

## RESEARCH ITEMS

## Ancient Gold-working Site in Rhodesia

A MIDDEN site on the Macardon Claims, West Nicolson, Gwanda District, Southern Rhodesia, discovered by Mrs. Winifred Macdonald and examined by her, produced material of no little interest which has been described by Neville Jones (*Trans. Rhodesia Sci. Assoc.*, 37; 1939). The size and thickness of the midden deposit suggest an occupation by one or two families for not more than fifty years. A flattish granite rock which outcrops on the surface is almost entirely covered by dolly-holes and was evidently used for the purpose of crushing the auriferous quartz mined in the vicinity. The crushing was done by means of pestles of diorite some of which were found still standing in the holes as the original inhabitants had left them. Most of the holes contained fragments of quartz broken to a size convenient for dollying. A little fine gold was obtained from the holes. Objects found included a portable crushing mortar, hammers, gold in the form of beads, cylindrical and tubular, foil, tacks, links, etc., twisted copper wire, copper chain fragments and links, copper beads and needle, objects of iron, including battle axes, imported celadon ware, beads and bored sea-shells (Polinices, Cypraea and Oliva), locally made ornaments of soapstone, beads of ivory, ostrich shell, achatina shell, amulets, pottery and a portion of a tuyère for ore reduction and slag. The gold beads are significant for methods of manufacture. From the evidence of the pottery, which is of the Sotho and Shona traditions, the celadon, the beads and the association of gold objects, it is probable that the Macardon site is to be dated at about the close of the fifteenth century.

## The 'Ultra-Perceptive' Faculty

THE existence of an 'ultra-perceptive' faculty, that is, the extension of perception beyond the normal and intellectual range, is not proved, but the scientific study of such perception has during the last few years received a fresh impetus. A paper by Dr. J. Hettinger, prepared for the Dundee meeting of the British Association, gives an account of an attempt to test statistically the probability of such a faculty. More than 150 subjects took part in the experiments which were carried out with the assistance of two professional 'sensitives'. Articles obtained from the subjects were placed in separate sealed envelopes and taken by the experimenter to the residence of the sensitives; one of the sensitives handled the envelopes while the other merely concentrated on the envelope laid on the table. The 'sensitive' then commented on the subject owning the particular article; for example, concentrating on one article, the sensitive said, "Pile of shillings, as if saved for some purpose". The subject with reference to this said, "I was counting the takings in a shop at the time, and had silver in piles." As a control, for each item given with regard to a particular subject by the sensitive an equal number of fictitious items was presented for acceptance or rejection. The results were treated to a detailed statistical analysis, and it was found that the deviation from chance expectation was more than fourteen times the probable error, indicating the probable existence of an ultra-perceptive faculty.

## Age of Wild Birds of Prey

IN a short paper E. Lowell Sumner, jun., gives the ages attained by representatives of a few species of raptorial birds which had been ringed by him during the past fifteen years (*Condor*, 42, 39; Jan. 1940). The greatest age was attained by a screech-owl, *Otus asio quercinus*, which was shot thirteen years after ringing, and the average age of five returns of this species was 5 years. A barn-owl, *Tyto alba pratincola*, lived for 10 years 4 months, and the average of eleven returns was 3 years 2 months; two horned owls, *Bubo virginianus pacificus*, almost equal in age, averaged 2 years 6 months. The diurnal birds of prey seem to have rather shorter spans. Of four recovered red-tail hawks, *Buteo borealis calurus*, the oldest had survived for 1 year 5 months, and the average was only 7½ months. One Canadian golden eagle was captured at least 3 years 10 months old, and one sparrow-hawk, *Falco sparverius*, at 2 years 7 months. The numbers ringed and recovered in this experiment are too small to give a reliable indication of either average or maximum age, but the distances at which the birds were recovered suggest the relative tendency to wander. The four red-tails were captured at an average distance from the ringing place of 69 miles, the single golden eagle and sparrow-hawk respectively at 23 and 10 miles, the eleven barn-owls averaged 21 miles, as against one mile for the five screech-owls, whereas the single long-eared owl recaptured had travelled 49 miles.

## Toxicity of Selenium-containing Plants to Pests

AMONG papers read before the annual meeting of the American Association for the Advancement of Science, which took place at Columbus (Ohio) at the end of December last are two on the above subject. V. H. Morris, C. R. Neiswander and J. D. Sayre discussed a method of rendering corn plants resistant to red spider attacks by growing them in nutrient solution to which was added each week 1 p.p.m. of sodium selenate. When the rate of selenium application was increased to 2 or 3 p.p.m., no red spiders were found to survive. Under such conditions the growth and normal nutrition of the plants was unaffected. Similar results have been obtained in additional tests with a number of other species of plants. In the second communication Messrs. Neiswander and Morris described results of experiments indicating that an accumulation of 90-100 parts per million of selenium in the tissues of certain plants was sufficient to prevent infestation by the common spider, *Tetranychus telarius*, and that a lesser amount controlled the chrysanthemum aphid *Macrosiphoniella sanborni*. The investigation suggests a possible method for controlling pests of ornamental plants.

## Viruses and their Insect Vectors

THE complex relations which exist between a plant virus and the insect which transmits it have been studied by M. A. Watson and F. M. Roberts (*Proc. Roy. Soc. Lond.*, B, 127, 543-576; 1939). They used three viruses, namely, potato virus 'Y', cucumber virus 1 and Hyoscyamus virus 3, which cannot be transmitted mechanically and are non-persistent

in the insects which transfer them. Three species of aphid were used as vectors: *Myzus persicae*, *M. circumflexus* and *Macrosiphum gaei*; their efficiency in transmitting the viruses increased with increasing time of fasting before feeding upon infected plants, and decreased as the time of feeding upon the diseased hosts increased. It would therefore appear that the viruses are inactivated by some substance produced by the aphids when feeding. *Myzus persicae* was the most successful vector, but the efficiency of each aphid varied according to the concentration and localization of virus in the plant, and to the inhibitive capacity of the insect for the virus.

#### Erosion Surfaces in the Allegheny Plateau

At the annual meeting of the American Association for the Advancement of Science, during December last, J. L. Rich presented an illuminating paper on the identification and interpretation of erosion surfaces. Aerial photographs of selected parts of the Allegheny plateau were used to illustrate the thesis that projected profiles or visual inspection of skyline elevations cannot be relied upon for the determination of the altitude of an erosion surface unless the region has not passed beyond the mature stage of the cycle of erosion. For all post-mature stages an indeterminate amount of elevation must have been lost by the inter-valley divides. Physiographic evidence proves an enormous difference in the rate of erosion between certain shale horizons in the Pennsylvanian and the massive Pottsville conglomeratic sandstone at its base. The difference is such that two or more cycles can be brought to old age stage on the shales, while the first cycle has scarcely passed infancy on the sandstone. In view of these complications, due to rock resistance and its bearing on the stage reached in the erosion cycle, it is clear that a re-examination of the physiography of the plateau is called for.

#### Decomposition of Azomethane

THE decomposition of azomethane yields different products depending on the procedure employed. Emmett and Harkness (*J. Amer. Chem. Soc.*, 54, 538; 1932) found that catalytic decomposition using an iron (synthetic ammonia) catalyst gave methylamine as an intermediate product and ammonia, hydrogen and carbon as principal end products, while Taylor and Jahn (*J. Chem. Phys.*, 7, 470; 1939) found that pyrolysis and photolysis gave initially methyl radicals which added on to azomethane molecules forming tetramethylhydrazine, which afterwards decomposed. Recently, Henkin and H. A. Taylor have reported data (*ibid.*, 8, 1; 1940) on the decomposition of azomethane by atomic hydrogen at 27°, 110°, and 195°. At 27°, gaseous products were absent. A liquid product, obtained in a liquid nitrogen trap, contained a small fraction volatile at -78°, which was probably unchanged azomethane. The non-volatile liquid component, which was, therefore, presumably the sole product of the reaction, was colourless, basic, and a good reducing reagent. It gave the azo-cuprous chloride complex characteristic of a secondary hydrazine, and microanalysis of the picrate and oxalate showed it to be *s*-dimethylhydrazine. The absence of hydrocarbons indicates the non-rupture of the azomethane molecule. At 110°, methane and ethane were present (10:1). A considerable proportion of the liquid product was volatile at -78°, and combustion tests on the gas

indicated methylamine. The residual liquid was again dimethylhydrazine. The liquid product from the 195° decomposition contained a larger amount of methylamine; the ethane yield was almost zero, and the amount of methane was only 20 per cent of that at 110°. Analysis of the fraction non-volatile at -78° indicated a compound with a nitrogen content lower than dimethylhydrazine. This is explained by assuming that methyl radicals join to azomethane molecules, with the ultimate production of tetramethylhydrazine and trimethylhydrazine. The possible mechanisms involved at the different temperatures are discussed.

#### Diffraction of Protons by Vapours

DETERMINATION of molecular structure by electron diffraction is now a well-established method. Provided that a suitable source and technique could be developed, the diffraction of protons by vapours is an extension of this method of great potentiality, since the intensity of scattering of protons by an atom should be about 2,000 times greater than the scattering of electrons. Light molecules could then be investigated. A first attempt in this direction is reported by H. J. Yearian (*J. Chem. Phys.*, 8, 24; 1940), who describes an apparatus and preliminary results on carbon tetrachloride which agree satisfactorily with electron diffraction data. An arc of 0.5-2.0 amp. is struck in hydrogen in a stainless steel ion source and the ions are accelerated to 1.5-2.0 kv. The beam (approximate composition, 20 per cent H<sub>1</sub><sup>+</sup>, 50 per cent H<sub>2</sub><sup>+</sup>, 20 per cent H<sub>3</sub><sup>+</sup>, 10 per cent heavy ions) is resolved into its ionic constituents by a magnetic field and the selected beam, after suitable focusing, falls on a stream of vapour at 10<sup>-5</sup> mm. pressure. The scattering is recorded photographically. Many difficulties of technique were encountered, principally space charge effects near the ion source, neutralization of the beam by molecules of the vapour, loss of sensitivity of the photographic film due to outgassing. Precautions taken to minimize these and other difficulties are discussed. The experience gained in these preliminary experiments has indicated certain desirable modifications of technique, which are outlined. This investigation may well be the precursor of an important new method of elucidating the structure of molecules.

#### Age of a Meteorite

A SHOWER of fragments of a stony meteorite which fell in Putulsk (Poland) in 1868 were supposed, on account of the reported high heliocentric velocity, to be extra-solar material, although this result is not confirmed by recent recalculation (C. C. Wylie, *Science*, 9, 264; 1939). The protactinium contents of this meteorite and of a granite low in radioactive material as representative of terrestrial material of similar composition have been determined by W. C. Schumb, R. D. Evans and J. L. Hastings (*J. Amer. Chem. Soc.*, 61, 3451; 1939) and the protactinium/radium weight ratios found. From the results the conclusion is reached that within the limits of error the age of the uranium atoms in this specimen of the Putulsk meteorite is the same as for terrestrial uranium. The protactinium was determined by coprecipitation with zirconium phosphate, followed by purification of the ignited pyrophosphate, the alpha-ray activity being measured on a recording alpha-ray counter. The method will determine as little as 10<sup>-13</sup> gm. of palladium per gm. of siliceous material.