

Research Items

South American Arrow Poisons

A FURTHER contribution to a controversy on the nature of South American arrow poisons is made by Dr. Henry Wassén of the Ethnographical Section, Gothenburg Museum, in the course of an ethnographical study of the southern groups of Choco Indians of Colombia, whom he visited in the latter half of 1934 (*Ethnologiska Studier*, Gothenburg Museum, 1935). The controversy originated in the identification, by Prof. C. G. Santesson of Stockholm, of the active principle in samples of arrow poisons used by the Choco Indians submitted to him by the late Baron Erland Nordenskiöld, to which he gave the name *pakurine*, and in the recognition that it had a specific cardiac effect. It was thus the first arrow poison having a cardiac effect to be reported from the New World. Prof. Rafael Karsten of Helsingfors, however, denied that Prof. Santesson had made out his case, and maintained on the evidence of his experience among the Indians of Ecuador that the poison of the Choco was identical in character and effect with other South American 'curare' arrow poisons, of which the active principle is curarine. Dr. Wassén has not only obtained further samples of the Choco poison, which confirm Prof. Santesson in his previous analysis, but he has also obtained evidence, which eluded Nordenskiöld, showing that the *kiératchi*—or *pakurú*—tree is probably to be referred to the species *Perebea*, sub-species *Naucleopsis*, or possibly *Ogeodeia*, of the family Moraceæ. Prof. Santesson, in an account of his investigation, has pointed out that, whereas curarine is an alkaloid, causing paralysis by acting on the ends of the motor nerves, purarine is a glycoside, like the active element in the poisons having a cardiac effect in the digitalin group. The animal poison obtained from the *kokói* frog (now identified from two specimens as *Dendrobates tinctorius*, Schneid.) produced in a frog paralysis of the muscles, and probably of the central nervous system, and finally of the heart with contraction of the ventricle. A very small dose causes death in white mice and rabbits by paralysing the centre of the respiratory system.

Crossing-Over in Male *Drosophila*

IN recent years, exceptional crossing-over has been found by several observers in male *Drosophila*, with and without special treatment. A great deal depends on what relationship this crossing-over has with the normal process found only in the female. In order to determine the time of its occurrence, it is necessary to induce crossing-over to occur with a higher frequency than in the normal male. Prof. H. Friesen, of the Institute of Experimental Biology, Moscow (according to a communication received by NATURE), has done this by X-ray treatment of mature males heterozygous for eight genes in the third chromosome. These males were mated with recessive females at intervals of three or four days. No crossing-over was found in the batches of progeny begotten in the first seven days, but after this time an increasing proportion of cross-over progeny appeared. What was remarkable about these cross-overs was

that identical cross-overs occurred in large groups; in an extreme case, 22 were of one cross-over type, due to crossing-over in a segment six units long, and all the rest (161) were non-cross-overs. Such a result would be produced if crossing-over had occurred several cell-generations before spermatogenesis. The induced crossing-over therefore occurs in the male at a different time from the natural crossing-over in the female, and an important distinction can be made between the two processes.

A Beneficial Weaver Bird

THE farmer's estimate of the damage caused to his crops by birds is nearly always too high, and insufficient attention is paid to their beneficial effects, such as the destruction of harmful insects and weed seeds. A notable instance is reported from the Philippine Islands by Canuto G. Manuel (*Phil. J. Sci.*, 58, No. 2, pp. 193-212, Oct. 1935). It is shown that a weaver bird, *Munia cabanisi*, which stood incriminated as a menace to the rice crop, usually had about four per cent of rice in its menu, the remaining ninety-six per cent being weed seeds. These figures are based upon the examination of the stomachs of eight hundred adult birds; moreover, damage to the rice fields is restricted to the visitations of flocks of the weavers when the crop is in 'head'. Scaring the birds from the crop at this time would seem to be a relatively simple process, and the cost of it could be balanced against the destruction of weed seeds throughout the rest of the year. The paper under review contains also a full and painstaking account of the habits and life-history of this particular bird.

Anatomy of *Calanus*

THE recent memoir by Miss Esther Lowe ("On the Anatomy of a Marine Copepod *Calanus finmarchicus* (Gunnerus)", *Trans. Roy. Soc. Edin.*, 58, Pt. 3, No. 23, 1935-1936) is a valuable addition to the many works on *Calanus finmarchicus*, which, economically so important, has been the subject of more researches than any other copepod, but the minute anatomy of which up to the present time was little known. This paper fills the gap in a very efficient manner, and it is moreover the first complete description of the general internal anatomy of any free-living copepod, with the exception of Hartog's work on *Cyclops brevicornis*. Endoskeleton, musculature, alimentary canal, hydrostatic organ and excretory system, circulatory, nervous and genital system are all described, and the whole is illustrated with beautifully clear figures. In view of recent researches on the movements of *Calanus*, the giant fibres of the nervous system are of special importance. A pair of longitudinal giant fibres extends along the whole length of the nerve cord, giving off branches which supply, alternately, the dorsal longitudinal muscles of the thorax (to which they constitute the only nerve supply) and the flexor muscles of the swimming feet, by means of which the rapid darting movement of the animal is accomplished. Anteriorly the two main fibres form a chiasma in the brain, and are

associated in the antennular motor nucleus with the internal endings of a bundle of giant fibres from the motor root of the antennular nerve. The distribution of the giant fibre system is examined in detail in relation to the muscular movements of the animal, and the evidence points to the conclusion that the system constitutes the effector portion of a reflex system governing the escape movement. The gut is without glandular diverticula, but a pair of diverticula corresponding in position to those of the *Cladocera* is present in a rudimentary condition. The author is certainly to be congratulated very heartily on tackling so successfully an arduous piece of work requiring both nicety of technique and accurate observation.

Nematode Worms of the North Sea

A VOLUME upon the free and parasitic nematodes, by J. H. Schuurmans Stekhoven, Jr., is the latest addition to that valuable series "Die Tierwelt der Nord- und Ostsee" (Leipzig: Akademische Verlagsgesellschaft m.b.H., 1935. 20 gold marks). Following the plan of earlier volumes this contains keys for the identification of species, and descriptions aided by numerous illustrations (277 text-figures), along with a summary of the recorded distribution.

Duration of Life and Respiratory Phenomena in Plants

THE relation of metabolic drifts to longevity in plants has been approached by Dr. B. N. Singh from the respiratory point of view in a recent paper (*Proc. Indian Acad. Sci.*, 2, No. 4, 387-403). His experiments have been confined entirely to the meristematic tissues, that is, that part of the plant entirely free from non-living tissues, so that the respiratory value represents the activity of all the cells in a given amount of tissue. In a group of annuals, of which the life-cycles varied from three months to more than six months, it was found that the respiratory index at successive stages of growth showed a steady and fairly rapid decline for short-lived plants, but remained almost constant in the case of plants with longer life-cycles. The initial rate of respiration in the meristematic cells, and their average respiratory rate over the whole life-cycle, are higher in the cases of the longer-lived plants, so that longevity appears to be connected in general with a higher rate of respiration. In conclusion, it is pointed out that a species will show approximately the same initial rate of respiration when F_1 and F_2 generations of the same strain are grown in successive years, and from this it is concluded that a plant may exhibit a potentiality for a certain rate of metabolism, just as it does for certain morphological characteristics.

Population Map of Greater London

THE Ordnance Survey has published, at the price of 1s. 6d., a map showing the density of population of greater London and surrounding areas on a scale of half an inch to a mile. The sheet extends north and south from Bletchley and Saffron Walden to Haslemere and Horsham, and east and west from Chelmsford and Rochester to Aylesbury and Farnham. Railways, main roads, rivers and county boundaries are marked. Names are chiefly confined to the boroughs, chief open spaces, towns, villages and rivers. Population density is shown by eleven varying tints of brown. The scale gives density per acre, square mile and square kilometre. Open public spaces

are shown in green; other areas without resident population in white. Centres of maximum and minimum density are marked by symbols and approximate values. The map is marked with co-ordinate lines 10,000 yards apart numbered with reference to the new grid system, thus enabling precise location to be indicated easily. Accompanying this large sheet is a smaller one (price 9d.) giving five profiles across London and adjoining areas. In these the horizontal scale is a quarter inch to a mile and the vertical scale is exaggerated ten times. Relief is in grey: density of population in light red. Places are marked each with its co-ordinate grid position and density per acre. The datum line of all density values is the profile of the topography.

Seismograms of Californian Earthquakes

ON March 11, 1933, Los Angeles was damaged by an earthquake of intensity 10 (international scale), the vibrations of which gave rise to a very slight record at Strasbourg. M. C. Bois was thus led to examine the records of other Californian earthquakes (*Publ. Union Géod. Géoph. Intern.*, ser. A, fasc. 13, 147-166; 1935). The records obtained at Strasbourg between 1924 and 1933 show that eight earthquakes of intensities 8 and 9 occurred in California without giving rise to seismograms that could be analysed. Good records were, however, provided by earthquakes of intensity 10 of continental origin and also by submarine earthquakes that were felt feebly or not at all on land. M. Bois thus concludes that the relations between the intensity of an earthquake in its epicentral region and the amplitudes of the different phases recorded at a distant station depend essentially on the geographical position of the epicentre.

'End Corrections'

THE correction to be added to the length of a conducting wire which ends in a large mass of conducting material, or to the end of an organ pipe which is provided with a flange, was estimated by the late Lord Rayleigh forty years ago as 0.824 times the radius of the wire or pipe. A recalculation on the same lines by Dr. P. J. Daniell in 1915 gave the coefficient between 0.8214 and 0.8217. In the January issue of the *Philosophical Magazine*, Prof. L. V. King gives the result of a more general investigation using inversion theorems of Bessel functions. The series involved converge slowly, and give values of the coefficient which ultimately are 0.8211, 0.82125, 0.82132, and Prof. King concludes they tend towards a value within the limits found by Dr. Daniell.

Heat Radiation

HEAT radiation from the clear atmosphere at night forms the subject of a paper by P. K. Raman, research scholar at the Meteorological Office, Poona (*Proc. Ind. Acad. Sci.*, 1, No. 2, May 1935). The purpose of the investigation was to compare two formulae in the light of all available data, namely, that of Brunt (*Q. J. Roy. Met. Soc.*, Oct. 1932) and that due to A. Angstrom (*Smiths. Miscell. Coll.*, 65, No. 3; 1915), which are as follows: (1) Brunt's formula:

$$S = \sigma T^4 (a + b\sqrt{e}),$$

where S = downward radiation on 1 sq. cm. from the atmosphere, T = temperature (absolute) at place of observation, e = aqueous vapour at place of

observation, $\sigma T^4 =$ black body radiation at temperature T , a and b are constants. (2) Angstrom's formula :

$$\frac{S}{\sigma T^4} = A - B \times 10^{ve},$$

where A , B and γ are constants and the other quantities have the same significance as in equation (1). Brunt's formula is tested on longer series of individual observations than those previously used; the correlation coefficients between $S/\sigma T^4$ and \sqrt{e} from individual daily values were in some instances very small, but those for the grouped means and monthly mean values were satisfactorily large. Angstrom's formula was similarly found to hold good in a general way, but did not always give a satisfactory fit within individual series of observations. It is maintained that, within the usual range of variation of e , Brunt's equation is essentially a variation of Angstrom's, but the author's preference is for Angstrom's formula because the physical ideas underlying it are held to be clearer. Interpreting the constant a in Brunt's formula, or $A - B$ in Angstrom's, as the fraction of black-body radiation at the temperature of the place of observation that is emitted by a small quantity of water-vapour, investigation was made into the minimum value of the atmospheric radiation by considering those cases where the air was very dry. The lowest value found for a on the earth's surface was 0.49 at a height of 3,500 ft. above sea-level, but some of Angstrom's observations taken from balloons gave a figure so low as 0.38.

Coefficients of Expansions of Salts

SILVER iodide has been reported to have a negative coefficient of cubical expansion, but the results obtained by Fizeau (1867) and Rodwell (1875) were very discordant, although both agreed as to the negative sign. Since this property is almost unique, it was desirable to have it confirmed by new experimental methods. Grinnell Jones and F. C. Jelen (*J. Amer. Chem. Soc.*, 57, 2532; 1935) have employed a dilatometric method in which the glass dilatometer is first weighed and then filled with mercury, and the exact temperature needed to bring the mercury meniscus to a reference mark in a capillary tube is determined. Then a weighed drop of mercury is added and a new lower temperature is determined which again brings the mercury to the mark, and so on. Then a large part of the mercury is replaced by a known weight of some other solid or liquid and the process repeated. A small quantity of a wetting liquid (toluene) is added to bring about contact between solid and liquid. In this way the coefficients of cubical expansion of silver iodide and some other salts were determined. The negative value for silver iodide was confirmed between 20° and 60°, the coefficient being -1.6×10^{-6} , which is nearer Fizeau's result (-4.1 to -2.7×10^{-6}) than Rodwell's (-55.7×10^{-6}).

Structure of Ice

THE arrangement of oxygen atoms in ice is known from X-ray measurements to be a very open one, like that of the silicon atoms in high-tridymite. Each oxygen atom in ice is tetrahedrally surrounded by four others at a distance of 2.76 Å. It has been assumed that it is bonded to these atoms by hydrogen bonds, the number of hydrogen atoms being just that required to place one hydrogen atom between each

pair of oxygen atoms. It is 0.95 Å. from one oxygen and 1.81 Å. from the other. Pauling (*J. Amer. Chem. Soc.*, 57, 2680; 1935) has suggested that ice may be considered to consist of water molecules arranged so that each is surrounded by four others, each molecule being orientated in such a way as to direct its two hydrogen atoms towards two of the four neighbours, forming hydrogen bonds. The orientations are further restricted by the requirement that only one hydrogen atom shall lie near each O—O axis. This agrees with the residual entropy of ice. The assumption allows a large number of configurations of an ice crystal, each corresponding to certain orientations of the water molecules, and the crystal can change from one configuration to another by rotation of some of the molecules or by the motion of some of the hydrogen nuclei. The fact that at temperatures above 200° abs. the dielectric constant of ice is of the order of magnitude of that of water shows that the orientation of the molecules can occur with considerable freedom. It is pointed out that a finite residual entropy calculated from low-temperature measurements and extrapolation to absolute zero may arise from failure to obtain thermodynamic equilibrium; measurements made under ideal conditions and extended to sufficiently low temperatures would presumably lead to zero entropy for any system.

α -Naphthoflavone as an Indicator

THE bromine liberated during the titration of bromates has been found by Dr. R. Uzel (*Coll. Czech. Chem. Comm.*, 7, 381 (1935)) to react with α -naphthoflavone so delicately that this substance can be used as an indicator in the volumetric estimation of bromates. An orange-red colour is produced by so little as one part of bromine in a million parts of the solution, and sensitivity is found to increase with the acidity of the medium. The indicator is prepared as a 0.1 per cent solution of α -naphthoflavone in alcohol or acetic acid. Up to 1 c.c. of this solution is added for each 50–100 c.c. of solution to be titrated. The author has extended its use to the volumetric estimation of arsenic, antimony, tin, hydrazine, aniline and acetanilide.

Luminosity Effects in Stellar Spectra of Type F

A QUANTITATIVE study of the lines used for determining spectroscopic parallaxes in F -type stars has been made by J. A. Hynek (*Astrophys. J.*, 82, 338). Total absorptions of a selected group of lines in 56 stars were measured with Moll-type microphotometers on plates taken at the Yerkes and Perkins Observatories, these measures being used to calibrate estimated intensities for an additional 54 stars. The behaviour of lines used as luminosity criteria is discussed for each F sub-class, and some interesting results are also found for lines of Ca I and Fe I. These lines behave in a peculiar way in types $F8$ and $G0$, since they decrease with increasing luminosity in dwarfs, but increase in giants, the maximum intensity being identical for $M = +4.5$ and $M = -3.5$. The sharpness of lines is also discussed through the parameter width/depth, and the scarcity of rapidly rotating stars between types $F0$ and $F5$ is confirmed. The diffuse-line stars are shown to be confined to a much smaller range of absolute magnitudes than the sharp-line stars, while a discussion of intensity changes (especially of the lines [K] and H δ) with spectral type confirms the consistency of the $H.D.$ classification for both sharp and diffuse line stars.