

RESEARCH ITEMS

Early Mayan Datings

A NEW series of publications of the National Geographic Society at Washington, D.C., is inaugurated by a study by M. W. Stirling, chief of the Bureau of American Ethnology, Smithsonian Institution, of a Mayan dating carved on a broken and re-used stela from Vera Cruz, Mexico ("An Initial Series from Tres Zapotes, Vera Cruz, Mexico", *Nat. Geog. Soc.: Contributed Technical Papers, Mexican Archaeology Series*, 1, 1; 1940). This monument was discovered in the course of archaeological explorations conducted by a joint expedition of the National Geographic Society and the Smithsonian Institution at Tres Zapotes, Tuxtla, Vera Cruz. Of some fifty mounds in four groups, each group with a rectangular plaza as a central feature, the easternmost, C, includes the second largest mound of the entire series, C1. In front of its south base was found a stela set up behind a roughly circular flat stone altar. It was a transverse fragment, intentionally broken in the middle, of a monument carved by an earlier people than those who re-used it. Facing the altar was a 'tiger-face' mask panel in low relief, while across the middle of the back was the greater part of an initial series. The numerals are in a vertical column with bars and dots placed horizontally—a rare but not unknown arrangement. The inscription is imperfect, but as restored by fully supported argument, it affords a dating which coincides with pottery finds, not yet fully worked out, but apparently to be assigned to the Middle American ceramic horizons. Only four other Initial Series are known, in which the style, with the horizontal arrangement of dot and bar, resembles that of this stela C, which is also the earliest of a group representing the earliest dates known in the entire body of Mayan inscriptions, and the three earliest of which have been found outside the classic Maya region.

Technique in Prehistoric Trephining

T. WILSON PARRY describes in *Man* of March 1940 the presumable method employed in trephining two prehistoric British skulls. Of these, one was found at Maiden Castle, Dorchester, in 1937 in association with a neolithic beaker of type B, the second in 1938 by Stuart Piggott in an early bronze age burial on Crichel Down, Dorset. At the time these two operations were performed, a notable advance in technique had been made, since the removal of a roundel of bone was more difficult and arduous than the elimination of a piece of bone reduced to dust by scraping, the method followed hitherto. In both examples the roundel had been removed from the left parietal. The dimensions in the Maiden Castle (late neolithic) skull operation are: laterally 65mm.; ant. post., 52mm.; oblique bevel of bone, 5–8 mm.; vert. thickness of skull, 5–7 mm. The corresponding dimensions in the Crichel Down (early bronze) skull are: laterally 60mm.; ant. post., 70 mm.; oblique bevel surface, 9–14 mm.; vertical thickness of skull, 5–14 mm. The Crichel Down skull is altogether thicker and heavier than that from Maiden Castle. A specimen from the Grotto of Casa da Moura at Peniche, Portugal, now in the

Geological Section of the Lisbon Museum, showing a continuous curving furrow united at both ends, is regarded as the first stage of the removal of a roundel of bone, the operation being unfinished. This method has not hitherto been described, but experiment with a neolithic beaked implement of flint on a recent skull has demonstrated the efficacy of what is here termed "the push plough" method, in which a thin, shallow furrow is gradually deepened until the bone is perforated. In neither skull is there any reparation of bone, so that if the operation was performed on the living, neither recovered.

Epidemic Dropsy in India

THE annual report for 1938 of the All-India Institute of Hygiene and Public Health, Calcutta, summarizes the teaching and research work carried out during the year. A most interesting research has been conducted on the disease known as 'epidemic dropsy'. A critical survey of its epidemiology, with much experimental work, led to the conclusion that this disease is associated with the use of mustard oil containing some toxic constituent. Mustard oil is widely used by the inhabitants for culinary purposes, and it was found that while some samples of mustard oil are innocuous, others are associated with the occurrence of epidemic dropsy, and experimentally induce the lesions associated with the disease. Investigation showed that the non-toxic and toxic oils could be distinguished by certain chemical and physical tests. Further investigation suggested that the toxic mustard oils might derive their toxic properties from some poisonous seed resembling mustard seed and mixed with it. After examination of a number of specimens of mustard seed, the seeds of *Argemone mexicana* were suspected to be the source of the poisonous substance in mustard oil. This plant grows wild and plentifully in various parts of India and becomes mixed with the mustard seeds at the time of harvesting. It was found that a mixture of 6 per cent of the oil expressed from the *Argemone* seeds with non-toxic mustard oil satisfied the same chemical and other tests as the known toxic oil, and experimentally induced the same lesions as the latter. The nature of the toxic agent is still under investigation.

Carotenoids and the Metabolism of Reproduction

THE possibility that carotenoid pigments have important biochemical roles in sexuality and the processes involved in the metabolism of reproduction is emphasized by R. Emerson and D. L. Fox (*Proc. Roy. Soc.*, B, 128, 275; 1940). In the life-cycle of certain species of the aquatic phycomyxete *Allomyces*, an asexual or sporophytic generation bearing thin-walled, colourless zoosporangia and thick-walled, brown, resistant sporangia, alternates with a sexual or gametophytic generation bearing colourless female gametangia and orange male gametangia. The pigment in the brown resistant sporangia of the asexual phase belongs to the melanin class and contains no carotenoid material. The orange pigment found exclusively in the male cells of the sexual phase is present in oil droplets within the cytoplasm

and is not found in the walls of the male gametangia, but is still apparent in the male gametes after their emergence from the gametangia. The female gametes, which are more than twice the size of the males, contain no trace of pigment. In the orange pigment of the male cells, γ -carotene was found in high concentrations with variable small amounts of β -carotene. The authors point out the accordance of these findings with the existing knowledge of the synthesis and selective storage of carotenoids or their derivatives in structures associated with reproduction in many cryptogams, higher plants and animals.

Induction of Polyploidy in Rabbit Ova

G. Pincus and C. H. Waddington (*J. Hered.*, 30, 515-518; 1940) have treated fertilized ova of rabbits *in vitro*, with ethyl alcohol, ether, colchicine or with supra-normal temperatures. These treatments gave a significant decrease in the cleavage rate, while cytological examination showed that fifteen out of forty eggs were tetraploid, most of the tetraploids being in the colchicine series. It is suggested that the inhibition of cleavage and the rate of chromosome division are differently affected so that sometimes tetraploid ova are formed. Tetraploid ova ordinarily fail to cleave, but the few that do cleave do so at a subnormal rate.

Interspecific Hybridization in Medicago Hybrids

THE diploid form of *M. falcata* ($2n = 16$) does not readily cross with *M. sativa* ($2n = 32$), but the more usual hybrids are between the tetraploid *M. falcata* and *M. sativa*. The resulting hybrids form a fertile polymorphic group. Analysis of these hybrids and of artificial hybrids made between diploid *M. falcata* and *M. sativa* are described by G. F. Ledingham (*Genetics*, 25, 1-15; 1940). A histological examination shows that in the cross *M. falcata* ♀ × *M. sativa* ♂, fertilization takes place and development continues for about a fortnight. In the reciprocal cross, fertilization occurs, but development usually ceases after two days. It is suggested that the rate of physiological activity and cell division of the endosperm embryo and maternal tissue is initiated by the chromosomes of the gametic nuclei.

Fruit Flies of Northern China

IN *Sinensia*, 9 (1938), Nos. 1-2, pp. 1-150, there is an extensive contribution on the Trypetidae or fruit flies of North China by Y. Zia and Sicien H. Chen. The journal in question, it may be added, is issued by the National Institute of Zoology and Botany, Academia Sinica, Pehpeichang, China. The present study is based upon material collected during a period of twenty-five years. Altogether, thirty-six genera and one hundred and thirty-five species are dealt with in this monograph. It is noteworthy that two of the genera and sixty-two of the species are described as being new. Special mention is made of the occurrence of two species of the genus *Rhagoletis*, namely, *R. reducta* and *R. scutellata*, for the reason that members of this genus are well known to cause much damage to fruits in Europe and North America. Although the relation of the two species named to horticulture in North China is unknown, their presence is noteworthy and is regarded as a menace to fruit production. It is creditable that, notwithstanding the disturbed condition of affairs in so much of China, the progress of natural science has not been wholly dislocated.

Sand-Dwelling Copepods

A. G. NICHOLLS continues his studies on copepods living in sand (*J. Marine Biol. Assoc.*, 23; 1939). New species are described from the Firth of Clyde and also from the St. Lawrence River. Revised keys are given for the species of *Leptopsyllus* and *Paramesochra*, *Leptopsyllus* now being restricted to those forms which lack endopods on the second legs. The two genera have been for some time in a state of considerable confusion, and although the author follows Kunz (1938) in basing the distinction on the presence or absence of an endopod on the second leg, he is of the opinion that the separation is not a natural one but will suffice until a thorough revision of these and allied genera has been made. An interesting find from Fintray Bay, Isle of Cumbrae, is *Remanea arenicola* Klie, occurring in relatively coarse sand near low-water mark. This species is so far only known from Kiel Bay. Three new species of *Leptopsyllus* and four of *Paramesochra* are described.

Weather and Radial Growth of Trees

AT the recent meeting of the American Association, Charles J. Lyon reported data from a New England forest, where suitable trees in close proximity to a meteorological station were blown down in a hurricane in 1938, as the result of an examination of their radial increment in comparison with the meteorological records. White pine, Scotch pine and red oak showed significant correlation with the rainfall of the spring months; but Austrian pine, Norway spruce and European larch showed no consistent correlation with the precipitation records of any period. There was almost no agreement between growth-rates and temperatures, though all the coniferous trees gave significant correlations between growth-rate and the temperatures of March and April, before the growth starts. This is interpreted as an effect of water supply, since the temperature of the air determines the frost in the soil. When the frost remains late in the spring, the water from the melting snow and from the early spring rains runs off to the rivers; but this water is added to the water supply of the trees if the frost leaves the soil early. On the whole, the native white pine tree is particularly sensitive to its water supply, and was the best indicator tree of those tested in this study. The width of its annual rings is a better index of growing conditions for crops and forests than the weather bureau records of rainfall and temperature for the year.

Water Culture of Apple Trees

TREES of many different species have from time to time been grown in nutrient solutions, and the method has been widely used in nutritional studies. H. L. Pearce (*J. Pom. and Hort. Sci.*, 17, 344; 1940) has recently used the method for comparing the course of absorption of nitrogen and potassium in dwarf and vigorous apple trees. One year old trees of Cox's Orange Pippin on Malling stocks IX and XII were grown in continuously aerated culture solutions for a complete season and the absorption of nutrients and water followed by analysis of the external solution. Growth records showed that the two rootstocks maintained their respective dwarfing and vigorous habits in these conditions, whilst the uniformity of the trees was greater than that obtained in soil. An unusual feature was the fact that the trees on M XII, which normally exhibit delayed

blossoming compared to trees on *M IX*, bore blossom as freely as those on the dwarfing rootstock. The vigorous trees absorbed more water per unit leaf area throughout the season than the dwarf trees, though the latter absorbed more per unit increase in fresh weight. The course of nitrogen and potassium uptake was closely similar in the two kinds of tree. The absolute amounts absorbed were greater for the tree on *M XII*, but the ratios of total growth made to nutrients absorbed did not differ significantly. No relation could, therefore, be observed between nutrient absorption and vigour.

Soil Decomposition of Straw

A RECENT paper by T. S. Sadasivan (*Ann. Appl. Biol.*, 26, No. 3, 497-508; 1939) shows that wheat straw is decomposed in soil largely by the activities of *Fusarium culmorum* and *Mucor* spp. These fungi were found on six different soils, but they appeared to give place to *Penicillium* spp. in the later stages of decay, or when the straw was treated with sodium nitrate.

Geochemistry of Fluorine

THERE has been little information available about the amounts of fluorine present in rocks, the lack of data being due mainly to the difficulty, hitherto, of determining fluorine with accuracy. The Willard and Winter procedure (*Ind. Eng. Chem.*, 5, 7-10; 1933) now furnishes an easy and surprisingly accurate method of analysis. E. S. Shepherd has established (*Amer. J. Sci.*, 117, 128; 1940) that fluorine is not so insignificant a constituent of the earth's crust as had been supposed. It is evidently present in quantities as great as, and sometimes greater than, chlorine, and this raises a question to which there is at present no satisfactory answer. What becomes of all this fluorine on denudation? The author hopes with continued work to be able to trace the vagaries of this elusive element. Meanwhile, it appears that plutonic rocks characteristically contain about 0.04 per cent. The lavas examined tend to have about 0.01, even where large amounts of fluorine are known to have been exhaled. Obsidian, however, has an average content of 0.07, rising exceptionally to twice this amount. In certain regions, notably the African rifts, there are strong local concentrations. In sedimentary rocks the average is 0.027, but ocean bottom samples have nearly twice as much. No correlation between fluorine and other elements has yet been detected, except a dubious one with potassium. A suggested relationship with phosphorus has not been confirmed.

Molecular Rotation in Organic Crystals

DIELECTRIC constant measurements have established the rotation of molecules in certain crystals, such as those of halogen hydracids and hydrogen sulphide, and also in some organic compounds, including certain polar derivatives of camphane, cyclohexane and ethane. A. H. White, W. S. Bishop, B. S. Biggs and S. O. Morgan (*J. Amer. Chem. Soc.*, 62, 8, 16; 1940) have extended this field by dielectric constant measurements with crystals of two derivatives of ethane, one of cyclopentane, five of cyclohexane, and thirteen of camphane in the non-aromatic class, and with a number of benzene derivatives (3,4,5-trichloro-*o*-xylene, trichloro-*m*-xylene, 3-nitro-4,5-dichloro-*o*-xylene, 5-nitro-3,4-dichloro-*o*-xylene, pentachloroethylbenzene, pentaethylacetophenone, pentamethylnitrobenzene and *o*-dinitro-

tetramethylbenzene). In the case of the non-aromatic compounds, the dielectric constant mostly rises abruptly at a transition to a value characteristic of polar liquids, as the temperature is increased. A relatively symmetrical gravimetric and volumetric distribution of atoms around the centre of gravity of the molecule facilitates its rotation in the crystal. In the aromatic compounds the dielectric constant of the solid behaves like that of the corresponding liquid and may be correlated with the dipole moment. The less symmetrical of the molecules cease rotating abruptly at transitions, while the more symmetrical exhibit reduced frequency of rotation but no transitions with falling temperature. The temperature at which the relaxation time reaches a given value depends (with one exception) on the number of chlorine atoms in the molecule in the symmetrical hexasubstituted methylchlorobenzenes.

Magnetic Spectrograph Coils

WHEN a beam of slow-speed electrons or ions is to be analysed by projecting it through a magnetic field, it is advisable to make the field in the vicinity of the trajectory as uniform as possible, and in many cases two equal coils placed coaxially at a distance apart equal to their radii have been used. With the same electric current in the same direction through the coils, the field in the median plane is uniform near the magnetic axis only. M. Ference, A. E. Shaw and R. J. Stephenson, of the University of Chicago, have shown (*Rev. Sci. Inst.*, February 1940) that it may be rendered uniform over the volume of a ring of radius up to a third of that of the coils by bringing the coils a little closer together. The theoretical proof of this is verified experimentally by balancing the field against that of a standard coil, using a small magnet and mirror to test the balance. With coils of 30.776 cm. radius, the field within a ring of mean radius 8 cm. is most uniform with the coils 28.890 cm. apart, and within a ring of 10 cm. with them 27.838 cm. apart. In the latter case the change of field from 9 to 11 cm., and from the median plane to parallel planes 1 cm. away, is only one part in 4,000.

Nebulae and Star Clusters in the Southern Hemisphere

H. Shapley and J. S. Paraskevopoulos have given some interesting pictorial results of a study of thirty nebulae and clusters photographed with the 60-inch reflector at the Boyden Station, Bloemfontein, of the Harvard College Observatory (*Proc. Nat. Acad. Sci.*, January 1940). Three quarters of the external galaxies (extra-galactic nebulae) that are near enough for close classification are spiral in structure, and most of the spirals can be placed in a few common categories. The illustrations given include several instructive curiosities and abnormal forms. One of these shown is *NGC 55* (exposure 2 hours), which with a major axis of nearly 33' is probably exceeded in angular dimensions only by the Andromeda Nebula and Messier 33. Its linear dimensions may prove to be outstanding among the external galactic systems. South African plates for the detection of Cepheid variable stars, used as distance indicators, are accumulating. Another plate shows the well-known globular cluster, Omega Centauri (exposure time 1 hour), one of the most remarkable of star clusters. Its total absolute magnitude is comparable to that of the small external galaxies, such as the companions to the Andromeda Nebula.