WINTER IS FOR MICROSCOPY
II MULTICELLULAR ALGAE

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In the April 2015 Issue (of Micscape magazine) I discussed the equipment I use and described some local unicellular freshwater algae. Here in Part 2 I will introduce some multicellular forms.

Haematococcus although a single-celled alga it gives the appearance of being multicellular as it occurs in colonies coating shallow rock pools. It thrives in enriched waters and is a common inhabitant of concrete bird-baths. It occurs in three forms:
i) a swimming cell consisting of a wide sheathlike wall and an an ovoid green chloroplast, often with a spot of orange-red carotenoid pigment; two flagella extend outwards at, what appears to be, the anterior end of the cell (Fig. 1a).
ii) a round sessile cell, green with some central carotenoid pigment (Fig. 1b).
ii) a round red cyst that is able to withstand drying (Fig. 1c). The red is the strong antioxidant astaxanthin which is thought to protect the resting cyst from the detrimental effects of UV-radiation from direct sunlight when the cells are in dry conditions.

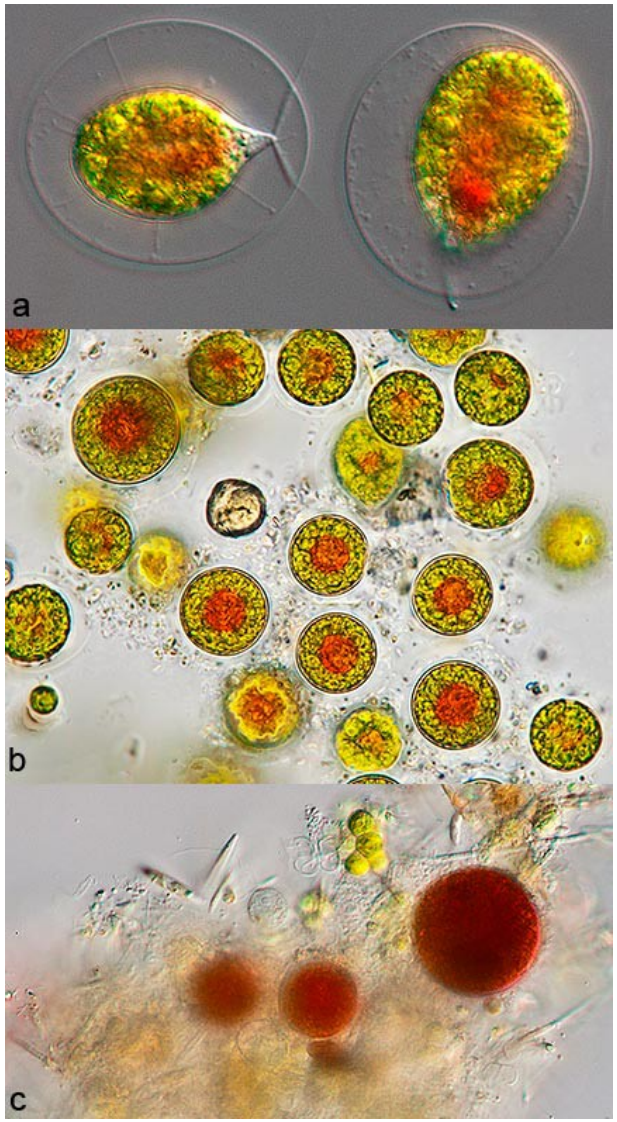

Fig. 1. *Haematococcus* sp. from my concrete garden birdbath:
a: swimming cells
b: normal cells
c: resistant cysts

Volvox is a relatively large, up to 1 mm diameter, actively-swimming colonial alga that can contain as many as 50,000 cells. Difficult to photograph owing to its spherical shape and its constantly rotating swimming action. Young colonies are small clear spheres with small green chloroplasts of individual vegetative cells connected to adjoining cells by strands of cytoplasm (Fig. 2a). As the colony matures it produces daughter colonies inside the ball which show up as large green blocks of chlorophyll (Fig. 2b). In late Fall as environmental conditions deteriorate the colony produces resting spores containing the same orange-red pigment seen in the resting spores of *Haematococcus* (Fig. 3). These spores overwinter and start a new colony when conditions improve.

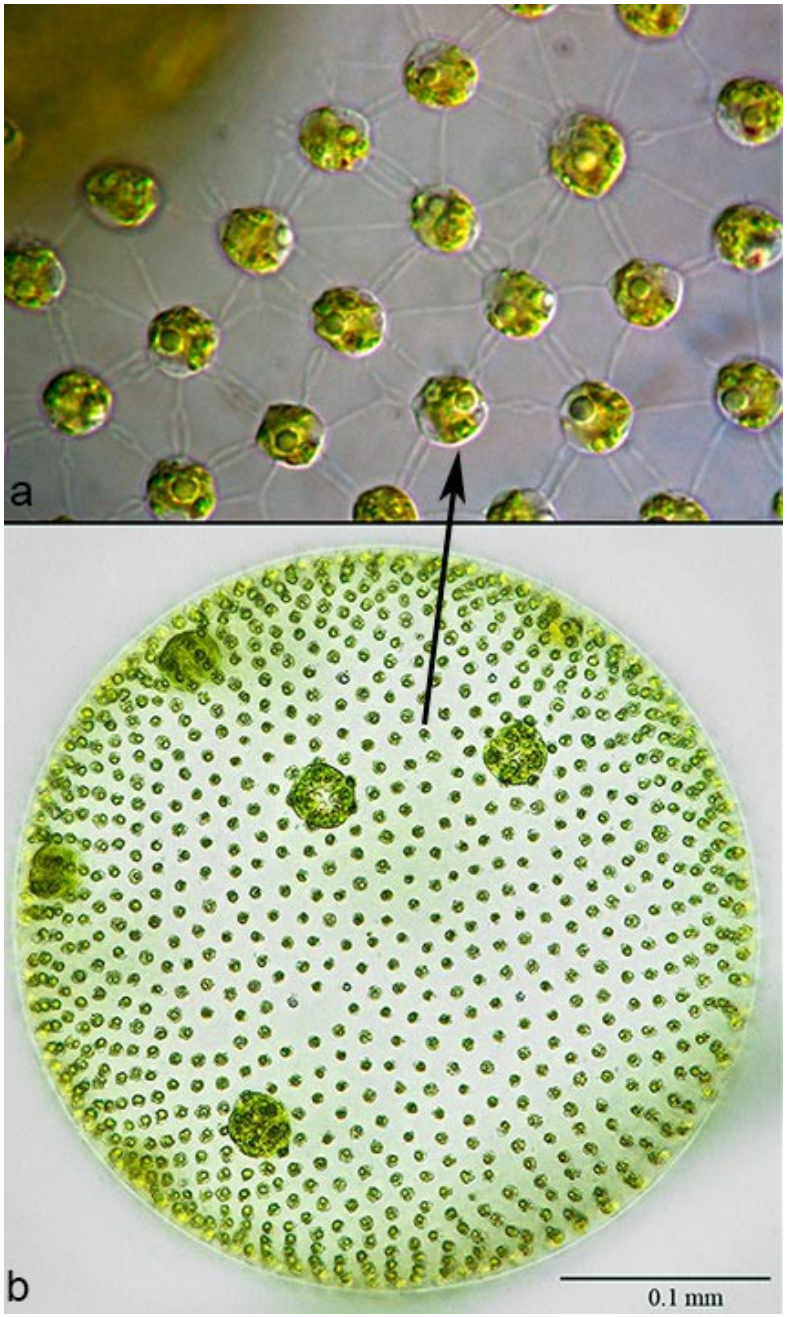

Fig. 2. *Volvox.*
a: green chloroplasts of individual cells with strands of clear cytoplasm connecting adjacent cells.
b: mature colony showing many small green individual cells and 5 larger daughter cells.

Fig. 3. *Volvox.*
Resting spores.

Pediastrum species occur as platelike colonies. The few I have seen are circular in outline. In the outer circumference the cells have protrusions/indentations whereas those in the inner plate are more regular. The inner cells may be contiguous (i.e., touching) or there may be spaces between adjacent cells. The plates are somewhat delicate and will break apart if not carefully handled (Fig. 4).

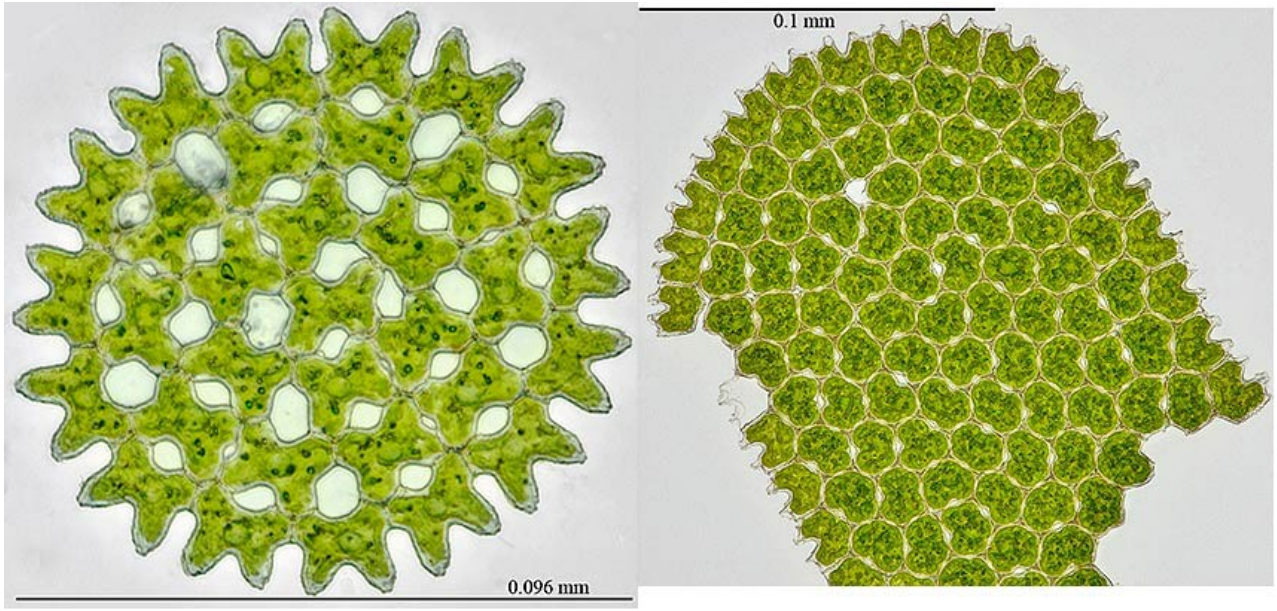

Fig. 4. Two species of *Pediastrum*

Many species in several genera have individuals living together in sphere of mucilaginous jelly. I think this specimen (Fig. 5) is *Sphaerocystis*. What was one individual has cleaved into several daughter cells (da) and all these are in their own little ball of jelly (je). Note the wide gelatinous sheath (sh) surrounding of the colony.

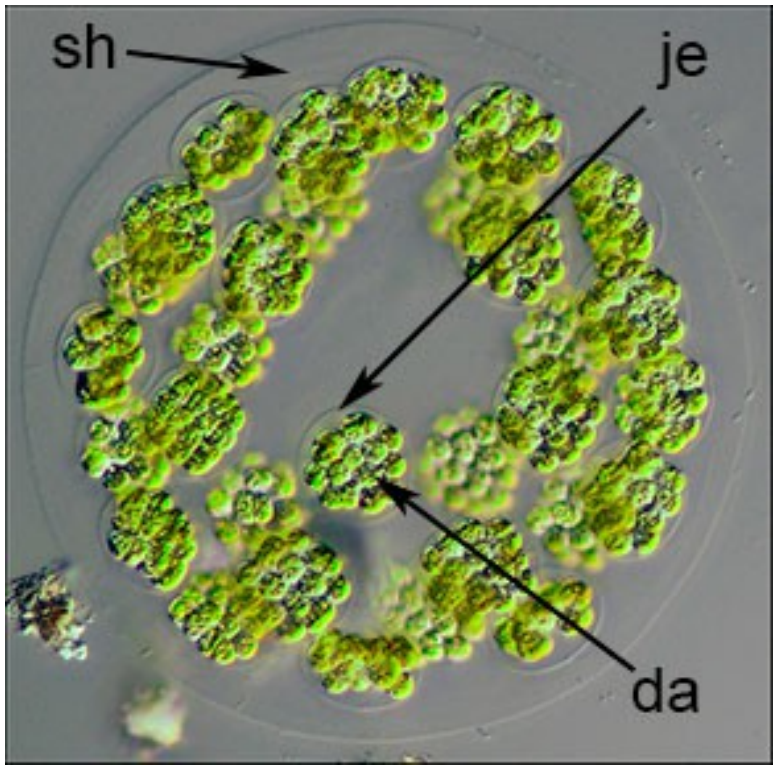

Fig. 5. Colonial algae in a mucilaginous sphere; possibly *Sphaerocystis*.

Perhaps the best known, at least in name, unbranched filamentous algae is *Spirogyra.* Each elongate cell (ce) contains one or more spiral chloroplasts (ch), cells are joined end-to-end to make a filament and usually many filaments occur together to form an obvious mat of green algae (Fig. 6)

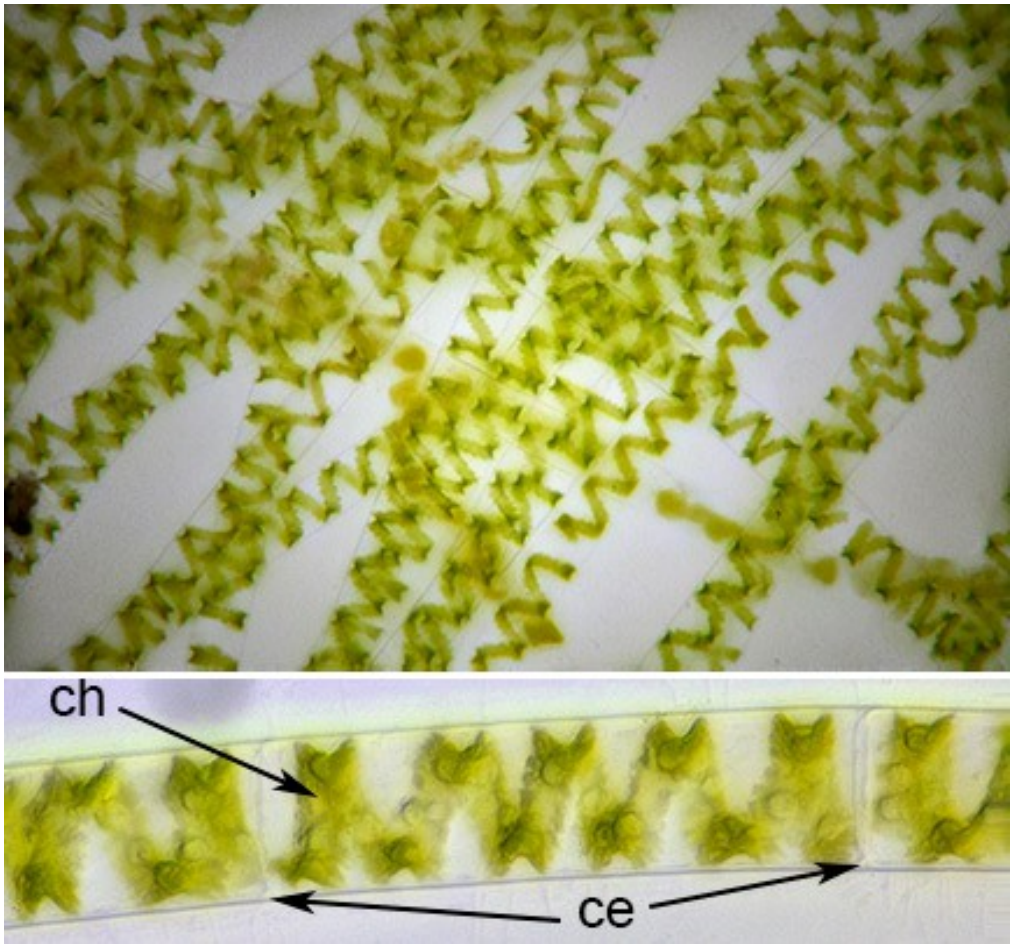

Fig. 6. *Spirogyra*
top a typical mass of filaments, each filament a string of individual cells

bottom an individual cell.
ch spiral chloroplast
ce end walls of a single cell

Zygnema is another genus of filamentous algae. Here each individual cell contains two star-shaped chloroplasts which makes identification simple. Some species have the filaments enclosed in a gelatinous sheath, just detectable in my image as fibrils extending outwards from the cell wall (Fig. 7).

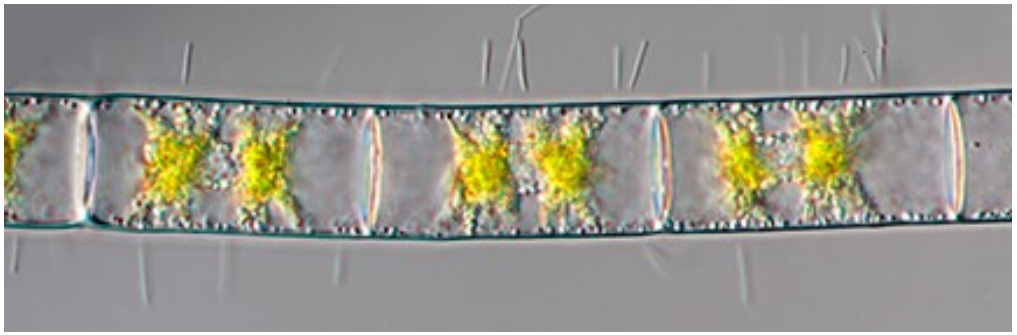

Fig. 7. *Zygnema,* showing characteristic chloroplasts

In my text book “Prescott, G.W. 1954. How to know the Freshwater Algae” one of the keys separates the filamentous algae based on the shape of the chloroplasts:

a) a parietal ribbon as seen in *Spirogyra*,
b) axial stellate as seen in *Zygnema*, and
c) an axial plate as seen in this genus *Mougeotia* (Fig. 8).

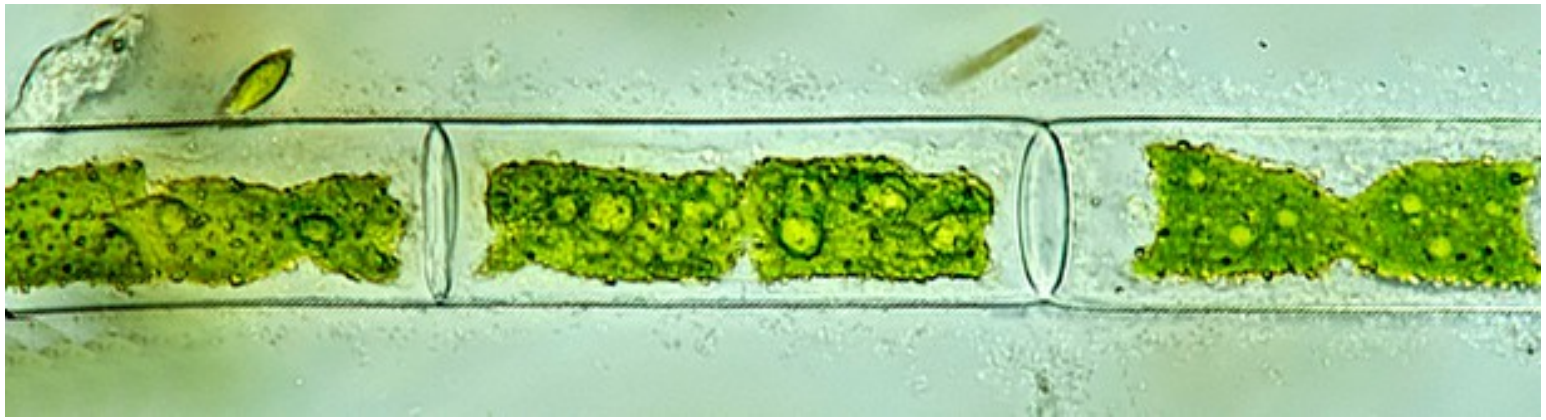

Fig. 8. *Mougeotia*, showing characteristic plate-shaped chloroplasts

Hyalotheca is another filamentous algae with short, almost square in side view, cells are often filled with green photosynthetic chloroplasts. The entire filament may be encased in thick mucilage sheath as seen in this image, Fig. 9 top, of *H. dissiliens*. In one report I read it was suggested that the sheath contributes to colonial coherence and increases the chance of dispersal as the filaments readily stick to migratory water fowl. I suspect that the sheath would also help keep the filaments moist, when in air, and prevent the algae drying and dying.

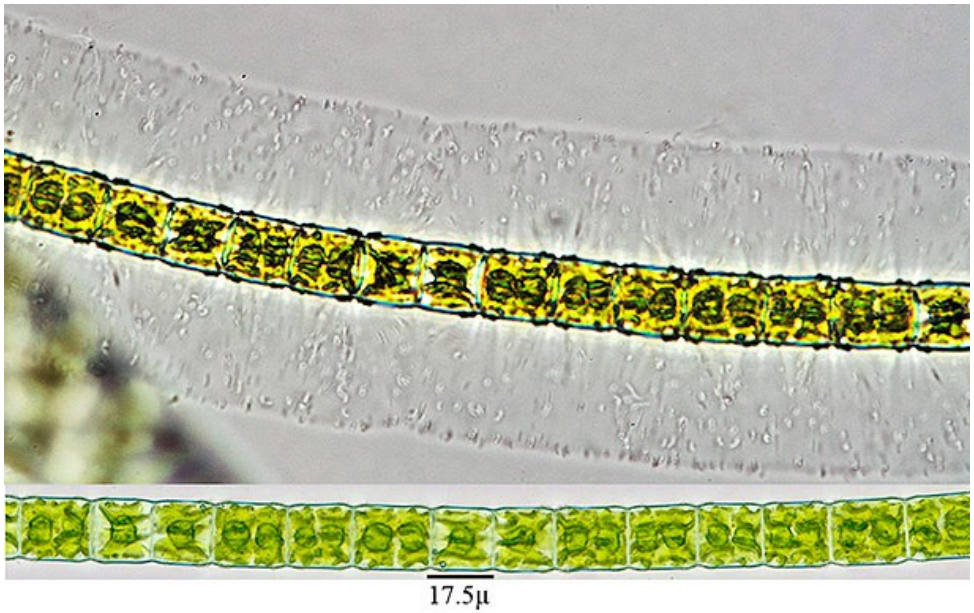

Fig. 9. *Hyalotheca dissiliens*

Besides the filamentous multicellular algae in the previous pages there is a group of multicellular algae that are branched. In this group of branched algae are species in the genus:

Draparnaldia, consisting of a filament of large cells forming an axis from which tufted plumes of branches of small cells arise (Fig. 10).

Fig. 10. *Drapanaldia*

Bulbochaete is another branched species but the branches are far fewer (Fig. 11) than the branch structure in *Draparnaldia.*

Bulbochaete can be recognized by the presence of bulb-like bases (Fig. 11, b) of the long 'hairs' projecting from the top of the cells.

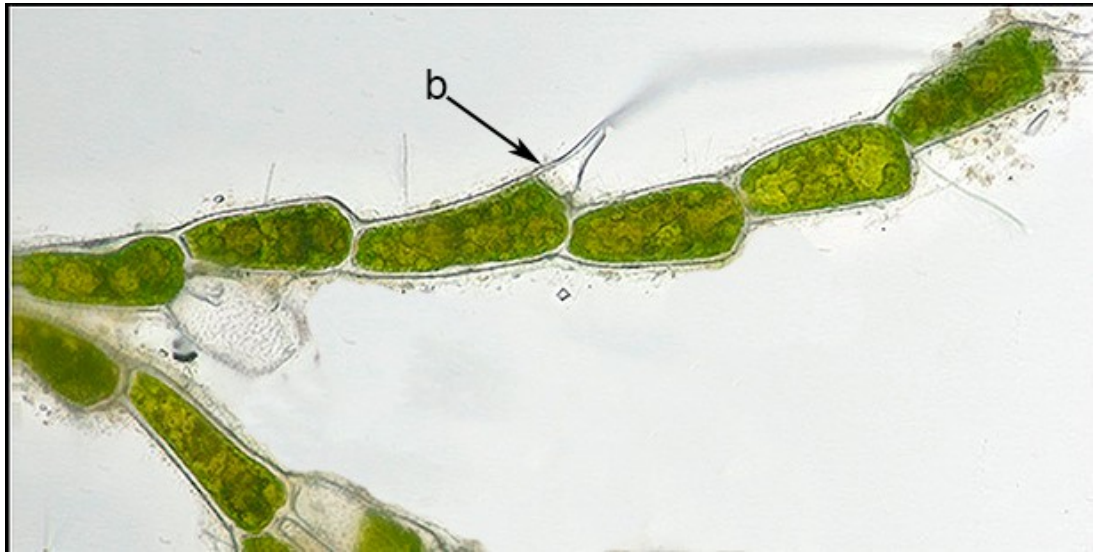

Fig. 11. *Bulbochaete*
b bulb-like base of cell's 'hair'

Comments to the author are welcomed, email : mothman AT nbnet.nb.ca

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