Research Items

Excavation in Brittany

IN 1929 Sir Robert Mond was invited to undertake the exploration of the Tressé *allée couverte* by Baron Robert Surcouf, its owner, and entrusted the work of excavation to Miss V. C. C. Collum. This megalithic monument is situated in the Forêt du Mesnil, Ille-et-Vilaine, and had not previously been explored, although it had been reported in 1880 and then scheduled as an ancient monument. Excavation took place in April 1931, and an account of the results then obtained has now been published ("The Tressé Iron-Age Megalithic Monument (Sir Robert Mond's Excavation)". By V. C. C. Collum. Pp. xii + 123, with 35 pls. Oxford University Press. 10s. 6d. net). The objective of the investigation was to test the generally accepted view that megalithic monuments in Brittany, such as this, have suffered 'violation' and disturbance in an age long subsequent to that of their erection. Careful and detailed records of excavation and stratification, therefore, were made. A peculiar and characteristic feature of the monument is the occurrence of two double pairs of sculptured human breasts, one double pair on a transverse stone blocking the northern end of the *allée*, the other on the western upright of the alcove beneath the transverse stone. In brief, the results of the investigation indicate that this is a native Gaulish tomb erected in the first century A.D., probably in the reign of Domitian. Fragmentary skeletal remains, not cremated, associated with pottery, both wheel and hand-made, steatite beads, iron which may have been part of a fibula adorned with bronze, and 'nondescript' flint and chert implements, together with the representation of female breasts, point to burial offerings to the mother-goddess or female principle, of which the cult was widespread in Egypt and the East, and at the date suggested as that of the megalith, incorporate in Eastern mysticism. The cult, it is suggested, reached Brittany and Great Britain by way of the Mediterranean, North Africa and the Iberian coast.

Iron Age Pottery in Britain

DR. R. E. MORTIMER WHEELER appends to his report on the excavation in 1934 of Maiden Castle, Dorchester (*Antiquaries J.*, 15, 3), an important, though provisional, amended classification of the Iron Age pottery of Britain. A previous classification, proposed by Mr. Christopher Hawkes, recognises three groups or cultures : A—composite, mainly Hallstatt, the type-site being All Cannings Cross ; B—marsh-village culture of Glastonbury and Meare, pottery with elaborate curvilinear decoration, pre-eminently 'Celtic' ; and C—Belgic immigrant culture, deficient in artistic expression, but technically well equipped, having the potter's wheel. Geographically, A is found over most of middle and southern England, and may be recognised so early as the sixth century B.C., remaining dominant in Oxfordshire, Kent and other south-eastern counties down to the first century B.C. In the west, it is replaced by B in the second century B.C., while the Belgic culture enters the south-east in the first half of the first century B.C. B occurs primarily in the south-west, but extends, on one hand, to Northamptonshire and Lincolnshire and, on the other, eastward into Sussex. There is no good evidence for C in Wessex before the beginning of the first century A.D. Provisionally, it is proposed to subdivide A into three parts : A1, 600–400 B.C., marked by finger-tipped ornament especially on high-shouldered *situla* types, and red-coated ('hæmatite') bowls, at first with rilled, and later with cordon decoration ; A2, 400–200 B.C., absence of above types and presence of poor derivatives of *situla* type, coarse, rough but light fabric, no decoration (well represented at Maiden Castle) ; AB, 200 B.C. to early first century, smaller and simpler types of A2, with pottery of B types. Class B, hitherto regarded as synonymous with Glastonbury, is now seen to be a complex of two or three elements of diverse origin. Decoration is not an adequate criterion. In its place is suggested the bead rim and the counter-sunk handle, neither of which occurs in A. The Belgic pottery does not reach Maiden Castle until the eve of the Roman conquest. Reproduction of modified B types with the aid of the potter's wheel suggest a composite culture BC.

Inbreeding of Swine

VARIOUS experiments on inbreeding of pigs have led to the conclusion that it is injurious to the race. In an experiment which has been continued for eight generations by Mr. R. E. Hodgson (*J. Hered.*, 26, No. 5) at the Experiment Station of the University of Minnesota, he reaches somewhat different conclusions. Brother-sister matings of registered Poland-China swine were made for eight generations without any marked loss of vigour. The strains chosen appear to have been exceptionally free from deleterious recessive characters. The experiments began with six sows, the strain from one being used as an out-bred control. Three of the inbred lines were lost in the first generation and a fourth in the second generation, due to reluctance to mate. In 1926 two new lines were started, one of which is now in the sixth and the other in the eighth inbred generation. The difficulty in securing matings has been less since the fifth generation, and it appears that the strains can now be propagated indefinitely by brother-sister mating. A few anomalies have appeared, and some undesirable characters were segregated, including odd psychological and physiological sexual reactions. Evidence was obtained that differences in disposition, such as super-docility and wildness, are inherited. A substrain with yellow and another with white blotches was segregated from one line. Comparison with the non-inbred strain indicates that no vigour has been lost, but that segregation of vigour has taken place in some cases.

Seasonal Variation in Oogenesis of a Hermit-Crab

M. K. SUBRAMANIAM (*J. Roy. Micr. Soc.*, 55, Pt. 1 ; 1935) has studied the oogenesis of a hermit crab, *Clibanarius olivaceus*, found in brackish water at the mouth of the Adyar River, near Madras. In January and February, after the heavy rains of the retreating monsoon, the sea-water mixes freely with the river-water, and the bar at the mouth of the river is

open. From the middle of March the level of the water in the river begins to fall, with consequent widening of the bar, and in early April the sea invades the river only at high tide, and even this ceases by mid-April. The crab was found to breed throughout the year but especially in the period from September to March. The ovaries were removed and carefully preserved, and the oocytes examined. In January and February the oocytes showed a voluminous formation of fatty yolk and the occurrence of albuminous yolk. From April to June there was less fatty yolk in the oocytes but more albuminous yolk. The author states that during the period from November to the middle of April, the salinity of the estuarine water is high, but later, as the bar closes, the salinity is suddenly lowered and there is a rise in the pH. The author supposes that the alterations in the condition of life of the crab may have led to a variation in the metabolism which may have affected the constitution of the oocytes.

Diseases of the Iris

A SHORT article by Mr. G. N. Bunyard, in the *Gardeners' Chronicle* for June 29, describes four diseases of Iris plants. Leaf spot, caused by the fungus *Heterosporium gracile*, and Leaf rust, *Puccinia iridis*, are two diseases of the foliage, and may assume serious proportions. Ammoniacal copper carbonate and potassium sulphide do not control either malady, but the simple routine of dividing the rootstock every second year gives healthy produce. Rhizomes and roots are subject to 'scorch' and 'rhizome rot', but no organism has yet been identified as the cause of either disease. Both may be controlled by lifting the rhizomes, cutting away the rotten parts, and then bathing the rest in a bright pink solution of potassium permanganate for twenty minutes. Planting in a 'hospital' bed containing peat and sharp sand further assists the progress of recovery.

Poisoning of Plants by Fluorine

ESCAPE of hydrofluoric acid during chemical operations in which ores rich in fluorides are treated with mineral acid is not easy to prevent, especially when steam is simultaneously liberated, and it may result in damage to the vegetation of the surrounding neighbourhood. An ingenious biochemical method of detecting poisoning of plants by the acid has been devised by Prof. Angelo Contardi in conjunction with Carlo Ravazzoni (*Rend. R. Ist. Lombardo Sci. e Lett.*, **68**, parts 6–9). The method is based on the observations (1) that hydrofluoric acid, which attacks the leaves of plants, remains for a long time in the form of soluble compounds capable of inhibiting the enzymic action of the acid phosphatase of rice husk, and (2) that the insoluble fluorides normally present in leaves exert only a very feeble action on this enzyme. The aqueous extract of the leaves under examination is evaporated to dryness, ignited and fused with sodium carbonate, the cold mass being then dissolved in water and the solution filtered. A second solution is prepared similarly from normal, unpoisoned leaves of the same kind of plant, and the effects of the two liquids on the enzymic action are compared.

Respiration of Barley Leaves

THE relation between carbon dioxide production and the concentration of the various carbohydrates during starvation of isolated barley leaves has been investigated by E. W. Yemm (*Proc. Roy. Soc.*, B, **117**, 483–525 ; 1935) using a combination of iodometric and modified Hagedorn-Jensen methods for the estimation of glucose, fructose, maltose and sucrose. Non-sugar impurities were determined separately after removing all the sugars by yeast fermentation. Carbon dioxide production shows a rise during the 12 hours immediately after isolation, and the subsequent rapid fall is interrupted after about 40 hours by a stage coinciding with the yellowing of the leaves. Finally, the respiration falls rapidly, concurrently with browning and death of the cells. No simple quantitative relation exists between the concentration of any individual carbohydrate and the rate of carbon dioxide production ; and, moreover, it is only in the initial stages that all the carbon dioxide arises directly from the available carbohydrate. During the remainder of the time, as much as 75 per cent of the carbon dioxide production arises from some undetermined source other than carbohydrate, and this production is less when the initial sugar content is high, that is, progressive carbohydrate exhaustion increases the production of carbon dioxide from undetermined sources. Determinations of the respiratory quotient suggest that this carbon dioxide arises from protein breakdown. (A similar conclusion was reached by Dastur and Desai with rice seedlings, *Ann. Bot.*, **49**, 53 ; 1935.) It is suggested that rapid sucrose hydrolysis is followed by glycolysis of fructose and accumulation of glucose, which disappears more slowly. Essentially similar results were obtained with bean leaves.

Grass Land Problems in South Africa

ANY traveller in South Africa must be impressed with the wide expanse of country, often comparatively high tableland, which is covered with a grassland dotted throughout with scattered trees, a typical savannah country. Botanically, such country is of the greatest interest as it always raises the question whether such a precarious balance between two types of vegetation will be maintained or whether the trees will close over and subdue the grass or the grass gradually choke out the trees. Economically also the problem is of the utmost importance, this balance of grass and trees being influenced by the head of game or by the amount of stock carried, and by the practice, or lack of regular practice, in seasonal burning of the veldt grasses. It is very fitting therefore that the new *Journal of South African Botany*, issued under the authority of the trustees of the National Botanic Gardens of South Africa and edited by Prof. R. H. Compton, director of the Kirstenbosch Gardens, should include in part 2 of its first volume, a very interesting general discussion of South African grassland problems by Prof. J. Phillips, of the University of the Witwatersrand. Under his direction, problems of grassland ecology are being attacked at the Botanical Research Station of the University at Frankenwald, in the high veld, and a preliminary study of the root systems of some of the characteristic high veld grasses, by Messrs. S. M. Murray and P. Glover, carried out at this station, is reported upon in the same journal. This study shows that very fundamental differences may be found in the root systems of pioneering species and other species ; whilst Prof. Phillips's paper shows the very wide nature and great economic importance of the problem raised by the study of these grasslands.

Evaporation in India

AN investigation into evaporation in India has been made in the Agricultural Meteorology Branch of the India Meteorological Department by P. K. Raman and V. Satakopan. The work is described in Scientific Notes, 6, No. 61 (Delhi: Manager of Publications). As the authors remark, "our knowledge of evaporation from the soil under natural conditions is practically nil in India", and they have had to content themselves with a study of the evaporating power of the atmosphere with respect to a free water surface, and to calculate this from various meteorological factors such as mean wind velocity, mean relative humidity and mean water vapour pressure, by an empirical formula. The formula chosen was derived from a formula of Carl Rohwer based on laboratory studies made with the view of testing separately the effect of the different factors. In Rohwer's formula, a factor $e_s - e_d$ appears, where e_s is the mean vapour pressure of saturated air at the temperature of the water surface and e_d is the mean vapour pressure of saturated air at the temperature of the dew point. In the absence of data for the temperature of free water surfaces in India, the rather bold assumption has been made that calculation of mean values can be made as though the temperature of the water is the same as that of the air, which is possibly true when one is dealing with averages. In that case, $e_s - e_d$ becomes $(100/h - 1) e$, where h is the relative humidity of the air and e is its vapour pressure. Calculated means of evaporation for a well distributed network of stations for each month are tabulated, together with the mean monthly rainfall. The evaporation is shown cartographically on maps of India, also the annual evaporation and the annual figures for rainfall minus evaporation. As might be expected, the area of greatest evaporation is in the west of India, with its centre in about latitude 20° N.

Activation and Evaporation of Adsorbed Atoms

J. E. LENNARD-JONES and C. Strachan (*Proc. Roy. Soc.*, A, June 1) have made a wave-mechanical calculation of the probability of activation of adsorbed atoms, and Strachan in a second paper extends the calculation to obtain probabilities of evaporation of atoms from surfaces. The atoms adsorbed on a crystal lattice may remain in one place, vibrating about a mean position, they may migrate from place to place or they may be ejected from the surface by the heat motion of the lattice atoms. The vibrations of the atoms about a mean position provide the activated energy states which are considered in this paper. The atoms are assumed to be adsorbed as a simple cubic crystal and the forces holding them are supposed to be of the Morse type in which the potential is given by two exponential terms corresponding to a short-range repulsive field and a long-range attractive field. Formulæ are found for the probability of excitation of different excited vibrational states and for the average life of an atom in an excited state. The life of an excited state seems to be of the order of 10^{-12} sec. in a particular case—this time is a few periods of the vibratory atom. The migration of atoms over the surface takes place when the atoms are in an activated state. The evaporation problem involves an extension to the case of transitions to a state in the region of continuous energy distribution. The theory is worked out and applied to the cases of H_2, HD and D_2. The surface forces are nearly the same for these molecules ; the different masses lead to different wave functions and the probabilities of evaporation from a surface at low temperature in these molecular species are roughly in the ratio 1, 0·2, 0·05.

A New Power Output Valve

IN the best types of modern broadcasting receivers, the output valve is usually of the triode or three-electrode type, since this enables the most complete freedom from distortion of the acoustic output to be obtained. This valve is, however, relatively insensitive, so that an additional stage of audio-frequency amplification is required, rendering its use uneconomic in the majority of commercial receivers. Such receivers therefore usually employ a pentode output valve, which will give the same output power for about one third of the input voltage required by the corresponding triode. The pentode output valve is very liable to produce distortion due to curvature of its characteristics over a considerable portion of its working range. This defect is claimed to have been removed in a new type of power output valve described by J. H. Owen Harries in the *Wireless World* of August 2. The new valve is of the four electrode type, the cathode and two grids being of normal construction and dimensions ; the novelty lies in the fact that the anode is a cylinder of unusually large diameter. It has been found that if the anode of a multi-grid valve is spaced from the outer grid at a certain critical distance, the undesired secondary emission is eliminated, and the consequent necessity for a suppressor grid, as in the pentode, is avoided. Characteristics of the new valves in comparisons with those of typical pentodes illustrate the improvement which has been obtained in linearity and resultant freedom from distortion. The impedances of the new valves are lower than those of the equivalent pentodes, while the mutual conductances are appreciably higher, thus giving about the same overall sensitivity. It is stated that the High Vacuum Valve Co. is now manufacturing these new valves in a two-watt output type, which is considered to be adequate for the average domestic user.

Structure of a Stellar Atmosphere

W. H. CHRISTIE and O. C. Wilson (*Astrophys. J.*, 81, 426) have described an interesting method of examining the structure of a stellar atmosphere in the case of the eclipsing binary ζ Aurigae. This system consists of a giant K-type component with a B-type companion, and the authors have devised a method whereby the effects of the light of the former may be eliminated from the composite spectrum, thus permitting a study of the light from the B star shining through the atmosphere of the K star. A series of spectra taken near the period of eclipse will thus give the relative heights to which various elements extend in the atmosphere of the K star, and also the relative number of atoms existing at different levels above the photosphere. Changes in the total absorption have been measured for nearly 100 lines in spectrograms taken at Mount Wilson during the 1934 eclipse, and the results grouped into the following six classes : neutral metals, Mg, Ti II (two groups), H, and Ca II. Accurate photometric observations are still badly needed to improve the values of essential factors such as the relative diameters of the two components and the inclination of the orbit. It is hoped that these will be forthcoming during the next eclipses in 1937 and 1939.