

RESEARCH ITEMS

Carbohydrate Metabolism after Burns

It is well known both in man and animals that there is a rise in the level of blood sugar during the first few hours after a burn. E. J. Clark and R. J. Rossiter (*Quart. J. Exp. Physiol.*, 32, 269 and 279; 1944) have studied the changes in carbohydrate metabolism produced by experimental skin burns in rats and rabbits. During the first three hours following a burn there is hyperglycemia, rise of blood lactate, decrease of muscle glycogen, and either no change or a decrease in liver glycogen. The increased blood sugar comes chiefly from the muscle glycogen via the liver (Cori cycle). All these changes, except for the liver glycogen, could be reproduced by injection of adrenaline into normal animals. Injection of adrenaline into rats and rabbits always causes a rise of liver glycogen. Further, it was shown that liver slices from the burned animals formed glycogen from glucose (*in vitro*) much less readily than did liver slices from normal animals, whereas liver slices from adrenaline-injected animals formed glycogen normally. The authors conclude that the changes are mainly due to the liberation of adrenaline, but that in addition there must be some other factor acting on the liver, either accelerating glycogen breakdown or inhibiting its synthesis. Results of other workers suggest that some factor in addition to adrenaline is also at work in the hyperglycemia of hemorrhage and asphyxia. There is no clue as to what the additional factor may be, but it is probably common to burns, hemorrhage and asphyxia.

Spanish Mackerel

CAPTAIN IAN S. R. MUNRO has published a most useful work in his "Revision of Australian Species of *Scomberomorus*" (*Mem. Queensland Mus.*, 12, Part 2; Nov. 1943). The Spanish mackerel comprise an important group of deep-sea food fishes which support a valuable coastal pelagic fishery in Australian waters, particularly Queensland, northern New South Wales and Western Australia. The industry is based primarily on the barred Spanish mackerel *Scomberomorus (Cybium) commerson*, caught by trolling in coastal waters, but there is a small net fishery of *Scomberomorus (Cybium) queenslandicus* sp. nov., which enters the estuaries along the coast during the winter months. Several other marketable species are caught in smaller numbers. All these, like their relatives from overseas, are first-class food fishes, and the larger forms provide good sport for game anglers along the coast of New South Wales and the Great Barrier Reef. A decline in the annual catches in spite of improvement in technique and equipment is due partly to a large increase in fishing activities during the spawning seasons. Investigations concerning the biology and economics are in progress, and the present work deals with the exact diagnosis and subsequent identification of all species. Four species are shown to occur in Australian seas. All members of the family are coastal inhabitants, and throughout the world they are seldom found in water deeper than forty fathoms. Some migrate into estuarine waters at certain seasons. Most of the species inhabit the clear tropical waters of ocean currents around rocky islets and coral reefs, tide rips and off-shore currents. Their preference for waters of low density and medium salinity apparently accounts for their coastal distribution. Good figures of the Australian species are given.

Carbon Dioxide as a Measure of Grain Infestation

R. W. Howe and T. A. Oxley of the Pest Infestation Laboratory at Slough discuss a method intended to give at least an approximate measure of insect infestation of grain in a short time. In this connexion it was thought that the rate of carbon dioxide production of infested grain, as a measure of metabolism, would probably be a satisfactory measure of infestation. The very different methods in use are either laborious or consume a great deal of time. While the carbon dioxide method gives less detailed information than the existing and more laborious methods, it has the great advantage over them of giving an estimate of the actual amount of damage which an infesting population is causing. The authors describe (*Bull. Entomol. Res.*, 35, 11; April 1944) a detailed technique for the routine determination of the carbon dioxide output of samples of grain. The carbon dioxide figure obtained is largely a measure of insect infestation of the sample of grain tested, and a table is given by which the numbers of various species of grain infesting insects may be estimated from the carbon dioxide figure. Clean grain of less than 15 per cent water content produces up to 0.25 per cent carbon dioxide in twenty-four hours at 25°C., so that results up to 0.3 per cent are considered to indicate clean grain. A result between 0.3 and 0.5 per cent indicates slight infestation or a water-content of more than 15 per cent. Grain showing a carbon dioxide content of 1 per cent or more indicates that it is highly unsuitable for storage. In such a sample this is an indication of an infestation of one Calandra weevil larva per 500 grains or 33 larvae per pound.

Embioptera or Web-spinners of the New World

IN the *Proceedings of the United States National Museum*, 94 (1944), E. S. Ross gives an admirable review of the systematics of the Recent and Tertiary species of the insect order Embioptera of North and South America. Some 71 American species are recognized and these are distributed in 17 genera and 6 families. All the genera excepting *Oligotoma* seem to be endemic to the New World. The systematics of the order are almost entirely based upon the characters of the males. The females are neotenic to a great extent and show but few characteristics. So far no features have been discovered to enable the genus or even the family of the females or of immature specimens to be identified. The best, or almost the only means, is to identify these by their definite association with known males. It is interesting to note that in the New World there are in the Clothodidae species showing the most generalized structural features of the order, and in the genera *Oligotoma* and *Chelicerca* those showing some of the highest specialization. The memoir, which extends to more than one hundred pages, includes 156 very clear text-figures illustrating structural details of the various species together with one photographic plate of wing venation. A work of this kind greatly aids in the identification of the insects concerned, and it is hoped that it will stimulate field collectors and students to devote attention to this peculiar but neglected order of insects.

Witches' Broom of the Cacao

AN interesting study of the ecology of a parasitic fungus is described by R. E. D. Baker and S. H. Crowdy (Memoir No. 8, Dept. of Mycology and Bacteriology, Imp. Coll. Trop. Agric. Trinidad, Jan.

1944). The paper deals with field studies and control methods of the witches' broom disease of cacao, caused by *Marasmius perniciosus*. The malady has assumed serious proportions of recent years, and several types of broom have been described in earlier publications. Broom formation is maximal in January or February, and minimal in June or July. Cacao trees bloom all the year round, and cushion brooms are strongly and positively correlated with the numbers of flowers at any one time. The disease appears to be more closely associated with flowering than with vegetative growth. Shoot growth flushes five or six times a year, and fan brooms appear with the flush, though the total amount of shoot growth has little effect upon the numbers of brooms. It can apparently affect pods only at an early stage of development. Eradication of the fungus by direct methods does not appear to be feasible, and the search for immune or highly resistant varieties of cacao seems to provide the only practicable possibility of control.

Development of the Eye in *Drosophila*

A. G. STEINBERG (*Proc. U.S. Nat. Acad. Sci.*, **30**, 5; 1943) has shown that the character 'bar eye' in *Drosophila* is controlled by the reduced size of the eye disk in embryo and by the fate of labile cells in the larval stage. These cells may either take part in eye formation or be transformed into chitin, according to the influence of external or internal causes. For mutants such as the 'lobes' and 'eyeless' in *D. melanogaster*, it would be interesting to know whether they developed in a similar way. Steinberg provides evidence that this is the case.

Electrical Resistance Strain Gauges

A PAPER read recently in London by S. F. Dorey before the Institution of Mechanical Engineers deals with the measurement of static strains using electrical resistance strain gauges in conjunction with a Wheatstone bridge, and having a cathode ray oscillograph instead of the usual galvanometer. The advantages of this arrangement are indicated in the paper, and it is shown that stresses so low as 250 lb./sq. in. can be measured readily under workshop conditions, provided the correct technique is applied. Methods of calibration of this equipment and also its use in two specific problems are described.

Bonding and Earthing of Single-Core Cables

AN article by E. A. Beavis and C. W. Schofield (*Eng. Supp. Siemens Magazine*, No. 216, April/May 1944) discusses the provisions which should be made for the bonding and earthing of metal-sheathed single-core paper-insulated lead-covered cables in three-phase installations. The subject is considered from the points of view of the sheath voltages which arise when the cables are bonded and earthed at one point only, and of the circulating currents which flow along the sheaths when multiple bonding and earthing is employed. The type of installation to secure minimum transmission losses, characteristics of various types of installations, earthing and bonding for various types of installations, and theoretical considerations of induced voltage and sheath current are discussed and, finally, the authors give some practical test results. The investigation covers cables for voltages of from 1 kV. to 33 kV., of cross-sectional areas of 0.25–1.5 in.² according to

voltage, and at cable spacings ranging from 2 in. to 120 in. Provided sheath voltages are not allowed to reach dangerous values, especially under fault conditions, it is concluded that earthing and bonding at one point is the ideal arrangement.

Flow of Current between Electrodes on a Metal Surface

A PAPER by the late Prof. W. M. Thornton describes investigations carried out on this subject (*J. Inst. Elec. Eng.*, **91**, Pt. 2, No. 20; April 1944). Measurements of the thickness of metal plates or tubes from one side only can now be made by a direct-current electrical method. In the 'four points in line' method a low voltage is applied by point contacts to the surface and the potential drop between them observed. In B. M. Thornton's 'six points in line' method there are two pairs of points on which the potential is observed, and in Warren's 'eight point' method the electrodes are arranged in two squares. On account of the spread of the current, the readings on the potential points differ and their ratio is an indication of the thickness of the plate. The six- and eight-point methods give values for the thickness that are independent of the resistivity of the metal. The theory of the flow of current between two electrodes in an infinite plate is well known; but the surfaces to be examined for thickness are in practice restricted in area and have boundaries which are not always of regular shape. The influence of proximity of the electrodes to a free edge has been previously examined. The paper deals with the flow of current between point electrodes in circular and elliptical areas, a square, a rhombus, narrow and wide lenticular areas and a narrow lune. The flow between points on the surface of metal tubes is considered. Results obtained by the 'six points in line' method are quoted and a collection of derived formulæ is added.

Flow of Fluid through a Nozzle

THE equations of motion of a compressible fluid, such as steam, through a nozzle present great difficulty even when the fluid is assumed to have no viscosity. Osborne Reynolds's well-known treatment (1886) applied only to the one-dimensional case when the velocity was uniformly distributed over each cross-section. In two dimensions very few exact solutions are known, and these relate to cases which are not realizable in practice. Rayleigh (1916) proposed a method of successive approximations. Taylor and Sharman (1928) used an electrical analogue to obtain solutions by experiment; their method failed when the speed exceeded the local speed of sound. A recent paper by J. R. Green and R. V. Southwell (*Phil. Trans. Roy. Soc., A*, **239**, 367; 1944) gives an approximate numerical method based on Southwell's general method of 'relaxation', which he has applied to a whole series of engineering problems. Given the shape of the nozzle, the first step is to use a conformal transformation of this shape into a rectangle. The exact differential equations are replaced by approximate equations of finite differences, which are easier to solve. Then, in accordance with the relaxation technique, the error of these approximations is expressed in terms of 'residual forces', and finally these 'forces' are 'liquidated', that is, reduced to negligible magnitudes. Like the electrical method, the relaxation method fails when the speed exceeds that of sound. An alternative method, not yet fully worked out, is proposed to deal with this case.