

Research Items

Prehistoric Archaeology of North-Eastern New Mexico

PROF. E. B. RENAUD, in his ninth report on the archaeological survey of the High Western Plains, which he is carrying out on behalf of the University of Denver, deals with the north-eastern area of New Mexico, which has been visited in summer field-work on various occasions since 1930. For archaeological purposes, the region has been divided into six districts covering the three areas of drainage—the Dry Cimmaron, the Canadian River, and the Pecos River. The region as a whole contains a large number of archaeological sites, of which 211 have been reported. Of these, the most common is the camp site, but other indications of the presence of man are tipi rings, grinding stones, potsherds and factory sites. No less than 86 camp sites have been recorded. 'Scattered finds' number 67. An important but difficult source of material is the 'blow-out'—hollows in sandy soils and dunes caused by various agencies, natural and other, at the bottom of which archaeological and sometimes palaeontological material has collected. The region is of archaeological importance as the peripheral area of two cultures, the Plains culture and the Pueblo. This is reflected in the pottery, which has been examined, classified and discussed in detail. The distinctive character of the two types and their subdivisions are clearly shown. The lithic industry, however, in this area is of more importance than the ceramic. Two successive cultural phases are distinguished—the Basket-makers and the Pueblo. Of the former, the earliest phase is the 'Fumarole' culture, first discovered by Prof. Renaud and Mr. H. J. Cook. The 'fumaroles' or mounds then examined were found to cover rock shelters. The stone implements from the 'fumaroles' fall into three classes. Of these, the largest and most important, constituting the true 'fumarole' industry, is of quartzite, flaked by percussion and Mousterian in appearance. This 'Fumarole' culture is clearly anterior to the Basket-makers of the caves of Oklahoma and New Mexico; and may represent the nomads who are postulated as preceding the true Basket-makers.

Longevity of Monkeys

Two aged macaques are described by Prof. W. C. Osman Hill, both of which lived in Ceylon (*Spolia Zeylanica*, 20, Pt. 2, 255; 1937). One, a male toque macaque, *Macaca sinica*, was an experimental specimen of the Government Bacteriological Institute, Colombo, and had been used by Sir Aldo Castellani in his experiments on yaws which were published in 1907. It died on March 2, 1936, when it was known to be at least thirty years of age, and was probably thirty-five. Thus it exceeded the recorded age of any of its congeners, although the macaques are outstanding amongst monkeys on account of their length of life. The second specimen, a male Celebesian black macaque, *Macaca nigra*, was full-grown when purchased for the Trivandrum Zoo on June 15, 1907. It died in 1933 after twenty-six years of captivity, and must have been several years older. Flower states that the black ape seldom lives more than ten years in captivity; but gives two unusual examples of survival to fourteen and eighteen years—a limit considerably exceeded by the Trivandrum specimen.

Cheek Bones of Teleostomes

TAKING the sensory organs of the lateral line as a criterion, T. S. Westoll (*J. Anat.*, 71, Pt. 3; 1937) has endeavoured to clear up the confusion that exists in regard to certain of the cheek bones in teleostome fishes. In recent years, it has been shown that the bone in the most primitive tetrapods which is homologous with the mammalian squamosal is associated with the horizontal part of the jugal canal. This provides a starting-point from which to work backwards to the fish. It is found that in the Choanata generally, allowing for modifications resulting from the adoption of different feeding habits, a squamosal bone can be recognized to be lost perhaps only in certain late dipnoans. On the other hand, in all known Actinopterygii the canal has degenerated, and in consequence the squamosal bone has disappeared.

Decapod Crustacea of Japan

A ZOOGEOGRAPHICAL survey of the decapod Crustacea of the Seas of Okhotsk and Japan carried out by Z. I. Kobjakova shows that in both areas boreal forms predominate to the extent of up to seventy per cent of all the decapod species occurring in the seas (*Trav. Soc. Nat. Leningrad*, 65, 185; 1936). Next in order follow the arctic-boreal forms, followed by subtropical, and the poorest representation, particularly in the Japanese Sea, is of true arctic species. In this Sea there is no abyssal fauna, because of the shallowness of the straits, and the history of the Sea, which to the close of the Pliocene was an inland sea separated from the Pacific by a strip of land, is also that of a shallow basin the floor of which has sunk up to 4,000 metres only in recent times. The isolation from the Pacific accounts for the large number of endemic forms (21 per cent of Macrura), for the smaller number of Pacific forms, and partly for the influx in relatively large numbers (12·3 per cent) of typical southern sub-tropical and even tropical forms. The decapod fauna of the Japan Sea is richer (113 species) than that of the Sea of Okhotsk (81 species), but in the latter there is a true abyssal fauna derived from the Pacific Ocean; on the other hand, southern sub-tropical representatives are much fewer in number.

The Millipedes of India

No. 4 of vol. 11 of the *Memoirs of the Indian Museum* (1936) consists of a long memoir by Dr. C. Attems of Vienna on the Indian Diplopoda. Under the term "India" are included the whole of the Indian Peninsula, Ceylon, Burma, Indo-Chinese countries and China, excepting the Malay Peninsula. The author states that systematic and faunistic knowledge of the Indian Diplopoda is still very incomplete, and in fact we are only at the beginning of a faunistic explanation. In the present paper, 62 new species and 15 new genera are described. The most characteristic feature of this fauna is the great number of Sphaerotheridæ present, all the genera, excepting *Zephronia*, being endemic. Altogether, 290 species and subspecies of Diplopoda are known from the region dealt with and, excepting five, they are all endemic. Of the 92 Indian genera, 64, or nearly 70 per cent, are endemic. Only South India can be

regarded as at all properly explored with reference to these animals, while China, with only 21 known species of Diplopoda, is least explored of all. Dr. Attems's contribution is likely to remain as the basis for the study of the oriental Diplopoda for many years and is, consequently, a work of importance to all students and workers on that class of myriapods.

Classification in the Amaryllidaceæ

THE four genera of the Amaryllidaceæ, *Zephyranthes*, *Pyrolirion*, *Hippeastrum* and *Habranthus* have been encumbered with a confused taxonomy for the last fifty years. Their numerous species have made an ever-increasing contribution to garden beauty, and it is therefore most fortunate that Mr. J. R. Sealy has recently reduced their classification to order (*J. Roy. Hort. Soc.*, 62, Pt. 5; May 1937). Characters of the spathe, the androecium and the gynæceum, have confirmed Dean Herbert's original descriptions of the four genera in 1821, and discount more recent tendencies to include them in two groups. The outlook of the paper is that of a 'splitter', but the descriptions now given are exact and clearly defined. They should effect the exact correlation of the name of a plant species with its degree of beauty or utility, which is the necessary contribution of taxonomy to horticulture.

Rust-Resistant Antirrhinums

THE severe attack of antirrhinum plants by the rust-fungus *Puccinia antirrhini* in 1934, turned the attention of gardeners to possible methods of control. Mr. D. E. Green has shown that the fungus cannot reasonably be kept in check by fungicides, and he has recently described his trials with resistant plants (*J. Roy. Hort. Soc.*, 62, Pt. 5; May 1937). A number of strains of the antirrhinum of American origin have been found to possess varying capacities for resisting attack by the rust fungus. The best of them is 62 per cent resistant; but resistance is not as yet combined with horticultural excellence. The attainment of such a combination presents the urgent problem of the future.

Gold in Plant Ash

AN announcement was made some time ago (B. Němec, *Ber. deutsch. bot. Gesell.*, 53, 560; 1935) that traces of gold had been found in the ash of *Zea Mays* grains from plants grown in the Žitný Ostrov (the so-called Rye Island between the arms of the Danube in south Slovakia). Danube sand from this district is known to contain gold (about 0.1 gm. per ton) and plants are able to accumulate it. According to analyses, the metal concentrates in the seeds and fruit of flowering plants, whilst the whole plant of *Equisetum palustre* is found to accumulate gold to the extent of 610 gm. per ton of ash. It is found that the gold content is related to the silica content of the ash. Among the ashes examined the following percentages of gold were recorded:

<i>Zea Mays</i> (fruit)	0.00015-0.0002
<i>Urtica dioica</i> (plant)	0.00168
<i>Datura Stramonium</i> (fruit)	0.00202
<i>Helianthus annuus</i>	—
<i>Mentha arvensis</i>	0.030
<i>Clematis vitalba</i> (stem)	0.011
" " (fruit)	0.06
<i>Salix caprea</i> (wood)	trace

Plants grown at other places where gold has been found were also found to contain recognizable amounts of the metal in the ash, but none was found in the

same species grown where gold was known to be absent. The metal was first detected by its reaction with dimethylamino-benzylidene thiocyanate, and later some of it was actually isolated by reduction and fusion into an ingot. Prof. Němec, in collaboration with Drs. J. Babička and I. Smoler, on February 27, read before the Czech Academy of Sciences a paper on the spectroscopic identification of gold in these plant ashes and gave further chemical evidence of the accumulation of the metal in the ashes of many plants growing in auriferous soils. The spectrograms are said to confirm the presence of gold in those plants in which the metal was detected by chemical means.

Geological Aspects of Deep Drilling Problems

THERE are three main differences between drilling a deep well and an ordinary well to a depth of only two or three thousand feet: in a deep well, the distance between points of development and application of mechanical power is increased, and temperatures encountered are higher and pressures greater. W. E. V. Abraham, in a paper presented to the Burma Branch of the Institution of Petroleum Technologists on May 4, considered the geological aspect of these three differences. The increased length of transmission shaft is on the whole an engineering problem, though geological forecasts as to depths at which particular horizons will be met are correspondingly less certain at greater depths; the strata drilled through are liable to be harder, tougher and more compact, and coring is a more difficult operation at depth. A point of interest to the geologist is that the depth/temperature gradient varies in different places depending on the nature of the strata encountered, that is, whether folded, synclinal or anticlinal. Sufficient data are not, however, available for the formulation of any theory of temperature/gradient variation. Other problems resultant upon increased temperature are concerned chiefly with cementation and mud control, and do not therefore come within the purview of the geologist. Increased pressure with depth, however, concerns the geologist vitally, and the problem is no simple one, since it has been proved that as a general rule fluid pressures do not increase in accordance with the corresponding hydrostatic head, but in some cases, after a certain depth has been reached, are more than twice the corresponding hydrostatic head. Several theories have been advanced to account for abnormal pressures encountered at depth, all of which are based on the assumption that free movement of the fluid is in some way prevented, with the result that high pressures are incapable of dissipation. The most probable cause of such abnormal pressures seems, on the evidence now available, to be the weight of overlying strata.

Hydrography of the River Severn

THE flow of the River Severn during the fifteen years 1921-1936 was the subject of a paper read before the Institution of Civil Engineers on April 20 by Prof. S. M. Dixon, Mr. G. Fitzgibbon and Dr. M. A. Hogan and now published. The Severn was selected for the purpose of flow investigation because it was the only large river free from artificial controls and river traffic within convenient distance from London. The portion of the Severn Valley dealt with lies above Bewdley and has an area of 1,632 sq. miles. The present course of the river seems to be the result of glacial action, and there are indications

that the pre-glacial valley ran northwards and is now covered by drift. It seems possible that a considerable quantity of water may be lost to the river by percolation along the direction of its old channel, particularly at low stages of flow. After discussing the selection of gauging stations, the methods of discharge-measurements and their accuracy, the paper (as reported in the *Journal of the Institution of Civil Engineers*, No. 7, 1936-37, June 1937) gives the results in graph form of 59 discharge measurements carried out during the years 1925-32 and one flood discharge in 1922. The largest discharge, 17,400 cusecs, was measured at the Elan Aqueduct bridge on December 11, 1929. Daily discharges for each of the fifteen years covered by the records have been plotted as hydrographs, of which five selected examples have been filed in the Institution library. Hydrographs of two floods (May 31-June 1, 1924 and February 16-22, 1928) are reproduced in the *Journal*. The difference between the average annual rainfall and the run-off (for the year commencing October 1) is 19.24 inches, or slightly more than half the rainfall. The largest loss, 23.80 inches, was in the year 1926-27, which had a high rainfall fairly evenly distributed throughout the year. The smallest loss was 13.63 inches in 1932-33, a year of low rainfall.

Borine Carbonyl

As is known, the simple hydride of boron, BH_3 (borine), has not been obtained, the simplest known hydride being diborane, B_2H_6 . A. B. Burg and H. I. Schlesinger (*J. Amer. Chem. Soc.*, 59, 780; 1937) find that a gaseous compound BH_3CO , which they call borine carbonyl, is obtained by the interaction of B_2H_6 with carbon monoxide in great excess and under pressure. The reaction reaches equilibrium rapidly at 100° ; at room temperature the reaction is slow enough to permit the isolation of the product: $B_2H_6 + 2CO \rightleftharpoons 2BH_3CO$. The formula was checked by the vapour density. The rate of decomposition is held to suggest the transitory existence of molecules of borine, BH_3 , but the isolation of the latter is not feasible. With ammonia, borine carbonyl forms a solid, stable at room temperature, having the empirical formula $BH_3CO(NH_3)_2$. Trimethylamine, on the other hand, rapidly and completely displaces carbon monoxide from the carbonyl at room temperature according to the equation $BH_3CO + (CH_3)_3N = (CH_3)_3NBH_3 + CO$, which is held to justify the conclusion that the reaction $BH_3CO \rightleftharpoons BH_3 + CO$ is far more rapid than the association of borine to form diborane. It is suggested that in borine carbonyl the borine and carbon monoxide are joined by a co-ordinate link consisting of electrons furnished by the carbon monoxide. The compound $(CH_3)_3NBH_3$ is remarkably stable and can be heated for some hours at 125° without showing any change in physical properties.

Response of the Ear to a Phase Reversal

C. S. HALLPIKE, H. Hartridge and A. F. Rawdon-Smith (*Proc. Phys. Soc.*, 49, 190) have studied the response of the mammalian ear to a sudden phase reversal in a sustained tone of sinusoidal wave-form. The tone was obtained from a photo-electric cell siren feeding an amplifier and loud-speaker, and an investigation with a piezo-electric microphone and cathode ray oscillograph showed that the phase reversal was present in the output from the loud-speaker. The effect of the phase reversal on a listener was that of a sudden temporary depression of the

sound intensity, sometimes accompanied by a tap or thud. The tone was then led to the ear of a decerebrate cat, and electrodes were applied to the auditory tract. The electrical disturbances were amplified and recorded. The record shows, instead of the phase-change, a temporary fall in response, which indicates that the aural elements in which these auditory tract potentials originate must be regarded as resonant structures. The electrical potentials obtained from electrodes on the cochlea were, however, similar to those from the microphone, and showed the phase change. It appears that the cochlear response originates in structures different from those responsible for the auditory tract response.

Separation of the Rare Earths

THE difficult problem of the separation of the rare earths has recently been attacked by a different method, employing the principle of distribution. Fischer, Dietz, and Jübermann (*Naturwiss.*, 25, 348; 1937) have found that it is possible to select liquids between which compounds of the rare earths will distribute themselves, and for pairs of which the distribution coefficients of the various rare earth elements are sufficiently different to enable a separation to be made. Thus, the halides of the rare earths will distribute themselves between water and organic liquids such as alcohols, ethers, and ketones, and the distribution coefficient is different for the compounds of different elements. By the addition of other substances to the system it is possible to alter the degree of separation. The difference in the distribution coefficient of the halides of two rare earth elements differing by unity in atomic number may be as great as 50 per cent, if suitable solvents and added substances are chosen. Automatic distribution fractionating apparatus may be employed, resulting in a much more rapid separation of the rare earths than can be accomplished by the tedious methods of fractional crystallization and precipitation.

A New Harmonic Analyser

THE problem of harmonic analysis arises in many connexions, and the labour of the arithmetical methods is such that several attempts to devise machines for the evaluation of Fourier coefficients have been made. An essential element of them all is, of course, some form of mechanical integrator. Henrici built several models, of which the last enables ten coefficients to be obtained in one operation, from a curve which is followed by a tracing point. A purely electrical instrument has been developed by Prof. Miles Walker and his collaborators which enables harmonics of a voltage or current wave to be separately determined; the integrator in this instrument is a watt-meter. A new instrument, designed by Mr. J. Harvey, of the Imperial College, made by Amsler, and of which an example has recently been added to the mathematical collection in the Science Museum, uses as the integrating device an ordinary planimeter wheel. The various harmonics are determined separately, each order by means of a separate, interchangeable pinion. Harvey's original model went only to the sixth order, but Messrs. Amsler, by added gearing, and without alteration of principle, have extended this number to ten (21 coefficients). With this instrument, results to an accuracy within 1 per cent can be obtained. The instrument can also be used to find areas and their first and second moments.