Fig. 2. Crystals from ethanol of the 'brain' hormone. ($\times c. 17$)

obtained from the colourless, active solution in the process of cooling to -18°C .

Using one of the afore-mentioned three parts as material, recrystallization was repeated with acetone and ethanol. 4 mgm. of a crystal was obtained from 3,539 mgm. of crude but active extract of the 'brain' hormone after these treatments (Fig. 2). The melting point of the crystal was $142^{\circ}\text{--}143^{\circ}\text{C}$. Both ultra-violet and infra-red spectra were examined.

Thirty-seven days old 'dauer-pupae' (artificially diapausing, 'brainless' pupae) of *Bombyx mori* were prepared for use in the bioassay. When $0.02\text{ }\mu\text{gm.}$ of the crystal which was dissolved in 0.01 ml. of ethanol was injected into each 'dauer-pupa' of *Bombyx mori*, five injected animals emerged respectively as moths on the 22nd (♀), 24th (♂), 28th (♀), 29th (♀) and 35th (♂) day following injection. However, no moth emerged from 38 control animals which were either not injected or mock injected with 0.01 ml. of ethanol without the crystal, for 100 days following pupation.

These results show that the crystal is the most important factor of the active principle of the 'brain' hormone.

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A Change of Phototaxis and a Tropotactic Response by Larvæ of the Mustard Beetle

De Ruiter and van der Horn¹ have reported on changes in phototaxis during the larval life of *Smerinthus ocellata* L. and mentioned the problem of functional significance. Preliminary work by me on the olfactory responses of the larvæ of the mustard beetle, *Phaedon cochleariae* Fab., were hampered for a time by complete reversals of results obtained in earlier replicato olfactometer tests. The cause proved

to be a response to light, and experiments similar to those of de Ruiter and van der Horn gave results comparable with those obtained by those authors, with larvæ generally positively phototactic at the beginning of an instar and negatively phototactic at the end. Observations of larval behaviour in the rearing cages showed that larvæ about to moult moved to the darker areas of the food-plant, mainly the underside of the leaf, so that the negative phototaxis shown by the larvæ is probably a response which gives protection during moulting.

After selection for equal aged larvæ in the olfactometer tests an additional response, this time to touch, was observed. In the experimental procedure two larvæ were used at a time, one at each side of a test airstream which occupied the centre of the chamber and contained the odour. A score of 0 or 1 was given, depending on whether the larvæ moved into, or away from, the test air-stream. It was found that a strong bias could be given to the results, for, when the larvæ were transferred to the chamber with a moist camel hair brush, they tended to move away from the side on which they were picked up by the brush. To overcome this, pairs of the 200 larvæ used were transferred in individual tests with the brush alternately on the opposite side of the body.

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MICROBIOLOGY

A General Structure for Cell Walls of Gram-Negative Bacteria

THE cell walls of a number of Gram-negative bacteria have been shown to contain a mucopeptide component similar in composition to that which forms a major fraction of the cell walls of Gram-positive bacteria¹. We have recently analysed the cell walls of an *Escherichia coli* mutant 26-26 requiring lysine for growth. A mucopeptide was isolated from cell walls by the procedure described by Mandelstam² which contained glucosamine, muramic acid, alanine, glutamic acid, diaminopimelic acid, serine, lysine and aspartic acid as major components. An ethanol-insoluble fraction from trichloroacetic acid extracts of cell-wall preparations contained on hydrolysis all the amino-acids found in the mucopeptide and also ribitol, phosphate and glucose. These results suggest that the cell wall of this organism contains the characteristic mucopeptide and in addition a ribitol teichoic acid³.

E. coli 26-26, grown in a minimal medium supplemented with sub-optimal amounts of lysine, accumulated inside the cell various precursors of these cell-wall components including uridine nucleotide mucopeptides. It also released into the growth medium uridine and cytidine nucleotides, diaminopimelic acid and lipomucoprotein⁴.

The mucopeptide component represents the rigid layer described by Weidel, Frank and Martin⁵ in *E. coli* B. They concluded that the cell wall consists of three layers of which the innermost is the rigid mucopeptide and the middle lipopolysaccharide with lipoprotein forming the outermost layer. The uridine nucleotide mucopeptides accumulated by *E. coli*