

## Research Items.

NEOLITHIC AGRICULTURAL IMPLEMENTS FROM CHINA.—In *L'Anthropologie*, T. 35, Nos. 1-2, P. Licent and P. Teilhard de Chardin describe two stone implements from an important neolithic site at Linn-Si, N.E. China, which are not only noteworthy in themselves but have a direct bearing upon a question of dating raised by Dr. Andersson in connexion with an implement found at Kalgan. The two implements in question are respectively 272 mm. long, 115 mm. broad, maximum thickness 16 mm.; 355 mm. long, 117 mm. broad, maximum thickness 26 mm. The latter differs from the former in being polished. Certain well-marked abrasions suggest that both were fitted with handles, and it is probable that they were used as hoes. The implement found by Andersson, which resembled the unpolished implement from Linn-Si, impressed him by its Solutrean style, and he suggested that it might point to an upper palæolithic in China; but it is now clear that it must be classified as neolithic. A further point which emerges is the close affinity of these agricultural implements with those of North America. This had already been pointed out by Andersson in the case of the Kalgan implement, and is supported by Mr. Moorehead after an inspection of the Linn-Si specimens. They may therefore afford further proof that North America was peopled from Eastern Asia.

PHYSICAL CHARACTERS OF THE AUSTRALIAN ABORIGINES.—Dr. F. Wood-Jones and Dr. T. D. Campbell have published in the Transactions of the Royal Society of S. Australia, vol. 48, anthropometric observations, comprising thirty-five measurements in all, of ten South Australian aborigines, eight Kookata from the Stuart Ranges, of whom three are females, and two, a male and female, Ngunga from Streaky Bay. The skin colour varied from light to very dark chocolate, the eyes were dark or medium brown, the hair was black (except in two cases in which it was white) and wavy, though in two cases approaching straight. The head in length ranged from 165 to 200 mm., breadth from 130 to 146 mm., being dolichocephalic in all cases, and in height from 112 to 135 mm. To these measurements have been added measurements from various sources which bring the total number of individuals up to nearly two hundred. As a result of the comparative study of these figures, so far as at present completed, it is apparent that the Australian aboriginal is uniformly dolichocephalic, remarkably platyrhinc, has long forearms, and remarkably long legs from the knee downwards.

THE TRICHOCYSTS OF PARAMECIUM.—Mr. J. T. Saunders (Proc. Cambridge Phil. Soc., Vol. I., No. 4, April 1925) has investigated the trichocysts of Paramecium and concluded that they are the means by which this ciliate adheres to surfaces. When Paramecia are attracted, chiefly by the  $P_n$  of the water, to a particular spot, adherence takes place. The extrusion of the trichocysts is due to slight pressure such as may be set up by the Paramecia colliding with an object in the water. Verworn's view that the trichocyst consists of semi-liquid material which hardens on being extruded into water is adopted. The author shows that the tip of the trichocyst thread is sticky but the rest of it is not. Ciliary motion does not cease when Paramecium is attached by its trichocysts. The speed of movement, which is dependent on ciliary activity, is reduced when the  $P_n$  of the water reaches 8.0, and this reduction in ciliary activity results in the slender trichocysts being able to hold

the organism fast. A further increase in the  $P_n$  of the water above 8.0 reduces the speed of the Paramecium so much that the force of the collision with an object is insufficient to cause expulsion of the trichocysts.

GOLGI APPARATUS, MITOCHONDRIA AND NUCLEI.—Dr. R. J. Ludford (Journ. R. Micr. Soc., March 1925) describes an improved technique the new feature of which is the employment of water at 35° to 38° C. for bringing about the reduction of osmic acid for demonstration of the Golgi apparatus. Dr. Ludford states that this method results in much less non-specific reduction than when the osmic acid is heated. The original paper should be referred to for details.

A GENETICAL STUDY OF THE FLAX PLANT.—A beautiful example of the application of pure science to practical problems is supplied by the very clear paper of Adelaide G. Davin and G. O. Searle, which appears in the Journal of the Textile Institute, Vol. 16, pp. T. 61-82, March 1925. As the result of extensive correlation studies they conclude that by ordinary selection methods it should be possible to isolate varieties of flax which are genetically distinct as to (1) flower colour, (2) time of flowering, (3) percentage of fibre, (4) length of stem, and (5) mean number of seeds per capsule. Also that it should be possible to breed new varieties of flax combining the qualities of tallness, high percentage of fibre and high mean number of seeds per capsule. From the practical point of view perhaps the most important facts appear to be the inheritance of variations in percentage of fibre and the fact that tall stemmed varieties contain more numerous fibres in each bundle of sclerenchyma, the fibres therefore being individually of relatively small diameter and with small open lumen. Probably such bundles of fibres have particularly valuable spinning qualities.

DROUGHT-RESISTANCE OF PLANTS.—It has been supposed that xerophytic plants are able to resist drought mainly by the reduction of their transpiration through special adaptations, such as hairs, thickened epidermis, and so on. N. A. Maksimov has studied the problem for several years, and according to him (*Journal of Experimental Agronomy*, Moscow, vol. 22, 1923) this is not the case. He has found, in fact, that the transpiration of xerophytes is, as a rule, far more extensive than that of typical mesophytes. Thus, xerophytes cannot be regarded as plants which are able to thrive under very dry conditions because of adaptations preventing loss of water through transpiration; their ability to resist drought depends not on their morphology or anatomy, but on some purely physiological characters. Amongst the latter most important are: (1) the high osmotic pressure of the juice in cells causing a powerful influx of water through roots; (2) the probable presence of special compounds preventing plasmolysis; (3) wilting of xerophytes occurs with a lower water-content than in mesophytes.

THE MORPHOLOGY OF THE CARPEL.—The traditional interpretation of the gynæcium of the flower as simply consisting of the union of modified carpillary leaves, by their margins when the ovules are parietally borne, by their folded flanks when the placentation is axile, with alternative suggestions as to the axial or carpillary origin of the central strand when this is left free from the ovary wall, is now under serious critical examination, thanks to the work of Miss Edith R.

Saunders. In a paper upon carpel polymorphism in the *Annals of Botany*, vol. 39, 1925, pp. 123-167, Miss Saunders gives reasons for thinking that widespread throughout the group of Angiosperms three different types of carpels can be found, all of which contribute to the making of the Angiosperm gynæcium. She distinguishes these three types as—(1) the valve carpel, which retains the traditional leaf form, a row of ovules being borne upon each foliar margin; (2) the solid carpel, which in its most reduced form is nothing but a fibro-vascular cord with a few lateral veins. (Such a carpel may project into the ovary cavity, giving rise to such a partition as the replum of the Cruciferae. When solid carpels are associated with valve carpels in a gynæcium, they are usually fertile and the valves sterile); (3) the semi-solid or pseudo-valve. In this type the valve contour is maintained, but the placentæ, instead of lying at the margin, are displaced to the neighbourhood of the central line and the vascular system also consists of a double strand running in close connexion with the funicles of the ovules. Many anomalies of stigmatic and stylar structure and arrangement receive a new interpretation at Miss Saunders' hands by means of these new conceptions of polymorphism in carpellary structure. Doubtless this new view-point will be thoroughly examined by students both of floral morphology and systematics.

THE DISTRIBUTION OF RADIOACTIVE SPRINGS.—Seventeen springs in the Velay region of the Haute-Loire have been examined by M. A. Baldet (*C. R. Acad. d. Sci.*, Paris, March 30), who found that only three of them showed any considerable radioactivity. The three streams in question lie practically in a straight line, the length of which is 44 km.; and more recently a fourth radioactive spring has been discovered, in the former bed of a stream the course of which has been diverted by floods. The new spring lies in the same straight line as the other three, so that it seems very probable that the distribution is not fortuitous, but that there is really a kind of long geological axis along which the strongest radioactivity of the region is distributed. This axis is nearly parallel to numerous lines of fracture in the surrounding country and to two ranges of volcanic hills. An extinct volcano lies on the axis near one of the springs, as do portions of two river valleys.

SPELLS OF ABNORMAL WEATHER.—The presidential address to the American Meteorological Society by Mr. Willis I. Milham dealt with "The Causes of Abnormalities," taking especially the year 1816, which in America has been styled "the cold year," and is often called "the year without a summer." The address is printed in the *Monthly Weather Review* for December. Much has previously been written about this year, which, as a whole, is said not to have been "record-breakingly cold," but was chiefly exceptional for a very cold summer. The possible reasons why 1816 was abnormal are considered. There had been the violent volcanic eruption of Tombozo in April 1815, which ranks with the four or five largest during the last two centuries, while a weak sun-spot maximum also occurred during 1816. For the 23-year period 1816-1838, July 1816 had the lowest temperature on record and both May and June were the second coldest, while from March to September the monthly temperatures were below the normal. For another abnormality the warmth in America of December 1923 is considered, and it is suggested that possibly some change in ocean-surface temperature over a large area was the cause. At Greenwich, December 1923 was about 1° colder than the normal. Mr. Milham alludes to the "crying need for a weather map of the whole

northern hemisphere, if not for the world." For some years now, 1910-1917, such weather information for the world has been published by the Meteorological Office, Air Ministry. In support of Mr. Milham's address it may be mentioned that in London the mean shade temperature in 1816 was 53° F. in June, or 5° below the normal for 150 years; 54°·5 F. in July, 7° below the normal; and in May and August the deficiency was respectively 3°·6 and 3°. The July mean was the lowest on record. June 1909 and 1916 are the only two Junes with temperatures so low as that of 1816. In every month during 1816 except September and October the mean temperature in London was below normal.

COLOUR CINEMATOGRAPHY.—Mr. Claud Friese-Greene recently described his process of colour cinematography before the Royal Society of Arts, and his lecture is printed in the *Society's Journal* for May 1. It is a two-colour process, and the two colour images alternate on a single film, so that ordinary projecting machines suffice for showing them. An ordinary motion picture camera has added to it behind the lens a rotating disc with two apertures in it, one filled with a colour filter that passes a very broad band of the red end of the spectrum, and the other filled with an opaque material except for a small opening that allows white light to pass and a "small portion of filter also passing light from the red end of the spectrum"—"in fact a pale yellow." In the positive print, the pictures corresponding to the first are dyed orange-red and the others are dyed blue-green. The advantages of the method are that the tendency of greens to show of a brownish tint in two-colour processes is avoided, the cost of the prints is less than one farthing a foot more than that of ordinary black and white films, and "the time in turning them out" is practically the same. Several examples were shown, and during the discussion that followed the lecture Mr. Colin Bennett said that "the results were appreciably better than those arrived at by other commercial methods of colour cinematography."

PHOTO-ELECTRIC CONDUCTIVITY IN ROCK SALT.—The phenomena of photo-electric conductivity in rock salt crystals which have been coloured yellow by the action of X-rays, are similar in many respects to those which have been observed in the diamond and other crystals with high refractive index. They are described by Dr. B. Gudden and Dr. R. Pohl in the *Zeitschrift für Physik* of March 17. Their observations were made in an electric oven, at temperatures of 30° to 40°, 60° to 80°, and 100° to 130°, the crystal being illuminated with light of short wave-length (405 and 436  $m\mu$  lines of mercury) with a potential difference of 800 volts applied to the electrodes. At the lower temperatures the crystals are insulators when not illuminated. The current starts without inertia as soon as the illumination commences, and drops at once nearly to zero when it ceases; this current is regarded as being due to the flow of electrons which have jumped from the phosphore particles, after absorbing radiant energy, leaving them in the excited state. If now the crystal is illuminated with infra-red light, there is a rush of current, which quickly drops to a low constant value; this is regarded as being due to the drop of electrons, coming from the cathode side, into the positively charged phosphore molecules. At the higher temperatures this action is facilitated by the thermal movements of the molecules, and at 100° to 130° there is practically no jump in the current when the red illumination is started, since there are no excited centres left when this takes place. Phosphorescence takes place when the second component of the current flows.

REFRACTIVE INDEX OF A MIXTURE.—Although there have been many attempts to establish a formula by means of which the refractive index of a mixture of two liquids could be calculated from the indices of its constituents and the amounts of each present in the mixture, none of them has been found applicable to all cases. In the issue of the *Physikalische Zeitschrift* for April 21, Prof. K. Lichtenecker claims that if the mixture involves no contraction, its refractive index  $\mu$  may be calculated from the refractive indices  $\mu_1, \mu_2$  of its constituents and the volumes  $v_1, v_2$  of the constituents present in 1 c.c. of the mixture by the formula

$$\log \mu = v_1 \log \mu_1 + v_2 \log \mu_2.$$

If contraction occurs on mixture, the value of  $\mu - 1$  as calculated from this formula is increased in the ratio of the increased density to the density to be expected on the linear law from the densities of the constituents. So far, the new law has been tested on few mixtures, but for them it has proved correct to within one part in 10,000.

MEASUREMENT OF IONIC MOBILITY.—The April issue of the *Journal of the American Chemical Society* contains two papers by D. A. MacInnes and co-workers on the measurement of transport numbers by the moving boundary method. In the first paper a simple form of apparatus is described in which two sharp boundaries are readily obtained at each electrode; the apparatus is very suitable for use in university courses. Experiment shows that the results should be calculated from rates of movement of the two boundaries separately; it is not safe to rely on the ratio of the movements. In the second paper the apparatus previously described is improved and measurements made of the transport numbers of the anions in 0.1*M* solutions of potassium, sodium, and hydrogen chlorides. The results were 0.492, 0.3865, and 0.8320, respectively. The product of the transport numbers of the chloride ion and the corresponding equivalent conductivities for the solutions is constant, which shows that the salts in these solutions have equal degrees of dissociation at 25°. Previous work shows that the same holds at 18°. This dissociation is considered to be complete, so that the influence of concentration on equivalent conductivity is due to changes in mobility rather than in the number of ions.

ORGANIC SYNTHESSES.—The suggestion has been made that "Organic Syntheses," an annual publication of satisfactory methods for the preparation of organic chemicals, can increase its scope of usefulness by making available directions for preparations which have been submitted for future volumes. The following is a list of some of the preparations which are now being checked by the editors. Those who wish a copy of directions for some of the listed preparations can procure the same by writing to Henry Gilman, Iowa State College, Ames, Iowa. Acetamide, acrolein, benzal pinacolone, benzylaniline, *m*-bromobenzyl chloride, *o*-bromotoluene,  $\alpha$ -cyano- $\beta$ -phenylacrylic acid, cyclohexyl-bromopropene, furoic acid, hydroxylamine base, *p*-iododimethylaniline, *p*-iodoguaiacol, mandelic acid, 1-methyl-2-pyridone, myristic acid, naphthaldehyde, phenyl isothiocyanate, symphthalyl chloride, propionaldehyde, pyromellitic acid, pyrrol carboxylic acid, thiophosgene, thymoquinone, *o*-toluamide, *m*-tolylene diamine, viscose.

MEASUREMENT OF RADIO SIGNAL STRENGTH.—The first accurate measurements of radio signal strength were made so far back as 1905 by Duddell and Taylor. An immense amount of experimental work has since been carried out all over the world. Many semi-

empirical formulæ have been suggested for predetermining the signal strength, but they only apply roughly for a given range and for a given wavelength. An important paper on this subject by Capt. Round and his colleagues in the Marconi Co. was read to the Institution of Electrical Engineers on May 6. They give a complete report of the measurements made on signal strength over great distances during 1922 and 1923 by an expedition sent to Australia. They apply the latest scientific formulæ to their observational data, but with only very indifferent results. The complete theory of world transmission by radio has yet to be given. It is pointed out that at great distances the signals go round the earth in both directions, producing interference and "beats" in the receiver. The attenuation of the signals is less during night time, and so a louder signal may come by the long path. For example, with the American signals a bi-directional effect was clearly produced at a distance of only 13,000 kilometres from New York. A study of the Australian signal measurements leads to interesting conclusions. It was found that, in general, when using long wave-lengths, the signals going by the west to east path were stronger, and those going by the east to west path were weaker, than was expected. In the case of the Bordeaux signals the ratio was 5 to 1. In the case of transmission across the Atlantic, transmission from America to England is undoubtedly better than transmission in the reverse direction. This fact appears to contradict the usual reciprocal relations of optical theory, and the authors look to the future for the observational data still requisite before the phenomenon can be explained.

MEASUREMENT OF WATER DISCHARGE THROUGH SLUICES.—There has just been issued, in booklet form, two papers, by Dr. H. E. Hurst and Mr. D. A. F. Watt, of the Physical Department, Egyptian Public Works Ministry, presented to the Institution of Civil Engineers, in 1924, dealing with the measurement of the discharge of water through the sluices of the Assuan Dam. The first paper details certain experiments made to determine the similarity of the motion of water through sluices and through scale models, and the second is a record of actual measurements of the Nile during its higher stages made by a method depending ultimately on direct volumetric computation by means of a masonry tank. In the first paper, the authors conclude that the discharge of large sluices can be determined from models with an average accuracy as good as that obtainable by current meter measurements, the scale of the model to be adopted depending upon the product of the velocity in the actual sluice and its linear dimensions. They state that the limit of smallness in their investigations occurred with weir conditions when the head above the sill was about 3 cm., the depth about 2 cm. at the gate, and the velocity about 0.4 m. per sec. They suggest that until further experiments are made over a wider range, it would be well to keep the product of velocity, in centimetres per second, and smallest dimensions of the orifice, in centimetres, above, say 100, and in general not to use orifices of less than 3 cm. in their smallest dimension. In the second paper, it is stated that the method employed for measuring the flow of the Nile was to use current-meters of specially stout construction to plot the velocity-distribution in the types of sluice used to pass the flood. Useful results were obtained which showed that current meter measurements agree closely with sluice measurements, and, therefore, that the uncertainty about the correctness of current meter results in a deep and rapid stream is largely removed.