WINTER IS FOR MICROSCOPY
III.
SOME PROTOZOA

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In Part I, in the April 2015 issue of *Micscape* showing some unicellular algae, I wrote:

"*It's now time to take a brief look at some of the multicellular algae, the filamentous algae, and the aquatic protozoa.....*
to be continued.*"*

Part II (July 2015, *Micscape*) looked at some multicellular and filamentous algae;
Part III considers some of the winter protozoa.

The term "Protozoa" is a taxon of convenience consisting of a large diverse group of animals that are not necessarily closely related.

Amoeboids

Included here are the single-celled flexible ‘bags’ of protoplasm which move by the protoplasm flowing out in the form of pseudopodia; 2 basic types, naked and testate.

1] **Naked amoeboids**

These species appear to have no fixed external shape, a circular or elongate central area with ‘arms’ (pseudopodia) sometimes described as a ‘stellate morphology’ (i.e., star-like).

Figure 1 shows some of their forms and their internal structure. There is a clear outer hyaline cytoplasm (hc); an inner granular cytoplasm (gc); a single nucleus (nu); several food vacuoles (fv), some empty and some with food; and pseudopodia (ps) or ‘false-feet’. 3 images of live individuals and 1 image of an individual fixed and stained with a formaldehyde/malachite green mixture.

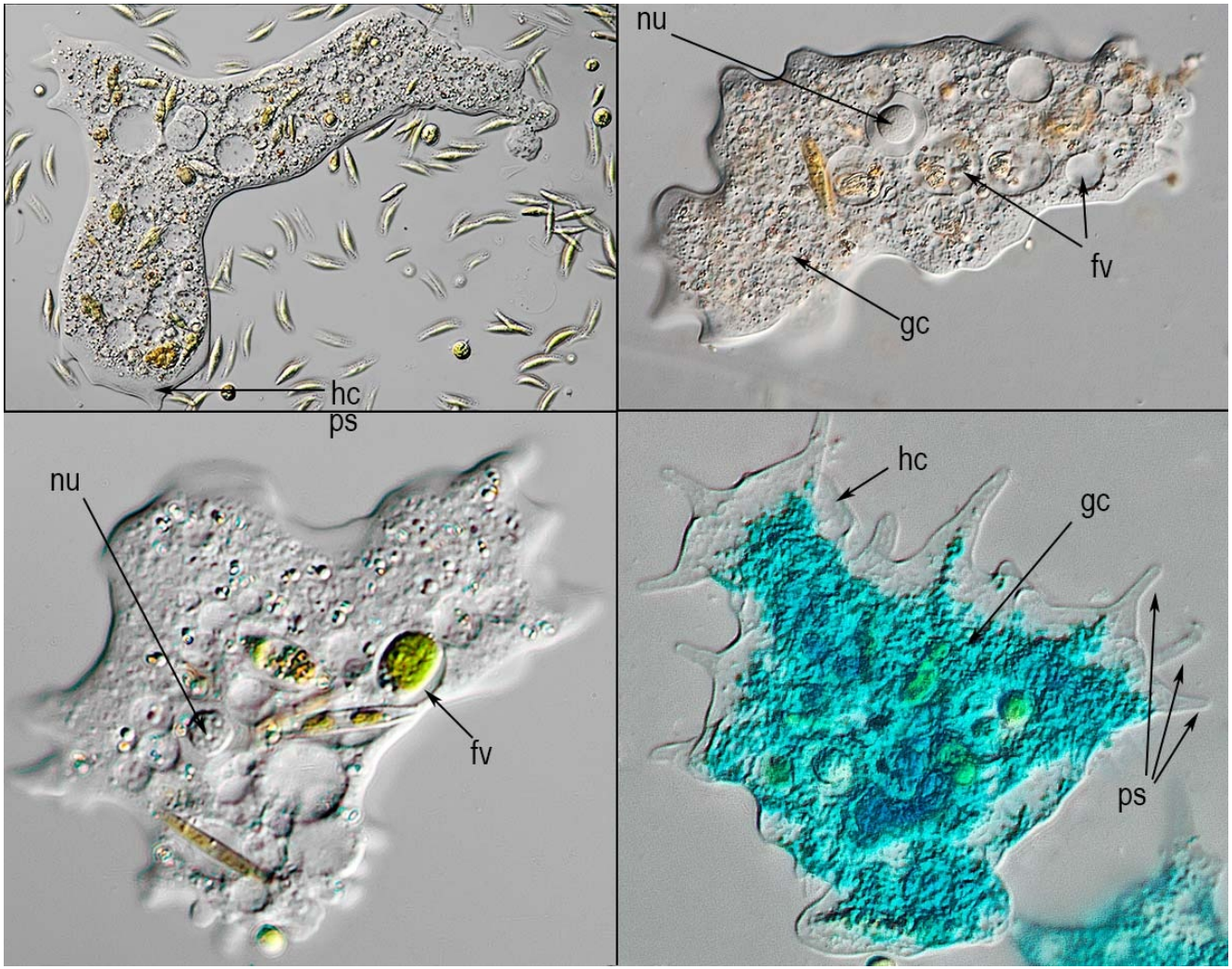
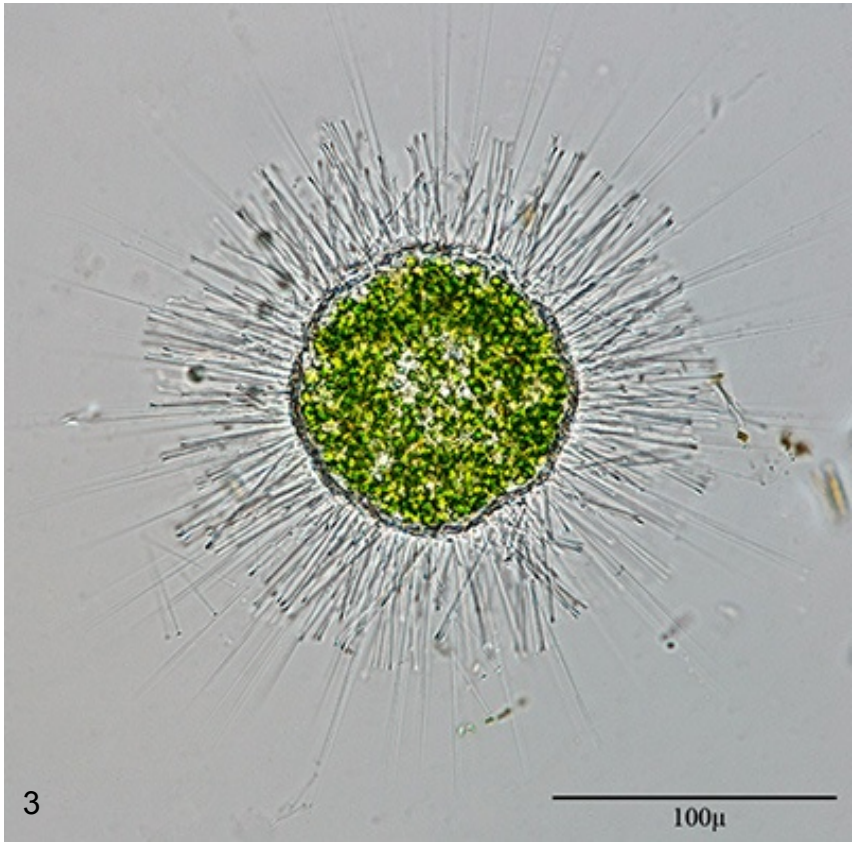


Fig. 1. Naked amoeboids

Most of the naked amoeboid protozoa are usually found ‘sliding ‘ over a surface. In contrast, the Sun Animacules (Heliozoa) are free-floating amoeboids. They are unicellular and roughly spherical with many pseudopodia supported by radiating axiopods (Figs. 2, 3, 4)



Figs. 2 & 3. Two species of Sun Animacules

Fig. 4. A Sun Animacule with very long axiopods

2] **Testate amoeboids**

These little single-cell animals are truly amazing – they construct houses called tests. These tests can be like half a sphere, flat bottomed with a domed top, or vase-shaped. The test may be proteinaceous and is often covered with inorganic particles such as sand or with secreted plates. In either case there is a single opening through which the pseudopodia protrude. The tests are resistant, I often find empty intact tests in samples of pond detritus.

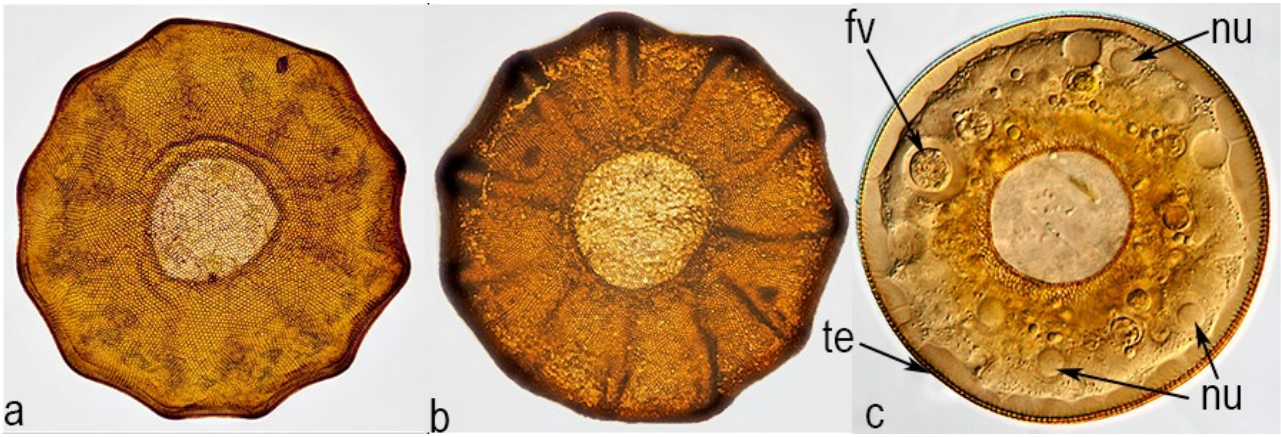


Fig. 5.

Amoeboid tests: a - focused on dorsal surface of an empty test showing the circular bottom opening,
b – same test but focussed on bottom opening,
c – test from the top but focused on the bottom opening showing a live amoeboid within,
nu = nuclei, fv = food vacuole, te = test wall

Fig. 6. Living testate amoeboid, focused through dorsal surface of test to show a single pseudopodium (ps) extending from the bottom opening of the test; it is just possible to see the hyaline cytoplasm at the leading tip and the granular cytoplasm behind.

Fig. 7. Test with living amoeboid (am)
a - ventral view looking through circular opening
b – dorsal view showing sand grains, diatom shells and pieces of wood? (black) that consitute the test

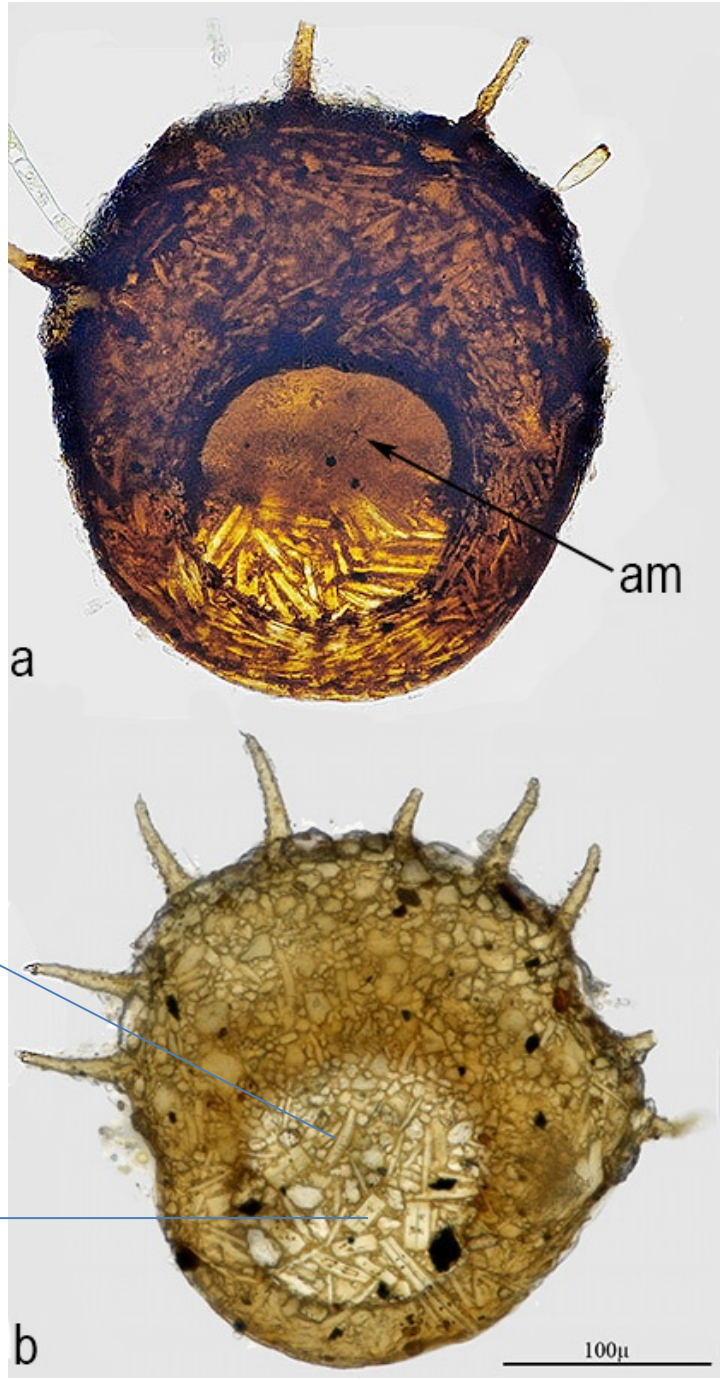


Fig. 8. Enlargement of the dorsal surface of the test showing sand grains, diatom shells (blue arrows), and tiny pieces of wood? (black)

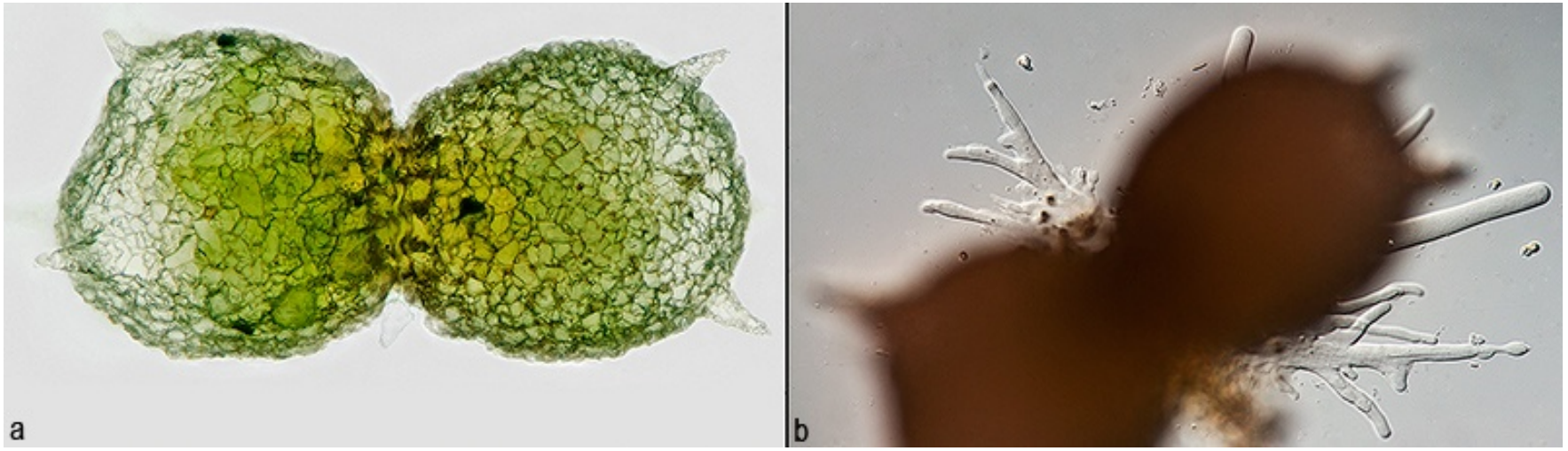


Fig. 9. a - two testate amoeboids conjugating. Tests appear to be made of sand particles, dorsal view.
b – another pair of conjugating testate amoeboids, focus on slide where pseudopodia are extending.

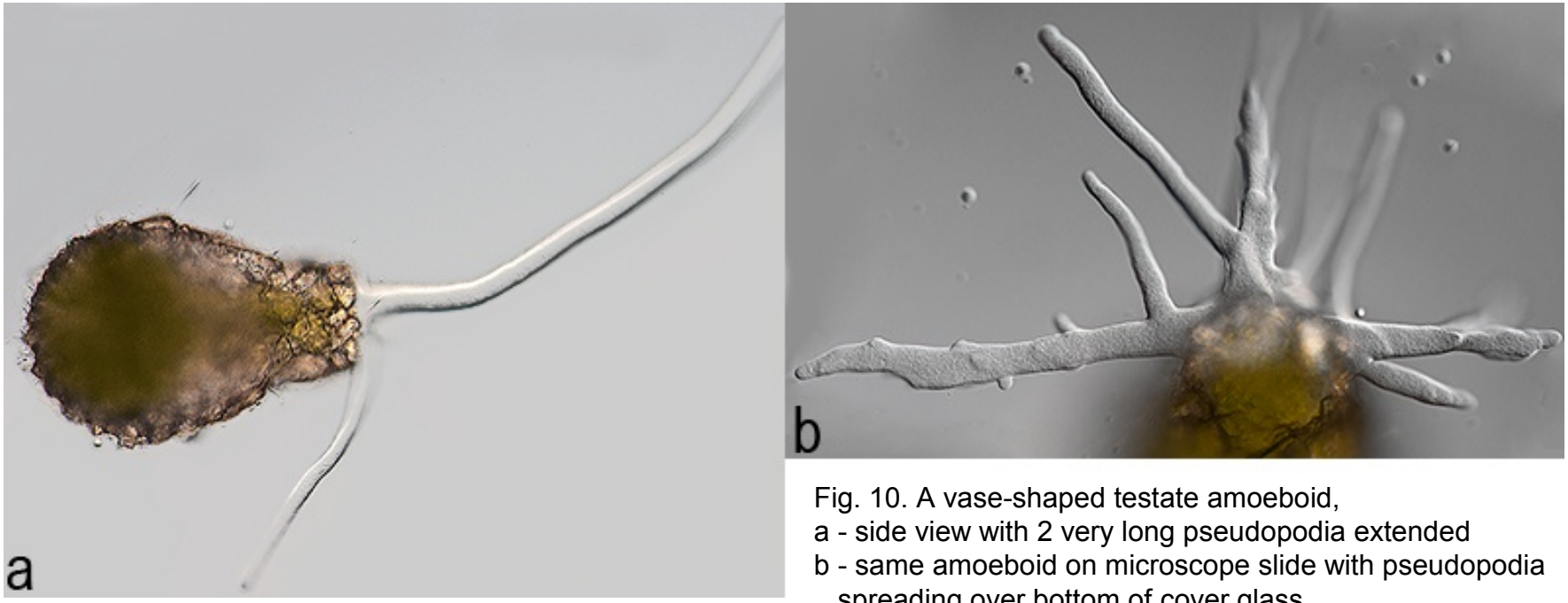


Fig. 10. A vase-shaped testate amoeboid,
a - side view with 2 very long pseudopodia extended
b - same amoeboid on microscope slide with pseudopodia spreading over bottom of cover glass

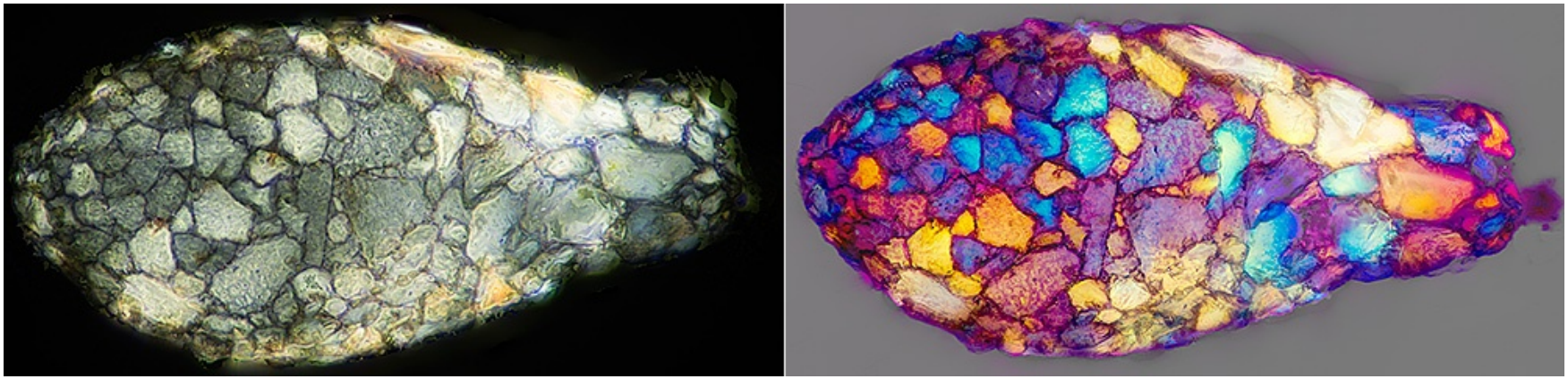


Fig. 11. A vase-shaped test. Left as illuminated with normal lighting, right when illuminated by polarized light. Test appears to be made entirely of sand grains, opening at narrow end top of the vase.

3] **The ciliates**

These are by far the commonest protozoa in all of my samples. Usually very active and fast swimmers which have to be slowed-down to get a decent photo (Protoslo from Carolina Biological Supply Company works well).

3.1 **Paramecia**, the “Slipper animalcules”, are the ‘classic’ ciliates being among the first to be seen by microscopists and are widely used in school biology classrooms. Relatively large single-celled protozoa which are just visible, especially when numerous, with the unaided eye. There are several species in the genus *Paramecium* of which *P. bursaria* is readily recognized by its green colour thanks to the endosymbiotic green algae living within its protoplasm (Fig. 12).

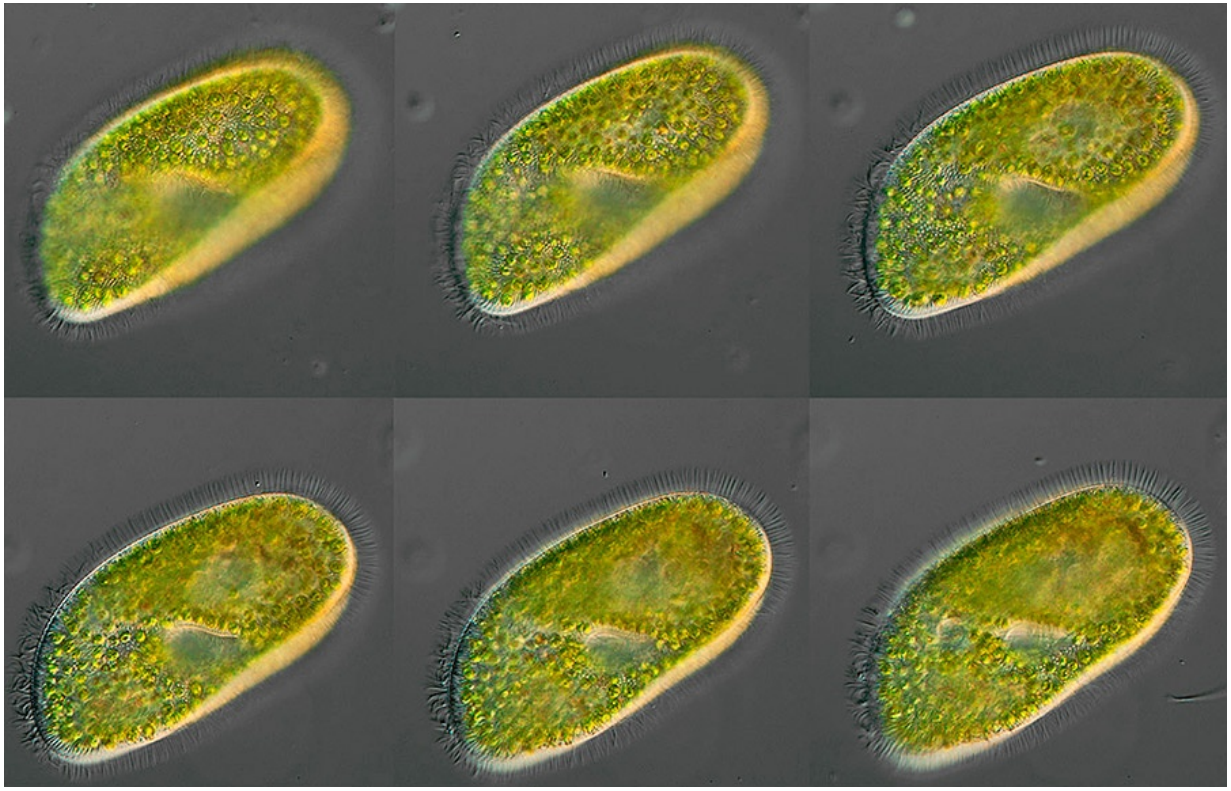


Fig. 12. *Paramecium bursaria*, 6 planes of focus

The other paramecia are colorless but are visible under the microscope thanks to their cell wall and the complex organelles within the body.

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