complexes play an important part in their chemical structure (see Bourne, *loc. cit.*). The 'liberation' of mitochondrial lipoids, therefore, might well result in an upsetting of the enzyme systems of an animal and lead to irreversible heat injury. There is evidence in the literature that heat can cause a break-up of mitochondria in a wide range of organisms including plant cells, frogs, fish, guinea pigs and rabbits (see references in Belehradek[3], and MacCardle[7]). It seems possible, therefore, to suggest tentatively that heat injury is due primarily to a break-up of mitochondria and a consequent disruption of enzyme balance. In the case of fully grown blow-fly larvæ, if a dehydrogenase system is truly involved in preserving this balance, its inactivation during heat injury may be through the mitochondria rather than a direct effect of heat.

Part of the work mentioned above was carried out some time ago at the Imperial College of Science and Technology, London. It will be continued, and full details published elsewhere.

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[1] Dennell, *Nature*, **154**, 57 (1944).
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[4] Fraenkel and Hopf, *Biochem. J.*, **34**, 1085 (1940).
[5] MacBride and Hewer, in Piney's "Recent Advances in Microscopy" (London, 1931).
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Mode of Entry of Contact Insecticides

Investigations now being carried out by us into the use of D.D.T. for the elimination of tsetse (*Glossina* spp.) have led to observations which have a bearing on the mode of entry of some contact insecticides. This problem seems generally to have been considered only in connexion with the usual methods of using contact insecticides, in which the object is to bring the poison, either by spraying or by dusting, into maximal contact with the general body surface of the insect. Mr. Napier Bax has pointed out to us an exception to this, for Tutin[1], so long ago as 1928, does record an observation in which two Carabid beetles and a Cicindelid died after being placed in a dish previously sprayed with an emulsion containing a rape-oil solution of pyrethrum, after the emulsion had dried. Nevertheless, no general attention seems to have been paid to the mere contact of insects with a sprayed surface. Thus Roy and Ghosh[2], discussing as recently as July 1944 various views on the mode of penetration of pyrethrum, and particularly those of Wigglesworth[3,4], record observations which led them to the conclusion that pyrethrum normally enters the insect body through the spiracles.

Our approach has been along the lines of Tutin's observation and therefore somewhat different from the one generally adopted; thus tsetse have been brought into contact with D.D.T.- and pyrethrum-covered surfaces through the feet only, flies being allowed to sit on the prepared surface or held over it with just their feet touching, for various specified periods. Contacts as short as five and even two seconds have proved fatal. One of us (F. L. V.) has demonstrated the presence of particles of D.D.T. on the pulvilli of flies so treated, and from observations on insects with varying degrees of pulvillar development it appears that the action of these poisons is more rapid when the pulvilli are well developed. Death has followed in the case of D.D.T. after intervals of half an hour or more, so that here we cannot completely dismiss the possibility of carriage of the poison to the spiracles from the pulvilli in the flies' efforts to rid themselves of the irritating particles. But death from pyrethrum has been so graphically rapid that no such explanation is tenable; thus repeatedly tsetse given a few seconds contact with the pyrethrum-treated surface have become completely paralysed in the interval between the removal of the fly from the poisoned surface and the handing of its tube to the recorder for marking. This rapid 'knock-down' action of pyrethrum is, of course, well known, but wears off so rapidly that the contact effect has not much practical application; it is the enduring quality of D.D.T.'s insecticidal principle that opens up possibilities of using the contact effect in a practical manner.

The experiments referred to have been carried out on the haired surface of small pieces of dried cattle hide treated with various strengths of D.D.T. (and pyrethrum) combined with various adhesive solutions (such as local gum, serum, wax, resin, etc.) and left to dry; it is therefore unlikely that any emanation entering through the spiracles can be held responsible for the effect, but further experiments are to be carried out. It is also very noticeable, particularly with the slower acting D.D.T., that the first symptoms of actual distress, apart from cleansing movements of the legs somewhat more persistent and continuous than usual, are convulsive movements of the legs, which suggest that their nervous control is the first activity to suffer interference.

Work is proceeding, but these observations do suggest that certain insecticides need not necessarily be applied in such a way as to bring about either penetration of the general body cuticle on a large scale, or entry through the spiracles; but that their action can be equally effective through contact of the feet alone, at any rate in species with well-developed pulvilli.

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April 13.

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Congo Red Fibrin Powder for Experiments on Proteolytic Enzymes

Stained fibrin substrates are sometimes used for experiments on proteolytic enzymes. Grutzner[1] used fibrin stained with carmine to estimate the amount of pepsin in a solution. Carmine fibrin cannot be used for testing for trypsin as the dye is dissolved out of the fibrin by alkalis. The difficulty was overcome by Roaf[2], who as early as 1908 used Congo red instead of carmine. Congo red is not dissolved out of the stained fibrin by hydrochloric acid or by sodium carbonate, and can thus be used for experiments on both trypsin and pepsin. Roaf first used a moist preparation which was preserved in equal parts of glycerol and water to which a little toluene