

## 50 Years Ago: “Barring the Door with the Head”

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None of us would think of putting his head in the smallest open window as the best means of locking up the house for the night. There are certain animals, however, that actually employ such means. For example, ants that live in the cavities of plants close the natural “look-outs” with their heads, which have precisely the size and shape requisite for the purpose. The Cuban toad, *Bufo empusa*, stops up the entrance of its hole in the same way. This creature’s head is its hardest part, but such “hardheadedness” is not general, and, to take another example, the South American spider *Cyclocosmia truncata*, prefers to employ for the end in view the stopper-shaped part of its hind-quarters, and trusts to this to resist intrusion or irritation.

Under the microscope one may observe the same kind of thing, as is demonstrated by the accompanying micrographs. The construction of protective sheaths or tubes is, of course, common among unicellular organisms — one need recall only the *Thecamebae*, which carry their cases with them. Among the ciliates is a small group, to which the *Vorticellidae* belong, which construct jackets. These are often the mucous coverings, as in *Ophrydium*; but among *Vaginicolidae* (I employ Dahl’s classification in “Die Tierwelt Deutschlands”) there are numerous forms of loricated ciliates. The material of their coats is not established, but it may be likened to the chitin of insects, and the term “pseudochitinous” is used.

The feature of special interest is the valve or operculum, i.e., the trapdoor of certain of these sheaths. In the genera possessing it, the operculum is part of the

sheath, to which it is attached by a membrane. When these animals contract in response to disturbance or danger, the membrane draws the doors behind them and the lorica is thus barred. This is a common occurrence, nevertheless we recognise with admiration the complicated mechanism of this protective device.

An operculum of the kind mentioned is present in the genus *Pyxicola* also, but here it is part of the body. In these forms the operculum is placed on one side of the ciliary disc. The photomicrographs show the successive stages of the opening of the “door” of the lorica. In Figure 1 we see the animal, fixed by its pedicel to an algal thread, about to emerge from the lorica. The operculum, which can be seen to be fairly strong and robust, has just been raised from the walls of the collar. This, as also the whole form of the sheath (of which more presently) is well shown in the illustrations.

Figure 2 shows that the animal no longer fills the lower part of the lorica, for the corresponding portion of the body substance is now protruded, which explains why the operculum begins to lean over to one side. In Figure 3, the extension of *Pyxicola* has gone further and its body has become slimmer in the lorica. The tilt of the operculum is obvious, and already some the cilia begin to show. Figure 4 displays them clearly, and the operculum is now turned under the unfolding disc.

Through the clearly transparent pseudochitinous sheath one can see a number of vacuoles in the animal’s body, as to the function of which, however, no details can be made out from the pictures, the first four of which, taken in quick succession, show the same ani-

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\* Reprinted from the January/February 1958 issue of *The Microscope*. Photomicrographs by Karl Löfflath, Munich. Translated from *Mikrokosmos*, 46 Jahrgang, Heft 7, 1957

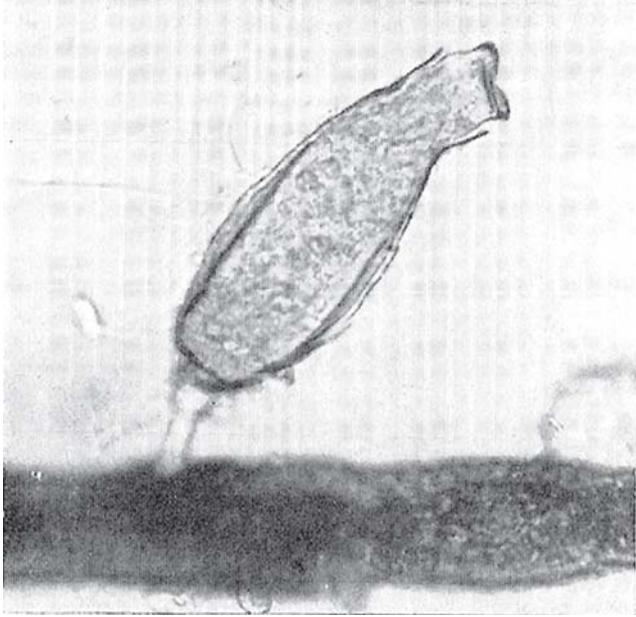


Figure 1. *Pyxicola* sp. The operculum is freed from the collar aperture.

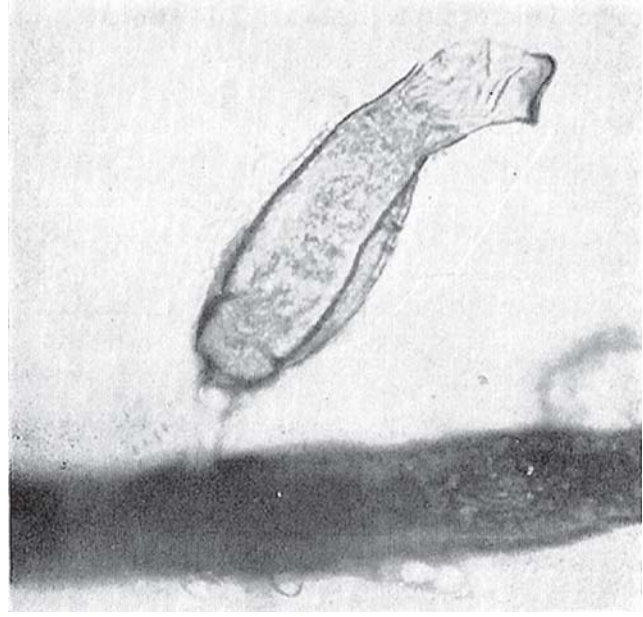


Figure 2. The animal protrudes further from the lorica.

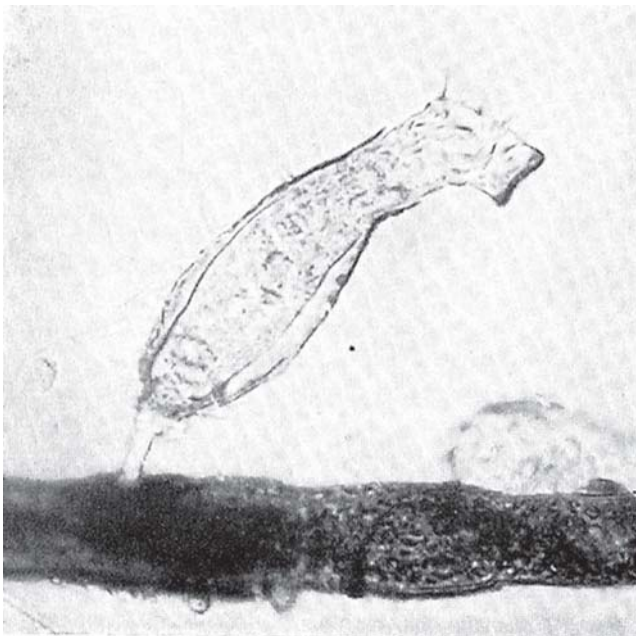


Figure 3. The operculum turns aside. Cilia begin to unfold.

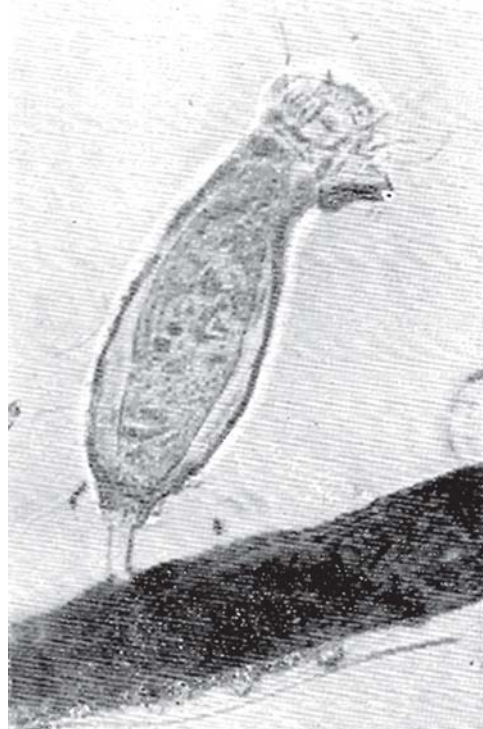


Figure 4. The operculum is thrown back. Space appears between body of animal and walls of lorica.

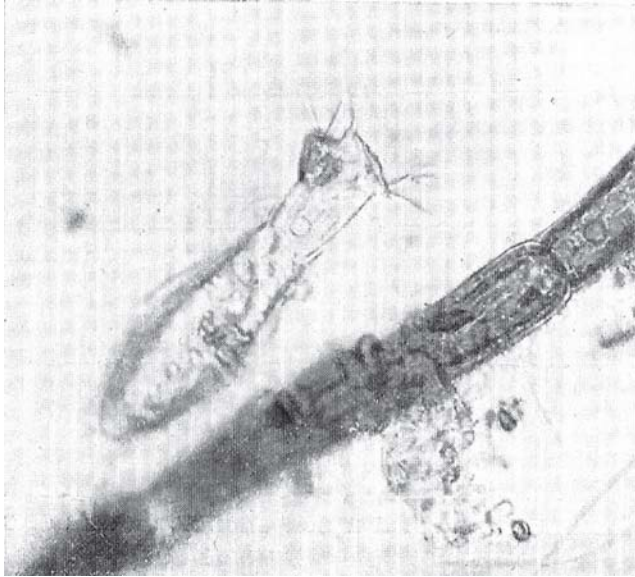


Figure 5. Cilia and vacuoles become visible.

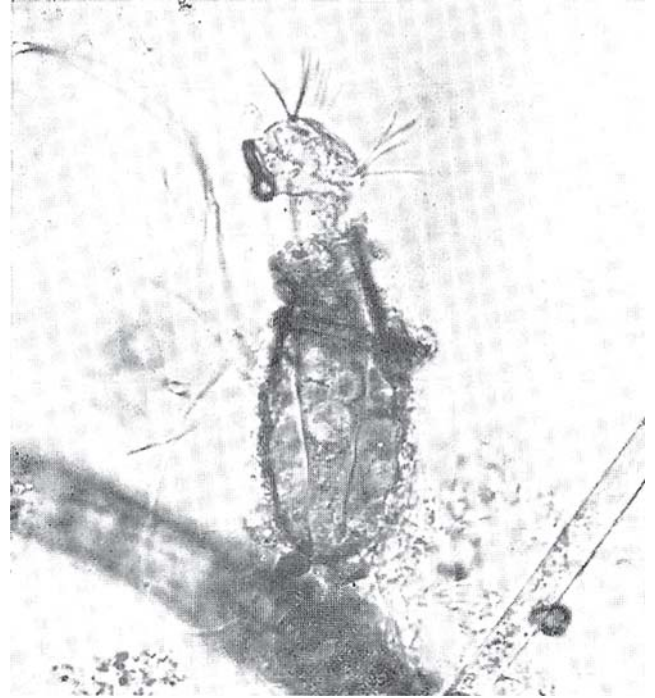


Figure 6. Ciliary wreath fully unfolded.

mal. In Figure 5, which was taken from another example, the collar of the lorica is visible, and a very considerable part of the body is protruded. Some of the cilia are clearly seen, for, while this is not possible by objective observation through the microscope, owing to the rapid beat of the cilia, this record was obtained by electric spark exposure.

Figure 6, again from another individual, makes the ciliary disc very plain and shows also that the rim of the operculum is stiffened. The neck of the lorica, the slenderest part of the collar, rises from a thick border of the algae or detritus, and the collar is here seen laterally, whereas the other figures all show it an optical section. The slim body of the animal in the lower part of the lorica stands out plainly, filled with vacuoles, and the large space between the walls of the lorica and its occupant is well marked.

One may wonder how it is possible for the organism to construct such a sheath with which its body is not in contact. Entz, Faure and Penard have studied the process, and have given the following explanation: The animal fixes itself by the foot and then forms a pedicel with a secretion that hardens. *Pyxicola* now contracts, causing the body to swell and thus produc-

ing the broad lower portion of the lorica. With the stretching of the body the upper part of the lorica naturally becomes narrower, leading finally to the contracted neck and collar. The dimensions of the operculum attached to the infusorian must of necessity conform to the aperture of the collar.

Occasionally two animals are to be seen together in one lorica, the result of fission. Owing to the crowding, one (or both) of the tenants must migrate and form a new shelter. Quite often one sees at the base of the lorica several very small individuals, up to the number of eight or so, which are either fixed to the bottom of the beaker or are swarms equipped with circlets of cilia. These are microconjugants into which the parent has broken up. They issue forth and enter the lorica of another individual, and fuse with it.

In the Family *Vaginicolide* the genera contain very many species. Particularly numerous are the epizotic forms, which attach themselves to larger animals, but not as parasites. Most of them are "specialists" and always seek a particular "horse" on which to ride. The *Pyxicola* mentioned in this account (the species could not be identified) is, as the illustrations show, found on algal threads and other weather plants.