Research Items

Neolithic Civilisation of Manchukuo

As part of the work of the Japanese first scientific expedition to Manchukuo, archæological investigations, not however of an intensive character, were carried out in the province of Jehol. Some twenty-four sites in southern Jehol produced results, mainly pottery, but associated with implements of chipped or polished stone. In a report on the results of this reconnaissance by Ichiro Yawata (Rep. of the First Scientific Expedition to Manchukuo, June to October, 1933, Sect. 6, Pt. 1, Waseda University, Tokyo. In Japanese with summary in English) the pottery is classified into four main groups: (i) yellowish-brown and dark brown of rather coarse fabric, some plain, but a large proportion with cord-marked or banded ornament; (ii) grey, brown or black ware of fine paste, wheel-made, with slip, and polished and in some instances with painted designs; (iii) grey, bluish or black, wheel-made, and baked to a fine texture, commonly known as Han type pottery; (iv) reddish-brown, of fine texture, containing a large proportion of talc powder. The distribution of the groups varied, but on most of the sites examined two or three of the groups were present and sometimes all four. So also polished as well as chipped stone implements were found sometimes on the same site. At Ho-Tung, Chen-teh, on a hillock on which relics were found from foot to summit, quantities of groups i and iii with small quantities of ii and iv were associated with spindle-whorls, chipped and polished stone axes and stone knives; and on a hill to the north-west of Lwang-ping, with groups i, iii and iv, stone knives, a grattoir, and some pieces of iron were found. The axes collected included one perforated specimen. Near Pei Piao a fragment of a bronze vessel was discovered. This appears to have had a high ringed foot. The bottom was divided into three panels, each with a double dragon design. An analysis gives a composition of copper, 66·98; tin, 8·62; lead, 21·64; nickel, 0·05; arsenic, trace. The results of chemical and metallurgical examination point to a pre-Han origin.

Methods of Psychodiagnosis

Character and Personality (3, No. 3) contains an article entitled "The Development Test as Applied to Infants in the Service of Psychodiagnosis" by Hildegarde Hetzer and Anneliese Braun, Educational Academy, Elbing. It gives a short report of the Vienna developmental tests carried out by Ch. Buhler, H. Hetzer and others. With these tests, consisting of seventeen series each containing ten tasks, they claim to "provide one means for the psychodiagnosis of infants useful for pediatricians, psychologists, educationalists and practitioners of healing methods for children". They check the performances of one to six years' old children in six chief lines of human behaviour: sensory perception, body control, sociability (language), learning capacity (memory and imitation), capacity to deal with a given material, intellectual productivity. The quantitative degree of development in each of these at a certain age is noted. Thus they find the developmental quotient in the same way as one finds the intelligence quotient. This quotient indicates "a general habit" and not inborn efficiency in a limited field of behaviour alone. An analysis of three practical cases illustrates the method. The results are checked by a doctor's opinion and general observation. They throw light on character traits and factors influencing character and personality, reveal errors of everyday judgment and give hints for therapy.

American Ground Squirrels and Pneumonic Plague

THE most extensive outbreak of plague among ground squirrels since the peak of the animal epidemic in California between 1907 and 1919 is being experienced on the west coast of the United States. Dr. W. H. Kellogg states that not only is ground squirrel infection not decreasing after thirty years, but rather it is increasing and spreading over a wider territory, so that from the Coast Range it has penetrated to the interior valleys of California and even to the Sierras (*J. Amer. Med. Ass.*, Sept. 1935). Thus a permanent endemic rodent focus has clearly become established. Equally disturbing is the fact that the plague shows renewed virulence and an increasing pulmonary tendency in the prevailing strain of the plague bacillus, and pneumonic plague, more deadly to man than bubonic, is thought to be directly related to the plague in ground squirrels and ground hogs. Once pneumonic plague has obtained hold in highly populated human areas, its spread becomes independent of ground squirrel or the flea which acts as carrier, because the bacilli are in the sputum and transfer may take place by droplet infection.

A Remarkable Dipterous Insect

THE discovery of a remarkable type of fly in Japan by Mr. M. Tokunaga was announced by him in 1932, when he gave it the name of *Nymphomyia alba*. Since this insect did not come within the limits of any known family of Diptera, the new family Nymphomyiidæ was established for its reception. Mr. Tokunaga's preliminary paper appeared in *Annotationes Zoologicae Japonenses* of 1932 and a brief account of this communication appeared in our columns (NATURE, **132**, 68; 1933). In the *Philippine Journal of Science*, February 1935 (pp. 127–210), the same writer contributes a long and detailed study of this insect's morphological features. Although *Nymphomyia* possesses brachycerous antennæ, it is regarded as belonging to the series Nematocera on the basis of the wing venation and other general characters. Its specialisation isolates it from any known families of Diptera, and on the whole, its primitive features mark it as being among the lower assemblage of the order. A study of its larval structure is greatly needed and, until this is available, definite conclusions as to its nearest affinities lack an important possible link in the evidence. A very peculiar feature of the insect is that the wings are deciduous, being easily broken off along a definite line, as in termites and ants. Whether or not this is a normal occurrence in life is as yet undetermined.

Sense-Organs of Spiders

Two almost simultaneous papers make a noteworthy contribution to our understanding of the sense-organs on the legs of spiders. B. J. Kaston (*J. Morphol.*, **58**, 1, 189–207; 1935) describes the histological structure of the lyriform or slit organs, and concludes that they probably function as chemoreceptors, stimulated by odorous vapours. They closely resemble the sensilla on the antennæ of insects. In an exceptionally interesting paper, H. Blumenthal (*Z. Morphol. Okol. Tiere*, **29**, 5, 667–719; 1935) has made a full histological and experimental study of the tarsal organ first noticed by Dahl in 1883. This organ, which lies dorsally on the tarsi of legs and palpi in both sexes of all but a few families, appears, like the slit-organs, to react to vapours. Spiders were found to respond to the arrival of a drop of water by approaching and drinking it, but this did not happen if the tarsal organ was excised. The organ may also function as a detector of taste, for spiders were apparently able to distinguish between pure water, sugar solution and brine. It is suggested that its chief biological value is in the search for drinking-water, in the finding of a mate and in the tasting of captured prey. The organ is comparable in structure to the Haller's organ of the ticks and the chemoreceptors described by Minnich on the legs of insects.

Growth and Moulting of Lobsters

KNOWLEDGE of the development of lobsters is a matter of great importance, for legislation fixing size limits and close seasons ought to be founded upon the natural history of the species. Some observations upon the growth of young lobsters have been made by W. C. Smith at Port Erin Marine Biological Station (*Trans. Liverpool Biol. Soc.*, **48**, 51; 1935), though the fact that the conditions were artificial warns against acceptance of the results as of general significance. It was found that moulting and mortality in lobsters from about a year to 2½ years old were almost confined to the summer months, with temperatures above 10° C., and that death rate reached a maximum with temperature. Moulting occurred from two to five times during the second year, generally three times; and two or three times in the third year. After the fifth to the eleventh year there is only one moult annually. Sizes were, at end of first growth period, 26–32 mm., at end of second year 42–57 mm., in autumn of third year 70 mm., but the numbers measured were very small. One female lobster was ten years old before reaching the legal fishery size of 9 inches, although a male of five years may reach the legal size for catching after next moult.

Pruning of Mature Apple Trees

MANY apple growers continue to prune mature trees as a matter of routine. It has been assumed that pruning is an indispensable foundation for fruitfulness in trees of all ages, but the conclusions expressed in a recent publication by Joseph Oskamp (Bull. 624, Cornell Univ. Agr. Exp. Sta., Ithaca, N.Y., March, 1935) do not support this view. The bulletin handles a formidable collection of detailed records, extending over a period of twelve years, which refer to trees about twenty-five years old. No significant effect of pruning on yield of fruit, or on its size, colour and freedom from blemish has been found. It is suggested that mature trees should merely be kept within bounds, so that the fruit is not difficult to gather, and that sufficient attention be given to the mechanical ability of branches to bear heavy loads of apples. The need for light at the centre of the tree also makes it necessary to remove whole branches as they tend to fill up the space within the crown of the tree too tightly.

Methods of Orientation in Ancient Babylonia

DR. ECKHARD UNGER appends to an account of ancient Babylonian maps and plans which have survived on clay tablets certain indications of the methods of orientation emerging from their examination (*Antiquity*, September). A world map, for example, shows, especially by the 'dark' fifth region in the north, that the north-west was at the top of the map. It has been shown that the Sumerians originally based their system on the direction of the prevailing winds in Mesopotamia, these being approximately north-west, north-east, south-east, south-west. They determined the individual character of these winds, and interpreted them as manifestations of gods of a like nature. The manifestation of the gods through the winds played an important part in the orientation of the temples set up to them, but owing to wind variation, the direction was the arc of a quadrant. The rising of the sun in the north-west quadrant at the summer solstice was the time for determining orientation in Babylon, the run of the streets, etc., affording an astronomical time-gauge, occurring once a year and providing a basis for the adjustment of the calendar by an intercalary month. The moon and stars also afforded systems of orientation; but in all the system was inclined, and did not follow the cardinal points as we understand them. This shows that the tradition of a deity associated with the wind survived. In practice, owing to wind variation, orientation was checked by the position of certain stars. 'Sunrise' and 'sunset' imply a similar orientation by quadrant, indicating not the direct easterly or westerly points, but the complete quadrant within which the sun rose or set.

Seismology in New Zealand

SOME interesting reports on earthquakes in New Zealand have recently been published. Dr. C. E. Adams and Dr. J. Henderson describe the earthquakes of the year 1934 (Dominion Obs. Bull. No. 102; 1935), twenty-four in number, one of which, on March 5, was of destructive intensity. Its epicentre lay in lat. 40·95° S., long. 176·8° E., about thirty miles off the east coast of the North Island. The earthquake caused considerable damage in the south-east portion of the North Island, and slightly disturbed the face of the country in the districts round Pahiatua and to the east. Dr. L. Bastings (Bull. No. 103) gives a list of the destructive earthquakes in New Zealand during the century 1835–1934. They are sixty-nine in number, six of intensity 10, fourteen of intensity 9 and forty-nine of intensity 8 (Rossi-Forel scale). Taking account of earthquakes of all three intensities, the author claims for New Zealand a seismicity twice as great as that of Japan. Mr. R. C. Hayes (Bull. No. 104) considers the annual and diurnal frequency of earthquakes in New Zealand. For all earthquakes (1848–1934), the maximum number occurs in June, and for strong earthquakes (intensities 7–10) during the hours 0–3 a.m.

Oxidation of Metals

G. D. PRESTON and L. L. Bircumshaw (*Phil. Mag.*, Oct.), working at the National Physical Laboratory, have investigated the oxide films found on metals and alloys at low temperatures up to 400° C., using electron diffraction patterns to identify the thin films produced. The oxide film on copper, formed at room temperature, at 100°, and at 183°, showed the structure of Cu_2O, the thinner films showed a marked tendency to orientation with a (111) plane parallel to the polished surface of the metal, but orientation disappeared with the thicker films. A brass (30 zinc : 70 copper) formed a Cu_2O film at 183° C. and ZnO at 400° C., an aluminium brass gave a film of Cu_2O, the absence of any record of Al_2O_3 being ascribed to the amorphous nature of the substance. Magnesium and its alloys gave cubic films of MgO. It is suggested that the orientation observed with Cu_2O (and less markedly with MgO) is such that the plane in the oxide having the higher density of metal atoms tends to lie on the polished surface.

Absorption of Short Wave-Lengths

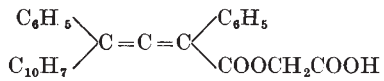
IN a paper published by the Bangalore Press on the transparency of the atmosphere in the ultra-violet and a possible means of extending the solar spectrum in the region 2200–2000 A., K. R. Ramanathan and L. A. Ramdas, of the Meteorological Office, Poona, have collected together many of the results obtained by different workers on the absorption of short wave-lengths by various agencies, particularly by oxygen and ozone. In the light of these results, they discuss the possibility of extending the solar spectrum beyond the limit attained up to now in the ultra-violet, which limit is stated to be 2863 A., reached by Paul Götz in Switzerland. Measurements of the absorption coefficients for ozone suggest that if the sun radiates as a black body at about 6,000° Abs. there should be a revival of the solar spectrum beyond the Hartley absorption band at about 2200 A. if ozone is the only absorbing agent. Herzberg, one of the investigators of the absorption of very short wave-lengths by oxygen, has suggested that the failure to detect any such revival is due to absorption by oxygen. This paper analyses some of the measurements of transparency of long horizontal columns of the atmosphere of the order of 1,000 metres that have been made by various workers, and a table is given which shows the absorption coefficient between 2893 A. and 1855 A. after the effects of haze, molecular scattering and ozone have been allowed for approximately, based on measurements by Jausseran and Rouard. In another table are shown the values of the intensity of solar radiation at 2900, 2200, 2063 and 2000 A. at the surface, at 16 km. and at 20 km., assuming that the sun radiates as a black body at 6,000° Abs., that the quantity of ozone in the atmosphere is 0·2 cm. at normal temperature and pressure, that the absorption coefficients for ozone below 2300 A. found by Meyer in 1903 are correct, and that the coefficients for atmospheric air are those found by Buisson, Jausseran and Rouard. The figures suggest that at 16 km. the solar spectrum might be photographed beyond 2200 A., if spectrographs of the same power as those used at the surface could be employed, but that it is very doubtful whether we could go beyond 1950 A. It is pointed out that a height of 16 km. is attainable by sounding balloons and even by manned stratosphere balloons.

New Kinetic Theory of Gases

IN the "Physics Forum" of the September issue of the *Review of Scientific Instruments*, Dr. I. I. Rabi of Columbia University directs attention to the new experimental facts with respect to gases which have been discovered by the use of molecular beams, and to the revision of the kinetic theory of gases which these facts have rendered necessary. While the hard sphere picture of the collision of two molecules is retained, wave mechanics requires the addition to it of a de Broglie plane wave of wave-length equal to Planck's constant h divided by mv, where m is the reduced mass $m_1m_2/(m_1+m_2)$ and v is the relative velocity of the two molecules. The effective area of the collision cross-section is changed from the πa^2 of the older theory to $4\pi a^2$ for small relative velocities and to $2\pi a^2$ for high velocities. The mean free path thus becomes a function of the temperature of the gas as well as the pressure, and there is no necessity to assume an attractive force between the molecules, which formerly meant the introduction of an assumed constant into the theory. The author concludes that the molecular radii and laws of force between molecules deduced from the older theory "have no real basis in fact".

Resolution of an Allenic Compound

IT is now known that allenic compounds in which at least one of the hydrogen atoms on each of the terminal carbon atoms of allene has been replaced by a substituent, can be obtained in optically active forms (Mills and Maitland, NATURE, **135**, 994; 1935). Another example is furnished by the resolution of an allenic acid:



by E. P. Kohler, J. T. Walker and M. Tishler (*J. Amer. Chem. Soc.*, **57**, 1743; 1935). The acid was first prepared by Lapworth and Wechsler in 1910, in one of the earliest of the many attempts to prepare an allenic compound suitable for resolution. The acid chloride has now been prepared, and also the glycolic acid derivative, which was resolved by means of the brucine salt. The acid, which melts at 195°, is a racemate or racemic mixture of two optical opposites which melt at 145°–146° and in ethyl acetate have the rotation $[\alpha]_D = 29{\cdot}5°$.

Late Type Variable Stars

IN the October *Observatory* (**58**, 285), Mr. A. D. Thackeray contributes an article on the observational facts which are known about the late type variable stars. We have here a field of astronomical work in which an enormous wealth of observational material is at hand with which theory has been unable to deal adequately. The complexity of the variations in magnitude, radial velocity and in spectral phenomena is very great, and there are many features which present grave difficulties to any attempts at a theoretical explanation. In particular, the presence of bright lines in the spectra is very difficult to account for in view of the very low temperatures of these stars, and the most hopeful line of attack must be an explanation in terms of chemical luminescence. This article should prove very useful, as it gives a summary of the known facts, with extensive references to the original works.