Research Items

Origin of Iron in Antiquity

IN *Antiquity* for March under the title "The Coming of Iron", Mr. G. A. Wainwright reviews in some detail the recorded finds of early examples of iron, and on this evidence offers suggestions as to the source of this metal in antiquity. The most ancient pieces of iron known are the beads from Gerzah, some fifty miles south of Cairo, which were found by himself. These are dated at about 3500 B.C. Sir Leonard Woolley found some fragments of iron in the Royal Tombs at Ur, which are dated at 3000 B.C. but may possibly be so early as 3500 B.C. These two specimens of early iron contain 7·5 per cent and 10·9 per cent of nickel respectively and are, therefore, meteoric. All early iron was formerly held to be meteoric; but Desch's analysis of the fragment with a bronze dagger handle found by Frankfort at Tel Asmar in Mesopotamia showed that smelted iron was in use in 2800 B.C. The celestial origin of the rarely occurring iron in early Egypt is recognised by the addition of the epithet "from the sky" added after the fourteenth century B.C., when smelted iron had been introduced. Egypt actually was the last of the countries of the East to receive iron, and then only under the intensification of influences from the north. In Mesopotamia iron was as rare as in Egypt until 1100 B.C. In Asia Minor from the twentieth century onward iron was used regularly, and from the fifteenth century Asia Minor, northern Syria and north-west Mesopotamia exported iron objects; while it was clearly the wanderings of the Asianic tribes which brought iron to Palestine in the fourteenth and thirteenth centuries. By 1100 B.C. Assyria, Carchemish, Cyprus, Greece and the Ægean were entering the iron age; while in the eighth century Sargon had in store one hundred and fifty tons of iron, of which the ingots resemble in their curious shape those which two hundred years later were entering Germany and France with the La Tène culture.

Development of the Kidney in the Frog

ALTHOUGH much work has been carried out on the development of the urino-genital system of *Rana*, the story was incomplete in certain respects and in particular in regard to the post-metamorphic changes in the male. Those of the female are clearer since there is not the same close anatomical connexion between the urinary and genital ducts. P. Gray (*Quart. J. Micro. Sci.*, 78, Pt. III; 1936) has filled in this gap and helped to disperse some of the previous misconceptions. Part of the confusion that exists in earlier accounts is due to the failure to recognise that in the adult three different regions are represented in the kidney. At metamorphosis, only the anterior and middle regions are present, and these are characterised *inter alia* by the possession of straight tubes running transversely. The first one or two of these are concerned with the passage of sperms, the next three or four carry both sperms and excretory products. Behind these are about six tubes, originally straight but afterwards becoming bent, which only serve to carry urine. In the posterior region, which begins to differentiate at the beginning of the second year, there are no straight tubes and it has no genital function. Kidney and genital ridge are connected by a sheet of blastema. This sheet breaks up into a number of strands, the rudiments of the vasa efferentia. In the second year the vasa run from the kidney, within which they are connected with a strand of blastema representing Bidder's canal, to the testis. The seminal vesicles are developed from a group of from four to six clumps of kidney blastema cells near the posterior end of the archinephric duct. It is not until the third year that these develop into the coiled tubes characteristic of the adult. The author suggests that they may represent the remains of an ancestral kidney specialised for sperm storage.

The European Corn Borer in North America

THIS insect is the larva of the moth *Pyrausta nubilialis* which was first discovered in the United States in 1917. It most probably was accidentally imported with broom-corn from Hungary or Italy, and had already been in the United States for some years before being detected. The results of sixteen years' investigation have shown that it is one of the most injurious plant pests that have invaded that country. According to the account given by Mr. D. J. Caffrey in the U.S. Farmers' Bulletin, No. 1548 (revised August 1935), a total area of about 265,000 square miles were infested by this pest at the end of 1934, while it has also invaded a large area in eastern Canada. So far, it does not appear to have extended farther west than the great lakes, while its eastward range reaches to New England and Long Island, N.Y. While corn (maize) is its chief host, it also attacks various wild and cultivated plants. Control by biological means is a scheme the possibilities of which are being fully explored: some millions of parasites from Europe and the Orient have been liberated and certain of these are now established over limited areas. Whether biological control will prove effective to an economic degree is uncertain, and several years, at least, must elapse before any judgment can be formed. Control by cultural methods is, however, effective and can be achieved by utilising or destroying all parts of infested plants each year before the insects develop from the borer stage into the moths.

Anomura of the Dutch East Indies

DR. I. GORDON has described the Anomura (excluding Paguridea) from the Dutch East Indies (Résultats Scientifiques du Voyage aux Indes Orientales Néerlandaises de LL.AA.RR. le Prince et la Princesse Léopold de Belgique. *Mémoires du Musée Royal d'Histoire Naturelle de Belgique*. Hors Séries. 3, fascicule 17, 1935). There are only a few of these, and all belong to known species of *Galathea*, *Petrolisthes*, *Pachycheles*, *Porcellana*, *Polyonyx* and *Remipes*. It is, however, a satisfaction to have further records of little-known forms which usually differ slightly from the original descriptions, notably *Galathea affinis consobrina*, de Man, which has peculiar feathered setæ on the dorsal surface of rostrum and eye-stalks, not present in the type specimens. The paper is illustrated with clear text figures.

Apple Rootstock Studies

A FURTHER stage has been reached in the intensive survey of apple rootstocks initiated by R. G. Hatton at the East Malling Research Station sixteen years ago. The apples then planted showed early indications of differential influence of stocks on the vigour of the scions, and subsequent reports showed the possibility of grouping the stocks according as their influence was relatively dwarfing or invigorating. The latest report (*J. Pom. and Hort. Sci.*, 13, 4, 293; 1935) shows that whilst certain rearrangements in the order of stock influence have occurred since the 1928 records were published, the main result is an accentuation of the original differences. The several criteria of vigour adopted, namely, total wood growth, thickness of trunk, height and spread of branches, and total weight of tree, give substantially similar results. Stocks *M*IX and *M*XII are consistently the most dwarfing and most vigorous respectively, and certain stocks of intermediate vigour give the same relative order with different scions. Data obtained by other workers at East Malling have shown that the ratio by weight of tops to roots remains constant for a scion on different stocks, though the actual weights vary. A review of the work of other investigators indicates that storage qualities and chemical composition of fruits may be influenced by rootstock, but resistance to certain diseases does not seem to be transmitted from stock to scion. Hatton attaches but little significance to the influence of scion on stock, but this aspect of the problem is not without importance, and much work remains to be done before the obscure relationship between these two parts of an apple tree is thoroughly understood.

Trachyte and Olivine-Basalt Associations

A CONTRIBUTION to petrogenesis of considerable interest is made by A. B. Edwards in the course of an investigation of the association of trachyte with olivine-basalt in the Tertiary igneous provinces of Victoria, Kerguelen Island, and Otago, New Zealand (*Proc. Roy. Soc. Victoria*, 48, 13; 1935). It is concluded that the association in these three areas supports the hypothesis that alkaline rocks are the normal product of differentiation of an olivine-basaltic magma, so long as there is no undue contamination by contemporary syntexis. The factors controlling differentiation are summarised as (*a*) chemical composition of the primary magma, acting through the type of pyroxene that crystallises; (*b*) the growth of cupola-like extensions above the main reservoir, permitting the accumulation of alkaline magma in localised bodies; and (*c*) the oxidising conditions ushered in by gas-streaming during extrusion, and the transport of sodic material accomplished by such streaming. In the absence of an immediately antecedent orogeny, such alkaline rocks can develop in a continental sialic region as readily as in an oceanic region; but conditions attending orogenesis favour large-scale assimilation of argillaceous and siliceous sediments, with accompanying production of andesitic types.

Canadian Earthquake of November 1, 1935

WE have received from Mr. E. A. Hodgson of the Ottawa Observatory a copy of his preliminary report on this important earthquake. From the records obtained at seven neighbouring stations, the epicentre is temporarily placed in lat. 46° 47′ N., long. 79° 4′ W., or about four miles north-north-east of Timiskaming, Que., and the focus is believed to be at a depth of about 125 miles. One result of this great depth is the large area of more than 500,000 square miles over which the shock was felt. Soon after the earthquake, Mr. Hodgson spent a month in the district around the epicentre. No fissures in bed rock were detected at any point; but it was found that the rails on the line from Kipawa to Dozois had shifted between points a few miles to the east and north of the epicentre.

Vision

THE review of recent progress in our knowledge of the underlying processes of vision which Dr. R. Granit of the University of Helsingfors contributed to vol. 76 of the *Finska Läkaresällskapets Handlingar* has now been made available to a wider circle by appearing in German in vol. 14 of *Acta Ophtalmologica* (Copenhagen: Levin und Munksgaard, 1936). In his review he insists on the importance of considering visual processes as a part of the physiology of the central nervous system. At points of the optical system where two or more paths for the impulse converge, interaction is possible, which may lead to summation or inhibition. He believes that future progress will be based on the duplication theory, according to which for small intensities of light the rods of the retina are the receivers and at high intensities the cones. He points out the fertility of the flicker method of illumination for investigating the properties of the retina and gives the results of observations, many of which he has carried out himself, on the frequency of the intermittent illumination at which the sensation becomes one of continuous light. He finds that this frequency increases with the logarithm of the intensity of the light, and with the logarithm of the area of the retina over which it is spread.

Theory of the Geometric Object

THIS was the title of a lecture given by Prof. J. A. Schouten, of Delft, at King's College, London, on March 17. The idea of a 'geometric object' was first introduced by Klein in 1909. Since the discovery of pseudo-parallelism in 1917, several definitions have been given by Veblen, Whitehead, Schouten and others, but none of these definitions was quite satisfactory. Since the Moscow Congress on Vector and Tensor Analysis in 1934, Wundheiler, together with Schouten and Van Dantzig, have carried on a further investigation of this problem. They have discovered that the lack of rigour in the old definitions was due to the fact that no account had been taken of the two aspects of a geometric object, the functional and the componental. Corresponding to these two points of view they have introduced the following definitions: (1) A *macrogeometric* object is one whose transformed 'determining functions' are functionals of the old determining functions and of the transformation functions. (2) A *microgeometric* object is one whose transformed components are functionals of the old components *at the same point*, and the transformation functions. Every microgeometric object is macrogeometric, but the converse does not hold. By taking a one-dimensional space and the affine group of transformations, an example has been constructed of a macrogeometric object which is not microgeometric. Such objects, however, scarcely ever occur, since objects occurring in geometry are nearly always of a distinct finite class, as defined by Veblen and Whitehead, and when this is the case, the objects can be easily 'completed' into microgeometric objects.