clear that the preliminary experiments here reported do not provide any answer to the obvious question whether, in *Tenebrio*, (II) or (III) themselves take part in the hardening process, or whether they are intermediate products in the conversion of 3 : 4-dihydroxyphenylalanine to protocatechuic acid, which then acts as hardening agent.

On the mechanism of the hardening process itself, we have as yet made only a few preliminary studies, and our results will be communicated at a later stage. It would, however, seem likely that it is brought about by the condensation of the oxidized *o*-dihydroxy acid with protein chains to form stable cross-linked structures in which the nitrogen originally present in free amino-groups becomes directly attached to the aromatic nuclei. Such a reaction, which would give structures resistant to the attack of hydrolytic agents, has its analogy in the well-known condensations of quinones with amines, and in particular that of *p*-benzoquinone with glycine[9]. This hypothesis appears to be in harmony with all the known facts about the hardening process.

The failure to detect any phenolic acid in the *Lucilia* larvæ examined is rather striking and requires further study. It may, however, be bound up with the fact that darkening of the puparium in *Lucilia* is slower, and the final colour paler, than in *Calliphora* or *Sarcophaga*, so that the hardening agent may only be present in very small quantity at any one time. The function of the considerable amount of succinic acid isolated is obscure, but it is probably derived from the larval blood, since it has also been isolated from the blood of *Gastrophilus* larvæ[10].

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Permeability of Insect Cuticle

I HAVE chanced to make an observation, at present unexplained, which may throw light on the properties of insect cuticle.

The leg of the cockroach (*Periplaneta americana*) is somewhat transparent, and it is easy to observe the main trachea through the cuticle. If one puts a drop of water on the exterior of the leg, just over this trachea, minute droplets appear almost instantaneously inside the trachea. In all cases the droplets appear only in that length of the trachea which is covered by the outer drop. These droplets later coalesce, and if the water drop on the outside of the leg is allowed to evaporate they eventually disappear.

The droplets do not wet the intima of the cuticle, and are judged to consist mainly of water. They appear in both the amputated and living leg ; if, however, the trachea is collapsed by mechanical pressure, etc., this phenomenon does not occur.

Similar droplets were also observed with certain other liquids (acetic acid, benzene, ether, etc.), but they disappeared more quickly than in the case of water. Droplets, however, did not appear with glycerine.

The droplets which appear in the trachea might be due to cooling and condensation of water following evaporation of the drop on the surface or to some osmotic effect, if one could postulate penetration of liquid through the cuticle. Direct chilling of the leg failed to produce this phenomenon, but if a drop of water is placed on a chilled leg, droplets still appear in the trachea. In the latter case temperature is gradually rising, so there is no question of further chilling. Moreover, arguing on theoretical grounds, the amount of water appearing in about 1 mm. length of trachea is much more than can be accounted for even assuming that the air inside the trachea is 100 per cent saturated and all the water vapour condenses. To test the second possibility, distilled water, a series of salt solutions (from 0·7 to 1·5 per cent) and cockroach blood were tried. In each case the droplets appeared. It is evident, therefore, that the droplets are not due to physical or chemical differences between external liquid and tissue fluids.

The cuticle of *Rhodnius* is sufficiently transparent, and it is easy to observe the main trachea through the cuticle in the abdominal segments on the dorsal side. Droplets can be produced in it by applying water externally.

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Structures of Ethylene Oxide and *Cyclo*propane

THE recent communication of Walsh[1] includes several statements which are open to question. The suggestion that the reactions of ethylene oxide are at present considered to be due to instability caused by ring-strain is not acceptable without qualification and explanation. Nobody, one hopes, still retains any purely mechanical idea of strain such as one finds in the springs of models. Nowadays reactions are universally attributed to the functions of electrons and nuclei, and an interpretation of the special reactivity of such a series as acetylene, ethylene, *cyclo*propane and *cyclo*pentane can surely be found by the application of quantum mechanical principles to the usual formulæ. These represent nothing more than the mode of linking of the atoms in the molecule, combined with an indication of the degree of symmetry of the statistical distribution of electrons. Thus we may be confident that the ring-binding in *cyclo*propane has the symmetry of an equilateral triangle, that in ethylene oxide of an isosceles triangle, and that of propylene oxide of a scalene triangle. The usual formula for *cyclo*propane is therefore as satisfactory a symbol as can be devised.

The statement that trimethylene oxide is less stable than ethylene oxide is surely incorrect. Is this a case of the old confusion between stability (or reactivity) and ease of formation ?

Again, the reactions of ethylene oxide are not to be compared with those of ethylene as stated by Walsh ; they are, however, very similar to those of acetaldehyde. Under ordinary conditions of tem-