Research Items

Canoes of Oceania

DR. A. C. HADDON and MR. JAMES HORNELL have made a detailed study of the canoes of Oceania, of which the first volume by Mr. James Hornell, dealing with the canoes of Polynesia, Fiji and Micronesia (Bernice P. Bishop Museum, Honolulu, *Special Publications* 27) is based in part on personal investigations in certain of the islands in 1924–25, in part on an exhaustive and critical examination of references in early travel literature with its illustrations, as well as of the models which are preserved in museums. References in early literature are usually inadequate, while the illustrations and the models are often inaccurate. Problems of distribution and dispersal will be considered by Dr. Haddon in a third volume. From the present collection of facts certain general conclusions as to population movements in Polynesia emerge. Two classes of vessel have to be taken into account, the outrigger and the double canoe. In outrigger canoes, in addition to rig and form of hull, the number of outrigger booms and the method of attachment to the float must be considered; in the double canoe the form and relative proportion of the hulls. The fundamental canoe types are reducible to three: (1) Proto-Polynesian, in which the hull has pointed ends, inclined upwards, but little emphasized, is strengthened by inserted ribs, and the canoe is rigged with a primitive sprit-sail; (2) Melanesoid-Polynesian, with head low and stern curved up high, profusely ornamented with carving, the sail a primitive sprit-sail, triangular or subtriangular; (3) Tangaroan, plank-built hull with ribs tied to ridges, the planks sewn together through holes, rigged with a primitive lateen sail. This third type was probably introduced by an Indonesian people who worshipped Tangaroa. From the evidence of the canoes it may be argued that the Proto-Polynesians reached Polynesia direct from Indonesia by way of Micronesia; and not after coasting along the shores of the Melanesian Islands as is held in the generally accepted view.

Fishes of Paraguay

A REMARKABLE similarity exists between the fish fauna of the La Plata and that of the Amazon basin, and two explanations have been offered: that the two faunas represent the same initial stock, which by migration over the marshy uplands between the Tapajos and the Paraguay or across the low divide between the latter and the Guaporé peopled the two river basins; or that the two faunas illustrate the parallel evolution of two distinct stocks. A contribution to a solution of the problem is made by Prof. Nathan E. Pearson, who has listed the fishes of the Paraguayan basins, and considers that it is unnecessary to assume parallel evolution to explain their Amazonian resemblances (*Pub. Calif. Acad. Sci.*, **23**, 99; 1937). Migration is a sufficient explanation. The fishes entered South America some time during the Tertiary Period and crossed the low Amazon valley and a highland divide to enter Paraguay. The Rio Guaporé and other tributaries of the Amazon seem to have afforded the migratory paths. At the present time, the possibility of such migration has been cut off, since the fall in the volume of the streams flowing from the highlands of Matto has given rise to an effective barrier, but the nature of the fishes on the two slopes of that barrier indicate that it is of recent origin.

Life-History of *Apophallus venustus*

FOLLOWING a previous account of its morphology and taxonomy, T. W. M. Cameron has published an account of the life-history and bionomics of the trematode, *Apophallus venustus* (*Canadian J. Res.*, **15**, No. 2; 1937). This trematode is endemic in the Lower Ottawa Valley, and has been found in cats, dogs and racoons. It has also been found in the great blue heron, though not in several other species of fish-eating birds examined. The first host is an operculate snail, and the only species discovered naturally infected was *Goniobasis livescens*, in which the percentage of infection may reach 31·6. The metacercaria stage lives in the second host, a fish, and eleven out of twelve species of freshwater fish when eaten by cats under controlled conditions were found to be capable of carrying infection. The metacercariæ are present in the subcutaneous tissue or the muscles. The adult in the cat lives principally in the ileum, and in the laboratory all infected cats lost their infection during the winter, so that the reservoir would appear to be the fish.

Lac in Malaya

ATTEMPTS to cultivate the lac insect (*Laccifer lacca*) outside India have been made from time to time. The most recent effort has been tried out in Malaya and an account of the experiment is given by Mr. N. C. E. Miller in Scientific Series No. 19 (1937) of the Department of Agriculture, Straits Settlements and Federated Malay States. Consignments of brood lac for the work were obtained from the Lac Research Institute, Nankum, India, in which country the insect has been propagated for several hundred years. It may be added that about 25,000 tons of shellac products are exported annually from India to all parts of the world. The consignments received in Malaya were used to inoculate rain trees (*Enterolobium saman*), *Cajanus indicus*, *Zizyphus jujuba* and plantation rubber trees. The outcome of the experiments was disappointing. It was decided that the climatic conditions in Malaya, especially the high degree of humidity, and other circumstances are wholly unsuitable. The very young insects, or swarming larvæ, showed a prominent tendency to colonize the host trees towards or on the main stems and to neglect the young growing shoots. Owing to this erratic behaviour and the rapid suberization of the branches, they failed to survive. Another contributing cause of the failure was the prevalence of a chalcid parasite of destructive propensities. These causes, and the inroads made by synthetic substitutes for resins, are stated to have led to the abandonment of any further trials.

Endosperm and Embryo in Reciprocal Cereal Crosses

IN reciprocal crosses of plants with different chromosome multiples, the more successful cross is usually the one in which the high chromosome number comes from the female parent. Messrs. J. W. Boyes and W. P. Thompson (*J. Genet.*, **34**, No. 2) discuss this subject in relation to cereals, recording a series of observations on embryo and endosperm development in reciprocal hybrids between *Triticum vulgare* and *T. durum*, *T. vulgare* and *T. dicoccum*, *T. spelta* and *T. monococcum*, as well as back-crosses and crosses between wheat and rye. Chinese wheat, unlike other varieties, can be readily crossed with rye pollen. In the crosses low-chromosome female × high-chromosome male, although there is a higher rate of endosperm growth, abnormalities in the endosperm are frequent. These include nuclei of unusual sizes, abnormal structure and irregular shapes, weakly staining cytoplasm and persistent non-cellular regions. The reciprocal crosses do not show these abnormalities, except in the widest crosses. The embryo, on the contrary, is healthy in development in all except the widest crosses, and the reciprocals show very little difference. In rye (7 chromosomes) × wheat (21), fertilization rarely occurs although the pollen germinates well on the rye stigma. In the back-crosses F_1 female × *vulgare* male, the endosperm varies widely from normal to conspicuously abnormal. This is attributed to a variable amount of chromosome unbalance, which is believed to be one of the causes of the differences in the endosperm of reciprocal crosses.

Diseases of Ornamental Plants

THE *Gardeners' Chronicle* of July 10 announces the appearance of two fungus diseases upon ornamental plants. Mr. D. E. Green directs attention to a downy mildew of snapdragons caused by *Peronospora Antirrhini*. The disease has been known in southern Ireland, and has now appeared in England. It checks the growth of young shoots, has a tendency to curl the leaves downwards, and often causes the plant to send out many small shoots from the base. Messrs. A. Beaumont and P. H. Gregory describe a leaf-spot disease of *Gerbera Jamesoni*, a plant which can be grown outside for market in Devon and Cornwall. The fungus *Ascochyta Geberæ* attacks the leaves, and produces brown spots with margins of purple. Pycnidia of the fungus are embedded within the tissue of the spots. The disease appeared in Italy in 1913, and has not since been described until its occurrence in Cornwall in 1936.

Protective Spray Deposits

THE efficiency of protective insecticides and fungicides depends largely on the amount of spray material which remains on the foliage immediately after spraying, and the degree to which this resists the various agencies which tend to remove it. Fajans and Martin (*J. Pom. and Hort. Sci.*, **15**, 1, 1–24; 1937) denote these two properties by the terms 'initial retention' and 'tenacity' respectively. They describe laboratory experiments from which are evaluated the effects of a number of spray supplements, particularly wetting agents, on initial retention and tenacity, the supplements being added to spray materials used in the form of suspensions. In the majority of the systems examined, the initial retention of a suspension was found to be the same as that of the aqueous phase, but in some cases the latter was reduced by the presence of the solid particles. This reduction seems to be related to an effect on the wetting and spreading properties of the spray, but is not independent of the nature of the surface sprayed. The tenacity of the spray deposit is dependent upon the characters of the spray supplement, the solid particles and the surface sprayed. It is comparatively higher on surfaces wetted with difficulty and is enhanced by oils, both hydrocarbon and glyceride. Highly surface-active supplements, especially at high concentrations, reduce tenacity, whilst those like gelatine and lime casein, which yield residues insoluble in cold water, have a favourable effect. These conclusions were tested in the field by treating a crop of potatoes against blight (*Phytophthora infestans*) with cuprous oxide sprays to which ten different spray supplements were added. A high degree of correlation was obtained between the amounts of spray residue and the control of blight.

Meteorology of American Floods

THE unprecedented floods on the Ohio and lower Mississippi Rivers last winter, coming so soon after the exceptional floods of March–April 1936 in the middle and north Atlantic States, have led C. F. Brooks and A. H. Tiessen to a study of the meteorology of such floods. An account of their work has appeared under the heading "The Meteorology of Great Floods in the Eastern United States" (*Geographical Rev.*, **27**, No. 2, April 1937) and has recently been reprinted as a separate paper. The flood of 1937, with its monetary loss of at least six hundred million dollars, is, according to these writers, the greatest American flood on record. They find that two meteorological features are common to all great floods such as those of 1882, 1889, 1903, 1913, 1922 and 1927, and those of the last two years, namely, "a rapid and continuing flow of moist tropical air into the country and a frequent and persistent elevation of this tropical current by a colder air mass over the same region". This arises from a persistent anticyclone over the western part of the North Atlantic and another over the central or northern interior of the United States, or a little farther to the west. The one drives tropical air northwards, the other polar air southwards, and ascent of the warm air is continuous and sometimes violent along the front between the two. The importance of the weather before the heavy rains that are the immediate cause of the flood is pointed out; a rapid run-off is favoured both by wet weather which saturates the ground and by severe frost that makes it impermeable; on the other hand, dense vegetation and a dry soil or a deep cover of snow over unfrozen ground may entirely absorb five inches or more of rainfall. The fact that great floods are confined to the winter and spring is to be attributed to the vegetation that protects the summer and autumn by hindering run-off and rapidly using ground water.

Young's Modulus Apparatus

THE August issue of the *Journal of Scientific Instruments* contains a description of an interferometer apparatus for the accurate determination of Young's modulus over a wide range of temperature, devised by Mr. J. W. Cuthbertson of the University of Manchester. A bar of the material about 9 cm. × 0·6 cm. × 0·3 cm. is supported symmetrically on parallel horizontal knife edges about 4 cm. apart; the

load is applied by needle points, near the ends of the bar, which support a bar to whose centre the load is applied by weights or by a lever. The rise of the centre of the test bar is transmitted by an invar wire to a tripod the other two legs of which are supported by hole and groove in a fixed plate. The tripod carries the lower plate of an interferometer the upper plate of which is fixed. The interference bands in reflected light are observed in a microscope and the number which pass a fixed line, as either load or temperature is gradually changed, is counted to get the rise of the centre of the bar. The bar and its supports are suspended in an oil bath by rods of invar bolted to horizontal iron beams which carry the interference apparatus. A few typical results are given.

Detection of Destructive Larvæ in Timber

IN the National Physical Laboratory Report for 1936 (London: H.M. Stationery Office. 2*s*. 6*d*.) Dr. R. L. Smith-Rose, the head of the radio department, describes an acoustic-electrical equipment for detecting destructive larvæ in timber. At the request of the Forest Products Research Laboratory, he explored the possibilities of applying microphone and amplifier technique to the detection of larvæ in specimens of timber. The first experiments showed that there was little likelihood of the successful application of a method of this kind to the detection of larvæ in buildings or growing timber, owing to the faintness of the sounds concerned relatively to the associated background noises. Further experiments carried out when the specimens were housed in a sound-proof container were promising. A suitable equipment was designed and constructed. The specimen of timber to be examined was placed in a sound-proof container with a suitable control specimen and a microphone was laid on each. When the specimen contained larvæ, the noises made by these could in general be readily distinguished from the more uniform background noise of the amplifier itself. In some instances different larvæ could be distinguished by the differences in the sounds they made. A description of the equipment used has been prepared for publication.

Reflection of Radio Waves in the Atmosphere

THE well-established reflection of radio waves in the upper atmosphere takes place at apparent heights of 100–200 km. and it is generally believed that the damping effect of atomic collisions on ionic motion prevents reflection from ionized layers much lower than this. R. A. Watson-Watt, A. F. Wilkins and E. G. Bowen (*Proc. Roy. Soc.*, A., **161**, 181) have now observed reflection from much lower levels. They used the pulse technique, refined so that a very short pulse was transmitted upwards and echoes of very short delay could be observed on a cathode ray tube. Continuous records and 'snap' observations were both used. The observers were able to detect a series of reflections which they interpret as arising from a few layers at height about 10 km., possessing reflection coefficients of the order 0·7 (for 50 m. waves and vertical incidence). The layers are fairly persistent in time and occur both by night and by day. The records also reveal reflections from the Appleton *D* region (50–90 km.) and from stratospheric layers at about 30 km. A feature of *D* region reflection is the occurrence of sporadic bursts of reflection lasting a few seconds. The appearance of a 30 km. reflecting layer has on several occasions been correlated with thunderstorms, and an appendix to the paper shows that the 'runaway electrons' predicted by C. T. R. Wilson should be bent round by the earth's magnetic field and might produce ionization of the type required. The occurrence of these low reflecting layers may have some practical bearing on short-wave transmission and in particular on television phenomena.

Concentration of Nitrogen Isotope

BY using the exchange reaction between ammonium sulphate and ammonia gas, H. C. Urey, M. Fox, J. R. Huffman and H. G. Thode (*J. Amer. Chem. Soc.*, **59**, 1407; 1937) have been able to concentrate the heavy isotope of nitrogen, ^{15}N, for use in biochemical and chemical investigations. A solution of ammonium sulphate was pumped into the top of a fractionating column under low pressure, ammonia was liberated from the salt at the bottom by addition of caustic soda, and the ammonia gas stripped by a packed column. This ammonia was fed back to the bottom of the column and escaped at the top. As a result of a 13-day run, nitrogen containing 2·54 per cent of ^{15}N was obtained, an increase of concentration of 6½-fold. The samples were analysed by the Bleakney mass spectrometer, giving an accuracy of 0·02 per cent ^{15}N.

Structure of Water

THE open tridymite-like structure of ice as regards the distribution of the oxygen atoms appears to have been definitely established by Barnes, and Pauling's explanation of the discrepancy between the entropies of ice calculated by Nernst's theorem and statistical methods indicates that the hydrogens are unequally spaced between the oxygens. Present theory, as developed by Bernal and Fowler and modified by Katzoff and others, considers liquid water at ordinary temperatures as having essentially a broken-down ice structure, permitting closer packing with a considerable amount of co-ordination persisting through hydrogen bonds. This co-ordination decreases with rising temperature or addition of electrolytes. According to Pauling, two of the four hydrogens which surround a four-co-ordinated oxygen atom tetrahedrally are bonded to it in much the same manner as in an isolated water molecule, while the other two hydrogens are at a greater distance (1·77 A. instead of 0·99 A.) from the oxygen and essentially bonded to other oxygen atoms. The oxygen nucleus in ice has four oxygens tetrahedrally bonded at 2·76 A., with a proton along each O—O axis. An examination of the Raman spectra of ice at 0°, of water over a wide range of temperatures, and of deuterium oxide, has been made by P. C. Cross, J. Burnham and P. A. Leighton (*J. Amer. Chem. Soc.*, **59**, 1134; 1937). The results are interpreted on the basis of a model consisting of O—H oscillators perturbed by various types of co-ordination. A semi-empirical treatment indicates that in ice at 0°, the four-co-ordinated structure predominates, but appreciable amounts of three- and two-co-ordinated molecules are present. Water is rather more than two-co-ordinated at 25°–90°, and is slightly less co-ordinated than deuterium oxide, two-co-ordinated structures predominating in both liquids. Little significance is attached to the existence of definite polymolecular structures such as $(H_2O)_2$, $(H_2O)_3$, frequently postulated as existing in liquid water.