

Research Items.

THE BRONZE AGE IN ESSEX.—A useful descriptive catalogue by Mr. Charles H. Butcher of the Essex Bronze Age implements and tools in the Colchester Museum inaugurates a series of Borough of Colchester Museum Publications. From the general character of the Bronze Age finds in Essex it would seem that this area retained its neolithic influences until a comparatively late date, and that the period contemporary with the barrows and burial mounds was of short duration. The greater proportion of the Bronze Age belongs to the period when founding was universal, and the socketed axes, leaf-shaped swords, and bronze spear-heads were in use. Evidences of continental influence are marked, especially in types of winged axes, rare in Britain, but commoner on the Continent, and curved tanged knives resembling those commonly found in Switzerland. These come from a hoard found at Grays Thurrock, as does also a halberd blade of hitherto unrecorded type. Of a number of hoards found in the county, this was the most remarkable, as it was the largest, the number of pieces being 298, and including socketed axes, leaf-shaped spear-heads, leaf-shaped swords, tanged and socketed knives, part of a mould, and 68 lumps of copper and bronze.

PRE-COLUMBIAN RUINS IN NEW MEXICO.—A prehistoric ruin in the Chama Valley, New Mexico, excavated by Mr. J. A. Jeancon, is described in a bulletin recently issued by the Bureau of American Ethnology. This ruin, known as "Po-shu-puinge," meaning "Calabash at the end of the ridge village," is undoubtedly pre-Spanish. The pottery discovered was of good quality and great variety. According to Indian tradition the village was formerly a great centre of trade in pottery and other artefacts. A great number of objects in stone and bone were found, including axes, knives, spear-heads, mortars and pestles, scrapers, bone dirks, flutes, awls, needles, and beads. Squares and oblongs of pottery were possibly tallies for some such game as is still played by Indians of the south-west. Seeds of squash, pumpkin, and gourd were found, as well as charred corn. Traditional evidence indicates that the people of the village came originally from some country to the north, and that it was their custom to kill their male enemies but to assimilate the captured women and children into the tribe. This would account for the presence of foreign types of pottery. Apparently the village was deserted very suddenly, the ancient inhabitants being driven out and vanishing completely, so far as is known.

PLAGUE INVESTIGATIONS IN EGYPT.—A report on plague investigations in Egypt by Dr. G. F. Petrie and Major R. E. Todd, assisted by Dr. R. Skander and Dr. F. Hilmy, has been issued from the Ministry of the Interior, Egypt, Department of Public Health (Government Press, Cairo, 1923). A brief history of plague in Egypt from the seventh century is given. The present series of epidemics dates from 1899, when plague broke out in Alexandria, the exact mode of its importation being, however, unknown. The subsequent history is one of a generalised dispersion of the infection throughout the country. The total number of cases notified from 1899 to the end of 1919 is 14,783. The second section of the report deals with the species of rodents trapped in the houses, etc., and with their insect parasites. Of the 67,000 rodents captured, nearly 40,000 were *Rattus rattus* and about 25,000 were *Acomys cahirinus* (the Cairo spiny mouse). *Xenopsylla cheopis* was the predominant flea. The exceptional severity of the epidemic in 1911 on one of the estates specially investigated is

explained by the remarkable degree of infestation of the back-to-back mud houses with *X. cheopis*. The relation of climate to bubonic plague is discussed, and a chapter is devoted to pneumonic plague, the prevention of which is likewise dependent in the last resort upon the extinction of plague in rodents. In the concluding pages emphasis is rightly laid upon the need for the enlightenment of the majority of the community if progress is to be made in the control of plague.

EUGLENA IN TADPOLES.—Prof. R. W. Hegner describes (*Biol. Bull.*, xiv., 1923, pp. 162-180) three species of *Euglena* from the intestine and rectum of frog- and toad-tadpoles. All three possess green chromatophores and red stigmas. A comparison of two sets of tadpoles of *Rana pipiens* from adjoining ponds, one set much retarded in growth and heavily infected with species A, and the other of normal growth, lightly infected or not at all, indicates that the dwarfing of the former may have been due to the presence of the euglenas. Tadpoles of *R. pipiens* containing very few specimens of species A were fed on the highly infected intestine of other tadpoles of the same species and became more heavily infected. The author thinks that the usual method of infection is not by ingesting such trophic forms of *Euglena*, but that a resistant, over-wintering form of species A probably exists by means of which the new broods of tadpoles become infected in the spring. Attempts to cultivate species A outside the tadpole failed, and the author concludes that the trophozoites are incapable of living and reproducing outside their host. Attempts were made to infect tadpoles of *Rana pipiens* with three species of free-living euglenoids, but without success. Apparently the species which inhabit the intestine and rectum of the tadpoles possess a resistance to the digestive juices which is not present in free-living euglenoids. Species A is also a regular inhabitant of the intestine and rectum of tadpoles of *Rana clamitans* and *Bufo lentiginosus americanus*, and can be transferred with food from tadpoles of one species to those of another. Prof. Hegner hopes to continue work on these organisms, which present excellent material for the study of the evolution of parasitism.

THE SILURIAN STRATA AND OSTRACODA OF MARYLAND.—The Geological Survey of Maryland has added to its handsomely published and weighty series of volumes a monograph on the Silurian (Gotlandian) system of the State, by Charles K. Swartz and other members of its staff (Baltimore, 1923). E. O. Ulrich and R. S. Bassler contribute an essay (pp. 233-270) on corresponding deposits throughout N. America, in which older and newer classifications are usefully explained. Their palæogeographic maps may be compared with the effective but less detailed series given by A. W. Grabau ("Textbook of Geology," part 2, p. 326, etc.), who concisely points out the interest in earlier Palæozoic times of the Appalachian region, which was liable to incursions of marine faunas from the north, from the Atlantic, stretching across to Britain, and from the south. Maryland lies well on the meeting-ground, and its later series, with the eurypterid zones of Wills Creek, herald the incoming of a continental Devonian type. Some of the beds contain little but ostracods, and E. O. Ulrich and R. S. Bassler furnish an account of Palæozoic types in general, in which several new genera are established and new methods of study are described. The distribution of ostracod shells across continental deposits from desiccating

pools by the action of the wind is well referred to. The volume contains 67 plates of fossils, and the existence of an Atlantic fauna adds to its interest for the numerous workers on Silurian stratigraphy in the British Isles. Those who seek especially for graptolites will, however, meet with disappointment.

WEATHER IN THE HIGHER ATMOSPHERE.—The U.S. *Monthly Weather Review* for last September contains an article on "The Law of Pressure Ratios and its Application to the Charting of Isobars in the Lower Levels of the Troposphere," by Mr. C. Le Roy Meisinger of the U.S. Weather Bureau. An attempt is made by the author to develop the preparation of free-air pressure maps to which he has devoted so much attention; the previous discussion in Supplement No. 21 of *Monthly Weather Review* was noticed in NATURE for June 9, 1923, p. 788. Previous efforts by the author to establish isobaric charts for the levels 1 or 2 kilometres (to 6500 ft.) above sea-level were in a way successful. The attempt is now made, by the aid of these together with the precisely measured surface pressure, to learn something about the pressure distribution at a higher level. Pressure ratios have been formed between the pressures at 1 and 2 kilometres above sea-level and between pressures at the surface and some selected higher level, those selected being 3, 4, and 5 kilometres (to 16,400 ft.) above sea. It is asserted that regardless of the level to which the computations refer, the accuracy is just about as satisfactory at the high level as at 2 km. level; this is of considerable importance to the law of pressure ratios. Computations for high levels at the aerological stations are compared with the results by means of kites at those levels. The computed and observed results at 3 and 4 kilometre levels show a remarkably good agreement. The determination of constants for non-aerological stations is thoroughly explained and the application to map drawing is well illustrated, several specimen pressure maps being given for sea-level and for 2, 3, and 4 kilometres above sea-level. A praiseworthy attempt is made to associate the wind direction and speed with the pressure at different levels. The discussion is useful for aviation and is of importance in weather forecasting.

MERCURY STANDARD CELLS.—The solubility of finely divided substances depends on the size of the individual particles. It follows, therefore, that standard cells set up with mercurous sulphate sufficiently finely divided should have abnormally high electromotive forces. Vosburgh and Eppley (Jour. Amer. Chem. Soc., January 1924) have tested this conclusion experimentally and found it to be correct. The order of the E.M.F. increase is from 40 to 100 millivolts. When Weston cells are being set up to determine the value of the international volt, it is important that the mercurous sulphate be sufficiently large grained. Digestion of the latter with a boiling solution of sulphuric acid is recommended as a wise, but somewhat untrustworthy, precaution.

GASES AT HIGH PRESSURE.—The issue of the Proceedings of the American Academy of Arts and Sciences for January contains the results of an investigation of the compressibilities of five gases at extremely high pressures which has been carried out by Prof. P. W. Bridgman, of Harvard, with the aid of the Rumford Fund. Hydrogen, helium, nitrogen, ammonia, and argon at 30°, 65°, and 95° C., and at pressures between 3000 and 15,000 atmospheres, were investigated, and the results are given in the form of tables and curves. In all cases, at pressures of the order of 6000 to 8000 atmospheres, the compressed gas has about the same compressibility as a liquid at

atmospheric pressure, and the volume shows no sign of approaching a limit asymptotically. The product of pressure and volume continues to increase up to the highest pressures at a rate which diminishes a little as the pressure increases. The volumes for pressures exceeding 5000 atmospheres are less than the minimum volumes for infinite pressure as given by the *b* term of Van der Waals' equation. A four constant formula suggested recently by Becker agrees better with the experimental results.

THE β -RAYS OF URANIUM-X₁.—Dr. C. D. Ellis writes to us with reference to the article under this heading which appeared in NATURE of February 23. The article was intended merely to give an abstract of the paper by Fraulein Dr. Lise Meitner, quoted in it, without any particular expression of opinion on one side of the subject or the other. Dr. Ellis, however, regarded it as "an authoritative statement of one side of a controversy" though "the question under discussion is still unsettled." On this account he directs attention to two papers in the February number of the Proceedings of the Royal Society, which were not seen by the writer of the above article before it was published, in which Dr. Ellis and Mr. H. W. B. Skinner have described in detail the present state of the opposite point of view, and have replied to previous papers by Dr. Meitner. These papers describe some remarkable experimental results on radium B and radium C, magnificent radiographs of the B-ray spectra of RaC and of RaB+RaC having been obtained. From the observed energy relations between the lines the frequencies of a set of γ -rays, which are assumed to produce them, are deduced; and the values obtained are regarded as having confirmed strongly the conclusion that the rays are due to transitions between stationary states in the nucleus; diagrams of the probable nuclear levels of RaB and RaC are given; the two sets show striking similarities, which fact is considered to be of great importance. Owing to a printer's error, the masculine personal pronoun was made use of in the article of February 23 in referring to Fraulein Meitner.

ELECTRIC CONDUCTIVITY OF CRYSTALS.—Herr F. v. Rautenfeld has measured the conductivity of rock salt at temperatures between 650° and 793° C., and of Iceland spar between 230° and 550° C., by means of alternating currents (*Annalen der Physik*, Nov. 1923). For the first substance he finds the relation between the conductivity κ and the temperature *t* to be $\kappa = 0.152 \times 10^{-9} e^{0.00287t}$, while for Iceland spar a different law holds, $\kappa = 0.01995 \times e^{-5756.5/T}$, where *T* is the absolute temperature. In both cases contact with the crystal was obtained by dusting the ground faces with platinum black and pressing flat platinum electrodes against them. F. Braun and, independently, F. Noack have determined the relation between the conductivity in different directions through rock salt, and v. Rautenfeld has measured plates cut perpendicular to the principal axis of Iceland spar, in the direction of cleavage, and parallel to the principal axis. The last gave somewhat uncertain values, but they were smaller than those obtained with either of the first-named plates. The first of the three plates gave the largest values, and the second approximately the geometrical mean between the first and the third. Herr v. Rautenfeld concludes that the conductivity in different directions does not depend greatly on whether atoms of the same kind, or atoms of different kinds, succeed each other in the directions concerned, but possibly more on their mobility sideways. The experiments cannot be considered to explain the mechanism of conductivity in such crystals.