OBSERVATIONS ON VASE-SHAPED, IRON-CONTAINING HOUSES OF TWO COLORLESS FLAGELLATES OF THE FAMILY BICOECIDAE

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Microscopy of coverslips that had been allowed to float on water from an aquarium standing over sand in a deep Petri dish revealed the presence of two kinds of colorless flagellates living in stalked, transparent vase-shaped houses (Fig. 1).

One of the flagellates inhabits an urn-shaped house which in my material was invariably attached to the sheath around chains of the bacterium *Sphaerotilus natans*. The other flagellate builds flared cups on relatively long stalks attached directly to the substrate (Figs. 4 and 5).

Collodion-coated grids for electron microscopy were placed on the surface of the water and on the following day were found to have been settled by the two flagellates, *Sphaerotilus natans*, and many other microorganisms. To the water in the dish was added an equal volume of 10 per cent neutral formalin and 10 minutes later the grids were removed, rinsed 3 times in large volumes of distilled water, dried in air, and without further treatment were examined in a Philips electron microscope (100-A). The houses of the flagellates were transparent and were marked by closely spaced transverse lines (Figs. 2 and 3). The urn-shaped variety was striated only in its lower half, but the flared cups bore a pattern of similar but more widely spaced transverse lines right up to the lip. At first glance the lines seem to run parallel to each other but closer inspection reveals that those marking the flared cup shown in Fig. 4 are really turns of a very shallow helix. I am indebted to Mr. Roderic Pontefract of our laboratory for pointing this out to me.

From a photograph (Fig. 1) and electron micrographs submitted to him since the Arden House Meeting, Professor E. G. Pringsheim of the Pflanzenphysiologisches Institut at the University of Goettingen, Germany, has recognized the flagellates as members of the genus *Bikosoeca*, discussed in detail by Picken (1941) and Pringsheim (1946). The precise identity of the organism shown in Figs. 1 and 2 is in doubt, but Figs. 4 and 5 are almost certainly *Bikosoeca petiolata*.

Pringsheim (1946) has discovered that the houses of some Bicoecidae con-

tain inorganic iron. I have been able to confirm this finding for the two species here illustrated, both of which gave a ferroferricyanide (Prussian blue) reaction after Tirmann and Schmelzer[1] (Fig. 5).

The presence of iron in the houses of the two flagellates probably explains why they show so much detail in electron micrographs without having been either shadowed with metal or impregnated with osmium or phosphotungstic acid.

Thanks are due to the Atkinson Foundation, Toronto, for providing the department with an electron microscope.

REFERENCES

1. Picken, L. E. R., On the Bicoecidae: a family of colourless flagellates, *Phil. Tr. Roy. Soc. London, Series B*, 1941, **230,** 451–473.
2. Pringsheim, E. G., On iron flagellates: a family of colourless flagellates, *Phil. Tr. Roy. Soc. London, Series B*, 1946, **231,** 311–342.

[1] As described in Mikroskopische Technik by B. Romeis, Munich, Leibniz Publishers, 15th edition, 1948, 282, § 1204.

EXPLANATION OF PLATES

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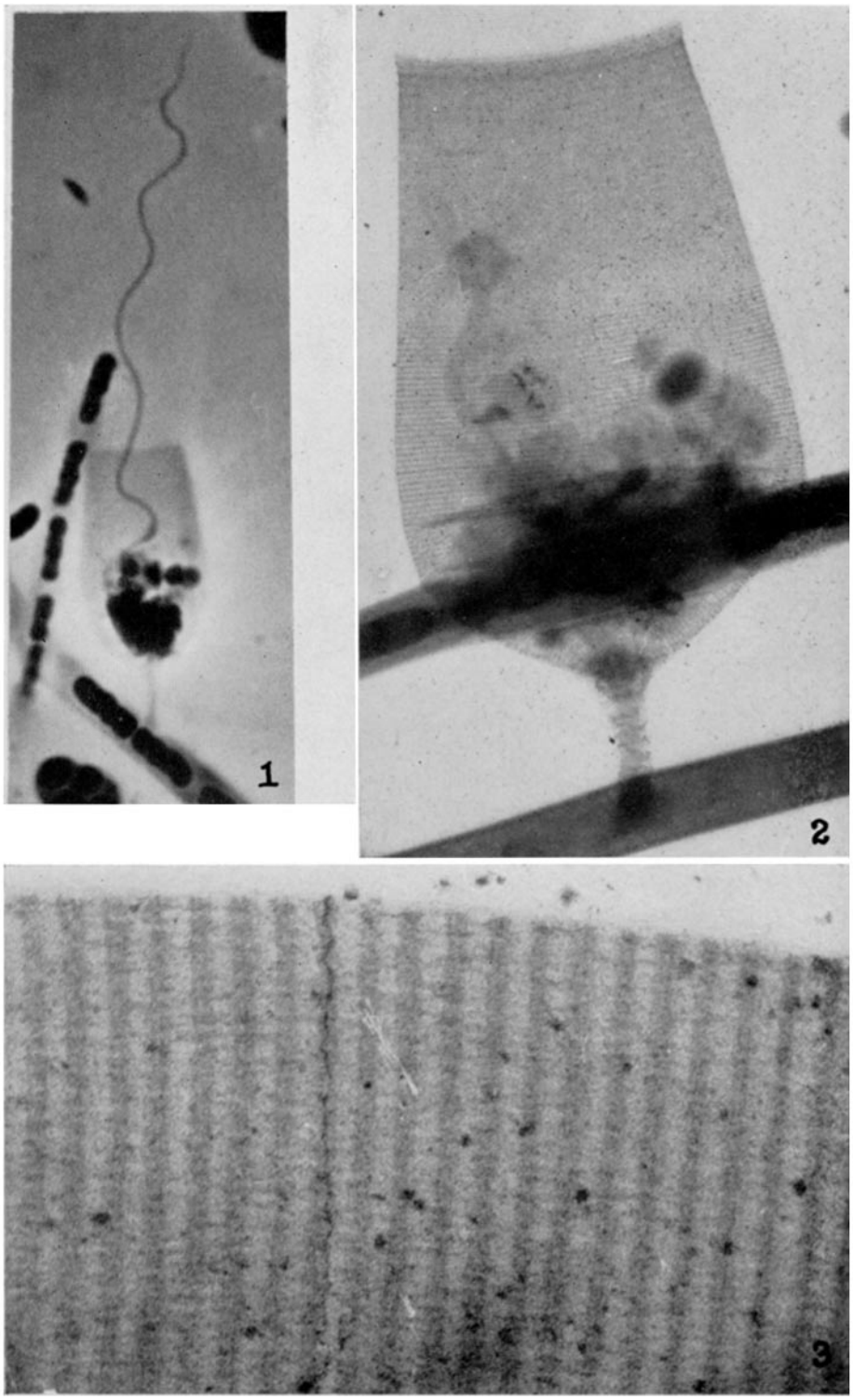
FIG. 1. Stalked house of flagellate attached to a chain of *Sphaerotilus*. Photomicrograph of an air-dried film covered with nigrosin; printed as a negative. × 2700.

FIG. 2. Electron micrograph of the urn-shaped house and disintegrated remains of flagellate of the type shown in Fig. 1. Formalin. × 12,000.

FIG. 3. Detail from the left edge of the house shown in Fig. 2. × 66,000.



(Robinow: Houses of two colorless flagellates)

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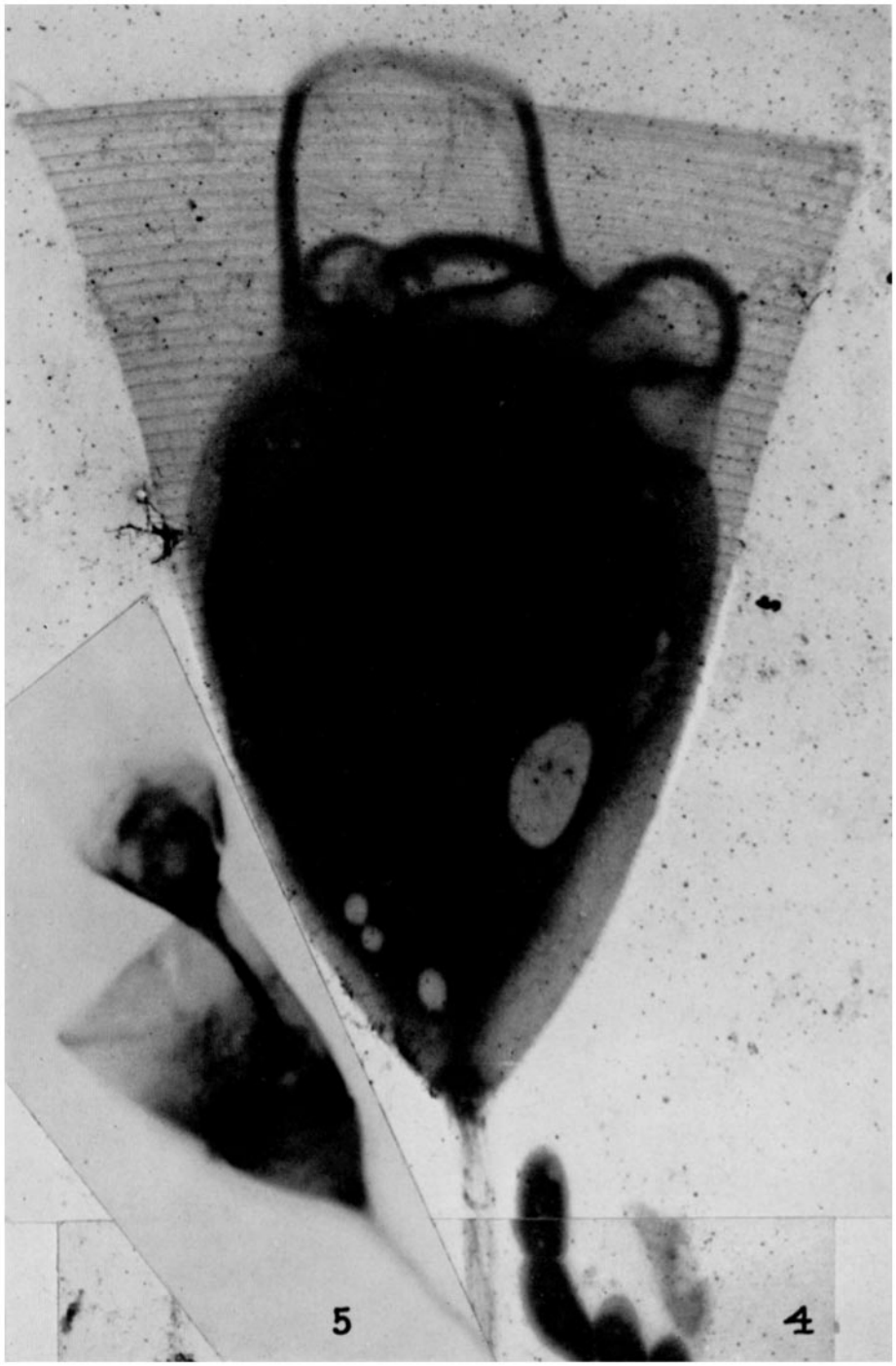
FIG. 4. Shallow helix in the wall of the stalked, cup-shaped house of a flagellate tentatively identified as *Bikosoeca petiolata*. 5 per cent formalin. Magnification approximately 16,000.

FIG. 5. Photomicrograph of Prussian blue reaction demonstrating the presence of iron in the house of *Bikosoeca petiolata*. The wall of the upper portion of the daughter organism growing towards the top right corner is too faintly stained to show in his illustration, but it is visible in the negative of this photograph. × 2700.



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