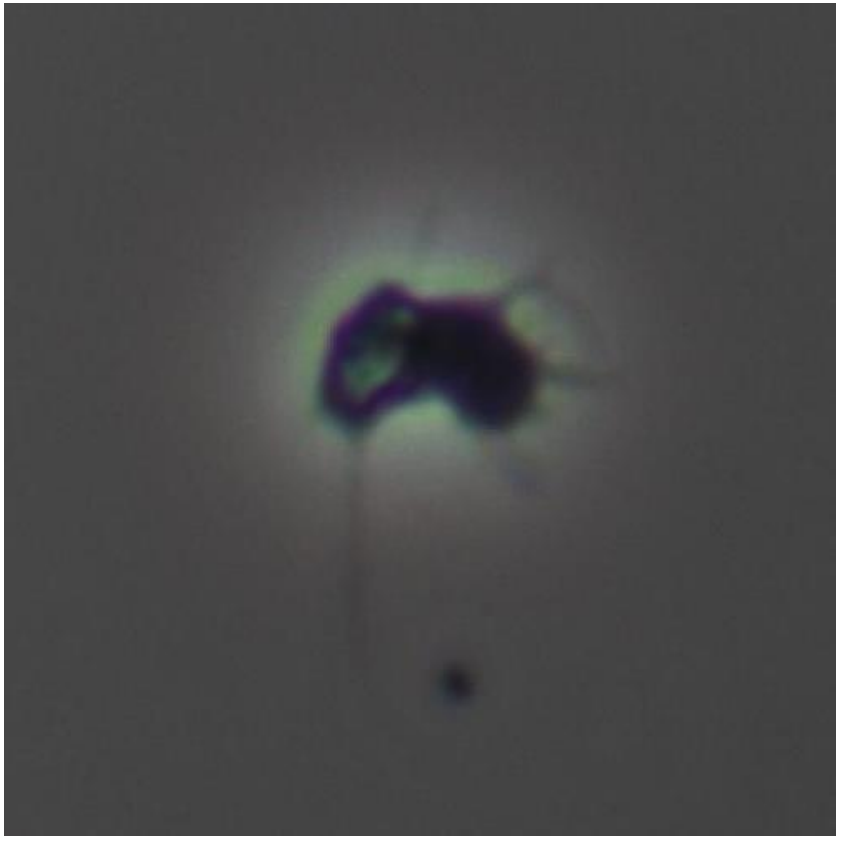
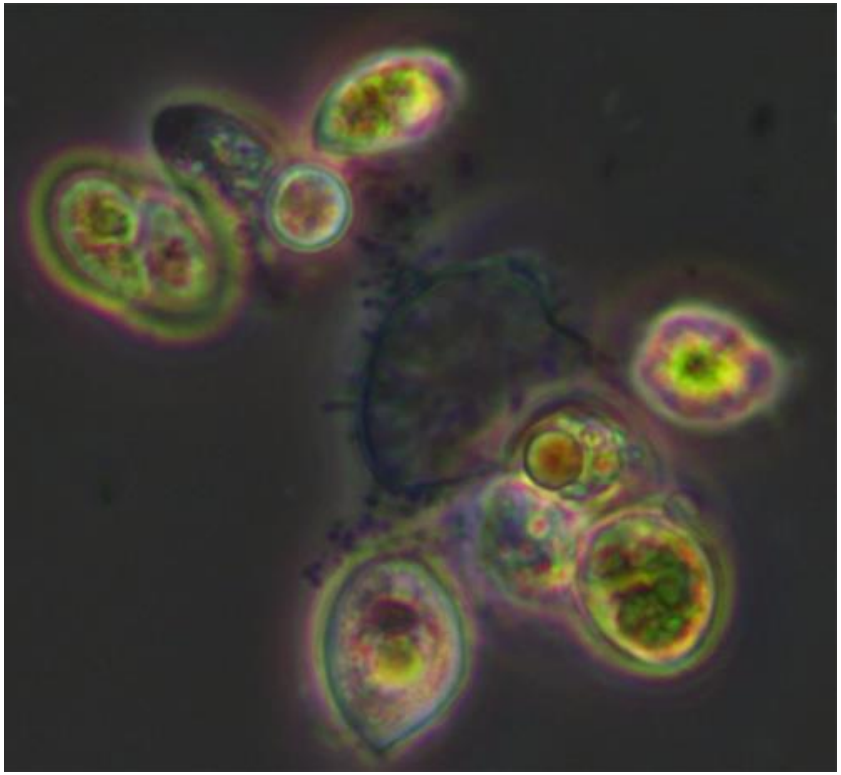
Life cycle of FD61
Paraphysoderma sedebokeresnse





Life cycle of *P. sedebokerense* (=FD61) from Hoffman et al. 2008. Isolation and characterization of a novel chytrid species (phylum Blastocladiomycota, parasitic on the green alga *Haematococcus*. Mycol. Res. 112:70-81

In A, the “vegetative cycle”, I have not been able to confirm step 11, conjugation or transformation of 1N amoeboid swarmers to a 2N amoeboid swarmer

In B, the “resting phase”, I have found synaptenemal complexes in the nucleus, which are pairings of homologous chromosomes prior to meiosis, and this confirms the 2N condition in the resting sporangium

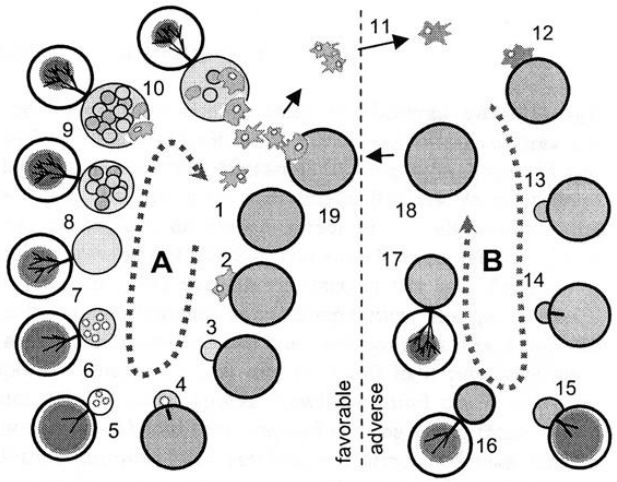
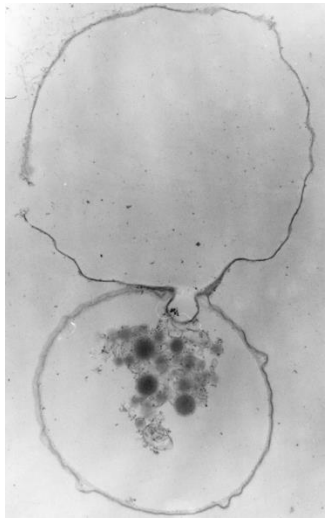


Fig 4 – Proposed life cycles of the parasitic chytrid in *Haematococcus* culture. (A) Vegetative cycle. An amoeboid swarmer arrives *via* water (1, Fig 2D), makes contact with a host cell (2, Fig 2E), settles and encysts (3, Fig 2F). The germ tube sprouts and crosses the cell wall into host cytoplasm (4, Fig 2G). Both the sporangium and the rhizoid system grow at expense of host cell (5, Fig 2H–J, Fig 5D). The fully-grown immature sporangium (6, Fig 2H) transforms (7, Fig 2J) into a mature sporangium with a thin cell wall full of new amoeboid swarmers (8, Fig 2I,K). Swarmers are released through a tear in the sporangial cell wall (9, Fig 5G,H), leave behind the empty sporangium and disperse in water (10, Fig 2L, Fig 5A,B). If they encounter a new host cell the cycle can repeat. (B) Resting phase. Dispersing amoeboid swarmers in stressful conditions conjugate and/or transform (11). A transformed (diploid?) amoeboid swarmer settles on the host cell (12) or possibly on another chytrid sporangium (see Fig 5J), and encysts (13). Germ tube crosses the cell wall into host cytoplasm (14), and a thick-walled resting sporangium grows (15–17, Fig 5E). A mature resting sporangium (18), now separated from host, disperses, perhaps *via* air or in soil. When a resting sporangium reaches favourable conditions, it begins to germinate (18), releasing new (haploid?) amoeboid swarmers (19). The vegetative cycle can resume as amoeboid swarmers find host cells.

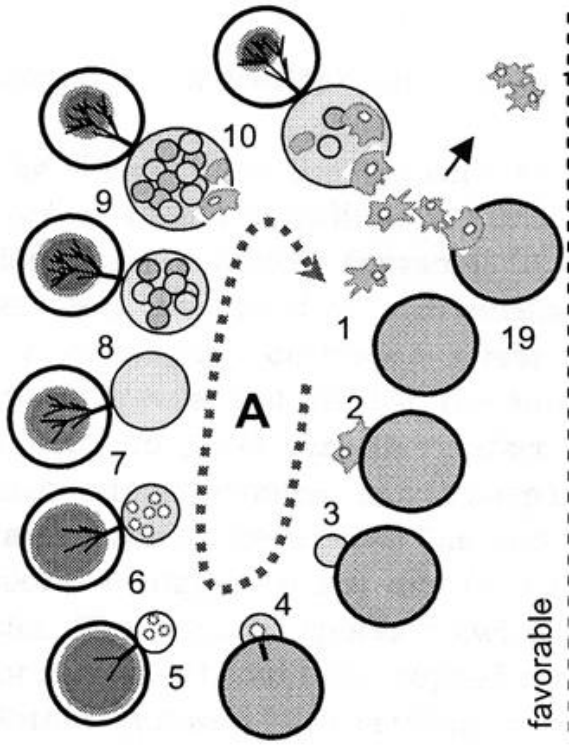
I have also found flagellar cross sections in the cleavage furrows, which confirms that flagellated spores are produced in this resting phase.

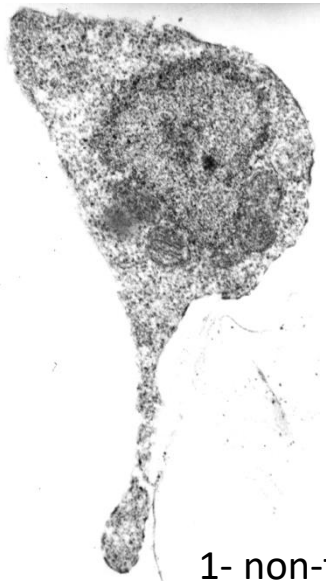
However, the one flagellated spore I have found does not have morphology typical of the Blastocladiomycota zoospore

(A) Vegetative cycle (1N)



empty sporangium

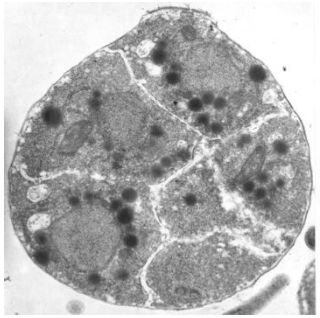




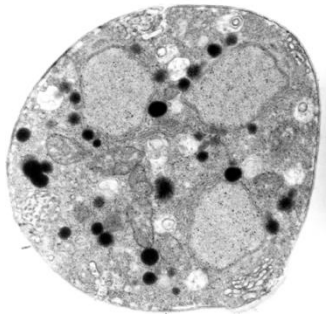
1- non-flagellate, pseudopodiate amoeba

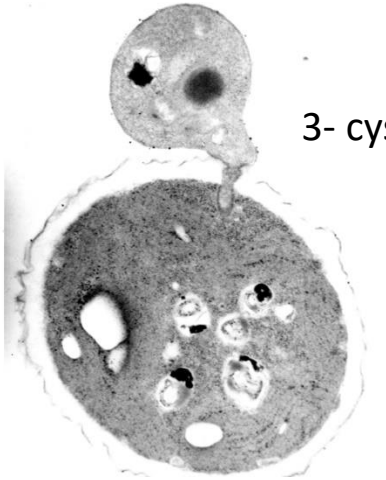
10- release of amoebae

cleavage within cyst



mitosis within cyst





3- cyst

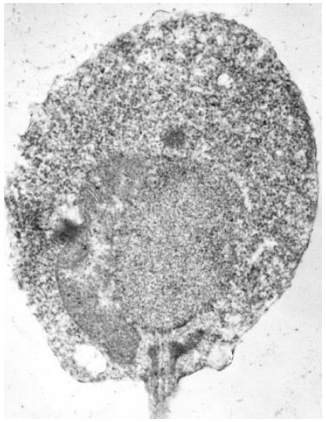
8- fully formed amoebae

(A) Vegetative cycle

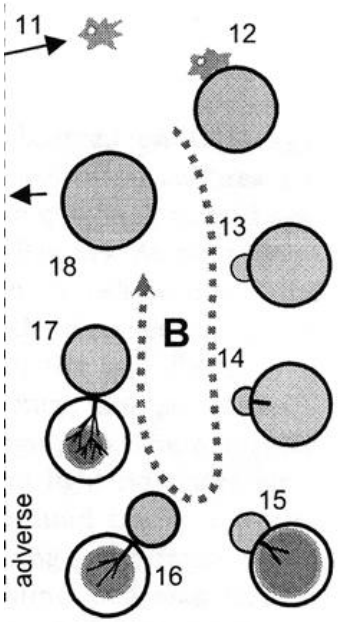
- The vegetative cycle is recognizable by:
  - the thin-walled sporangium;
  - The presence of non-flagellated, pseudopodiate amoebae;
  - The absence of any flagellar cross-sections in the cleavage furrows.

(B) Resting phase

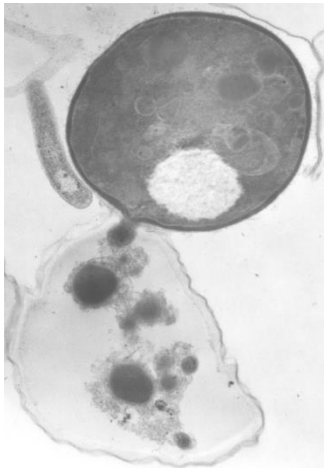
Empty resting sporangium



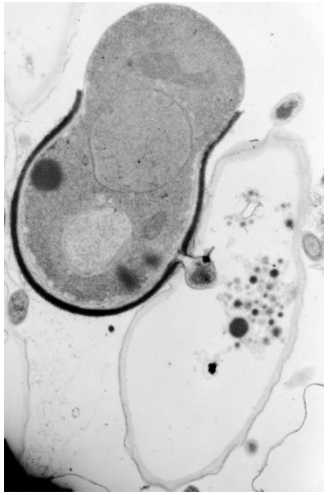
posteriorly uniflagellate zoospore



multiple hapoid (?) nuclei (arrows) following meiosis

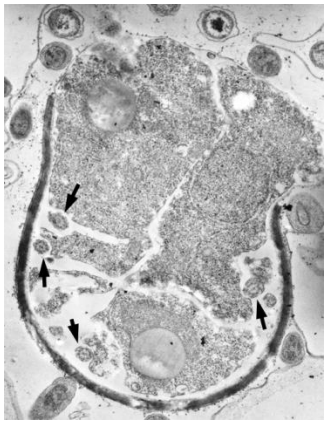


15-17- thick-walled resting sporangium

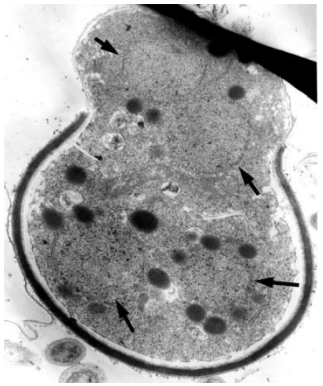


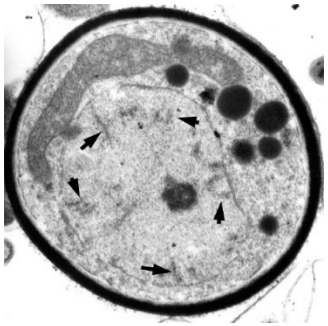
A single, large diploid (?) nucleus

flagellar x-sections (arrows) in cleavage furrows



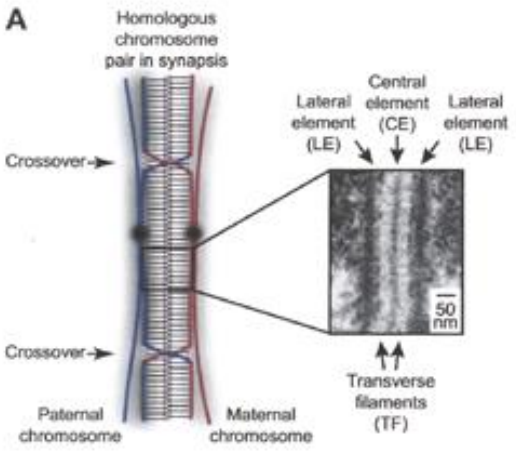
cleavage of zoospores

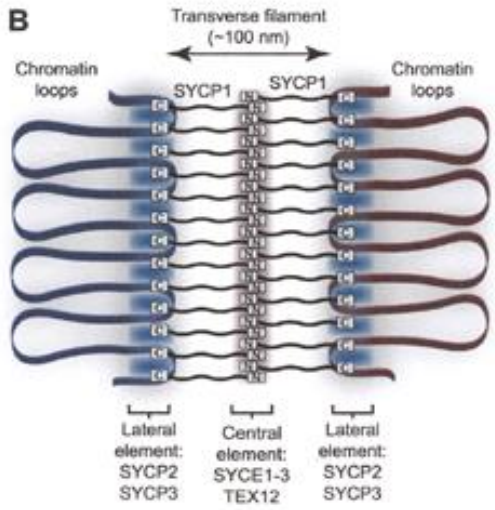


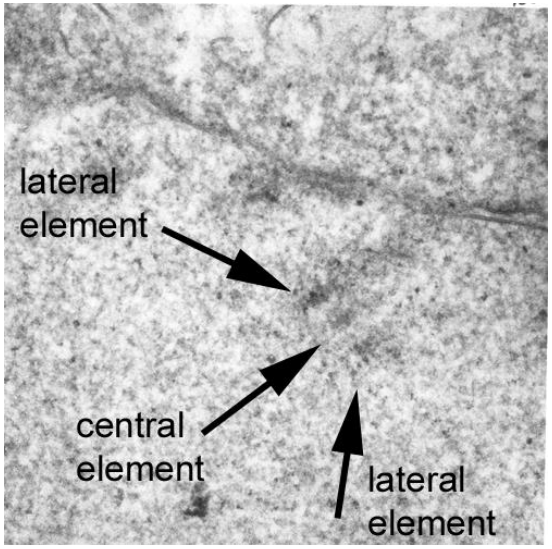


synaptenemal complexes (arrows), indicators of meiosis

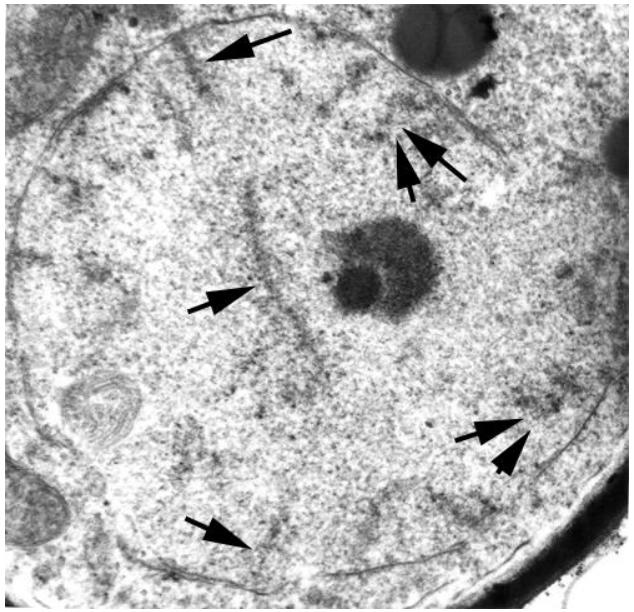
Synaptenemal complex



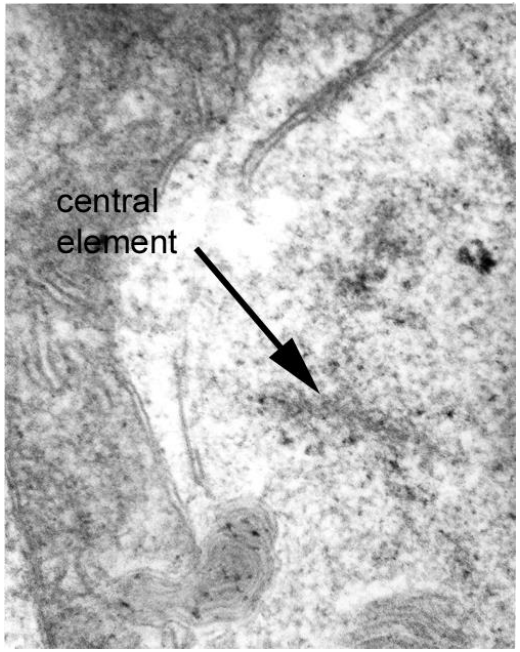




cross-section



The dark lines in the nucleus (single arrows) are “central elements”; double arrows indicate cross sections

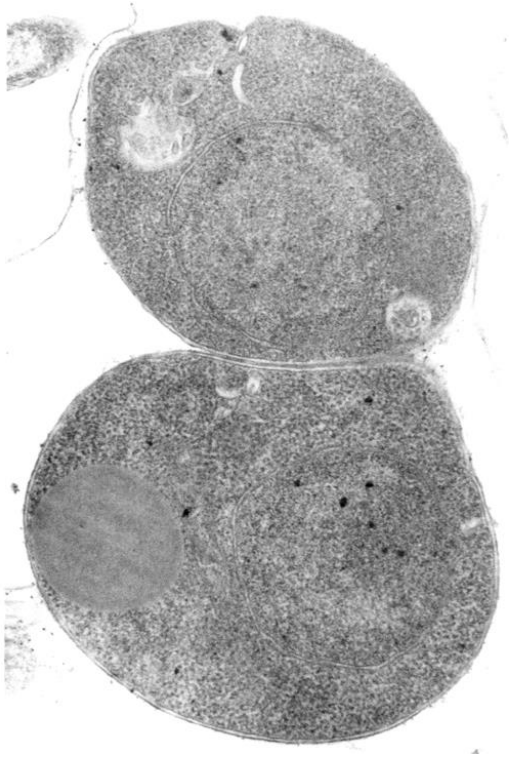


longitudinal section

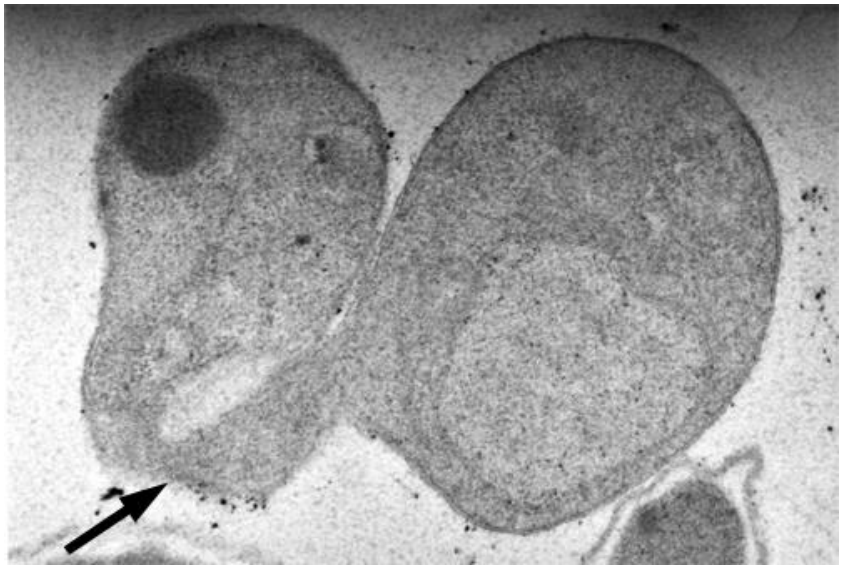
(B) Resting phase

- The resting phase is recognizable by:
  - The thick-walled sporangium;
  - The presence of synaptenemal complexes in the nucleus, in which homologous chromosomes pair prior to meiosis;
  - The presence of flagellar cross-sections in the cleavage furrows;
  - The presence of flagellated zoospores.

Possible conjugation

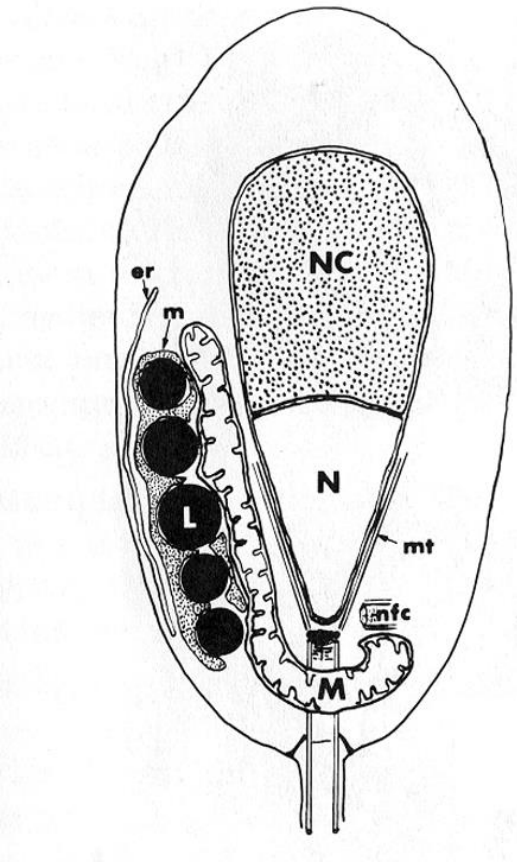


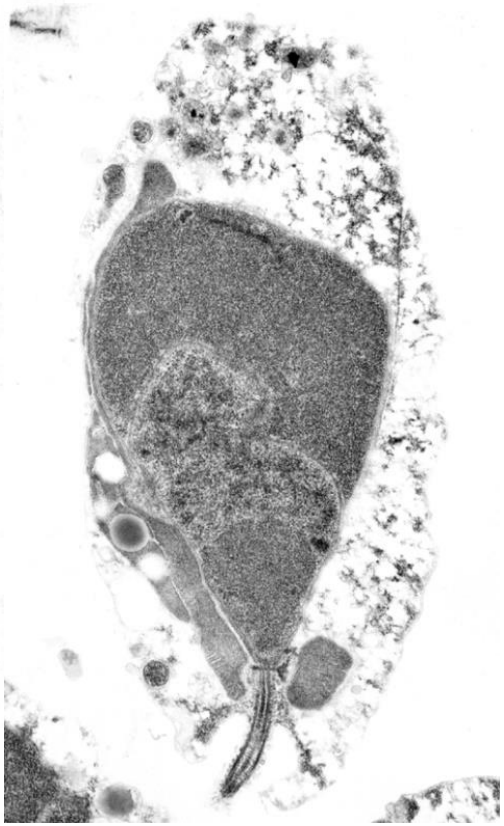
I often see what appear to be 2 encysted amoebae in close contact, but 30 serial sections (not pictured here) through adjacent cysts do not indicate that the adjacent walls fuse. (I would not expect encysted spores to fuse; rather, I would expect to see motile amoebae fuse).



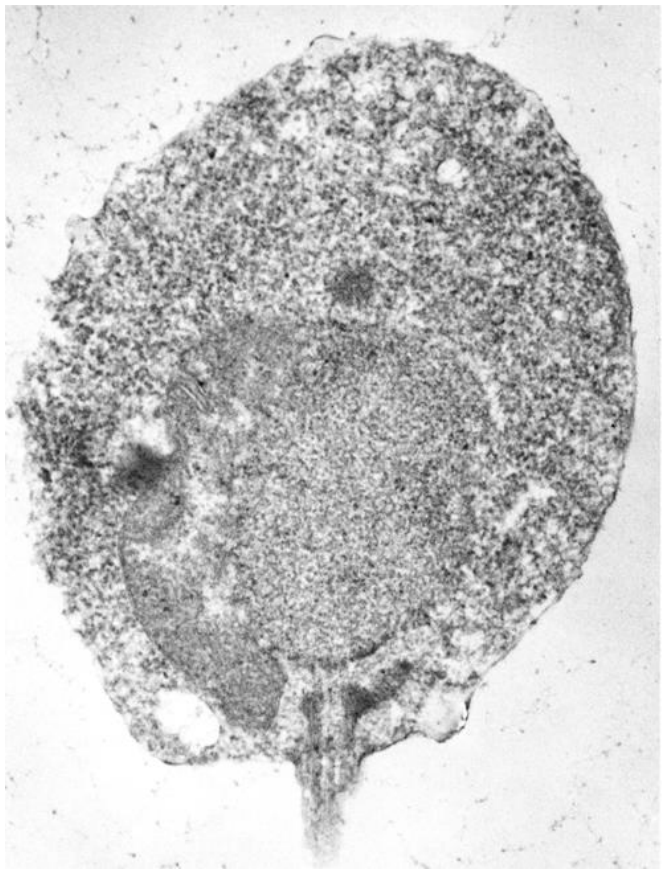
I have only been able to find this once (from a set of 12 serial sections), which appears to be germ tube fusion (arrow) of 2 encysted amoebae.

Flagellated zoospores





Typical Blastocladiomycota zoospore, with a “nuclear cap” composed of aggregated ribosomes, and a side body complex



Observed zoospore from FD61, which appears much different from a typical Blastocladiomycota zoospore

Summary

- I want to confirm conjugation of 1N amoeboid swarmers (produced in the vegetative cycle) that would result in a 2N resting stage
- I want to see more of the flagellated spores produced after meiosis and subsequent mitosis in the resting stage, to compare their morphology with that of other Blastocladiomycota.