Research Items

Stone Age Cultures in Uganda

IN *Man* of March, Mr. T. P. O'Brien, leader of the African Prehistoric Research Expedition, reviews the Stone Age cultures of Uganda on the evidence of the sites throughout the country examined by the expedition. *Kafuan and Oldowan.* The Kafuan pebble culture is the oldest recognisable in Africa, ante-dating Oldowan I. It occurs mostly in gravels deposited by Pluvial I rivers. The implements are mostly small, showing a rough reduction of the edge to produce chopping and cutting tools. The Oldowan type implement is a rough chopper. Oldowan pebble tools are few. *Uganda 'Cromerian'.* A crude large-flake culture found in talus deposits, belonging to a dry period preceding Pluvial II. *Chellean.* A few water-rolled proto- or early Chellean tools are found in the gravels of the top terrace of the Kagera. True Chellean does not occur widely. *Acheulean.* On present evidence appears after a gap. The lowest stratigraphically dated is in Horizon *M*, which marks a climatic break in Pluvial II. The majority of the implements are of large flakes adaptable to the 'wood technique', though only a small proportion actually show real wood technique. It is comparable to Leakey's Stage I–II at Oldoway. Higher up in the same beds and again associated with a climatic break is a later phase of Acheulean, there being no, or little, evidence of intervening stages. In this, the *N* Horizon, there is evidence of deterioration or regression in style. In the *O* Horizon, Upper Acheulean occurs in plenty and well made. The most remarkable feature of this horizon is the appearance of an entirely new culture, previously known from the French and Belgian Congo—the *Tumbian*, of which the characteristic tools are oval or long *bifaces*, which later develop into beautiful *feuilles-de-laurier*. The *tranchet* is common. This culture occurs with the advanced Acheulean, but the relation is not yet clear. *Levalloisian.* First appears between *M* and *N*, and afterwards carries on until it develops finally into Still Bay. *Upper Palæolithic.* The Aurignacian does not occur in Uganda, surprisingly, probably owing to lack of suitable stone.

Metabolism during Mild Exercise

MUCH attention has been devoted, during recent years, to the effects of hard exercise on metabolism. F. C. Courtice and C. G. Douglas (*Proc. Roy. Soc.*, B, **119**, 382) have studied the effects of the milder exercise of walking ten miles at 4·5 m.p.h. This amount of exercise was insufficient to increase the blood lactic acid, and the conclusion is reached, after discussion, that the respiratory quotient gives a trustworthy indication, under these conditions, of the nature of the foods metabolised. During the exercise the respiratory quotient (*R.Q.*) rose owing to increased carbohydrate metabolism. After the exercise the *R.Q.* fell, and acidosis and ketosis developed, owing to increased metabolism of fat. If the subject had consumed much carbohydrate on the day before the exercise, there was no evidence of increased fat metabolism after the exercise. The consumption of carbohydrate just before the exercise did not have this effect (see also NATURE, **136**, 1001; 1935).

Fertilisation in *Acacia Baileyana*

DR. I. V. NEWMAN has published two further papers which complete his investigations on the life-history of *Acacia Baileyana* (*Proc. Linn. Soc. N.S.W.*, **59**, parts 3–6). The carpel is found to arise as a single folded foliar structure with ovules inserted along the margins. The integuments are only formed after fertilisation, and the megaspore is possibly smaller than the microspore. The anther is regarded as containing eight sporangia, each with a one-celled archesporium which develops into a 16-celled pollinium. This condition should make it possible to determine definitely whether the split in the chromosomes is suppressed in the last premeiotic telophase. The pollen grains germinate in the anther, cutting off a generative cell which becomes spindle-shaped, has a definite membrane, and cytoplasm less dense than that of the grain. The pollen was grown successfully on 1 per cent agar with 20 per cent sugar solution. As the legume contains only 12 ovules, a pollinium on the stigma furnishes an excess of pollen tubes and two frequently enter the same embryo sac. Evidence was obtained that the extra male nuclei fuse with the polar nuclei, producing endosperm with occasionally as many as $7n$ or $8n$ chromosomes. The mature sac becomes filled with starch grains, and after fertilisation the endosperm nucleus divides to form about 64 free nuclei before wall-formation begins around the embryo.

Hemimerus, a Parasite of the Giant Rat

MESSRS. JAMES A. G. and John W. H. Rehn have recently published an article revising the species of *Hemimerus* (*Proc. Acad. Nat. Sci. Philadelphia*, **87**, 457–508; 1935). This genus is allied to the earwigs, but is wingless and eyeless, with the hind body terminating in thread-like cerci, instead of forceps. So far as is known, the species of *Hemimerus* only occur as ectoparasites on terrestrial giant rats of the genus *Cricetomys*. The hosts, as well as the parasites, are limited in distribution to tropical Africa. The most important fundamental studies of these curious insects have been made by Dr. Heymons who, in 1905, showed that the offspring are produced viviparously, a peculiar kind of placenta enabling them to undergo their development on nutriment provided by their female parent. The adaptations of *Hemimerus* are those of a true parasite which lives externally on its host. The food appears to consist of epidermal products and of a fungus which possibly grows on the skin of the host. Messrs. Rehn have examined 343 specimens of the insect from various parts of Africa, and find that their distribution ranges from Portuguese Guinea, across the continent to Mozambique and the north-eastern Transvaal. The northern and southern range cannot be accurately defined at present, owing to paucity of material or records, from areas where it and its host undoubtedly occur. The authors redescribe the three species already known, and recognise five other species previously unrecorded. The paper is accompanied by a full bibliography of the genus and forty-seven figures illustrating diagnostic characters.

Control of Antirrhinum Rust

THE fungus *Puccinia antirrhini*, causing a rust disease of snapdragon plants, has established itself firmly in England during the last two years. This fact renders any experiments upon its control of more than passing interest. Mr. D. E. Green has conducted an extensive series of such experiments, using nine types of spray fluid, and three fungicidal dusts (*J. Roy. Hort. Soc.*, **61**, Pt. 2, 64–76, February 1936). Copper-containing sprays were found to be effective, and of these, Burgundy mixture was the most suitable. Control was not absolute, however, and as it was considered that at least six sprayings were necessary, this method is likely to daunt even the *Antirrhinum* enthusiast. Mr. Green is, however, trying another method, namely, the raising of rust-resistant snapdragons, and the results of these trials will be awaited with great interest. They give high promise already.

Tulip Fire Disease

TULIP fire caused by *Botrytis tulipæ* is the most serious disease that attacks the tulip crop, and a descriptive account of it, with control measures, is given by A. Beaumont and others (*Ann. App. Biol.*, **23**, p. 57). The blooms on attacked plants are rendered quite unmarketable, but though the direct loss on account of diseased bulbs is small, the indirect loss is by no means negligible where the flowers are 'topped', as a substantial increase in size is made during the period subsequent to 'topping'. No varieties are known which are completely resistant; but the degree of susceptibility varies; Baronne de la Tochnaye, for example, seems to be the most resistant tulip in the Devon–Cornwall district. A close correlation exists between meteorological conditions and the incidence of tulip fire, rainfall and humidity being the most important factors as they are the conditions necessary for germination and infection. Three types of symptom occur, fire, spot and rot. Fire is a primary infection and appears as grey lesions on leaves, flowers and capsules, whereas spot arises secondarily from spores derived from fire lesions. Rot is less common, and attacks the bulb only, although the resulting plant is sickly and generally fails to flower. Control measures are bound up with proper cultivation. Bulbs should be lifted every year and planted, preferably deeply, in fresh soil. Late planting and wide spacing are advocated, while careful roguing and destruction of diseased plants with avoidance of mechanical injury are also of the first importance. Various methods of chemical control have been tried, but the results have not yet met with much success. Further experiments in this direction are in progress.

Timber Seasoning

THE fourth number of the *Forest Products Research Records*, published under the auspices of the Department of Scientific and Industrial Research, deals with "Timber Seasoning", by R. G. Bateson. The importance of this investigation is that it deals with both air seasoning, the old common method, and kiln seasoning. Of particular interest from the practical householder's point of view is the statement that it is not possible to dry timber out of doors in Great Britain sufficiently for use in artificially heated buildings. "Under the most favourable circumstances," says the author, "the moisture control might conceivably be reduced to about 12 per cent in the height of summer but 18 per cent represents a far more usual figure; whereas a moisture control of 9–12 per cent is required for interior wood work in centrally heated buildings". In the experience of the present writer, old air-seasoned Scots pine panelling dating from about the middle of the eighteenth century cracked badly when central heating was introduced into the house, whilst oak panelling stood up much better—but both examples prove the contention of the author. In this connexion, the author points out that certain 'refractory' hardwoods which take months to season in the kiln, can be kiln seasoned in a week or two if air seasoned for a year or two previously. This would appear to show that there is yet something to learn about air seasoning in the case of some species of, and probably the finer, timbers.

Magnesium Metasomatism

AN important paper by N. Sundius on "The Origin of Late Magmatic Solutions containing Magnesia, Iron and Silica" appears in *Årsbok*, **29**, No. 7, of the Sveriges Geologisks Undersökning. The sulphide ores of Fennoscandia are often associated with quartz-rich rocks containing magnesium-, iron- and aluminium-bearing minerals such as micas, cordierite, amphiboles and garnet. Almost invariably the presence of these minerals has been ascribed to metasomatic changes due to the introduction, often through great distances, of oxides from some external source of supply. Locally, the metasomatic rocks have been sufficiently mobilised to act as intrusions towards their own country rocks. A peculiar feature of the scarn and ore occurrences in which magnesium metasomatism is manifested is the scarcity of evidences of volatile substances of the kinds usually regarded as pneumatolytic carriers. Sundius discusses a number of examples and concludes that a supply of outside agents is not always necessary, but that magmatic differentiation products corresponding to the minerals in question may be concentrated from a magma as residual solutions and may crystallise *in situ* or be squeezed out into the adjoining country rocks. Water at high temperature is regarded as the chief cause for the production of such late-magmatic solutions. The latter are supposed to contain hydroxyl-bearing compounds, probably silicates, and possibly aluminates and ferrites. Metasomatic activity on the part of the water-rich magma solutions is favoured by the diminished stability of earlier-formed felspars in their presence. The author admits that vaporisation of metallic compounds from the magma may have played a prominent part in some cases, though, he adds, no examples have as yet been clearly revealed. The problem is far from being solved and Sundius himself warns petrologists that "a rigorous application of the theory here developed is not advisable".

The Southern Alaska Range

S. R. CAPPS has recently described an area of some 23,000 square miles which was still largely unexplored when the surveys reported were begun in 1926. (U.S. Geol. Surv., Bull. 862). The parts of the Range now described reach heights up to 12,000 feet and include a labyrinth of rugged mountain crests and valley glaciers. One of the highest mountains of the region is Mount Spurr, a volcano which still shows signs of mild activity. Other volcanoes lie to the east, forming part of the great line of vents that stretches along the Alaska Peninsula and the Aleutian

Islands. The oldest rocks of the region are gneisses, mica-schists, crystalline limestones and quartzites, known to be pre-Triassic and thought to be Palæozoic in age; they may, however, be Pre-Cambrian. Less highly metamorphosed Mesozoic sediments follow, cut by gigantic intrusions of a general granitic character. The age of the Mesozoic sediments in the Alaska Range has proved difficult to determine, as the rocks consist of a monotonous alternation of argillaceous rocks and graywackes which are almost devoid of fossils. Just why these particular Jurassic and Cretaceous seas should have been so inhospitable to life is a baffling problem, for near by, in the Pacific littoral belt of the Alaska Peninsula, a prolific fauna flourished during those periods. Near the shores of Cook Inlet there are extensive deposits of Tertiary lignitic coal, but at present more accessible supplies are available for the local market. Lodes carrying promising amounts of gold and silver have been discovered near the borders of granitic intrusions, but lack of transport facilities has so far retarded development.

Organic Liquids in Diffusion Pumps

K. C. D. HICKMAN (*J. Franklin Inst.*, February) has studied the behaviour of organic liquids used to provide the vapour stream in diffusion pumps, and he has been able to clear up some of the inconsistencies in reports of their behaviour. The liquids—the Burch vacuum oils and such esters as dibutyl phthalate always contain traces of relatively volatile substances, and in the operation of the pump these substances collect in the high vacuum region, spoiling the vacuum there. They then redissolve in the condensate and are not eliminated by the backing pump. The author constructed a two-stage pump in which interconnexions ensured that the more volatile constituents were transferred to the rough pump, while the high-vacuum pump operated with the best fraction of the vapour. The pump gave a much better vacuum under these conditions than in the case where the interconnexions were changed to reverse the direction of fractionation. A further development was the construction of a fractionation pump in which successive fractions of the pumping liquid were used in successive vacuum stages. A practical form of this pump is to be described in a future paper.

Potassium Isotopes in Minerals and Plants

THE question of the variation in the isotope ratio of potassium in plants has received conflicting answers, the balance of evidence being that there is no isotope effect. The element has three isotopes, 39, 40 and 41. The abundance ratio K^{39}/K^{41} has been determined, with somewhat varying results. A. K. Brewer (*J. Amer. Chem. Soc.*, 58, 365; 1936), using the mass-spectrograph, with a constant velocity source permitting the entire primary ion beam to be focused on the entrance slit, and a Dempster type analysing chamber, finds the ratio $K^{39}/K^{41} = 14{\cdot}27 \pm 0{\cdot}04$ for Vesuvius lava. Most other minerals examined show only small differences, the abundance ratio being in general near 14·25. A low value ($14{\cdot}11 \pm 0{\cdot}03$) was obtained for Hawaiian basalt and a high value ($14{\cdot}6 \pm 0{\cdot}05$) for wyomingite (a lava). The results obtained with 32 plant ashes show distinct variations in the isotope ratio, the K^{41} content differing between plants by as much as 15 per cent. Kelp shows the most pronounced deviation ($12{\cdot}63 \pm 0{\cdot}20$) from the general average. It is interesting to note that plants have likewise been shown to exhibit a selectivity in the case of heavy hydrogen. The factors contributing to the abundance ratio variations appear to be the variety of plant, age, soil and section of plant. In a second paper (ibid., p. 370) the same author reports that the abundance ratio for Pacific water is 14·20, no appreciable variations being observed between samples from different localities or at points down to 2,500 m. in depth. The value for the atomic weight is calculated as 39·094, in close agreement with the value accepted by the Committee on Atomic Weights.

Effect of Weather on 132-kilovolt Line Insulators

THE experience gained during the last few years in the running of the Grid in Great Britain under all kinds of weather conditions has shown that the behaviour of the 'chains of insulators' needs close study. In industrial areas, or where the atmosphere is polluted, flashovers occur, although the lines are adequately insulated according to the usual standards and the insulators are regularly cleaned. In a paper read to the Institution of Electrical Engineers on February 19 by J. S. Forrest, an investigation with the object of finding out which kind of insulator is most suitable for use under foggy conditions is described. The investigation was carried out at the Croydon transforming station of the Central Electricity Board. It was found that in fog or with dirty insulators under humid conditions, the leakage current is very unsteady, and continuous 'surging' often takes place. These current surges are due to surface discharges on the insulators and are usually self-extinguishing, but a severe surge may develop into a complete flashover. The experiments have led to a testing technique to determine which of the available types of insulators is most suitable in neighbourhoods subject to fogs. It is found that the frequency and magnitude of the current surges give a criterion by which the performance of insulators can be judged. It is unnecessary and therefore uneconomical to clean tension insulators as often as suspension insulators. It is probable that the better performance of the tension chains is due to the more efficient cleaning by rain and to the less tendency for leakage-current surges to develop into complete flashovers.

Radial Velocities of 100 Extra-Galactic Nebulæ

THE discovery of the enormous velocities of recession of some of the spiral nebulæ, together with the distance-velocity relation and its resulting hypothesis of an expanding universe, has led to a more intensive study of the radial velocities of these objects. The 100-in. reflector at Mount Wilson has already been used for determining the radial velocities of many nebulæ, and now a further list of 100 velocities has been published by Humason (*Astrophys. J.*, 83, 10) in which the range in distance of the observed objects has been greatly increased. This list includes values for nebulæ in clusters or groups as well as for 56 isolated nebulæ; and the velocities found, with six exceptions, are all of recession, ranging from 50 km./sec. to 42,000 km./sec. When correlated with distance, these results indicate that the velocity-distance law is still sensibly linear up to the distance of 70 million parsecs (the estimated distance of the clusters in Boötes and Ursa Major).