

through the cuticle, one point remains to be mentioned. The ease with which the contents of the canals are revealed by splitting the cuticle indicates that there is no fusion between them and the surrounding endocuticle; indeed there may exist around each filament a small annular space which might well be involved in insecticide penetration.

In conclusion, it should be stated that the cuticle of the Cyclorrhaphous third larval instar is probably specialized in connexion with its ultimate conversion into the puparium, and that chitinization of pore canal contents may not be of widespread occurrence. Nevertheless, a renewed examination of the cuticles of a number of diverse insects would be of interest.

A full account of the work of which these results form a part will be given later.

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<sup>1</sup>Wigglesworth, V. B., *Bull. Ent. Res.*, **33**, 205 (1942).

<sup>2</sup>Richards, A., and Anderson, T. F., *J. Morph.*, **71**, 135 (1942).

<sup>3</sup>Holmgren, N., *Anat. Anz.*, **20**, 480 (1902).

<sup>4</sup>Plotnikow, W., *Z. wiss. Zool.*, **76**, 333 (1904); see figs. 8 and 10.

<sup>5</sup>Berlese, A., "Gli Insetti", vol. 1 (Milan, 1909).

<sup>6</sup>Wigglesworth, V. B., *Quart. J. Micro. Sci.*, **76**, 269 (1933).

<sup>7</sup>Campbell, F. L., *Ann. Ent. Soc. Amer.*, **22**, 401 (1929).

### The Term *Tractellum* in Flagellate Organisms

In the latest number of the *New Phytologist* an article appears under the heading of "Recent Work on Flagellar Movement", by D. Barker of the Department of Zoology and Comparative Anatomy, Oxford<sup>1</sup>.

Though there is considerable difference of opinion apparently on the structure of flagella or cilia there is now no difference of opinion on one fundamental point, and that is that the waves or disturbances start at the base of the flagellum and not at the tip. This being so there can be no such thing as a tractellum. The whole misconception originated so far as I can gather with the flagellum of *Peranema trichophora* (Ehrbg.) Stein, as described and figured by Verworn<sup>2</sup>.

Direct photographic evidence, taken from the high-speed cinema film, that the waves start at the base of the flagellum of *Peranema* and not at the tip was given in NATURE so long ago as 1936<sup>3</sup>. We know that in all cilia lining epithelial structures so far investigated, and also in the frontal and abfrontal cilia or flagella on the gills of *Mytilus* or *Modiolus*, the waves start at the base, and the same is true for all sponges so far as we know. Finally, the same has been shown to be true for more than a dozen different species of flagellates, and there is no direct evidence of it starting from the distal end.

It seems, therefore, highly desirous that the term *tractellum* should disappear from all text-books, elementary or otherwise, until direct photographic evidence of its existence is produced.

In the majority of flagellates the flagellum or flagella are attached to the anterior end of the cell, but to use an apt expression of a colleague, the organism is not *pulled forward by its hair but it is pushed forward by its nose*.

Actually the anterior end of the cell is pushed round by the flagellum and the whole cell thus made

to rotate and gyrate about a given axis, and this of itself is sufficient to supply a forward component on the simple mechanical principle of the inclined plane.

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<sup>1</sup>Barker, D., *New Phyt.*, **42**, No. 1, 49 (1943).

<sup>2</sup>Verworn, M., *Pflugers Archiv.*, **48**, 149 (1890).

<sup>3</sup>Lowndes, A. G., NATURE, **138**, 210 (1936).

### How the Sperm Reaches the Archegonium in *Pellia epiphylla*

In text-books on botany *Pellia epiphylla* (L.) Corda is very often chosen as an example of the liverworts, and hence any information about its structure and biology is of interest. It has no doubt been chosen because it has, in comparison with the majority of liverworts, a relatively massive gametophyte and a large sporophyte; it is also a widely distributed and common plant.

It is usually assumed that the sperm swims by means of its two flagella from the antheridium to the archegonium, which contains the ovum. The archegonia are, however, placed at the apex of the plant and the nearest antheridia are 5-10 mm. distant on the dorsal surface. Showalter has shown that free sperms in a closely related genus (*Aneura*) may take several hours to spread a distance of 10 mm. In previous investigations<sup>1</sup> it was found that in many mosses and liverworts it was the spermatocytes, each of which contains a single sperm enclosed in a membrane, which were liberated from the antheridia, and that these were carried rapidly by the agency of surface tension over the free water surface at a rate of about 20 mm. per minute.

In June 1943 plants with ripe antheridia were taken and their upper surfaces wetted. The spermatocytes were seen to be extruded in grey masses into the water, and when these reached the surface their spermatocytes were seen to break apart and disperse over the wet surface with great rapidity. The spermatocytes reached the archegonial involucre in about fifteen seconds. It takes about fifteen minutes for the free, swimming sperm to emerge from the spermatocyte, so that from the time of opening of the antheridium only a little more than fifteen minutes would elapse before free, swimming sperms were at the archegonia. If the transport of a sperm from an antheridium to an archegonium depended on its swimming powers alone, it would take several hours for it to reach the archegonium, and in that time the wet surface of the thallus might become dry.

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Muggoch and Walton, *Proc. Roy. Soc., B*, **130**, 448 (1942).

### A New Method of Electrical Testing, Applied to Insulated Wires

A DIFFICULTY was experienced recently in carrying out some electrical tests on enamelled wires at temperatures up to about 120° C. Pairs of wires were twisted together in accordance with B.S.