

## Research Items

### Archæology in Australia

MR. D. S. DAVIDSON, who from April until July, 1930, was engaged in archæological reconnaissance in the Katherine River-Victoria River region of North Australia for the Museum of the University of Pennsylvania, points out in a discussion of the problems to which his investigations have given rise (*J. Roy. Anthropol. Inst.*, 55, pt. 1) that very few serious attempts at excavation have been made, the few of any importance being those sponsored by the South Australian Museum. The absence of pottery and the nomadic habits of the aborigines make the location of a site a matter of difficulty, but the desert areas offer compensation in the preservation of objects perishable elsewhere. The use of caves in the wet season and of rock-shelters has provided material for investigation, but the aboriginal practice of burying implements and personal belongings for safe-keeping is a disturbing factor in stratigraphic study. Of the caves examined, some were still in occupation. It was not possible to estimate the antiquity of the material found. Natives must have inhabited the area for thousands of years, but the cave deposits give the impression that they might have been built up in a few centuries. The classes of objects found were not numerous. One of the problems of the future will be to distinguish important localised types. A tentative classification suggests that the 'pirioid' type of adze point appears to antedate the use of quartzite spear-heads, while these quartzite spear-heads quite definitely antedate the type of blade which is a product of the pressure flaking technique. This appears to be a fairly recent product as its use is only now spreading to north and central Australia, among the tribesmen of which the technique appears to have been unknown previously, while the former, the quartzite spear-head still in use, is the only one of the two occurring archæologically.

### Serbian Gypsy Cult of the Anvil

DR. ALEXANDER PETROVIČ, in continuation of his study of the gypsies of Serbia and Bosnia, has described their cult of the anvil (*J. Gypsy Lore Soc.*, Ser. 3, 14, Pt. 4). The gypsies of Rogatica make their own anvils, buying good iron or steel. Prayer precedes the making; and when the anvil is made it is wrapped in rags and brought into the tent where none may see it, until the appointed day, when the maker gives a feast and a sheep or hen is slaughtered. The anvil is exhibited after dinner, surmounted by three lighted candles, of which one has been saved from the preceding feast of St. Elias. After prayer, the anvil is struck for the first time with a hammer, and those present offer gifts of coin, gold if possible, with exclamatory wishes of good luck. During the rest of the day, neighbours come in to look at the anvil and make similar gifts. In olden times payment for any work done was not given to the smith, but placed on the anvil. On St. George's Day it is decorated with young boughs; and on St. Elias's Day and New Year's Day a lighted candle is stuck in the hole, again with an expression of good luck. When a young boy was apprenticed one of his fingers was placed on the anvil and struck three times with the hammer. The anvil was definitely regarded as sacred.

An old anvil is never thrown away, but kept in the house "like an old man or an old woman". In cases of theft, suspected persons swear their innocence by the anvil, which is set up in the yard in front of the house of the injured party, surmounted by a lighted candle, some salt and a piece of bread. At Mirijevo, near Belgrade, an axe takes the place of the anvil. As sacred, the anvil and everything connected with the forge were believed to have healing powers. The water in the tub by the anvil, in which the heated iron is plunged, is holy and is given as medicine to both cattle and human beings. A similar cult and oath are found among other gypsies in connexion with the fiddle and money. It is thus evident that the Serbian gypsies venerate and regard as holy that by which they earn their living.

### Noise and Efficiency in Works

REPORT No. 70 of the Industrial Health Research Board ("Conditions of Noise", by H. C. Weston and S. Adams) describes an experiment that has been made to test the effect of continual noise upon the efficiency of weavers. Noise is first defined as unpleasant or disturbing sound, such as obtains in the weaving sheds. Two groups, of the same efficiency, worked first for six months and then for a year in the same conditions and with the same materials. One group, of ten men, was exposed to the usual noise. The other, also containing ten men, was given ear-defenders which reduced the intensity of noise by 15 decibels or half the apparent loudness. At first the increased personal efficiency in the protected group was considerable. It became less so afterwards, but the average increase remained as high as 7½ per cent in the latter part of the experimental period. A similar experiment in 1932 rated the increase at 12 per cent, but possibly the conditions were more favourable. The workers liked wearing the ear-defenders, and even those accustomed to the noise and immune from its effects in respect of irritability and distraction were increased in efficiency. It is impossible, however, to infer from this experiment the value of decreased noise in cases where the work is different and the initial noise less.

### Japanese Bopyrids

S. M. SHIINO describes a large number of Bopyrids in two papers, Bopyrids from Tanabe Bay (1 and 2) (*Mem. Coll. Sci., Kyoto Imp. Univ.*, B, 8, No. 3, 1933 and 9, No. 4, 1934). Twenty-eight species are described, eighteen of which are new. It is a most interesting collection and several peculiar features are pointed out. Of the branchial parasites, a large number inhabit hermit crabs, but several other groups are parasitised, including two *Pencæopsis* and a *Solenocera*. The abdominal parasites are not so numerous. *Bopyrina giardi* Bonnier is recorded from *Hippolyte* sp., its general constitution being largely in accord with the characters given by Bonnier for the European form, but there are certain differences, notably that of the male cephalon being fused with the first thoracic segment in those from Japan, whilst it is separate in those from Europe, and anal spines are present in the latter, absent in the former. Four females, each carrying a male, were found in

the branchial cavity of one *Hippolyte*. The male has a coloured pattern on both dorsal and ventral surfaces. A common species inhabiting the left branchial cavity of the hermit-crab *Clibanarius bimaculatus* is a new species of *Pseudione*, *P. clibari-cola*. It never occurs in the right cavity, which is sometimes occupied by another type of Bopyrid, also a new species, *Pseudione asymmetrica*, and this is never found on the left side. Sometimes both species are found in the same individual.

#### Movements of Copepods

THE importance of copepods in the ecology of fresh- and salt-waters is well established, but little is known of the actual mechanism of their swimming movements or of their methods of feeding. A recent paper by A. G. Lowndes ("The Swimming and Feeding of certain Calanoid Copepods". *Proc. Zool. Soc. London*, Part 3, 687-715; 1935) is therefore especially welcome. By a variety of methods, including the polygraph process and ultra-rapid photography with exposures up to 1/30,000 of a second, the movements of the appendages were examined in seven of the commoner marine species and three species of fresh-water copepods. Much evidence is brought forward to show that feeding cannot be regarded as purely automatic or non-selective. In this connexion the observation that *Diaptomus gracilis* caught in a pool, the waters of which were green with unicellular algae, had been feeding on desmids on the bottom is of special interest. In this paper the author supports the theory that the Centropagina are a more primitive group of copepods than the Calanina. The theory is favoured partly on the grounds that their predatory method of feeding can be regarded as more primitive than the more highly specialised filter feeding. All observations were made with the animals living free in a large body of water approximating so far as possible to their natural environment. Much information is given on the rate of movement of limbs and the actions of the animal. It cannot be too strongly stressed that observations of this nature should prove invaluable in the elucidation of the habits and migrations of copepods as shown by field collections.

#### Growth Records on Fruit Trees

ONE of the difficulties encountered in pomological research is the amount of time and labour involved in the collection and recording of large numbers of data relative to the growth and fruit production of apple trees. A census method which reduces to a minimum the labour of recording summer growth has been developed by M. C. Vyvyan at the East Malling Research Station (*J. Pomol. and Hort. Sci.*, 13, 202; 1935). Various well-defined growth structures on the tree are classified into categories such as bearing or non-bearing, short or long, growing or non-growing, etc., each of which is denoted by a letter of the alphabet as a distinguishing symbol. The recorder examines each growth from the apex to the base of the tree or sample branch and calls out the corresponding symbols in order. These are then recorded and the numbers in each category counted simultaneously by the use of an ingenious combination of typewriter and reset counters. The result is a typewritten map of the whole tree forming a permanent record of the various growths and their positions, and this can be expanded at successive periods as growth proceeds.

#### Prediction of Rubber Yield

ONE of the chief problems confronting the rubber research worker is the length of time needed before reliable results as to the yield capacity of the plant can be obtained. The tapping test that is usually employed, conclusive as it is, is only applicable when the latex system is sufficiently developed, that is, a period of seven or more years has to elapse before comparative tests and selection of clones can be carried out. Genetical work is in consequence seriously hampered. A new method, however, has recently been evolved by H. Gunnery (*J. Rubber Res. Inst.*, 6; 1935), by which the yield can be accurately predicted at an early stage in the life-history of the plant. A detailed study of the anatomical structure showed that two distinct types of sieve tubes occur, one of small, the other of large, diameter. The latter are invariably associated with latex vessels of wide bore, that is, occur in trees of high-yielding capacity, while the small type of sieve tube is found in low-yielding trees in conjunction with small bore latex vessels. Further, the type of sieve tube is constant in all parts of the plant and at all ages. By means of qualitative analyses of the phloem of young *Hevea* seedlings, therefore, low-yielding individuals may be eliminated at a very early stage, and much valuable time saved in all work of a selective nature.

#### Glacial Geology of Yorkshire

IN "The Glacial Geology of Holderness and the Vale of York" (published by the author, 61 Carr Lane, Acomb, York, 1935, price 4s.; cloth 5s.), Mr. Sidney Melmore gives a scholarly and conscientious review of the glacial problems in an important area. The boulder clays, buried cliff and raised beaches of Holderness, the Speeton shell-bed, the Kelsey Hill deposits (with list of fauna), the moraines and drift and high-level flanking deposits of the Vale of York, the Kirkdale bone cave, the Leeds hippopotamus, the relation between rivers and joints in the country rock, and many other topics of interest are treated from a historical point of view. The author's method of approach gives full credit to the achievements of the pioneers, Sedgwick, Buckland, Phillips, Prestwich, and to other workers such as Dakyns, Reid, Lamplugh. His quotations at the chapter headings alone would form an interesting short history of the progress of investigation. The division of the matter into numerous small chapters makes for freshness and easy reference; and the two dozen maps and diagrams are all that could be desired.

#### Effect of the Moon on Barometric Pressure

"THE Lunar Atmospheric Pressure Inequalities at Glasgow", by R. A. Robb and T. R. Tannahill (*Proc. Roy. Soc. Edinburgh*, 4, Part 1, No. 9), is a paper dealing with the effect of the moon on barometric pressure at Glasgow Observatory deduced from an analysis of a record, extending from 1868 to 1912, of hourly values of atmospheric pressure recorded photographically, and checked by daily control readings of a standard barometer at 10h, 12h, 14h, 18h and 22h G.M.T. A rough examination of these records had shown a strong diurnal variation, an effect at variance with determinations of the harmonic coefficients at other places made by Chapman, who found the semi-diurnal coefficient to be the chief one, giving an amplitude of 0.012 at Greenwich, 0.083 at

Batavia and 0.060 at Hong-Kong. In order to reduce accidental variations, Robb and Tannahill rejected all days on which the difference between the pressure at two successive upper transits of the moon exceeded 0.1 inches of mercury. Nine groups of observations were obtained by dividing the 45 years into three equal periods, into three seasonal groups—winter (Nov.-Feb.), equinoctial (March, April, Sept. and Oct.) and summer (May-Aug.), and three groups for which at the initial lunar upper transit the lunar semi-diameter was equal to or less than 14.99', 15'-15.99' and equal to or greater than 16.00'. The hourly inequalities for these groups and for the total data were corrected for any known variations with solar time that might, owing to the selection of data, have been only partially eliminated. The harmonic analysis of the corrected hourly inequalities gave for the whole period the following values for the first three Fourier terms:

$$0.0640 \sin(\theta + 267^\circ) + 0.0156 \sin(2\theta + 285^\circ) + 0.0089 \sin(3\theta + 292^\circ),$$

where the amplitude is in millibars and  $\theta$  is reckoned from upper lunar transit. Estimates of the probable errors of the coefficients appeared to establish the reality of the first two, and the preponderance of the diurnal over the semi-diurnal variation at Glasgow accordingly appears to be a real phenomenon, for which no satisfactory explanation is offered.

#### Dielectric Constants of Liquids at Radio Frequencies

In a paper published in *Hochfrequenztechnik und Elektroakustik* (46, 92; 1935), Dr. D. Doborzynski describes a somewhat novel method of determining the dielectric constant of non-conducting liquids at radio frequencies. The innovation consists in making use of the carrier waves of known frequencies received from broadcasting stations in place of a local source of oscillations. A tuned receiving circuit is set up with a main variable condenser in parallel with another variable condenser of small capacitance. For a fixed setting of the main condenser, the four frequencies required are those corresponding to the maximum and minimum settings of the small condenser, first with this in air, and next with it immersed in the liquid under examination. These frequencies are determined by simple interpolation over a small portion of the scale of the main condenser. Since it is known that, at the present time, most broadcasting stations attain a frequency constancy of an order better than 3 parts in 10<sup>4</sup>, it is considered that in the neighbourhood of 1,000 kc./sec., the above four frequencies can be determined to within  $\pm 0.25$  kc./sec., resulting in an overall accuracy of the dielectric constant determination of better than one per cent. The method has been applied to the measurement of the dielectric constant of benzol and nitrobenzol at 20° C., the values obtained being 2.29 and 34.5 respectively. The possibility of extending the method to conducting liquids is now being explored.

#### Radioactivity of Actinium

ALTHOUGH actinium was discovered in 1899 by Debierne and has been much studied since, all attempts to find any effect due to the radiation from actinium itself have so far failed. The fact that the direct descendant of actinium is radioactinium, an

isotope of thorium, indicates that a  $\beta$ -particle must be emitted in the disintegration of actinium, and since this has not been discovered experimentally it has been assumed that it is emitted with very low energy. The discovery by Sargent in 1933 of the relation between the decay constants of  $\beta$ -emitters and the upper limits of their energy spectra made the behaviour of the actinium  $\beta$ -particle seem anomalous. The modification of the tube counter devised by Libby, in which a screen is substituted for the usual solid wall, makes it possible to detect electrons of very low energy, and D. E. Hull, W. F. Libby and W. M. Latimer (*J. Amer. Chem. Soc.*, 57, 1649; 1935) have in this way detected the  $\beta$ -radiation of actinium. The radiation is half-absorbed in 0.0023 gm./sq. cm. of aluminium and is easily deflected in a magnetic field. The maximum energy of the  $\beta$ -particles is about 220,000 electron-volts, which fits well on the lower Sargent curve. The paper contains full details of the chemical methods of purification of the actinium, the most difficult problem being the removal of radioactinium. Co-precipitation with thorium perhydroxide was the method finally adopted. The radiation was identified as due to actinium itself by the excellent agreement between the theoretical and experimental growth curves.

#### Thermal Data for Purine Derivatives

THE importance of the thermal data for purine derivatives in biochemistry is recognised, so that some recent accurate determinations in this field are of interest. R. D. Stiehler and H. M. Huffman (*J. Amer. Chem. Soc.*, 57, 1734; 1935) have measured the heats of combustion and heat capacities of adenine, hypoxanthine, guanine, xanthine, uric acid, allantoin and alloxan, and from the results have calculated the heats of formation, entropies and free energies. All the compounds except adenine had been previously burned by earlier workers, and discrepancies of 0.1-2 per cent with the older data are found. The measurements were made with the best modern technique and the results may be summarised as follows. The free energy values are believed to be accurate to 300-600 gm. cal. The data are at 298.1° Abs. The heats of combustion, in k.cal., are at constant pressure and the water liquid, per mole.

	Heat of combustion	Free energy $\Delta F^\circ$ (in gm. cal.)
Adenine	663.74	70,420
Hypoxanthine	580.20	17,250
Guanine	596.89	10,220
Xanthine	516.02	-40,730
Uric acid	458.84	-91,460
Allantoin	409.55	-107,470
Alloxan	273.58	-182,880

When the free energies are compared, some interesting facts are brought out. In going from adenine to hypoxanthine and from guanine to xanthine, both of which involve the same type of deamination in different parts of the six-membered ring, decreases of 53,170 and 50,950 gm. cal., respectively, are observed. In the changes adenine to guanine and hypoxanthine to xanthine to uric acid, all of which reactions involve the addition of an oxygen atom and a shift of a hydrogen with the corresponding opening of a double bond, the free energy decreases are, respectively, 60,200 gm. cal., 57,980 gm. cal. and 50,730 gm. cal. These changes indicate that, in the crystal at least, the bond energies are distinctly affected by their positions in the compounds.