

Research Items

Copper in Early Britain. Two communications on metallurgy in early Britain appear in the *Proceedings of the University of Durham Philosophical Society*, 9, Pt. 2. The first, by Dr. A. Raistrick and Dr. J. A. Smythe, describes a bronze celt, a fine specimen of the flanged type without stop ridge, found in the working of clay pits at Birtley. It falls naturally into a group of finds associated with the entry of the Bronze Age peoples into the area by way of the Wear Valley. The weight of the celt is 8 oz., its length 13.2 cm., and maximum width, cutting edge, 5.2 cm., flange 2.4 cm. A metallographic examination reveals that it is a bronze rich in tin, and the analytical results show that the copper and tin were of a high degree of purity. The metal had been cold-worked and afterwards annealed at a comparatively low temperature. In parts, particularly on the flanges, cold-working had followed the heat treatment. Tests for hardness with the Brinell machine gave the figures, in the thick parts 140, at the edge and sides 178, and at the flange 200. The second communication, by Mr. C. G. Whittick and Dr. J. A. Smythe, deals with a cake of copper from Carleton, Glasserton, Wigtownshire, of Roman origin. As it had been suggested that it might have come from the copper-mining area of Wales, it was compared with samples from four cakes found in North Wales and now in the British Museum. The Carleton cake appears to have been cast in a rude open mould or pan with edges expanding upward. In no case is there direct evidence of dating, though there is little doubt about the question of a Roman origin. The analysis and metallographic examination of the Carleton specimen agree in indicating that it is a lead-bronze alloy. A determination by recalculation of the character of the copper used shows that it is so similar to the four Welsh coppers as to make identity of origin extremely probable.

Binocular Perception of Flicker. Miss M. D. Vernon read a paper on the "Binocular Perception of Flicker" before Section J (Psychology) of the British Association at the recent Leicester meeting. The critical frequency (that is, the fusion point) of a white monocular flickering field has been found to depend only upon the brightness of the field, when wavelength, retinal area and state of dark adaptation are constant. If, however, a steady, non-flickering, plain or coloured field is presented simultaneously to the other eye, it is found that the critical frequency is modified. The critical frequency is reduced (1) when the steady field presented to the other eye is brighter than the flickering field; (2) when the steady field contains a black figure of varying complexity; (3) when the flickering field contains a black figure; but this effect is masked by the presentation of a plain, steady field to the other eye. The critical frequency is reduced considerably more when both fields are figured, and is greatly increased if both fields are made to flicker simultaneously at the same rate, but is reduced again if the fields are figured. The effect of the figures is not due to their interest and cognitive attentive value, since a plain black cross produces as great an effect as the drawing of an interesting real object. It is suggested that these phenomena may be explained in terms of (a) a conflict in the binocular percept between unlike monocular percepts, and a reinforcement between

like ones, (b) a conflict in awareness between the different features of the binocular percept, that is, the figures and the flicker.

Hepato-Pancreatic Glands in an Indian Earthworm. K. N. Bahl and M. B. Lal (*Quart. J. Micro. Sci.*, 76, Pt. 1, June 1933) have investigated the structure and function of the intestinal glands of an Indian earthworm, *Eutyphoeus waltoni*. The glands extend as paired structures from segments 79 to 83. As the two glands of a pair are fused in the mid-dorsal line, and the glands of successive segments are connected, the organ may be regarded as one large gland extending over five segments. It consists of lobules of glandular epithelium and interlacing lamellæ. The lobules are separated from one another by sinusoid capillaries and the two epithelial folds of a lamella enclose a blood-sinus. The gland cells resemble liver cells in shape and structure. The gland opens into the intestine by eighteen apertures, spread over five segments, and the apertures are lined with the ciliated gut-epithelium. The blood supply of the gland resembles a hepatic-portal system: blood is collected from the posterior segments (the last 109-127) of the worm into a ventral intestinal sinus which empties all its blood into the sinusoid capillaries of the gland. From the gland issue five pairs of intestino-dorsal vessels which carry all the blood from the glands into the dorsal vessel. The glands develop as dorsal outgrowths of the endodermal lining of the gut. They secrete no calcium, but a tryptic enzyme has been demonstrated. Thickly set glycogen granules are present in the gland cells. It is concluded that the glands are of the nature of a hepato-pancreas.

Pigments of Ascidiæ. Prof. Umberto Pierantoni (*Atti Soc. R. Napoli*, vol. 19, No. 3) has investigated the colour, which varies according to the season and environment, of *Botrylloides leachi*. The colour is due to the presence of pigment cells or capsules originating from blood cells at first freely moving in the blood sinuses, and later—when they have become reduced to pigment capsules—adhering to the walls of the peripheral sinuses. The pigment, which is of nuclear origin and is emitted from the nucleus into the cytoplasm, belongs to the group of melanins. When the process is completed, the entire cell, including the nucleus, has become transformed into a mass of pigment-granules, which the author regards as katabolic products of the cells or of the organism in general. The pigment of *Clavelina lepadiformis* is also contained in blood sinuses and is the product of wandering cells but is white, and the cells which produce it are amoeboid. The pigment, which appears in vacuoles in the cytoplasm (and apparently the nucleus does not participate directly in the formation of the granules) is not a product of degeneration, but a secretion which accumulates and precipitates in the vacuole, leaving the nucleus intact. The chemical reactions of this white pigment show it to be composed of guanin.

Poisonous Snakes. The principal article in *Tabula Biologica Periodica* (2, No. 4, 1933) is by Th. A. Maass on poisonous vertebrates, part 1, *Ornithorhynchus* and the reptiles—*Heloderma* and the poisonous snakes. The account of the poisonous

Amphibia, fishes and invertebrates is to be included in the next volume. Information in tabular form is given upon the recognition characters of the more important genera and species of poisonous snakes. About 250 species are included in the table, the utility of which would have been further increased by an indication of the area of distribution of the respective species.

Mutations in Irradiated Tomatoes. Six mutations arising in tomatoes after treatment with radium are described by Dr. E. W. Lindstrom (*J. Heredity*, vol. 24, No. 4). Some fifteen or more monogenic mutations are already known in the tomato, scattered on six or seven of the twelve pairs of chromosomes in this species. All but one of the induced mutations are different from the natural ones. Three of them (virescent-white, yellow foliage and yellow seedlings) show chlorophyll deficiency, two are morphological (ridged or rough leaves, and rolled cotyledons with sparse, drooping foliage and slow growth). In another, the plant is greatly stunted and the flowers are sterile and never open. All showed normal chromosome counts and behaved as simple recessives in inheritance. Four of these mutations arose from the radiation of young growing tips and two from radiated seeds. Many other untested variations were also obtained. One plant, which was heterozygous for virescent-white, was chimeral in nature, having a light green sector in which the flowers also showed complete pollen abortion. The light green chloroplasts are interpreted as a cytoplasmic effect, and on a branch which reverted to full green the fertility of the flowers was also restored. These mutations will be useful for a further investigation of the chromosome map in tomatoes.

Copper and Colouration of Onion Scales. A point of both scientific and practical interest is dealt with in Bulletin 552 of Cornell University Experiment Station, in which Dr. J. E. Knott gives an account of manual experiments upon the colour and thickness of onion scales. Colour in particular seems to be improved in many soils by the addition either of superphosphate or copper sulphate, the latter salt being most effective. A dressing of 200 to 300 pounds to the acre is recommended when onion scales are either thin or poor in colour.

An Interesting Hybrid Oak. Dr. William Trelease has described an interesting hybrid oak (*Proc. Amer. Phil. Soc.*, 72, No. 4, 1933) which, as is shown by the photographs, bears some acorns like those of one presumptive parent, the bur oak (*Quercus macrocarpa*) whilst other fruits have the glossy elongated acorns and shallow cups of the white oak. Such 'chimeral' behaviour, whilst familiar now in 'graft hybrids', arising as buds from the region of the graft union, is most unusual if not unique in a tree that should presumably have arisen from an acorn of hybrid origin. A full account of the tree is being published by its discoverer, Mr. Orpheus M. Schantz.

Dolerites of Spitsbergen. A general account of the geology and petrology of the dolerites of Spitsbergen, based on observations made during three field-seasons, has recently been given by G. W. Tyrrell and K. S. Sandforb (*Proc. Roy. Soc. Edin.*, 53, Pt. 3, No. 21, pp. 284-321; 1933). Most of the intrusions are sills. Four facies are distinguished: the normal type; coarse gabbroidal and pegmatitic types;

basaltoid contact-rocks; and endomorphic modifications known as 'white trap'. A feature of much interest is the co-existence of fresh olivine with a mesostasis containing abundant quartz. In the Carboniferous and Permian rocks the sills are uniform, non-transgressive and widely extended; whereas in the Mesozoic formations they ramify as a network through the strata, and send off dyke-like protrusions into fractured and arched beds. It is believed that this contrast is due to injection under deep and shallow covers respectively. The consensus of evidence is that the intrusions and the accompanying basaltic lavas are to be dated as between late Jurassic and Lower Cretaceous. Useful comparisons, with new average analyses, are made between the Spitsbergen suite and the Mesozoic or near-Mesozoic dolerites and basalts of other regions.

Charging Water Drops. Prof. C. T. R. Wilson has suggested that rain drops may be electrified in falling through air which contains ions moving vertically under the action of an electric field. The drop will meet upward-moving ions, while if the electric field is not too large, the downward-moving ions will not be able to overtake it, and the drop will acquire an excess charge of the upward-moving sign. A direct experimental test has been carried out by J. P. Gott (*Proc. Roy. Soc.*, A, October). A vertical electric field was maintained between two large metal plates, ionisation was supplied by X-rays and drops were allowed to fall through holes in the two plates and were collected in a cylinder connected with an electrometer. The location of the ionising beam and the electric field employed were varied in different experiments, so that the drops in their passage between the plates were exposed to different types of moving ion streams; the results obtained were in accordance with Wilson's predictions.

Reflecting Echelon Grating. W. E. Williams has recently published an account of the reflecting echelon designed by him and made by Messrs. Adam Hilger, Ltd. (*Proc. Phys. Soc.*, September). This apparatus demands a degree of perfection in the optical surfaces which is higher than that for any other optical instrument. Its construction is made possible by the fact that optically finished surfaces of quartz or fused silica will form an adherent contact without distortion. A number of plates are worked to flatness and equal thickness and mounted in adherent contact. The resolving power of the echelon is so high that special methods are necessary for testing the completed instrument, and these are described in some detail. In use the instrument is mounted in an air-tight chamber, since the definition is seriously affected by changes in barometric pressure occurring during an exposure. An image of the fringes is thrown on the slit of the auxiliary spectrograph by a lens or a concave mirror. The instrument may be used as a high resolving power instrument for fine structure work, or it may also be used for the accurate comparison of wave-lengths. An advantage claimed over the Fabry-Perot interferometer lies in the fact that the resolving power of the Fabry-Perot is limited by the reflecting power of the silver (or other) films, which falls off rapidly in the ultra-violet. The resolving power of the new instrument may be increased indefinitely by adding plates, while very high resolving power can only be obtained with the Fabry-Perot at the expense of separation of orders.