RESEARCH ITEMS

Transfusion into the Bone Marrow

WORKERS who are studying the intravenous administration of blood and other fluids will be interested in the method of delivering such parenteral fluids into the manubrium of the sternum which is described by Mr. Hamilton Bailey, of the Royal Northern Hospital, London (*Brit. Med. J.*, 181; Feb. 5, 1944). Referring to the work of L. M. Tocantins and J. F. O'Neill (*Surg. Gynæc. Obstetr.*, **73**, 281; 1941), Mr. Bailey says that he considers the manubrium as good a receptor as a vein for infusions of all kinds and for pentothal anæsthesia. After local anæsthesia with novocain, a special trochar is introduced between the two plates of the manubrium, the depth to which it penetrates being controlled by two wings on the instrument. To make sure that the bone marrow has been reached and to avoid such possible accidents as the injection of the fluids into the superior mediastinum, sodium citrate is first injected with a syringe fixed to the cannula. If this syringe then withdraws bone marrow, which looks like blood, easily and liberally, it is known that the cannula is in the bone marrow. It is then quickly linked to the transfusion apparatus. A possible danger is the production of osteomyelitis, but this has not occurred in Mr. Bailey's sixty cases. Whole blood cannot be introduced as rapidly as it can be given into a vein by gravity, but this difficulty is being overcome. Advantages of the method are that it is relatively painless, that thrombosis or phlebitis cannot occur, and that the apparatus is on the sternum and so is out of the way of the surgeon during operations and can be controlled by the anæsthetist. The method is also free from the difficulty, which is often considerable, of getting a cannula into the veins of severely shocked patients, whose veins may be also so severely collapsed that satisfactory reception of the parenteral fluid is difficult; in dehydrated infants the method is certain and safe. It can, moreover, be carried out in a poor light, so that fluids can be given more easily and quickly under black-out conditions.

Inheritance of Awn Barbing in Wheat

THE beards or awns of wheats are normally rough, due to short, thick-walled, unicellular hairs with fine points which are directed towards the tip. Among 'smooth'-awned durum wheat selections, it has been found that two different, true-breeding types may be distinguished (P. F. Knowles, *Canad. J. Res.*, **21**, C 198; 1943). In the first type, termed 'smooth', the upper half of the awn is free from barbs and the lower half very slightly scabrous, increasing in intensity towards the base of the awn. In the second or 'intermediate' type, barbs are found from the tip to the base of the awn, but in the upper part they are few in number and reduced in size, whereas in the lower portion they are very numerous and intermediate in character between the 'smooth' and the normal 'rough' types. The types are shown to be due to the expression of two pairs of alleles, designated *Rr* and *Ss*. *RRSS*, *RRSs*, *RrSs*, *Rrss*, etc., are 'rough'-awned, *rrSS* is 'intermediate', *rrSs* is a non-true breeding 'near-smooth' and *rrss* is the true-breeding 'smooth'-awned type. The segregations obtained for the characters of glume colour, glume pubescence and awn colour, showed that the inheritance of each is determined by the action of one pair of factors, that glume pubescence is linked with awn colour and that the inheritance of all these is independent of awn barbing. It is a pity that the symbols *R* and *S* have been used in accordance with the notation first used for barley but now discarded for that species: *R* is usually reserved for the three grain-colour factors and *S* has been used for the spring habit. Furthermore, the smooth-awned gene originally designated *S* in barley is a dominant.

Physiology of Incompatibility in Plants

IN the third paper of this series, D. Lewis (*J. Genetics*, **45**, 171; 1943) describes his investigations on incompatibility in autotetraploids. It will be remembered that in diploids a style carrying S_AS_B will inhibit the growth of either S_A or S_B pollen grains. In tetraploids there are complications such as the pollination of $S_AS_CS_CS_D$ by S_AS_B pollen. Using synthesized tetraploids of *Œnothera organensis*, the author has investigated this and similar phenomena. Pollen heterozygous for different *S* factors can be shown to differ by their reaction to temperature and growth. The fact that a pollen tube carrying an incompatible and a compatible gene in relation to those of the style show different reactions according to the specific genes involved indicates that competition is taking place for some substance. The author suggests the similarity between incompatibility in plants and the phenomena of antigens and antibodies in animals. The effects of incompatibility upon survival of tetraploids and economic selection are discussed.

Effects of Banana Selection

K. G. DODDS (*J. Genetics*, **45**, 113; 1943) has examined the cytology of some diploid parthenocarpic bananas. Three of the five examined are structural hybrids, a fourth shows little bivalent formation while the fifth exhibits a single reciprocal translocation. Parthenocarpy and sterility of the female flowers is genetic in origin. The author shows that parthenocarpy and female sterility arose by gene-mutants in fertile diploids; the resulting edible types were taken into cultivation and propagated by clones. By selection, and in course of time, parthenocarpy became established, and with the absence of selective control on the sexual process the evolution of structural hybridity took place. This was favoured probably by the selection of more sterile forms. Hence male sterility was added to female sterility. Later, polyploidy arose, but this is considered to be of less importance in the evolution. Possibly the larger size of polyploids may have attracted the early selectors.

Electric Polarizations in Extremely Dilute Solutions

THE abnormal behaviour sometimes found in the polarization curves at high dilutions on plotting polarizations against mol fractions has been supported by some investigators and denied by others. R. Davis, H. S. Bridge and W. J. Svirbely (*J. Amer. Chem. Soc.*, **65**, 857; 1943) have made some measurements in benzene and dioxane solutions and computed the molecular polarizations by Hoecker's method. This involves plotting the product of polarization and mol fraction of the solute P_2N_2 against N_2 and taking the slope of the resulting line as P_∞. This will be equal to P_∞ only if P_2 is constant. Large-scale plots showed that the P_2N_2 against N_2 plot was linear under proper conditions, and the conclusion was reached that the

abnormal behaviour in polarization curves encountered in very dilute solutions is due to experimental error in measuring P_1 and has no physical significance.

Solubility of Silver in Mercury

AN interesting study of the solubility of silver in mercury has been published by D. R. Hudson (*Metallurgia*, Sept. 1943). The author has determined the solubility over a range of temperatures up to 450° C., the materials being sealed in a glass bulb. The measurements, combined with those of previous workers, with which they are consistent, afford information extending over a temperature range exceeding 950° C. Measurements quoted in the highest range up to the melting point of silver were made by Murphy using the usual metallurgical methods. The existence of the peritectic temperatures of formation of Ag_8Hg_4 and Ag_5Hg_8 produces no noticeable effects on the graph of log N_{Ag} plotted against $1/T$ (where N_{Ag} represents the molecular fraction of silver in the saturated liquid solution, and T represents the absolute temperature). At two other temperatures, however, sudden changes of slope of the graph occur, and may be roughly predicted from purely physical properties of silver and mercury by using an equation due to Hildebrand. The equation may be modified so as to allow for the solid solubility of mercury in silver, and in this way a somewhat closer approximation to the experimental determinations can be obtained. Although the equations used by Dr. Hudson exhibit the main features of the experimental determinations, the shape of the liquidus curve of a binary metallic system cannot in general be closely predicted from a knowledge of relevant physical properties of the pure components.

Carbon Monoxide 'Cool Flame'

AT a temperature just below the ignition point, a mixture of carbon monoxide and oxygen shows a pre-ignition glow or 'cool flame', the spectrum of which has been studied by A. G. Gaydon (*Proc. Roy. Soc.*, A, 182, 199; 1943). Photographs were got of the spectra with carbon monoxide and oxygen or nitrous oxide. The cool flame shows the same faintly banded spectrum as the normal flame, but this band structure is more clearly developed. The OH bands are absent from the cool flame, which, however, shows strong sodium emission. Cuprous chloride appears very readily as an impurity, and the band systems of CuCl show a markedly different intensity distribution in the cool flames with oxygen and with nitrous oxide. The application of the results to the theory of the combustion mechanism is briefly discussed. The paper is the third in a series on the flame spectrum of carbon monoxide.

Electron Diffraction of Amorphous Polymers

WHEREAS some polymeric substances give characteristic crystalline diagrams under X-ray or electron diffraction examination, others show such diagrams only when stretched under suitable conditions of temperature. Normally, in their unstretched form they give an 'amorphous' pattern, retained in several cases even on stretching. Special attention has been given to 'amorphous' polymers by G. D. Coumoulos (*Proc. Roy. Soc.*, A, 182, 166; 1943). The configurations of polyvinyl acetate and the acrylate and methacrylate polymers revealed by electron photographs suggest a zigzag carbon atom chain for the long main-chain, which has the 1,3 structure, with the side-chains alternately on the right and the left of the zigzag chains and on planes approximately perpendicular to the axis of the main chain. These side-chains are subject to lateral cohesive forces which group them in clusters. In the clusters, the side-chains tend to lie parallel to one another. In the lenses the clusters consist of a few side-chains showing no recognizable arrangement. The multilayer pattern suggests a certain orientation of the side-chains with perhaps more grouping together. The patterns indicate an 'amorphous' character due to the close packing of the side-chains in clusters, producing distortion of the main-chain and preventing adlineation. On the basis of this configuration, some of the elastic properties of these polymers are discussed and a note is made on the occurrence of high elasticity.

Production of Penetrating Showers

L. Jánossy and G. D. Rochester have reported (*Proc. Roy. Soc.*, A, 182, 180; 1943) the results of an experimental study of the nature of the shower-producing radiation suggested by an earlier investigation by Jánossy. It is shown that about one third of the radiation producing penetrating showers is non-ionized and more penetrating than photons. The total intensity of this non-ionizing radiation, named N-radiation, is found to be about 0·001 per cent of the full cosmic radiation near sea-level. The N-radiation is possibly the energetic part of the penetrating non-ionizing component of cosmic radiation. It is suggested that this radiation consists of neutrons.

Direction of Rotation in Spiral Nebulæ

UNAMBIGUOUS determination of the direction of rotation of extra-galactic nebulæ with respect to their spiral pattern needs three data: the sense of the rotation, the sense of the spiral pattern and the sense of the tilt. The first can be obtained from spectrograms, the second from direct photographs, but there is still considerable controversy over the determination of tilt, which cannot be observed directly but must be inferred from observations which may be interpreted differently by different people. A recent paper by Edwin Hubble (*Astrophys. J.*, 97, 112; 1943) uses dissymmetry of obscuration with respect to the major axis as a criterion of tilt in fifteen spirals in which the arms can be traced. He finds that the arms are either all trailing or all leading the nuclei. In four critical cases, he claims, lanes of obscuration silhouetted against the nucleus show unambiguously which is the nearer side of the nebula; and applying this criterion of tilt, he finds that the arms are trailing. As a working hypothesis he therefore assumes that the arms trail in all spirals. In recent papers, however (*Stockholm Ann.*, 14, Nos. 1, 3, 4; 1942), Lindblad and Ohman come to the opposite conclusion by assuming that the dark matter is distributed more or less uniformly through the nuclear region. The heavier obscuration should then occur on the farther side of the nucleus, where the light rays are absorbed most. Unfortunately, in the one case where the Swedish school agrees with the American as regards the direction of tilt, they disagree on the sense of the spiral pattern. The matter is of great importance in discussing the evolution of spiral nebulæ, and further independent evidence is badly needed.