

RESEARCH ITEMS

Modern Stone-Age Man in South Australia

AN interesting light is thrown on possible methods used by early man by a recent description of modern stone-age man in the Musgrave Range, South Australia. The Pitjendara tribe is one of the most primitive in Australia, and among their few possessions are spears and spear-throwers fitted with an adze stone on the end. The manufacture of these spear-throwers is the subject of a recent paper "An Unrecorded Method of Manufacturing Wooden Implements by Simple Stone Tools", by C. P. Mountford (*Trans. Roy. Soc. South Aust.*, 65, (2); 1941). The tools selected were natural stones chosen for possible cutting edges, but left undressed. With these as the sole instruments a shaped slab of wood was stripped from a small mulga tree—a slow, laborious process—and the bark removed before being taken to camp. Here the shaping and finishing took place with the help of smaller, but still unflaked, stones, and finally with the aid of the adze stone of a finished spear-thrower. The adze stones themselves were merely flakes of chert with good cutting edges and were stuck into the handle end of the spear-thrower with spinifex gum warmed over the fire. When these stones became blunted with use there were some attempts to create a fresh cutting edge by tapping them with the wooden blade of a spear till miniature flakes were broken off. The throwing peg was made of wood and attached by spinifex gum to the tip of the spear-thrower and then securely bound with tendon. The stones used in these processes were all discarded and left behind, and as such stones bear no recognizable trace of their use by human beings, a material culture such as that of the Pitjendara tribe might well become extinct without leaving any trace of its existence.

Hæmophilia-like Condition in Pigs

HÆMOPHILIA and blood conditions that resemble this abnormality have been known in man for many years. On the other hand, such a condition appears to have remained hitherto undetected among pigs. R. Bogart and M. E. Muhrer have described a hæmophilia-like condition in a line of inbred Poland China pigs (*J. Herod.*, 33, No. 2, 1942.) The feature first becomes evident at about two months in age but is by no means constant in this respect. In general, the abnormality becomes increasingly severe as the animals become older. Like hæmophilia in man, it is due to a thromboplastin deficiency. It appears that this hæmophilia-like condition in pigs is due to a recessive gene and that the variation between different individuals as regards the severity of the abnormality is brought about by modifying genes. The character is not sex-linked as in man but would cause great losses to pig breeders should the gene concerned become widespread. The authors observed the phenomenon in animals used for breeding at the Missouri Agricultural Experiment Station.

Colchicine and the Production of New Types of Forage Crops

UNTIL recently the production of improved varieties of plants has been almost restricted to selection and hybridization within and between closely related species, since intergeneric hybrids show a complete or high degree of sterility. Colchicine affects mitosis, and cells which have an optimum dose of this sub-

stance may begin to divide but fail to complete the process, so that the two sets of chromosomes reunite with a consequent doubling of the chromosome number. If this effect can be induced in tissues which will eventually give rise to the gametic tissues, normal pairing of chromosomes occurs at meiosis so that fertility is restored and an amphidiploid type is produced. The difficulty to date has been to devise a method of application of the colchicine which produces sufficient penetration of the tissues without killing the plant. F. H. Peto and G. A. Young (*Canadian J. Res.*, 20, No. 3, Sect. C; 1942) have tested methods of application of colchicine to sterile hybrids of *Triticum* species with *Agropyron glaucum*. The more effective methods were (1) immersion of the young seedling in 2 per cent colchicine solution and (2) enclosure of the decapitated seedling stem in a capsule containing agar with 0.1 or 0.4 per cent colchicine. The latter method affected the young tillers and proved the most effective; of the surviving plants 21.2 per cent showed fertility, and this treatment also led to less wastage of the valuable hybrid material than methods involving immersion of seedlings or seed in the solution. The application of these methods to *Triticum-Agropyron* hybrids shows that fertility may readily be induced in the sterile hybrids by doubling of the chromosome number; this opens the possibility of combining the characters of related genera and the production of a vast range of new types of forage crops. One such colchicine-induced fertile amphidiploid, first produced in 1938, is now available in sufficient quantity for extensive field tests, while a number of others will be ready for similar trials in the course of a few years.

Diseases of Miscellaneous Crops

SEVERAL uncommon diseases of seakale, artichoke, sweet corn, asparagus and rhubarb have been briefly described by D. E. Green (*J. Roy. Hort. Soc.*, 67, Pt. 3; March, 1942). Rhubarb is occasionally attacked by the honey fungus, *Armillaria mellea*, in addition to crown rot and grey mould. Seakale may be infected with club-root, black-rot (*Pseudomonas campestris*), soft-rot (*Bacterium carotovorum*) and violet root-rot (*Helicobasidium purpureum*), which also parasitizes chicory, artichoke and asparagus. Grain mould of sweet corn may be caused by several fungi of the genera *Penicillium* and *Fusarium*.

Analysis of Certain Foods

AT a meeting of the Society of Public Analysts and Other Analytical Chemists held on May 6, E. T. Illing and E. G. Whittle gave analytical data for samples of soya bean meal and of cereal fillers ('pabs' and bread) and discussed them in relation to the methods used. Starch was determined by several methods: precipitation by alcohol, and precipitation as iodo-compound which in some instances was decomposed and the starch precipitated by alcohol and weighed. Soya meal gave consistently high results by the first method, and moist mixtures of soya meal and bread gave low results by the last one. Methods were suggested for calculating the contents of soya meal, cereal and filler and meat in sausages and the like from the determined percentages of water, fat, protein, starch (by alcoholic precipitation) and salt-free ash. Some observations were made on the microscopic detection of soya.

Gravimetric Micro-determination of Magnesium

THIS method was described by P. F. Holt at a meeting of the Society of Public Analysts and Other Analytical Chemists on May 6. Benedetti-Pichler's method for the gravimetric micro-determination of magnesium, in which the metal is precipitated and weighed as $MgNH_4PO_4 \cdot 6H_2O$, was found to give results which varied according to the time allowed for precipitation. Consistent but high results were obtained if the precipitate was allowed to stand in contact with the mother-liquor for several hours. A precipitation time of one hour or less gave values which were irregular but approximated to that calculated from the formula. Good values are obtained by this method if five hours are allowed for precipitation of the magnesium-ammonium salt and an empirical factor is used for conversion of precipitation weight to weight of magnesium.

Quantum Chemistry

THERE is a remarkable identity, due to Dirac, connecting the operators of exchange and spin. Taken in conjunction with the principle that in the problem of several electrons, a wave function must change sign when the orbital and spin co-ordinates are both subjected to the same permutation, the identity shows that any permutation of the orbital variables can be obtained from a certain spin operator. In other words, spin compensation goes with anti-symmetry of the spin function. This is known to be fundamental in the quantum explanation of chemical bonds. E. Schrödinger has obtained a generalization of Dirac's identity (*Proc. Roy. Irish Acad.*, 47, 39; 1941). In the generalization, chemical compensation of spin occurs in groups of particles, instead of in pairs of single particles. Something like this applies to the heavy particles (proton-neutrons) in the nucleus. Spin compensation in this case corresponds to unit charge for each two particles. This view is supported by its agreement with several basic results concerning the nucleus.

Frequency Comparisons

L. A. MEACHAM (*Bell Lab. Rec.*, 20, No. 7, March 1942), in an article on high-precision frequency comparisons, describes a test circuit capable of making short time measurements. When measurements must be made within a short period, direct methods fail because the time intervals cannot be determined with sufficient accuracy; but as deviations rather than absolute values are of interest, it is possible to substitute comparisons between the frequencies of two or more similar but independent oscillators. Excellent precision is obtainable by this method with equipment built to check the performance of bridge-stabilized oscillators used in the Bell System frequency standard. The oscillators were designed to be stable within 0.0001 c./sec. and the testing circuit, therefore, had to detect a variation of ten times this amount. Furthermore, the momentary nature of the changes necessitates that the measurements represent nearly instantaneous frequency values and be obtained at very brief intervals. Two 100 kc. oscillators are employed, adjusted to differ in frequency by about 0.1 c./sec. Their outputs are added together in a hybrid coil and the sum amplified and rectified to fire a thyratron tube once each beat cycle, in turn discharging a condenser through a spark coil. The resulting high voltage from the coil causes a brief flash of light in the neck of a mercury vapour lamp.

A circular scale marked in milliseconds is rotated by a 1,000-cycle motor synchronized with current from the frequency standard, to record the time between flashes. Each discharge illuminates the scale and records the time on a slowly moving film, so that the time which elapses during a single ten-second beat-cycle is recorded to the nearest thousandth of a second, and any irregularity in the beat frequency amounting to more than one part in ten thousand becomes apparent. As the frequency of the beat pulses is only one millionth of the frequency of either 100 kc. oscillator, the precision of the comparison between the pair of oscillators is approximately one part in ten thousand million (10^{10}). An irregularity so small as to be undetectable by any rapid direct method thus produces a very noticeable record in the new measuring device.

Penetrating Cosmic-Ray Showers

Counter experiments on showers penetrating at least 50 cm. of lead are reported by L. Jánossy (*Proc. Roy. Soc., A*, 179, 361; 1942). It is concluded that these penetrating showers are parts of extensive air showers, are neither energetic cascades nor knock-on showers but are probably connected with the production of mesons. The connexion of the penetrating showers observed at sea-level with the production of mesons in the atmosphere is discussed from the alternate postulates that the mesons are (i) produced by photons and (ii) that they are mainly produced by protons and possibly neutrons.

Movements of Hydrogen Focculi

M. A. ELLISON has described his investigations on surges near sunspots and quasi-eruptive focculi in the vicinity of chromospheric eruptions (*Mon. Not. Roy. Astro. Soc.*, 102, 1; 1942). A short account is given of the spectrohelioscope which was used at Sherborne (*J. Brit. Astro. Assoc.*, 50, 107; 1940) but some modifications were introduced for the present investigation. Ellison has kept a special watch for surges since 1940 and has found that they are the most frequent of all prominence types, though they are the most short-lived of chromospheric phenomena. Radial velocity - time curves are shown in diagrams and a table includes various details regarding position, times of beginning and ending, etc. Distance integrals and accelerations are deduced and the former are in satisfactory agreement with the heights observed for the limb prominences of corresponding type. In the case of quasi-eruptive focculi, the Doppler time-curves are of the same general form as those for surges, but the velocities of ascent and descent are greater. In one case the velocity of ascent was found to be a little greater than the value of g on the sun's surface. In the years 1940-41 about five hundred measures of radial velocities were made on active short-lived dark focculi which occurred in the vicinity of sunspots. A well-defined maximum frequency of descending motions was shown to exist at about 30 km./sec. and of ascending motions at 35 km./sec. These figures are in good agreement with those obtained by H. W. Newton at Greenwich in 1930-33. There is one important difference, however. The Greenwich analysis showed a high percentage of radial velocities in the range 0.9 km./sec., and the Sherborne results did not reveal this. The apparent discrepancy is due to the fact that Ellison sought specially for active focculi and omitted slow-moving focculi.