RESEARCH ITEMS

Metabolic Stimulants and Wound Healing

T. H. C. Barclay, D. P. Cuthbertson and A. Isaacs (*Quart. J. Exp. Physiol.*, **32**, 309; 1944) measured the time required for healing standard circular skin wounds in rats. In normal animals the time was about 20 days. Addition of dried thyroid gland to the diet throughout the healing period reduced the average healing time by 11 per cent. Addition of 2-4-α-dinitrophenol (0·012 per cent of diet) reduced the healing time by 15–27 per cent. Larger doses of dinitrophenol (0·09 per cent of diet) were without effect, possibly because of the great loss of weight which occurs. The results were shown to be statistically significant; but the authors do not think that they justify the use of these stimulants to aid wound healing in patients. It has been shown by others that these substances have no effect on the rate of cell proliferation *in vitro*, and it is suggested that the *in vivo* effect may be due either to increased circulation-rate improving the blood supply to the wound, or to cell proliferation induced by some product of the increased body catabolism.

Posterior Pituitary Extract and the Heart-Rate

THE slowing of the heart which results from injection of posterior pituitary extract has been ascribed to (1) reflex slowing from the rise of blood pressure, and (2) depression of the myocardium either directly or as a consequence of coronary vasoconstriction. M. E. M. Sawyer and G. H. Ettinger (*Canad. J. Res.*, **22**, E, 26; 1944) claim to have shown that neither of these factors is responsible. The experiments were performed on conscious dogs; the extract was administered by continuous intravenous infusion over a period of one to two hours at the rate of about 2 pressor units per hour. In normal dogs the heart slowed to about half its resting rate. Dogs whose hearts had been completely denervated (by a preliminary operation) showed no slowing at all; this confirms earlier work of Z. M. Bacq and S. Dworkin (*Amer. J. Physiol.*, **95**, 605; 1930) and proves that the slowing is mediated by the nervous system and is not due to any direct action of posterior pituitary on the heart. It would seem likely that the slowing is a reflex effect from the rise of blood pressure; but the authors present the following evidence against this view. In one dog the blood pressure actually fell by 5 mm. mercury, yet the heart slowed from 72 to 52 beats per minute. In the remaining six dogs the rise of pressure was small (10–30 mm. mercury) and the slowing was maintained for some time after the pressure had returned to normal. Such evidence is suggestive; but much more will be required before the effects of blood pressure changes can be ruled out.

Cultivation of *Plasmodium gallinaceum* in Tissue Cultures

No one, says F. Hawking (*The Lancet*, 693; May 27, 1944), has yet succeeded in cultivating the trophozoites of malaria parasites *in vitro* for an indefinite period; but he has now succeeded in cultivating *Plasmodium gallinaceum* of birds in roller-tube tissue cultures of tissue from the spleen, liver, marrow and brain. It will be remembered that S. P. James and P. Tate (*Parasit.*, **30**, 128; 1938) showed that this and certain other avian plasmodia show stages which develop in reticulo-endothelial cells and in the capillary endothelium of the brain and other organs (the exo-erythrocytic forms). The occurrence of similar stages in the life-history of the human malaria parasite has not yet been proved. The commonest form of the parasite found by Hawking in his tissue cultures was the large oval schizont, which was usually found free from any cell. Small mononuclear forms were also fairly common. At the time of writing, Hawking had found apparently healthy parasites on the fifteenth day of culture, after which time the cultures were overgrown by fibroblasts. Tissue taken from tubes on the eighth day and injected intraperitoneally into chicks infected these with typical endo- and exo-erythrocytic forms. Fluid taken from several tubes on the ninth day and injected intraperitoneally into chicks infected them. Hawking thinks that multiplication of the parasites really occurs in the cultures, because, although parasites are hard to find in the original implant, they are present in large numbers after several days of cultivation, and clusters of tiny mononuclear forms are often found (which are figured), and these may be the results of schizogony. A detailed description of the forms of the parasites seen during this work will be published later.

Venezuelan Catfishes

LEONARD P. SCHULTZ studied and collected the fishes in the Maracaibo Basin of Venezuela and other localities in the winter of 1942, and now makes a detailed report on some of them ("The Catfishes of Venezuela, with Descriptions of Thirty-eight New Forms", *Proc. U.S. Nat. Mus.*, **94**, No. 3172; 1944). 127 species and subspecies and 63 genera are recognized in this work—38 new forms are described and 6 new genera. Keys are given of the families, genera and species, and the whole will be a most useful help to all ichthyologists. The chief value lies in the fact that nearly all the material was collected personally and that colour notes were made from the live fishes. The common names are frequently included, and in several cases the young are compared with the adult.

Asymmetry in Inheritance

G. DAHLBERG (*Proc. Roy. Soc. Edin.*, **62**, 20; 1943) has considered the question of asymmetry of pattern or of expression of such characters as polydactyly. Frequently such a character appears on one side in one individual and on both sides in another individual. Suggestions have been made that both environment and genes are the causative agents of this phenomenon. The author, however, indicated that manifold genotypical asymmetry, due to genic influence, will account for the apparently erratic behaviour. The final effects may arise from a gene or several genes acting at a particular stage in development where planes of symmetry are being formed. The genes may act by determining the distribution of extra-nuclear factors. This genotypic asymmetry entails a distinct form of latency to be distinguished from latency due to Mendelian recessives and from environmental thresholds. The author indicates suitable subjects for tests of the theory.

Petrogenesis of the Transkei Dykes

NORTH of East London in the Cape Province of South Africa there are two immense dykes which, appearing near Cathcart, follow an easterly direction for nearly a hundred miles before they are cut off by the coast, where each of them has a thickness of about 1,000 ft. The various types of rocks which make up the dykes have been interpreted as differentiation products due to the fractional crystalliza-

tion of a dolerite magma (F. Walker, *Trans. Roy. Soc. S.A.*, **30**, 79; 1943); but a more detailed investigation has led E. D. Mountain to a very different conclusion (*Trans. Geol. Soc. S.A.*, **46**, 55; 1944). The main dyke-rock is a dolerite-pegmatite which differs chemically from the normal Karroo dolerite in containing higher potash and combined water, and lower magnesia. Patches of rock with the same characters have been produced in normal dolerite as a result of contamination by sediments, and Prof. Mountain presents evidence that the dolerite-pegmatite was formed by large-scale contamination of the same kind. As it is traced to the west, the southern dyke passes imperceptibly into normal Karroo dolerite. The northern dyke, however, becomes increasingly acid towards the west and finally becomes a quartz-felspar rock indistinguishable from a metamorphosed sediment. Along one stretch the northern dyke encloses a 20-ft. dyke-like band of essentially sedimentary material which can be matched with the neighbouring Beaufort sandstone. This 'dyke' persists for several miles; but eventually it grades into granophyric quartzite, which in turn merges continuously through granophyric dolerite into dolerite pegmatite. The rock sequence from dolerite to sediment is identical with that commonly observed in the reaction rims around sedimentary xenoliths found in dolerite.

Solubilization by Soap Solutions

THE name 'solubilization' is applied to the power possessed by even dilute water solutions of soaps (and other colloidal electrolytes) of bringing into thermodynamically stable colloidal solution such substances insoluble in water as hydrocarbons and dyes. The commercial importance of this phenomenon has long been known; but its mechanism has only recently been given by J. W. McBain as consisting of sorption upon, or incorporation within, colloidal micelles. J. W. McBain and K. E. Johnson (*J. Amer. Chem. Soc.*, **66**, 9; 1944) have now shown by measurements with a water-insoluble dye and four potassium soaps that the solubilization increases so rapidly with the higher soaps as to cast doubt on the suggestion that it is solution in the hydrocarbon fraction of the molecule; but rather favour its incorporation between the layers of lamellar micelles, the only form for which there is direct evidence. Potassium chloride greatly increases the solubilizing power of fully formed micelles and also produces in dilute solution micelles of still higher solubilizing power.

Structure of Boron Carbide

THE very hard boron carbide, B_4C, has been examined by the X-ray method by Zhdanov and Sevast'yanov (*C.R. Acad. Sci. U.R.S.S.*, **32**, 432; 1941—in English) and by H. K. Clark and J. L. Hoard (*J. Amer. Chem. Soc.*, 65, 2115; 1943), whose results are in agreement. The structure is very unusual, the type of co-ordination shown by the boron and carbon being curious. B_4C belongs to a rhombohedral lattice, with constants $a = 5{\cdot}19$ A. and $\alpha = 66° 18'$, with three stoichiometric molecules B_4C in the unit cell. The corresponding hexagonal lattice constants are $a = 5{\cdot}60$ A. and $c = 12{\cdot}12$ A. for a cell containing nine molecules. The structural units are a linear chain of three carbon atoms and a group of twelve boron atoms arranged at the vertices of a nearly regular icosahedron. Each boron has six-fold co-ordination, being bonded to five others in the same icosahedral group and to either a carbon or a boron. Thus a continuous three-dimensional network of boron runs through the crystal. A high degree of resonance leading to a condition not far removed from metallic binding is presumably of considerable importance in accounting for the stability of the structure, and the boron network is not of the ordinary covalent type.

Squirrel-Cage Induction-Motor Starters

A PAPER by G. A. Wauchope (*J. Inst. Elec. Eng.*, **91**, Pt. 2, No. 20; April 1944) describes a recent development in this class of apparatus. In a pumping station in which were installed a number of pumping units automatically started and stopped by changes in water-level, the motors were of the 3-phase double-wound squirrel-cage-rotor type controlled by contactor-type star-delta starters. During the starting period, the current was found to be higher than anticipated, with the result that the starter overload releases had to be provided with special restraining devices to prevent tripping under normal starting conditions. It was further observed that the high current-peak occurred when the motor connexions were automatically changed from star to delta. This phenomenon occurred in installations where the motors were of the simple squirrel-cage type as well as where the rotors were of special design to limit the starting current. The author gives reasons for the occurrence of the phenomenon and describes a new design of star-delta starter for squirrel-cage motors which followed from the investigation. The starter enables squirrel-cage machines to be used in many fields where a slip-ring motor has formerly been essential.

Invariants and Tensors

THE theory of invariants was much studied, particularly by Cayley, Sylvester and Clebsch, in the second half of the nineteenth century. Its central problem was, given an equation representing some geometric configuration, to find functions of the coefficients of that equation which were unchanged in form when the axes of reference were altered. In the twentieth century the theory of relativity brought into great prominence the use of tensors; these can be used for expressing physical laws which are independent of the axes of reference. These two theories have now been linked up together in an important paper by D. E. Littlewood (*Phil. Trans.*, A, 239, 305; 1944). He proves that all the results of the older theory can be obtained in the new. Moreover, there is a close correspondence between the symbolic method for invariants, introduced by Aronhold and developed by Gordan, Grace and A. Young, and the tensor method. The chief difficulty in both cases is that, although it is easy to write down an unlimited number of expressions which have invariant properties, it is difficult to decide whether any one of these may not turn out to be identically zero, or whether any two of these may not represent the same invariant. To do this requires a somewhat elaborate technique. That for the symbolic method is based on ordinary algebra, but the corresponding technique for tensors is more akin to group theory, and in particular to the quantitative substitutional analysis of A. Young. It is remarkable that Young developed this, not from tensors, but from his work on the symbolic method. Littlewood's paper appears to open up several promising lines of investigation, some of which will be discussed by the author in a later paper.