

Research Items

Cave Paintings of Eastern Spain

PROF. H. OBERMAIER, in a review of the palaeolithic art of eastern Spain (*L'Anthropologie*, 47, 5-6), reconsiders in the light of recent discovery the evidence bearing on its date, which once generally accepted as Pleistocene and Upper Palaeolithic, has recently been assigned by certain archaeologists to the Mesolithic period. Prof. Obermaier here argues for the Pleistocene dating. The caves with paintings are found in all the Mediterranean provinces extending southwards from Lerida through Tarragona, Teruel, Castellon, Cuenca, Albaceta, Murcia and Jaen. Though mostly maritime, some caves are situated at some distance from the sea in the mountainous interior. Albarracin (Teruel), for example, is 130 kilometres inland. The resemblance with the Franco-Cantabrian cave art of northern Spain, admittedly Pleistocene, is considerable, the most important difference being the prominence of the human form in eastern Spain, rare or absent in the north, and throwing a remarkable light on costume, weapons, etc., as well as on mode of life, warfare, and even belief. Apart from this resemblance, the argument for the age of the eastern paintings must depend upon the character of the animals which are depicted. The fauna of northern Spain is poorer than that of the cave art of France; reindeer, rhinoceros and mammoth are absent. In central, southern and eastern Spain, northern species do not appear at all, while the southern fauna had already disappeared. What remains are the species of general distribution, ibex, deer, horse, Bovidae, boar, lynx, rabbit. The animal figures of the east are very much reduced in size, but for the most part are clearly to be distinguished, though some on this account are ambiguous in form. Nor were the painters always meticulously careful in detail; nevertheless it has been possible to identify a number of species with certainty, while other identifications are probable. None is domesticated, and all belong to a palaeolithic fauna. Two further arguments are adduced: first the resemblance to the *art mobilier* of the cavern of Parpallo, Valencia, from proto-Solutrean and Solutrean levels, and secondly the relation of its schematic forms to the Azilian art in a line of descent in schematization.

Vitamin B₂ and Flavin Phosphoric Acid

A SHORT article in *NATURE* on December 18, 1937, p. 1070, summarized the present position with regard to the vitamin B₂ complex. It was there mentioned that 'vitamin B₂' is now regarded as a complex of three distinct factors—namely, (1) the pellagra-preventing (P.P.) factor, which cures pellagra in man, monkeys or pigs, and the so-called black-tongue of dogs; (2) lactoflavin (known as 'riboflavin' in the United States), which is needed for the growth and well-being of rats, and probably of many other species; and (3) vitamin B₃ (the so-called 'rat acrodynia', or 'rat pellagra' factor) which prevents certain characteristic skin lesions in rats. Work on the chemical characterization of these three constituents of the 'B₂ complex' has made rapid progress of late. Lactoflavin was already synthesized in the laboratory a year or more ago. In the issue of *NATURE* referred to, mention was made of the identification of the pellagra-preventing vitamin (or

pro-vitamin) with nicotinic acid. The matter is now taken a step further by the recent announcement in the current issue of *Pflüg. Arch. ges. Physiol.*, by Karrer, Laszt and Verzár that vitamin B₂ deficiency in rats is cured by 'flavin phosphoric acid'. The close chemical relationship thus suggested between two constituents of the vitamin B₂ complex, vitamin B₂ and lactoflavin, raises many interesting points which will no doubt be the object of further study.

Pennatulacea of the John Murray Expedition

IN a recent report, Prof. Hickson describes several interesting forms although none is actually new to science (The John Murray Expedition 1933-34. Scientific Reports, 4, No. 5. The Pennatulacea, by Prof. Sydney J. Hickson, 1937). Numbers of certain species, hitherto only known from a single specimen, are present, providing material for the study of growth and variation, and in one case (*Umbellula huxleyi*) it is possible to prove that several previously described species are only growth stages or varieties of one widely distributed species. *Umbellula huxleyi*, like many others from the deep sea, is now shown to have a very wide geographical distribution, extending perhaps as far east in the Pacific Ocean as Hawaii. The remarkable *Chunella gracillima*, regarded previously as very rare, was found in great numbers in the Pemba Channel, where it was first discovered by the *Valdivia* Expedition. This was associated in both collections with *Funiculina quadrangularis*. The only other locality in which *Chunella gracillima* has been found is in the Bali Sea in the Malay Archipelago, where it is also associated with the only specimen of *Funiculina* obtained during the voyage of the *Siboga*. The sexual condition of all species wherever possible is noted.

Crabs from Singapore

No. 13 of the *Bulletin of the Raffles Museum*, Singapore, Straits Settlements (Aug. 1937), contains many papers of interest, two of which deal with the Brachyura: "Notes on a Collection of Swimming Crabs (Portunidae) from Singapore" by Chia-Jui Shen, and "On the Crabs of the Family Ocypodidae in the Collection of the Raffles Museum" by M. W. F. Tweedie, curator of the Museum. There are many swimming crabs in this region, but all belong to the sub-family Lupinae, the groups Lupocycloidea and Podophthalmoida each being represented by one species and the group Lupoida by twenty-six. It is shown that the Portunidae are more abundantly represented in the warmer regions than in the cooler. This paper is illustrated by excellent figures of many of the species, and two new species of *Neptunus* are described. The material for the second paper was collected for the most part mainly in mangrove swamps around Singapore Island and on the east and west coasts of the Malay Peninsula. A key is given of the species (19 and one sub-species) of *Ilyoplax* and their geographical distribution, and there is one new species described. The new genus, *Pseudogelasimus*, closely related to *Ilyoplax*, is proposed for a single male specimen with peculiarly long eyes and associated broadening of the carapace and very unequal chelae. A large number of other species belonging to other genera are described.

Genitalia of Orthopteroid Insects

No. 5 of vol. 96 of the Smithsonian Miscellaneous Collections (1937) is devoted to a comprehensive account of the male genitalia of orthopteroid insects, written by Mr. R. E. Snodgrass of the U.S. Bureau of Entomology. The author points out that the external genitalia in these insects are primarily phallic organs. Accessory parts or periphallallic (claspings) organs are but little developed and when present they are, for the most part, secondary formations having no apparent relationship in the different groups. The true appendages of the ninth segment are, however, retained in many families as a pair of small styli which are carried on the hind margin of the 9th sternum. It is only in the Grylloblattidae that these styli retain their bases or coxopodites (coxites): in all other families these basal elements are fused with the sternum. The median penis of Ephemeroptera and some Dermaptera is a different structure from that of the Orthoptera because it is clearly a product of the union of two separate penes, each containing an outlet duct. The median penis of Orthoptera, and probably of most pterygote insects, is not produced by the union of two primary organs, each containing part of a primitive lateral duct. The external and internal genitalia, and their homologies, are discussed in great detail in all the Orthopteroid orders and related groups. Mr. Snodgrass's account is accompanied by numerous original figures notable for their clarity and detail. At the end of the memoir there is a very full bibliography of the literature on the subjects concerned.

Photosynthesis of Coffee Leaves under Natural Conditions

F. J. NUTMAN has recently described a method of studying the carbon dioxide absorption by individual leaves under field conditions (*Ann. Bot., N.S.*, 50, July 1937), and by the use of this method supplies evidence that these leaves assimilate more vigorously in shade than in full sunlight under tropical conditions in the northern province of Tanganyika Territory. The reasons for this behaviour are discussed; it is concluded that stomatal closure in direct sunlight is the most probable explanation and experimental evidence in support of this conclusion is promised in a subsequent communication. These conclusions have some general importance as Nutman has previously shown that the cause of a serious die-back disease of coffee in East Africa may be found in a shortage of carbohydrates.

'Brown Oak' Disease

MR. K. T. ST. G. CAETWRIGHT has investigated the cause of a brown rot of oak and sweet chestnut (*Trans. Brit. Mycol. Soc.*, 21, Pts. 1 and 2, 68, Oct. 1937). The common beef-steak fungus, *Fistulina hepatica*, is responsible, and though it may cause little loss of strength in the early stages, a severe attack makes the wood very brittle. The decay does not continue in converted timber, and 'brown oak' is actually easier for the carpenter's work than normal wood. Growth of the fungus is most rapid at 25°-27° C., and the paper suggests that it may obtain its sugar from the breakdown of tannin; the brown material may be a degradation product of lignin and hemicelluloses. Full descriptions of the organism as it appears in wood and upon culture media are given, and two coloured plates aid in realistic portrayal.

Mounds of Arctic America

ALL travellers on the low coastal plain of northern Alaska between Point Barrow and the Mackenzie delta have noted the curious, isolated, more or less conical mounds that diversify the otherwise featureless plain. The Eskimos call such a mound a *pingo*. In a paper in the *Geographical Review* of January 1938, Mr. A. E. Porsild discusses the origin of these and other earth mounds in north-western America and Greenland. He agrees with E. de K. Leffingwell that the Alaskan mounds may be formed by hydraulic pressure. This type is old and shows no sign of recent movement. The freezing of the surface layers over previous unfrozen strata produced conditions favourable to artesian wells. Where downward freezing checked the subterranean seaward flow of water, hydraulic pressure forced upwards the surface layers. A second type of mound, common in the Mackenzie delta, is found in level country or near the border of a lake or former lake basin. This type ranges from a few feet to more than two hundred feet in height and averages 40-75 ft. They often show a median rupture sometimes enlarged to a 'crater' and a well-defined stratification conforming to the slope of the surface. Mr. Porsild suggests that these mounds are formed by local upheaval, due to expansion following downward freezing of a body of water enclosed between bed rock and frozen surface soil. The position of this type of mound supports the theory. When sedimentation fills a lake, freezing of the surface is sure to occur first, thus producing the necessary conditions for the subsequent elevation of the mound. Many of the mounds are in an advanced stage of destruction due to subaerial erosion: some contain small lakes.

Earthquakes of the Channel Islands

SEVEN years ago, Mr. A. E. Mourant issued a valuable catalogue of the earthquakes of the Channel Islands from 842 until 1931 (*Société Jersiaise*, 50 pp.). To this, he has recently added a supplement (*Trans. Soc. Guern.*, 12, 523-540; 1937) containing accounts of nineteen additional earthquakes from 1640 until 1935, the majority of which originated in centres near the Channel Islands. Of these centres, the one most frequently in action (especially in 1804, 1843 and 1926) is the Jersey focus, situated off the Cotentin coast opposite Jersey. Another important focus, connected with strong earthquakes in 1799 and 1843, lies beneath or near Guernsey. Mr. Mourant notices the interesting point that the occurrence of an earthquake in the Channel Islands tends to be associated with the approach of a depression after an interval of fine weather.

Trade and Counter-trade Winds

MANY interesting facts about the trade and counter-trade winds are revealed in a detailed analysis of eleven years of observations with pilot balloons at Kingston, Jamaica, that is given by S. Proud in Professional Note No. 78 of the Meteorological Office. The natural wind structure above the locally controlled surface wind consists of a layer of trade winds (which blow mainly from east and south-east) several kilometres thick, surmounted by a more shallow transitional layer of veering wind that leads to the counter-trade, which last is an extension southwards and upwards into the tropics of the westerlies of temperate latitudes. The gradient

of temperature between the poles and the equator in the stratosphere, which is the reverse of that at the earth's surface, is such as to weaken and ultimately to reverse the westerlies at great heights above the tropopause. Such reversals were found on three occasions, one during the remarkable ascent to 26 km. (87,000 feet) of October 6, 1928, which showed southeasterly winds from 20 to 26 km. Apart from day to day variations in the wind structure, which are considerable, there is the well-marked annual oscillation from south to north and back again of the northern boundary of the trade winds at the surface in accordance with the varying declination of the sun but with a lag of about two months, which tends to cause a similar variation in the height at which the counter-trade is reached, this being much less in and around March than in September. The completeness of the reversal is, however, much greater from November until May than in other months. It is shown that the few occasions when the trade wind was absent at all heights were mostly when the main polar front was in the neighbourhood or when a hurricane was developing, generally to the north of Jamaica.

Photochemical Union of Hydrogen and Chlorine

A. J. Allmand, H. C. Craggs and G. V. V. Squire (*J. Chem. Soc.*, 1869; 1937) have carried out investigations on the above subject. In reactions at low pressures in the absence of oxygen the effect of light intensity (I) on the velocity was found to be proportional to I^n , where n varied over the range 0.05 — 1, the latter figure being found at low chlorine pressures, the values becoming lower as the light intensity and chlorine pressure were increased. At sufficiently high pressures, there was an intensity range in which $n = 0.5$. The rate of reaction and quantum yield passed through a maximum as the chlorine pressure was increased. Intensive drying of a low-pressure mixture was not found to inhibit the reaction in light, the addition of small quantities of water vapour to the dried gases actually retarding the reaction somewhat. The results are explained by assuming the existence of the radical Cl_2 . Reaction chains are terminated by disappearance of Cl and Cl_2 , both on the walls and, without triple collisions, in the gas phase.

Solubilities of Citric and Tartaric Acids

SINCE the information on the solubilities of citric and tartaric acids in water was very incomplete, these properties have been reinvestigated by L. H. Dalman (*J. Amer. Chem. Soc.*, 59, 2547; 1937) who gives values from 0° to 100° for both acids. The solubility curve for tartaric acid is a straight line representing solutions in equilibrium with anhydrous tartaric acid, this line being represented by the equation $s = 51.8573 + 0.2643 t$, where s is solubility in per cent by weight and t is temperature. The solubility curve for citric acid consists of two straight lines which intersect at 35.8°; below this temperature, citric acid monohydrate exists, whilst above it, anhydrous citric acid is the stable phase. The solubility curve for the monohydrate is represented by the equation $s = 48.9559 + 0.5231 t$, and that for the anhydrous acid by $s = 57.8564 + 0.2616 t$.

Improvements in Cinema Sound Reproduction

THE improvements in the quality of the sound reproduction in the cinemas of Great Britain has

greatly increased since its inception ten years ago. In the chairman's address to the Radio Section of the Institution of Electrical Engineers given on November 3, these developments are broadly traced out and an indication is given of the trends of further research. The average human ear, it was stated, can appreciate sounds having frequencies lying between 16 and 20,000 cycles per second. The early equipments of 1928–30 had a frequency range lying between 100 to 4,000 C.P.S. and a power range of 30 'decibels'. At 1,000 C.P.S. a power range of 130 decibels can be appreciated lying between the threshold of audibility and maximum audibility. The difficulties of maintaining a recording power range of 30 decibels on the film led to serious alterations in the character of the recorded sound. Distortion was also introduced by the film propelling mechanism, which consisted of a gear-wheel and sprocket-tooth. A harsh and throaty reproduction was thus produced. The volume range of the film is expressed as the ratio of the amplitude of the maximum signal that can be recorded on the track to the amplitude of the background noise from the film itself. If the background level is 30 decibels below the maximum signal it is inaudible. The elimination of ground noise was the aim of the earlier inventors, and this led to considerable improvements. The extension of the frequency range of the amplifiers has been from 100–4,000 to 50–8,000. The loud speaker range has been extended to 30–8,000 and the harmonic distortion has been greatly reduced. The amplifiers and loudspeakers are now in an advanced state of development. Cinema acoustics are becoming better understood, but it is not yet possible to predict with confidence the overall characteristics of a well-tryed equipment when installed in a new auditorium.

Comparison of Right Ascensions

W. W. H. GREAVES has recently issued a paper "A Comparison between the Right Ascensions of the Second Greenwich Catalogue of Stars for 1925.0 and of the FK3" (*Mon. Not. Roy. Astro. Soc.*, 98, 1, Nov. 1937). The systematic differences in right ascension between the Second Greenwich Catalogue for 1925.0 and the *Dritter Fundamentalkatalog des Berliner Astronomischen Jahrbuchs* (usually referred to as "FK3"), have been determined, and this complete systematic difference $\Delta\alpha$ is given by $\Delta\alpha = \Delta\alpha_a + \Delta\alpha_s$, the terms on the right-hand side being taken from tables. It has been found that the $\Delta\alpha_a$ values include periodic terms which involve the tangent of the declination, and it is suggested that this may be attributed to a periodic error in the determination of the azimuth of the Airy transit circle. In the previous Greenwich Catalogue, a similar effect was noticed, but opposite in phase. This change appears to be associated with a change in the system of determining azimuth. For the first catalogue, the azimuths were based on the observations of nine stars situated within 4° of the north pole, but when the second catalogue was commenced in 1922, the azimuth list was extended down to declination + 45°, and at present comprises 79 stars. This appears to have introduced a noticeable change in the periodic azimuthal term, but it is admitted that the precise instrumental origin of the change is obscure. It is suggested that a diurnal oscillation in azimuth with a seasonal change in its amplitude might be a possible contributory cause.