Research Items

Pleistocene Relations in East Anglia and Germany

DR. FREDERICK E. ZEUNER, in support of the tentative scheme for the interpretation of the Pleistocene deposits of East Anglia put forward by Prof. P. G. H. Boswell (1932 and 1936) has instituted a comparison of these deposits and those of the Pleistocene of northern Germany (*Proc. Prehist. Soc.*, **3**, 1; 1937). There is a remarkable similarity between the two series in (1) stratigraphical sequence, (2) in the palæontological evidence from the Cromer Forest Bed and that of Mosbach and Mauer, and (3) a fair agreement in the archæological sequence. In the geological evidence the correlation is as follows: (6) Scottish Readvance—Pomeranian—Würm 3; (5) Hunstanton Brown Clay—Wechsel—Würm 2; (4) Upper Chalky Boulder Drift—Warthe—Würm 1; (3) Great Chalky Boulder Clay—Saale—Riss 2; (2) Norwich Brick-earth and (?) Cromer Till—Elster—Mindel 2; (1) a possible glaciation in late Crag times—a supposed early glaciation of unknown extension—Günz. The evidence from Hoxne is the first from a British station to show a minor interglacial oscillation, which is correlated with the "Pre-Würm", or so-called warm Mousterian, of Germany between Saale and Würm 1. This implies the identification of Hoxne as Riss-Würm and not Mindel-Riss, as has been maintained by some. A comparison of the Cromer Forest Bed fauna with Mosbach and Mauer indicates that it belongs, as they do, to the Günz-Mindel interglacial, while the Crags, affording evidence both geological and palæontological of a cool climate or even of two cool subphases, may be regarded, with some reserve, as Günz. The archæological succession, beginning with Mr. Reid Moir's Crag industries as Günz, and the Chellean or Abbevillian as Günz-Mindel interglacial, while Clactonian 3 (High Lodge) is assigned to Riss-Würm, is shown to coincide fairly closely with the sequences and their geological correlations in both Germany and France.

Early Sculpture from Iraq

SOME unusual and important examples of early Sumerian and Babylonian sculpture from Iraq acquired for the British Museum (Bloomsbury) by the National Arts Collections Fund have been described and figured by Mr. Sidney Smith (*Brit. Mus. Quarterly*, **11**, 3). The earliest in date is a grey granite vase, egg-shaped, with slightly flattened base. The present maximum height is $5\frac{1}{4}$ inches. Beginning $\frac{1}{4}$ inch above the base are three rows of round-topped leaf-like decoration, which often represents mountains; while the circumference at the centre is divided between two groups representing lions, each attacking a bull. The theme and carving show that this vase is closely connected with a limestone libation vase now in the Bagdad Museum found at Erech, stratum III. This fixes the date as the period of the polychrome pottery called Jemdat Nasr' ware, before the archaic Sumerian period. A steatite bowl, 7 inches in diameter, $4\frac{1}{2}$ inches high, is carved on the outside in continuous low relief, which breaks up into separate groups, representing several acts, or different parts of a ritual, the connexion of water, bulls, snakes, vegetation, pointing to a rain-making ritual. Apart from its exceptional artistic merit, the bowl is of interest from the historical point of view. It is not later than the early part of the Agade period, about 2500 B.C., and it may be earlier. The appearance of Indian bulls on a local piece of work shows that close trade connexions led to an interchange of religious ideas. Secondly, the appearance of marked astral symbolism is important, because ordinarily Early Dynastic monuments show no such symbols, whereas they appear on the seals of early Indian type in some profusion, and in the same obscure connexion as on the vase. At present there is nothing improbable in the hypothesis that astral symbolism came into Sumer in the Early Dynastic period, through contact with the ancient civilization of India.

Movement within *Paramecium* Fragments

IN the usual protoplasmic streaming, or cyclosis, within *Paramecium*, the whole space of the endoplasm is occupied by a counter-clockwise movement, the cause of which has not yet been adequately interpreted. Teruhiko Hosoi narcotized *Paramecium* (*caudatum* type) by *iso*-propylalcohol and then cut the animals transversely into two parts at different levels (*J. Fac. Sci. Imp. Univ. Tokyo, Zoo.*, **4**, 299; 1937). In each cut portion of whatever type cyclosis took place in the same direction as in the intact animal and without any marked change in the rate of flow after the injurious effect due to dissection had subsided. The author suggests that the motive force of the movement may lie in special substances attracted to the intersurface between the ectoplasm and the endoplasm and thus may lie along the entire course of the cyclosis.

Antarctic Polychaetes

A STUDY of the polychaetes collected by the *Belgica* Antarctic Expedition of 1897–99 was begun by M. Pruvot many years ago, and by 1905 he had made numerous notes and drawings on the Aphroditidae. His death unfortunately took place before the work was ready for publication, and thus it happens that it is only now that Prof. P. Fauvel has ably edited and brought together those observations and drawings of Pruvot's, which are still of interest to-day ("Résultats du Voyage de la Belgica en 1897–99". Rapports scientifiques: Zoologie. Polychètes par Pierre Fauvel. Anvers, 1936). Prof. Fauvel has in addition completed a description of the collection. At the time when it was originally made, more than a dozen species were new to science, but during the years that have elapsed since then most of them have been described in the reports of other expeditions, leaving three only to be here recorded as new. The *Belgica* records are, however, valuable in that they give additional evidence concerning geographical distribution, and from that point of view especially this report will be welcomed. Emphasis is placed on the cosmopolitan distribution of certain species, at one time considered bipolar, but actually found in temperate and tropical seas of both hemispheres. It is also remarked that temperature seems to have much more influence on polychaetes than does pressure.

Rust Fungi of the Philippines

MANY new species are described in the second paper, by J. C. Arthur and George B. Cummins, on Philippine rust fungi in the Clemens collection, made in 1923–26 (*Philippine J. Sci.*, **61**, No. 4, 463–488; Dec. 1936). *Crossopsora fici*, as its specific name suggests, attacks *Ficus variegatus*; *Pucciniosira clemensiæ* parasitizes a species of *Berberis*; *Gerwasia asciculata* occurs on *Rubus* sp., whilst *Uredo derridicola* forms pustules upon the insecticidal *Derris* plant. *Sphœrophragmidium irregulare*, *Ravenelia lævioides*, *Spumula clemensiæ*; many species of the genus *Uredo*, *Endophyllum emasculatum*, *Puccinia plectranthella*, *P. hemigraphidis*, *Aecidium manilense* and *A. dapsile* add to the imposing list of species new to science. Latin diagnoses make the descriptions of international value.

Tobacco Mosaic Protein

Two papers recently available (*Proc. Amer. Phil. Soc.*, **77**, No. 4, April 22 ,1937) summarize the fundamental work on virus proteins carried out at the Rockefeller Institute for Medical Research. Dr. W. M. Stanley gives evidence to justify the conclusion that a protein of unusually high molecular weight, obtained by him in crystalline form, is actually tobacco mosaic virus. The crystalline protein prepared from such different hosts as tomato and phlox, has the same chemical composition, isoelectric point, optical rotation and biological activity. Normal plant protein has a much lower molecular weight, and has other properties different from the virus protein. Crystals of the prepared material are needle-shaped, 0·02–0·03 mm. long, and give a regular crystalline pattern on X-ray analysis. Dr. Stanley's paper is highly informative, and supplies a succinct digest of the most recent work on this complex subject. Dr. Ralph W. G. Wyckoff describes "The Ultracentrifugal Study of Virus Proteins" in the same journal (pp. 455–462). He gives particulars of an air ultracentrifuge inspired by the original apparatus of Svedberg, with which he has demonstrated that the virus protein has a molecular weight of approximately 17,000,000. The apparatus can also be used to test whether the virus is one molecular species, or a family of related proteins, and can be employed to purify a virus extract, without chemical treatment, with its ultimate loss of strength. The delicacy of this method should make it possible to study less sturdy viruses than tobacco mosaic, and should open a new avenue of investigation.

Map of Ellsworth Trans-Antarctic Flight

THE material for a map of the Ellsworth trans-Antarctic flight of 1935 has been assembled by Mr. W. L. G. Joerg and Mr. O. M. Millar in the *Geographical Review* of July. The data consisted of sixty-six photographs taken during the flight and certain related photographs taken by Wilkins during his flight in 1928. Although much of the map is tentative, certain important conclusions emerge. Stefansson Strait of Wilkins disappears, and the peninsular character of Graham Land is re-established. Of equal interest is the narrow strip of shelf-ice lying on the south-western side of Graham Land and separating it from an enlarged Alexander Land or Island. This was crossed at an altitude of 3,050 metres and photographs were taken especially of the Alexander Land side. This strait was more thoroughly explored later by Mr. J. Rymill and found to be at least 200 miles long. The Graham Land side was found to be mainly eruptive rocks, and the Alexander Land side fossiliferous stratified rocks. The two sides, contrasted in the photographs, probably represent the meeting of the plateau and Andean structures of Antarctica. Farther along the track various mountain peaks were seen, notably the Sentinel Range (lat. 77° 15′ S., long. 88° W.) and another too far distant to photograph or even to place accurately, in about lat. 78°–80° S. and long. 85°–90° W. Nearer the Ross Sea the high ice plateau seems to be unbroken by range or nunatak. The maps are on varying scales and bring out these and other features clearly.

Effect of Obstacles on Sunshine Records

THE ideal to be aimed at in the placing of a recorder for the measurement of the duration of sunshine is a position where the sun is never obstructed when at a sufficient height above the horizon for a record to be obtained. For the standard instrument used in Great Britain—the Campbell-Stokes recorder—which focuses the sun's rays on a card and produces a burn when those rays are strong enough—it has been found that practically no record is obtained until the elevation of the sun exceeds 3°. The task of finding a position quite free from obstacles of greater elevation than 3° over those portions of the horizon, roughly from north east to south-east, and from south-west to north-west, above which the sun passes during some part of the year at less than 3° elevation, is in many places an impossible one, consequently some information is desirable about the amount of loss resulting from obstruction, and this has been supplied by E. G. Bilham in "The Effects of Obstacles on Sunshine Records" (*Prof. Note* 76. (M.O. 336*p*.) London: H.M. Stationery Office. 4*d*. net.). The problem cannot be solved simply by calculating the length of time during which the sun is obstructed and comparing that with the total time during which it is above 3°, because there is a decided falling off in the frequency of recordable sunshine as the sun's elevation diminishes, due to haze, atmospheric absorption, varying cloud perspective, and other factors. If, however, the average percentage of the day's sunshine recorded when the sun's elevation is below various values in places free from obstruction is obtained, it is then possible to find the average percentage losses for obstruction of those values at places that have such obstructions. This is done up to 12° elevation, and it is shown that the percentage loss for a given altitude of obstruction is less in summer than in winter and less in the south of England than in Scotland. It is cheering to find that in general the percentage loss is much smaller than might have been expected; for example, in the summer half of the year, obstacles of 6° cause on an average little more than 1 per cent loss even if they extend laterally over the whole of the region occupied by the sun when its elevation is less than 6°.

Nature of Calomel Vapour

CONSIDERABLE interest has been taken in the nature of calomel vapour as deduced from vapour density measurements, that is, whether calomel is HgCl or Hg_2Cl_2, since this is connected with the problem of the molecular complexity of mercurous salts. Earlier measurements corresponded with HgCl. Odling, in 1864, observed that a piece of gold leaf is amalgamated in calomel vapour and he concluded that the vapour is dissociated to some extent at least

into Hg and $HgCl_2$, and this was confirmed by others. Smith and Menzies in 1910 showed that at 400° dissociation was complete in the sense of the equation $2HgCl = Hg + HgCl_2$. Since the mean molecular weight still corresponds with the formula HgCl, this is in agreement with previous work. H. B. Baker in 1900, however, had reported that when calomel was dried for three weeks in the dark with phosphorus pentoxide its vapour density at 400° corresponds with Hg_2Cl_2. F. T. Gucker, jun., and R. H. Munch (*J. Amer. Chem. Soc.*, **59**, 1275; 1937) have now reinvestigated the matter by measuring the absorption of the resonance line 2537 A. by calomel vapour. From 450° to 100° the results indicate complete dissociation of the vapour, in accordance with Smith and Menzies' results, in the case of undried calomel. The vapour of carefully dried calomel shows the presence of mercury only at temperatures from 400° to 250° but not below. Calomel sublimed in a vacuum at 200° and condensed on a target cooled with liquid air shows no trace of mercury, whilst the condensate from a mixture of mercury and excess of mercuric chloride, sublimed in the same way, showed mercury in the deposit. The vapour of carefully dried calomel also showed general absorption in the ultra-violet, which the undried calomel does not show. The results of vapour density measurements of carefully dried calomel at 375°–425°, however, corresponded with HgCl (or $Hg + HgCl_2$) and not with Hg_2Cl_2 as found by Baker.

Production of Artificial Radioactive Elements

INTERESTING work on the production of artificially radioactive elements by bombarding lithium and magnesium with α-rays of 8 cm. range from thorium-C′ is reported by A. Eckardt (*Ann. Phys.*, [v], **29**, 497; 1937). No radioactive elements could be detected by means of a Geiger counter when lithium was bombarded. Nuclei which might possibly have been formed are $^{10}_{4}Be$ and $^{9}_{5}B$ [$^{6}_{3}Li + ^{4}_{2}He \rightarrow ^{9}_{5}B + ^{1}_{0}n$; $^{7}_{3}Li + ^{4}_{2}He \rightarrow ^{10}_{4}Be + ^{1}_{1}H$]; but $^{10}_{4}Be$ is shown to be a stable nucleus. The stability of $^{9}_{5}B$ remains an open question, since its mass had not been determined when these experiments were carried out. Three possible radioactive nuclei, $^{27}_{14}Si$, $^{28}_{13}Al$ and $^{29}_{13}Al$, could be obtained from magnesium, of which the first two were detected. Their half-life periods are 7·6 min. and 2·2 min., respectively.

Adsorption of Gases and Vapours on Activated Charcoal

A CONTRIBUTION to our knowledge of adsorption and the formation of surface compounds is made in a note by R. Juza and R. Langheim (*Naturwiss.*, **25**, 522; 1937). The adsorption of gases and vapours on activated charcoal was investigated, particularly from the point of view of changes in the magnetic properties of the adsorbed substances. The paramagnetism of oxygen disappears when the gas is adsorbed at room temperature on activated charcoal. This probably indicates the formation of surface compounds between the charcoal and oxygen, which, like carbon monoxide and carbon dioxide, are not paramagnetic. In the case of the adsorption of benzene vapour, the paramagnetism of the system is less than that of the two substances taken separately and added together. Similar results are found for bromine and iodine. If the magnetism of the charcoal is assumed to be unaltered, there is a decrease in the diamagnetic susceptibility of benzene, whilst bromine and iodine become paramagnetic on adsorption. The paramagnetism in the case of bromine and iodine may indicate a splitting of the molecules into atoms under the action of surface forces, though another explanation is that the diamagnetism of the charcoal does not remain constant, but is decreased owing to the introduction of the adsorbed substance between the lattice planes of the graphite.

Astronomical Work at the Hamburg Observatory

IN the yearly report for 1936 by Dr. Schorr, director of the Hamburg Observatory at Bergedorf, it is stated that the 60-cm. refractor has been used for the photography of open star clusters, for spectrograms of Nova Lacertæ 1936 and for the spectra of variable stars. Vol. 2 of a *Durchmusterung* of stellar spectra is complete, and vol. 3 is in course of preparation. A very useful catalogue of proper motions (*Bergedorfer Eigenbewegungs-Lexikon*, 1 and 2) has been distributed. Two specimen plates taken with the Schmidt reflector and correcting lens are reproduced. These plates show the "North America" nebula in Cygnus and the Great Andromeda nebula. The diameter of the field is 8°, and the images on the edge of the field show, in the reproduction, no trace of elongation. An investigation has been made of the astrograph telescope and measuring machine (sources of error, corrections, methods of reduction, etc.) with the view of using this instrument in taking part in the re-observation by photography with wide-angle lenses, of the zones of the Astronomische Gesellschaft Catalogue, which was originally based on meridian observations centred around 1880. The work of deriving accurate star places by photography with lenses covering a field of 5° × 5° or greater was initiated, as is well known, by Dr. Schlesinger of the Yale Observatory.

Red Shifts and the Distribution of the Nebulæ

IN a paper under this title (*Mon. Not. Roy. Astro. Soc.*, **97**, May 7, 1937), Dr. Edwin Hubble considers the possible interpretation of red shifts as Doppler effects or otherwise. The subject has been treated in his recent work, "The Realm of the Nebulæ", and the present paper deals more fully with the problem. In the former work he points out that if red-shifts are simply velocity-shifts, the correction to magnitude is $4\Delta\lambda/\lambda$, but if they are not it is $3\Delta\lambda/\lambda$, and as the relation derived from observation is $2{\cdot}7\Delta\lambda/\lambda$, red-shifts are not velocity-shifts, unless some vital factor in the investigation had been ignored. The paper considers some of the criticisms of Eddington and McVittie. Eddington showed that in certain equations used by Hubble the possible effects of dispersion in the absolute magnitudes of nebulæ had been neglected. Nevertheless, Eddington himself, after investigating the effects of dispersion, finds that the necessary corrections are of no importance. Hubble is of opinion that the observational data, when weighted in favour of the theory of red-shifts being due to an expanding universe, "still fall short of expectations". McVittie's numerical errors in some previous calculations have been corrected; but, as Hubble points out, the revised figures do not affect the argument in the present paper. In a homogeneous, expanding universe, when corrections are applied for the dimming effects of red-shifts, a negative curvature would introduce an apparent thinning out of the nebular distribution. As observation shows an apparently increasing distribution density, a negative curvature can be adopted only if we discard the theory of homogeneity or expansion.