

Research Items.

THE INTERPRETATION OF PREHISTORIC "FINDS."—An interesting example of the light which can be thrown upon prehistoric objects of doubtful use by ethnographic data is given by Dr. Paul Rivet in the *Compte rendu* of the Liège meeting (1924) of the French Association for the Advancement of Science. Count Bégouen found in the cave at Montesquieu-Avantès (Ariège) an object of stone of which the surfaces were pitted with holes, most of them pierced right through from side to side. The date was either Magdalenian or Neolithic, it was uncertain which. A second object similar in certain respects—the figure of a feline—was found in a Magdalenian stratum in the grotto of Isturitz (Basse Pyrénées). It is, like the object previously described, pierced with holes, five in number, and in addition it is engraved. Four of the engravings appear to represent stylised barbed harpoons. Dr. Rivet suggests a common purpose for these dissimilar objects. He compares them with certain objects of ivory in use among modern Eskimo and described by Culin in his study of the games of American Indians. These are used for a species of cup and ball game, not, however, purely for amusement. Eskimo children use these objects when the sun first reappears after the long winter, to hasten his complete return. The game is definitely magical. In the same way the piercing of the hole by a point of bone in the prehistoric specimens may have been a magical ceremony symbolic of the piercing of game and practised before a hunting expedition.

PLACE-NAMES OF THE VIRGIN ISLANDS.—Since the acquisition in 1917 of the Danish Virgin Islands by the United States, the Coast and Geodetic Survey has been active in the preparation of a modern map and in amplifying the survey of the coastal waters. Although the earliest map of St. Croix was so old as 1671, there was no modern map of the islands incorporating accurate surveys. The latest effort of the Coast and Geodetic Survey is a Geographic Dictionary of the Virgin Islands of the United States by J. W. McGuire (Special Publication No. 103). In this gazetteer all place-names are entered with a note of their situation and derivation, and an indication of those which are rejected as being misspelt, superfluous or obsolete. From the length of the list of works consulted, it is clear that no trouble has been spared in compiling a trustworthy and scholarly guide to the place-names of these islands. The pamphlet also contains an introductory geographical chapter.

THE CYTOLOGY OF CANCER.—The September issue of the *Journal of the Royal Microscopical Society* opens with an admirable account of the general and experimental cytology of cancer by Dr. R. J. Ludford. In order to traverse the wide field more rapidly, Dr. Ludford has summarised the observations and theories in the form of twenty-one diagrams, either original or based on published figures. He gives a brief account of the behaviour of the nucleus and of the cytoplasmic organs—mitochondria, the Golgi apparatus, and the much discussed Plimmer's or bird's-eye bodies—and of keratinisation, and the formation of fat and pigment, and appends a summary of the properties of cancer cells cultivated *in vitro*. In his conclusion Dr. Ludford points out that with present microscopic technique there is no means of distinguishing between a normal and a cancerous cell. The virus of cancer, cultivated by Gye and photographed by Barnard, is smaller than the largest colloidal particles in the cell, and too small to be seen with the microscopes in common use.

THE CONTINUITY OF THE VERTEBRATE NERVOUS SYSTEM.—Frances M. Ballantyne (*Trans. R. Soc. Edin.*, vol. 53, pp. 663-670) records observations on the development of sensory nerves in *Lepidosiren*, and states that the olfactory nerve, the auditory nerve, and the spinal sensory nerves are at first protoplasmic bridges—each being a continuous strand and not a chain of discrete cells—which become fibrillated and lengthen as the embryo forms. Careful observation of large motor neurones in the spinal cord has convinced the author that the terminals of the axons, instead of ending in a club on the surface of the next neurone, really penetrate into its substance, and their neurofibrillæ pass directly and without a break through the cell and along its axon. No sign of a network either in or around the cell could be observed, and the neurofibrils are straight and unbranched within the cell. The dendrites of the neurone are at first thick processes which branch repeatedly and end in tapering threads of cytoplasm which appear to be without neurofibrillæ. The axon branches penetrate either into the body of the cell or into the thick proximal part of the dendrites, and the author supports the view that the great development of the dendrites, with their many branches, is to increase the surface of the cell in order to facilitate the metabolic processes, that is, the function of the dendrites is nutritive rather than nervous.

LEAF-MINING DIPTERA.—Memoir 78 (August 1924) of the Cornell University Agricultural Experiment Station deals with the leaf-mining Diptera of North America. Its author, Mr. S. W. Frost, brings together a good deal of useful information which will appeal to the dipterist and to the economic entomologist. The leaf-mining habit is regarded as having developed from the scavenger habit. Larvæ, having first entered the plant as scavengers, became adapted to an existence within the living host, and finally migrated to the stems and leaves, where they are now miners. It appears that 287 genera, including 589 species of North American plants, are affected by leaf-mining Diptera. The fly *Agromyza curvipalpis* var. *texana* Mall., for example, mines 15 species of Compositæ, and *Cerodontia femoralis* Meig. mines 22 species of Gramineæ. On the other hand, *Agromyza pusilla* Meig. has been recorded from 17 different families of plants, while at the opposite extreme there are other Diptera only known from a single species of plant host. Altogether there are 11 genera, including 61 species of Diptera, recorded as having the leaf-mining habit in North America, and they pertain to six families only. These families are the Cecidomyiidae, Trypaneidae, Agromyzidae, Drosophilidae, Ephyridae, and Anthomyiidae. Biological and descriptive accounts of these various species occupy pp. 29-132, and there follow lists of the leaf-mining Diptera of the world classified both under plant names and insect names. These two catalogues are useful compilations and appear remarkably complete. At the end of the memoir there is a very full bibliography of the subject.

SUGGESTED ALTERNATION OF GENERATIONS IN THE RED ALGÆ.—Prof. R. W. Phillips has certainly resuscitated from the literature a very interesting problem connected with the alternation of generations in the genera *Phyllophora*, *Gymnogongrus*, and *Ahnfeldtia* (*New Phytologist*, vol. 24, pp. 241-255, 1925). Whilst a few species seem to show normal alternation of sexual and tetrasporic generation, in others the tetrasporic generation has not been recorded. But

in these others curious warts have been recorded, which prove to be of the nature of nemathecia, that is, fructifications consisting of threads in which the successive cells of the threads become converted into tetraspores. Schmitz thoroughly investigated these more than thirty years ago and convinced himself and his fellow-investigators that these fructifications were of parasitic nature, and not the tetraspores of the host. In that case, where is the tetrasporic generation of the host plant? Prof. Phillips recalls the curious habit these marine algæ have of being parasitic on a nearly allied plant, and asks the pertinent question whether this is not a more striking example still of this with the parasite actually the tetrasporic generation of the same plant.

PRESERVATION OF PLANT TISSUES IN MUD.—Any hint as to the condition under which plant structures may be preserved in soil long enough to permit of their subsequent petrification may ultimately prove of value in the interpretation of fossil structure. It is well, therefore, to have placed on record such observations as those of R. E. Hunter and Winifred E. Mottram (*New Phytologist*, vol. 24, pp. 193-206, 1925), who noted that the moving shingle bank at Blakeney had left exposed some of the old marsh mud containing plant remains which, to judge from the rate of shingle movement, etc., were upwards of 200 years old. The authors have thus been led to undertake the troublesome task of trenching in the salt-pan of the marsh, after drainage. The results show that the roots of the living plants penetrate to considerable depths, and that, in certain circumstances, a plant such as *Triglochin* may decay at the base very slowly whilst the living crown continues active for a very long time. They concluded from the rate of accretion of the marsh that a plant of *Triglochin* examined was perhaps thirty-six years old. The plants exposed by movement of shingle were stems of *Sticte Limonium*, and were *in situ*. Investigation of the actual marsh does not appear to have cleared up adequately their presence here, but it has shown that the conditions existing in certain types of "soft" salt-marsh pan certainly favour the preservation of plant remains.

BURMESE PERISSODACTYLA.—Dr. Pilgrim has published in a memoir of the Geological Survey of India (vol. 8, No. 3, 1925) an account of the Eocene Perissodactyla of Burma. These are represented by members of the Titanotheriidae, of the Amyndodontidae, an aberrant family of rhinoceroses, and of the Tapiridae. The discovery of titanotheres in Burma is of great interest. The family is typically American, and the only other parts of the world in which it has so far been found are Transylvania, with the sole genus *Brachydiastematherium*, and the newly discovered forms obtained in Mongolia by the American Museum of Natural History expedition. Dr. Pilgrim describes a new genus, *Sivatitanops*, and also a form ascribed to the American genus *Eotitanotherium*. The memoir is well illustrated, but on the technical side the types used by the Publication Department of the Government of India need renewing and the type-setting a stricter supervision.

EARTHQUAKES IN NEW ZEALAND.—The report of the Dominion Observatory, New Zealand, 1924-25 (Bulletin No. 58), contains some notes on the earthquakes of 1924. The Milne seismograph was in operation throughout the year, and the Milne-Shaw seismograph from February 8. During the last ten months of the year, 62 earthquakes were recorded by the former, and 73 by the latter, instrument. Seventy earthquakes were felt during the year, sixty

in the North Island and ten in the South Island, none of which attained a destructive intensity. Maps have been prepared and will shortly be published showing in considerable detail the distribution and intensity of the earthquakes felt in New Zealand.

OBSERVATION OF EARTHQUAKES IN A RAILWAY TUNNEL.—It is well known that earthquakes are either not felt at all or felt only slightly in railway tunnels and mines, even when the shocks at the surface are very strong. In the great Japanese earthquake of September 1, 1923, the damage to tunnels was very slight, and occurred only a few yards from either end. To determine the rate at which the amplitude decreases with increase of depth, Mr. S. Nakamura (*Proc. Phys.-Math. Soc. of Japan*, vol. 7, 1925, pp. 127-130) placed two of Omori's tromometers, one in a transverse shaft connecting two parallel tunnels each $1\frac{1}{2}$ miles long at a depth of 375 feet below the surface and nearly 500 yards from the northern end, the other just outside the tunnel at that end. Comparisons were made for nine earthquakes during the first three months of the present year, and they show that, as a rule, the amplitude of the principal vibrations was less in the tunnel than outside, the ratio ranging from 0.19 to 1.93. Though the general variation in the ratios of the amplitudes with varying periods agrees approximately with that computed from the formula for the Rayleigh waves, the agreement is not close enough to allow the inference that the observed waves were the Rayleigh waves.

PRECIPITATION IN SCANDINAVIA.—A new rainfall map of Norway and Sweden, on a scale of 1 : 2,500,000, is published by H. W. son Ahlmann in *Meddelanden från Statens Meteorologisk-Hydrografiska Anstalt*, Band 3, No. 4, Stockholm. The Swedish part is taken from the map by A. Waltén which previously appeared in the same publication. The Norwegian part is based on the rainfall statistics of the Norwegian Meteorological Institute and the volume of water in the Norwegian rivers. The author has devised also a method of finding the relation between the amount of precipitation and the extent of glaciation in any region. Values of rainfall based on the flow of rivers are adjusted by the addition of certain coefficients of evaporation. The coefficient decreases with the amount of fall, since great falls are at high elevations when temperature is low and evaporation not active. The only region where data were insufficient was Finmark, where rainfall stations are few and there is little present glaciation and no measurement of the flow of rivers. The map shows in a striking way the great variations in rainfall in Norway and the rapid decrease in amount from the west to the east of the Scandinavian peninsula.

UPPER AIR IN SAMOA.—A tentative discussion of pilot balloon flights has been made for the twenty months, May 1923-December 1924, at Apia, Western Samoa, in latitude $13^{\circ} 48' S.$, longitude $171^{\circ} 47' W.$, by Mr. Andrew Thomson, Director of the Apia Observatory, to obtain the direction and velocity of the trade winds at various altitudes, the nature of the antitrades overlying them, and the variation of these great air movements with the season of the year. Further observations are in progress, but it is not believed that up to a height of 12 km. (7.5 miles) the figures now given will be materially altered. The coasts of South America lie 6200 miles to the eastward, and the continent of Australia 2500 miles to the west, and the expanse of the ocean is otherwise free from the influence of land except for numerous islands, the influence of which is said to be inconsiderable. Apia

lies slightly to the south of the centre of the South-east Trades. On the open ocean in the immediate vicinity of Samoa, winds from the quadrant south-east to north-east blow for 48 per cent. of the time during the months of December and January, and 85 per cent. during June to August. The velocities of the balloons for the two periods May to October (the dry season) and November to April (the wet season) are resolved for each 0.5 kilometre of altitude into north-south and east-west components. The north-south component is weak and approximately the same for wet and dry seasons. The east-west components show that the trade-wind movement of the air to the west decreases steadily with altitude and becomes zero at 3 km. (1.9 miles) in November to February and at 7.2 km. (4.5 miles) in May to August. The eastward motion of the Antitrades setting in at these levels continues to a height of 12 km. (7.5 miles).

DIELECTRIC CONSTANTS OF UNSATURATED COMPOUNDS.—In the *Journal of the American Chemical Society* for October 1925, C. P. Smyth and C. T. Zahn give the results of measurements of the dielectric constants of ethane, ethylene, acetylene and *n*-butylene carried out in order to investigate the structure of unsaturated bonds. Other experiments have indicated that a double bond in a hydrocarbon chain often gives rise to a moment in the molecule which can be determined from the dielectric constant of the substance. The moments of the ethane, ethylene, acetylene and acetylene molecules are zero, but *n*-butylene has a small moment. This evidence shows that the electrons of an unsaturated bond are symmetrically arranged, but have a stronger field of force than a saturated bond. If the unsaturated bond is not symmetrically placed in the molecule, the effect will be to give the substance a measurable moment.

DIMENSIONS OF MOLECULES.—By means of the Stephan-Maxwell-Jeans equation, calculations of the average cross-sectional areas for the molecules of substances can be made from their diffusion coefficients. The rate at which molecules diffuse through a gas depends not only on the absolute velocities of the molecules, but also on their size, since the possibility of collision increases with increasing size or cross-sectional area. In the *Journal of the American Chemical Society* for October 1925, E. Mack, Jr., describes a method of finding diffusion coefficients by direct weighing and gives values for several substances. The average cross-sectional areas of these were calculated from scale models in beeswax by shadow projection, and were in excellent agreement with the values found by the diffusion method, showing that the models of the molecules were of the correct shape. The experiments confirm the view that benzidene and diphenyl have a collapsed structure.

COMPUTATION OF SPECTRAL ENERGY.—The Department of Commerce of the Bureau of Standards has recently published a series of "Tables and Graphs for facilitating the Computation of Spectral Energy Distribution by Planck's Formula." The set consists of seven sheets each about 24 in. × 19 in., printed on stout paper, the price being the very reasonable one of 35 cents. Of the sheets, five are charts, the remaining two a sheet of explanations and a sheet of tables. Table 1, which will be of use to the general physicist, gives values of the intensity of radiation E_λ for different values of $\lambda\theta$ (λ =wave-length, θ =absolute temperature), expressed as fractions of the value at maximum, which occurs for $\lambda=\lambda_m$, where $\lambda_m\theta=2890$. The values are given to four significant figures. Tables 2A and 2B give values of E_λ for λ from 0.4 μ to

0.72 μ , and for θ from 1000° to 2800°, the ordinates being on such a scale (different for each temperature) that $E_\lambda=100$ at 0.59 μ in Table 2A, at 0.56 μ in Table 2B. The five charts provide graphs corresponding to the second of these tables, the scale being altered from chart to chart so as to provide an accuracy of 0.33 per cent. in the energy values, 0.1 per cent. in the temperatures. From such curves it is a very simple matter to deduce the colour-temperature of a radiator from observations of the relative energies at 0.56 μ and one other wave-length. The graphs are on millimetre paper, and are very clearly executed. The value $C_2=14350$ is chosen for the radiation constant occurring in Planck's formula, though work done by Coblenz at the Bureau of Standards gave $C_2=14320$. It is shown, however, that this makes a negligible difference to the accuracy required, and in any case it is easy to use the charts in such a way as to allow for the difference.

METALLURGY IN ANCIENT MEXICO.—The method employed by the ancient Mexicans in the manufacture of certain metal objects has been repeatedly investigated with no very conclusive result. Strebel holds that although these objects have the appearance of wound wire welded or soldered together—and some were undoubtedly made by this process—the usual method employed was that of *la cire perdue*. They had not hitherto been submitted to microscopic examination. Dr. Axel Hultgren, however, has now applied this method of investigation to three exactly similar bronze bells from Nochistlan in Central Mexico, and has published the result in vol. 17, N.S. of the *Journ. des Américanistes de Paris*. Externally these bells have a grooved appearance suggesting that they have been made by winding a metal wire and subsequent welding, but internally they are perfectly smooth. An analysis of their composition gave copper 92.40, tin 6.95, lead 0.02, phosphorus 0.05, antimony less than 0.1, iron and aluminium less than 0.1. The microscopic examination showed the dendritic structure typical of cast alloys, and such as would be in accord with the chemical composition. The branches of the dendritic structure are the first formation of crystals in a falling temperature, and contain less tin than the material intervening between them which solidifies later. This proves, therefore, beyond question that the bells were cast. Had they been made from wire, the dendritic formation would have been distorted.

CONSTITUTION OF GLASS.—Prof. W. E. S. Turner has summarised the more important sections of our present knowledge of the nature and constitution of glass in a paper presented to the Society of Glass Technology and published in the Society's quarterly journal (September 1925). He has applied the Ramsay and Shields equation to the study of the molecular complexity of glasses with the aid of some data on surface tension and density, and has shown the fluid glass "molecules" to be of high molecular weight. Further investigation of the molecular complexity is developed by the application of indirect evidence. The existence of chemical compounds in glass has received attention, and the relation between percentage oxide content and the properties of thermal expansion, density, tensile strength, compression strength, etc., suggests that the oxides retain their individuality. The existence of breaks in the curves of composition—specific volume, etc., is taken as evidence of the presence of compounds. Much more investigation of physical and physico-chemical character is necessary before definite conclusions can be drawn. The same issue contains important communications from other authors on the constitution of glass.