Research Items

Origins of Speech and the Orang-Utan

DR. CORNELIUS J. CONNOLLY, professor of physical anthropology in the Catholic University of America, as the result of a study of the brains of fifty species of primates from the lemur to man in the primate brain collection of the Smithsonian Institution, Washington, D.C., claims to have found in the cerebral cortex of the orang-utan the first rudiments of the brain structures of speech (*J. Physical Anthrop.*, Oct. 1936). It is believed by neurologists that the associative process, which with the power of making articulate sounds constitutes the essential element in human speech, is centred in that part of the cerebral cortex known as Broca's area, found in both frontal lobes of the brain, and set off from the rest of the brain by well-marked depressions, the inferior frontal sulci. This area is now found to appear first among the primates in the orang. Absent in the gibbon, it is more emphatically marked in chimpanzee and gorilla. The sulcus subdividing the inferior frontal region, on the other hand, is exclusively and constantly human, never appearing in the anthropoids; but there is evidence of it in *Pithecanthropus* and Neanderthal man. It is possible that the exclusively human *V*-shaped area of the cortex enclosed by this sulcus may be that in which the association between sound and objects, making symbolism possible, takes place. So far as surface pattern of the cortex is concerned, the orang and two higher apes appear to have stopped on the threshold of speech. A second point emerges from the study of thirty-five orang brains of both sexes and various ages. This shows that while the principal sulci are present in all from birth and are standardized, there is greater variability in the pattern of the secondary channels in the orang than there is in either of the other great apes. As the sulci divide functional areas of the cortex, it would seem that the brain of the orang is possibly capable of further development.

Roding of the Woodcock

THE habit of the woodcock of flying over definite tracks at dusk and in the morning during the breeding season has been investigated by T. Warwick and V. D. van Someren (*Scot. Nat.*, 1936, p. 165). A particular pair of birds developed four roding circuits, varying in length from one to three miles and used with different frequencies. The flights, which took place irrespective of the kind of weather, lasted for almost an hour beginning about 9 p.m. and might include so many as thirteen circuits. Both birds occasionally flew together, but most often the male was unaccompanied. The rate of flight was approximately twenty miles an hour, and it was noticeable that as darkness fell the length of time taken to complete a particular circuit increased. The purpose of the roding habit is obscure: each circuit followed a line on which one or more marshy feeding places occurred, and when another woodcock was encountered the roding flight was interrupted while the interloper was driven off. The authors accordingly regard roding, since the woodcock is not a song-bird, as having an aggressive basis and as delimiting the territory by regular patrolling. It is unfortunate that the position of the nest relative to the system of roding flights was not definitely determined.

Resistance of Fish to Supercooling

EXPERIMENTS on the effect of low temperatures on live fish have so far shown that death follows cooling to about − 1° C. It was not clear whether death was due to the conversion of body fluids into a solid state, or whether the low temperature by itself had a fatal effect on living cells. To decide this question, P. J. Schmidt and his collaborators have investigated the result of keeping fish in supercooled water (*C.R. Acad. Sci., U.S.S.R.*, **3**, No. 6; 1936). The authors succeeded in supercooling the body fluids, for a prolonged period, to a temperature more than 2° below their normal freezing point. The experiments proved that fish can stand supercooling even to − 3·06° C. if no crystallization of the surrounding water or of the body fluid occurs. This suggests that fish perish mainly from the effects of ice forming within the body, and not from the effects of low temperature. Such powers of resistance to supercooling should be of biological significance for fishes, since cases of supercooling of water occur in natural conditions. The phenomenon can be interpreted as a true anabiosis, if the latter is defined as a depression of life by the elimination of water from living matter, so that a complete cessation of life-processes results.

Standard Errors of Mendelian Ratios

TABLES of standard errors of Mendelian ratios have been worked out by Messrs. S. S. Purewal and P. K. Rao (Misc. Bull. No. 11, Imperial Council of Agric. Research, 1936. Delhi: Manager of Publications; London: High Commissioner for India. 12 annas or 1*s.* 3*d.*) The standard errors expressed in numbers of individuals have been prepared for the ratios 1 : 1, 3 : 1, 9 : 7, 15 : 1, 13 : 3, 27 : 37 and 63 : 1, and standard errors expressed in percentages for the 1 : 1 ratio. The tables give the standard errors for values of n from 5 to 1,000 and can be used for numbers up to 100,000. A deviation greater than twice the standard error is considered significant. These tables should be useful for geneticists and plant breeders.

The Temperature Scale

WHILE the final standard scale of temperature is Kelvin's thermodynamic scale, independent of the properties of any particular substance, it is on the properties of gases that we have to depend for the practical realization of the scale in certain low and certain high temperature ranges. An examination of the properties of hydrogen, nitrogen and carbonic acid then available led Daniel Berthelot in 1907 to conclude that the coefficients of expansion and of pressure of a perfect gas and of actual gases at very small densities were 0·0036618, from which it follows that the temperature of freezing water on the Kelvin scale is 273·09° K. Much accurate work on helium and the above gases has been done in the last thirty years, and from a consideration of it Prof. Keesom and Dr. W. Tuyn, in a communication from the Kamerlingh Laboratory of Leyden (Supplement No. 78), come to the conclusion that a more accurate value of the coefficient is 0·0036611, from which it follows that the freezing point of water is 273·14° K.

Velocity of Radio Waves

MOST of the measurements being made at the present time on the ionosphere are based on the assumption that radio waves travel with the velocity of light. The paper by R. C. Colwell, N. L. Hall and L. R. Hill, which appears in the *Journal of the Franklin Institute* of November, on the experimental determination of the velocity of radio waves, is therefore a timely one. The experiments were made between West Virginia University and Fairmont State College, which are 20 kilometres apart. A continuous train of very short radio pulses from the sending station travel to a receiving station, where their phase is adjusted so that a pulse starts back the instant it is received. Synchronization between the transmitting and sending station is automatically obtained, as they are both supplied from the same 60-cycle power network. The observations so far obtained indicate that the velocity of the ground waves varies between one half and two thirds the velocity of light. The experiments give no indication of the velocity of sky waves. To obtain measurements of these, it would have been necessary to have a second radio station on a stratosphere balloon. It is concluded that the velocity with which radio waves travel along the ground is considerably less than that of light. This reduction in the velocity is attributed to the influence of the conductivity and dielectric constant of the earth and to the ionization of a certain layer of the atmosphere. The authors also conclude that the velocity of ground waves is not constant, and that the strength of ground waves varies during periods of atmospheric disturbance. On one occasion, the received signal was four times normal strength, and during this period the measured velocity was a minimum.

'Lumophor' Glass for Tubes containing Luminous Gases

RECENT researches on 'lumophor' glass, that is, glass for use in making the tubes containing luminous gases, has led to the discovery of much more effective materials for making these tubes. A brochure recently published by Glaswerk Gust. Fischer, Ilmenau, Thuringia, gives many technical calculations and measurements on the efficiency of various types of lumophor glasses. An abstract of it is given in the November number of *Helios*, the electrical export trade journal published in Leipzig. It is found that the brightness of the tube increases very appreciably with the current taken by it, but the luminosity in lumens per watt shows its maximum value with a small tube current. The characteristics shown by the various types of lumophor glasses are all of a similar nature. Interesting data are given on the influence of external temperatures from $-60°$ to $+220°$ C. on the light intensity. It is known that luminous tubes for blue light burn differently according to the external temperature even when filled with a mixture of rarefied gases having high resistance powers against cold. This dependence is more pronounced when lumophor glasses are used. In this case, the luminous colour results from the radiation from the mercury vapour and the radiation of the luminescence of the glass walls. The experiments made with a photo-cell and the measurements show that the light intensity throughout the medium temperature range, which coincides with the surface temperature range, has the maximum value. At temperatures exceeding 220° C., No. 1 lumophor glass loses its pure white colour and assumes a greyish-white tint. At 0° C. the colour becomes duller as the pressure of the mercury vapour decreases. The light blue tube No. 2 shows a violet colour at $-40°$ and above 135° becomes a greyish-white. Owing to 'fatigue' of the glass, the light emitted falls 30 per cent in the first two hours and then remains constant, even after the lapse of 3,400 hours. Switching the tubes off invariably leads, on relighting, to an increase in luminescence.

A Co-ordinated Cuprous Complex

IN the most stable derivatives of cuprous copper, the co-ordination number appears to be 4, for example, in $K_3[Cu(CN)_4]$. It is found (F. G. Mann, D. Purdie and A. F. Wells, *J. Chem. Soc.*, 1503 ; 1936) that cuprous and silver iodides form compounds with tertiary phosphines and arsines analogous to the well-known non-ionic aurous chloride derivatives $[R_3P(As) \rightarrow AuCl]$. The cuprous compound would be expected (for 4-co-ordinate copper) to be $[(PR_3)_3CuI]$, analogous with $K_3[CuI_4]$. In this compound the copper is joined by three co-ordinate and one covalent link, giving the 7 electrons which the copper requires to attain the electronic structure of krypton. This suggests that the 2-co-ordination compound, $[R_3P \rightarrow CuI]$, should be very unstable, whilst actually many members of the phosphine and arsine series are very stable. X-ray analysis of the arsine compound shows that the true molecule actually consists of four simple units, $[Et_3As \rightarrow CuI]_4$. In this molecule, the four cuprous atoms are arranged at the apices of a regular tetrahedron: the four iodine atoms lie each at the centre, but above the plane of, one face of the tetrahedron. Beyond each cuprous atom is an arsenic atom lying on the elongation of the axis joining the centre of the tetrahedron to the copper: the three ethyl groups are then joined to each arsenic atom so that the tetrahedral angle is subtended both at the arsenic and at the first carbon atom of the ethyl groups. The stability is conferred by each iodine atom, in addition to being covalently linked to its original copper atom, also becoming joined by co-ordinate links to the other two copper atoms of the same tetrahedral face. Each copper atom acquires 7 electrons and is identical, in both co-ordination number and electronic structure, with that in $K_3[Cu(CN)_4]$. Interesting derivatives with $\alpha\alpha'$-dipyridyl were also prepared.

Orionid Meteors

MOHD. A. R. KHAN, of the Osmania University, Hyderabad, Deccan, observed the Orionids from October 18 until 21, a total of 124 being recorded in the four nights. He has deduced a radiant at $93{\cdot}7° + 14°$ by combining the observations over the period. It would have been better, if possible, to have used the results for each night separately, as the radiant moves eastward from night to night. Mr. J. P. M. Prentice discusses this matter in *Memoirs of the British Astronomical Association* (Report of the Meteor Section), May 1936. He concludes, after careful study of this shower, that the radiation comes from three sharply defined centres situated at close intervals in declination + 15°, and that these three centres move approximately 1·3° (small circle) each day.