Ruggles Gates in which field, cultural, and, to a less extent, laboratory investigations are combined, has recently appeared (*Phil. Trans. Roy. Soc. Lond.*, B, 226, 239–355; 1936) and is doubly welcome for the results given and as a further example of improving taxonomic methods. The paper is concerned mainly with the results of field investigations of *Œnothera* populations made in eastern Canada in 1932, and with the detailed analysis of the cultures raised from the seeds collected. Seventeen new species and fifteen new varieties are fully and carefully described and figured. Valuable notes are given on the ecology, genetical peculiarities, behaviour under cultivation, and, for some of the cultures, the cytology. Such studies have enabled the author to indicate south to north movements in several different lines, epharmonic responses to environmental conditions, and evanescent characters which appear only during a part of the flowering season. That the catenation of all the plants dealt with in the paper and cytologically investigated was found to be, without exception, a ring of 14 chromosomes, may be considered further evidence that the genus *Œnothera* is cytologically exceptional among plants. Nevertheless, the suggestions made as to the causes of the polymorphism found in Eastern North America also apply, with certain modifications, to other genera. Gene mutations are said to have been active in supplying the raw materials for specific differentiation. Crossing has also probably played a part in increasing the number of specific types, the hybrids breeding true because of catenation. Such new 'constant' types are morphologically of equivalent value to the older species. Parallel mutations have also occurred many times in the different species.

Virus Diseases and Cytology

Two short papers by Dr. F. M. L. Sheffield (*Ann. App. Biol.*, 23, 498 and 506; August 1936) consider the reactions of host-plant cells to attack by virus disease. The first paper confirms some earlier experiments by Prof. B. M. Duggar, that the spraying of virus extract upon an unwounded plant did not result in entrance of the virus. Actual injection of an infectious liquid into single cells only resulted in about ten per cent infection, thus suggesting that all cells of the host are not equally susceptible to virus attack. The second paper shows that virus does not produce inclusion bodies in the guard cells of a leaf of *Solanum nodiflorum*, though these bodies may appear in every cell over large areas of the epidermis. This fact has now been correlated with the absence of protoplasmic connexions between the epidermal and guard cells, thus providing circumstantial evidence that the spread of virus from cell to cell is along the plasmodesma.

Irish Fungi

DR. P. O'CONNOR has published a "Contribution to Knowledge of the Irish Fungi" (*Sci. Proc. Roy. Dub. Soc.*, 21, No. 39; Sept. 1936). He has paid most attention to the rusts and smuts, the Ascomycetes, Phycomycetes and Fungi Imperfecti, but the Aphyllophorales, the Exobasidiales and Auriculariales of Rea's classification of the Basidiomycetes have also received attention. Nearly 350 species are recorded, frequently from numerous localities; the kind of spore produced by rust fungi is noted, and host plants are also listed. Several fungi are cited as new to the Irish flora, whilst *Cicinnobolus Plantaginis* on *Plantago maritima*, *Septoria Rubiae* on *Rubia peregrina*, *S. Saxifragæ* on *Saxifraga spathularis*, and *Rhabdospora lentiformis* on ash, are new to the fungus flora of the British Isles.

Alkaline Rocks of Chilwa, Southern Nyasaland

AT the meeting of the Geological Society of London on November 4, Dr. Frank Dixey delivered a lecture on the alkaline rocks occurring in the vicinity of Lake Chilwa. The types described comprise the following: syenite; volcanic vents infilled with carbonates and brecciated felspar-rock; hydrothermal rocks in the vents; nepheline-syenite; and swarms of associated dykes of sölvsbergite, microfoyaite, phonolite and nephelinite. The period of activity is ascribed to about the end of the Lias or not very long afterwards. The series thus represents a hitherto unrecognized phase of Karroo or early post-Karroo igneous activity. The felspathic materials of the vents include a unique rock-type containing 70–78·8 per cent of orthoclase, but with a potash content of 13 per cent—an amount which is even higher than is normally found in orthoclase itself. The gneisses and other rocks surrounding the vents are all altered, and sometimes they are thoroughly impregnated by the felspathic intrusive, with production of types comparable with Brögger's fenite-tveitåsite series (Fen Complex, Oslo District). The limestones of the Basement Complex in southern Nyasaland and the overlying younger limestones are of negligible bulk compared with the carbonate-rock of the vents and are also of different composition. The sedimentary or metamorphic limestones are accordingly rejected as a source of the carbonate-rock of the vents, which is regarded as of very deep-seated or even of magmatic origin. An account of Dr. Dixey's field work and that of C. B. Bisset, accompanied by the results of a petrographical investigation by W. Campbell Smith, will be published as a Bulletin of the Geological Survey of Nyasaland.

Temperature Measurements in Oil Wells

UNTIL recent years, systematic measurement of well temperatures has been impracticable owing to lack of a suitable instrument and technique. M. Schlumberger, H. G. Doll and A. A. Perebinossoff, in a paper presented for discussion at a meeting of the Institution of Petroleum Technologists on November 10, describe how these difficulties have been to a large extent overcome by the evolution of an extremely sensitive recording thermometer and technique for its operation. The instrument is capable of being run through all normal sizes of drill-pipe and tubing, has an accuracy of 0·1° C. and permits continuous logs to be traced at 15 cm. per sec. without noticeable time-lag. When run inside the well, it is in contact with the fluid contained therein and consequently measures the temperature of the fluid and not of the surrounding formations. It can be used in wells in thermal equilibrium with their surroundings and also in wells in thermal evolution with equally valuable results; also in both open and cased holes. Moreover, in a well where the exchange of surroundings is not limited to heat alone, it is capable of recording actual material flows of oil, gas or water into the well. The advantages of the instrument are,

therefore, obvious, but factors such as bottom-hole effect in drilling wells, size of the hole, nature of the fluid in the hole, etc., complicate interpretation of temperature diagrams. Close co-operation between a surveyor having experience of temperature measurement and a field staff familiar with local conditions is the prime necessity for accurate interpretation of temperature records, and only in this way can the maximum aid be drawn from them.

Production of Artificial Radioactivity by Deuterons

J. J. LIVINGOOD and J. J. Livingood and G. Seaborg have recently described the results of bombarding a number of heavier elements with 5-million volt deuterons from the Lawrence cyclotron accelerator (*Phys. Rev.*, **50**, 425; 1936). Zinc, antimony, ruthenium, bismuth, tin were bombarded with deuterons (currents up to 3·5 microamp.) and in every case β-radioactivity was produced. The complicated decay curves show that several radio-elements are formed in each case, and tentative nuclear reactions are suggested. In some cases the new active elements can be identified by comparison of their decay periods with those of the products of bombarding neighbouring elements with neutrons. In the case of tin, a chemical separation of indium, tin, antimony was made, and each of these was found to be associated with a characteristic activity. The case of bismuth is particularly interesting, since the product of the reaction

$$^{209}_{83}\mathrm{Bi} + {}^{2}_{1}\mathrm{H} \rightarrow {}^{210}_{83}\mathrm{Bi} + {}^{1}_{1}\mathrm{H}$$

appears to be identical with the radium E of the natural radium series. It has the expected decay period, and it was possible to detect the α-particle activity of the polonium (radium F) formed by a successive transformation. The α-particles had the correct range. This is the first case of the synthesis of a naturally occurring radio-element.

Protium – Deuterium Ratio in Water

SEVERAL attempts have been made to determine the ratio protium – deuterium (^{1}H:^{2}H) in ordinary water, and the results mostly fall into two groups, either near 5500 or near 9000. The ratio has again been determined by a method which involves no extrapolation and in which the final value is approached from both the light and heavy side (N. F. Hall and T. O. Jones, *J. Amer. Chem. Soc.*, **58**, 1915; 1936). The authors believe that many of the discrepancies found rest upon inadequate correction for alteration in the oxygen isotope ratio (^{16}O:^{18}O) in the water used. They paid special attention to this. Surface water from a lake was freed from deuterium by repeated electrolysis with recombination of the electrolytic gases. When the *deficiency* in ^{18}O thus caused had been restored by carbon dioxide equilibrium against the original water, the density loss due to deuterium alone was 16·5 γ. The same water was electrolysed in stages and the electrolytic hydrogen burned in air. The *excess* of ^{18}O thus introduced was removed in the same way, and the density loss was again 16·5 γ. Control of oxygen isotope ratio was exercised by index of refraction measurements. With the value 1·1074 for the density at 25° of pure deuterium oxide (oxygen normalized) the protium – deuterium ratio in Lake Mendota (Madison, Wis.) surface water is calculated to be 6,400 ± 200, taking account of the non-additivity of volumes. This is in good agreement with G. N. Lewis's early estimate of 6,500. Using the ratio 6,400, Aston's recent determination of the physical atomic weights of the hydrogens, and the Mecke-Childs' conversion factor, the physical atomic weight of ordinary hydrogen becomes 1·0083 and the chemical value 1·0081.

Range of Loudspeakers

LOUDSPEAKERS are of value not only for domestic use with radio sets but also for other purposes. The paper on "The Appraisement of Loudspeakers" by F. H. Brittain, of the Research Laboratories of the General Electric Co., Ltd., the first half of which appeared in the *G.E.C. Journal* of November, is of both scientific and commercial value. Mr. Brittain begins by enumerating the common imperfections of electro-acoustic systems and then considers in detail the effect they have on the performance of loudspeakers used in connexion with domestic entertainment, with public entertainment such as talking films, etc., and with public address systems. If the sound originates in a studio, the sound waves of frequencies lying between 50 and 7,000 cycles are usually clearly transmitted. If the sound originates under less carefully controlled conditions, such as 'outside broadcasts', the frequency band may be much curtailed. In the case of reproduction from a gramophone record, the frequencies recorded lie between 200 and 6,000 cycles, after which there is a progressive reduction in output until about 40 cycles, when there is a complete cut-off. The frequency discrimination of radio receiving apparatus is nearly always well marked. When using broadcast receivers, owing to the closeness of adjacent stations, it is not usually possible to receive frequencies above about 7,000 cycles, and this is only attained under favourable conditions. At the low-frequency end the cost of the equipment at about 80 cycles makes it necessary to reduce the output. With the loudspeakers at present in use, the small size of the average table set makes reproduction of frequencies below 80 nearly impossible. Even with the latest sets fitted with special devices, the frequency band never exceeds about 10,000 cycles. Further causes of failure are described and the methods used for measuring them are indicated.

Changes in the Spectrum of the Star 25 Orionis

A STUDY of the spectrum of 25 Orionis by Helen Dodson (*Astrophys. J.*, **84**, 180) forms a useful contribution to the literature of bright-line stars. She has measured 147 spectrograms, covering the period 1915–33, and has found periodic variations in velocity (from both absorption and emission lines), line width, line contours, and line intensity ratios (V/R) for the double hydrogen emission lines. The velocity changes from the hydrogen lines are nearly synchronous with changes in the V/R ratio, but the period is not constant—having decreased from 1817 to 1025 days. The amplitude of velocity changes from individual hydrogen lines increases for the later members of the Balmer series; but the phase is the same for each, although the V/R ratio shows marked differences of phase from line to line. The helium lines are exceptionally interesting owing to the fact that their changes (in velocity and contour), while definitely related to the central hydrogen line velocities, are conspicuously out of phase with the latter. This is the only difficulty in accepting McLaughlin's hypothesis of a rotating, pulsating, nebulous atmosphere, which would account satisfactorily for all the remaining features of this and other similar bright-line stars.