Biology of Fungi
PMB 110

John Taylor & Tom Bruns

Lecture 4 Labyrinthulomycota & Plasmodiophoromycota

Parasexuality

Fusion between two, genetically similar individuals.

Occasional fusion of nuclei to make 2N.

Mitosis with occasional crossing over.

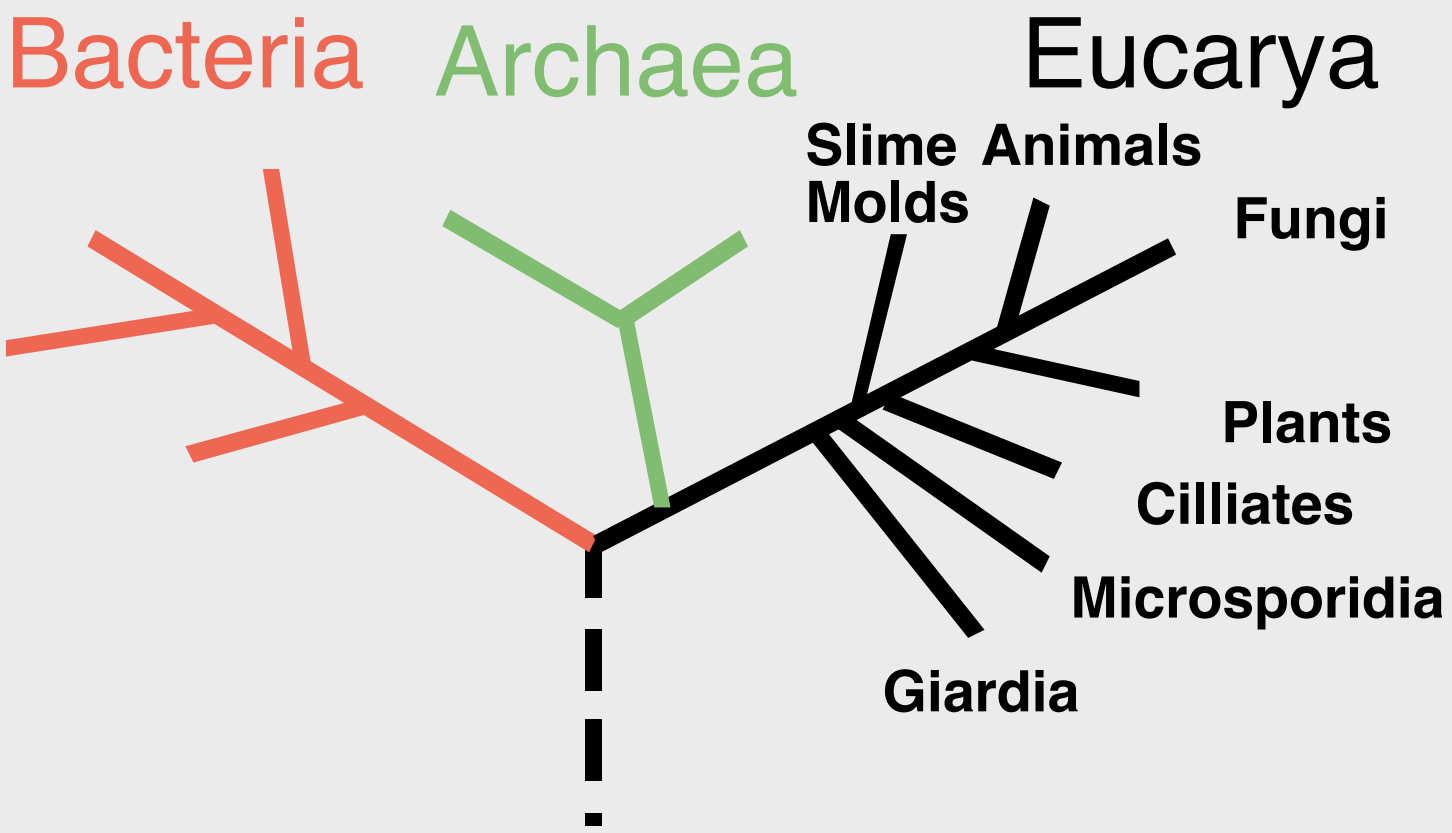
Aneuploidy to lose chromosomes.

Parasexuality

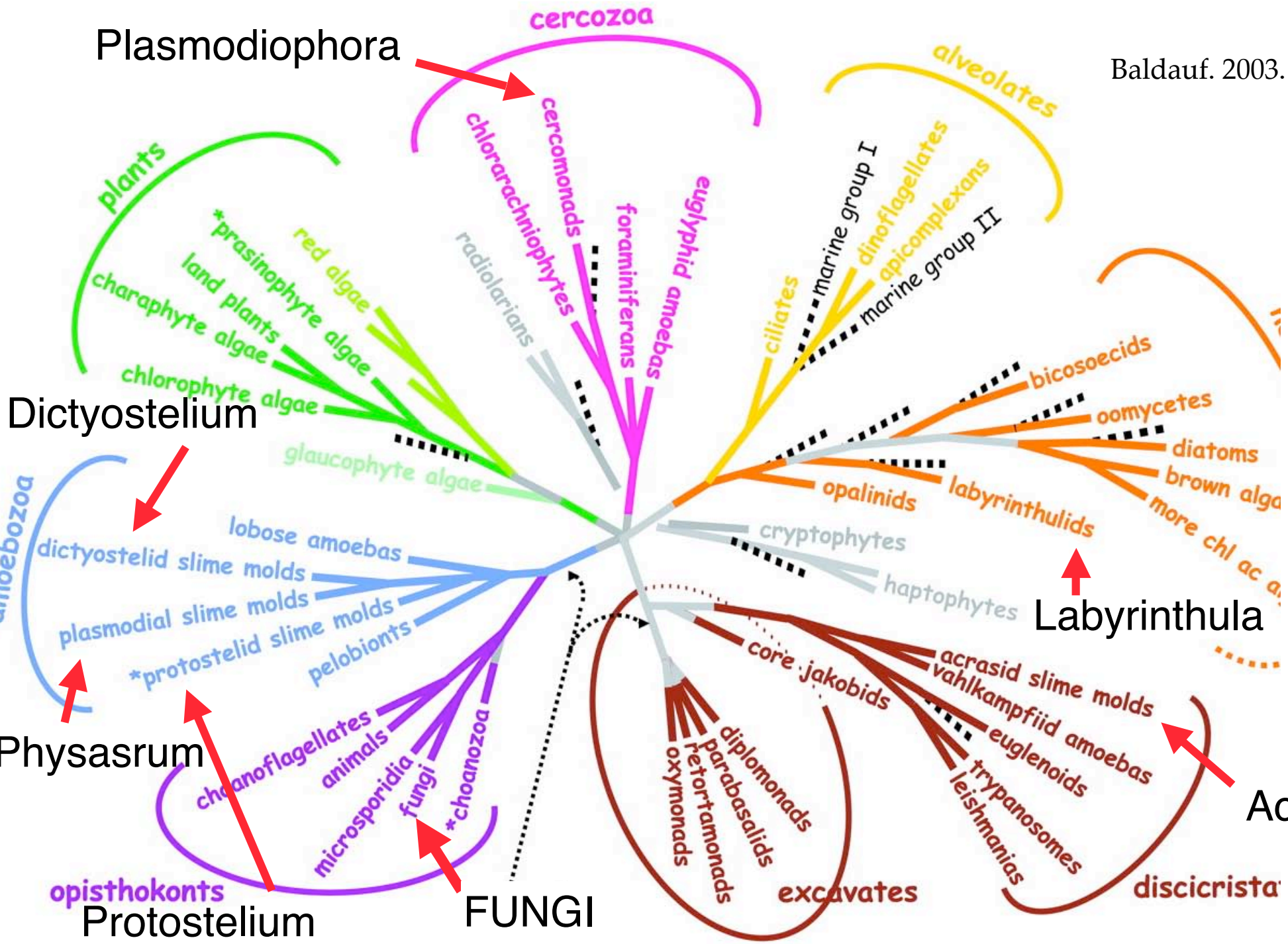
Speed up parasexuality by:

Each parental strain has a temperature-sensitive mutation.

Benlate to disrupt microtubules during mitosis.



Small Subunit Ribosomal DNA Tree


Plasmodiophora
cercozoa
alveolates
Baldauf. 2003. Science
plants
cercomonads
chlorarachniophytes
foraminiferans
euglyphid amoebas
radiolarians
ciliates
marine group I
dinoflagellates
apicomplexans
marine group II
*prasinophyte algae
red algae
land plants
charaphyte algae
chlorophyte algae
glaucophyte algae
Dictyostelium
bicosoecids
oomycetes
diatoms
brown alga
more chl ac a
opalinids
labyrinthulids
cryptophytes
haptophytes
Labyrinthula
lobose amoebas
dictyostelid slime molds
plasmodial slime molds
*protostelid slime molds
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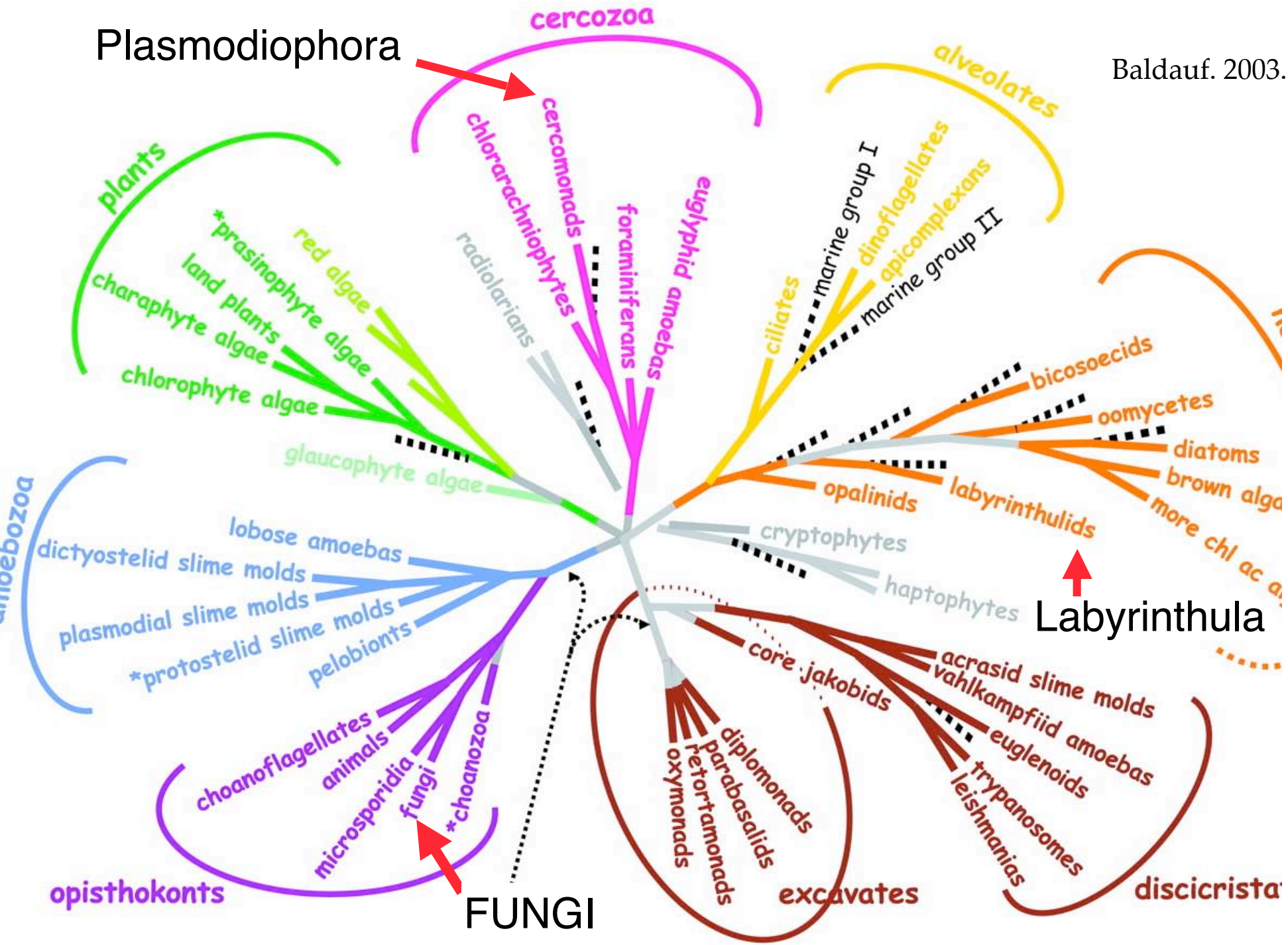
trypanosomes
leishmanias
diplomonads
parabasalids
retortamonads
oxymonads
choanoflagellates
animals
microsporidia
fungi
*choanozoa
Physasrum
Acrasis
opisthokonts
excavates
discicrista
Protostelium
FUNGI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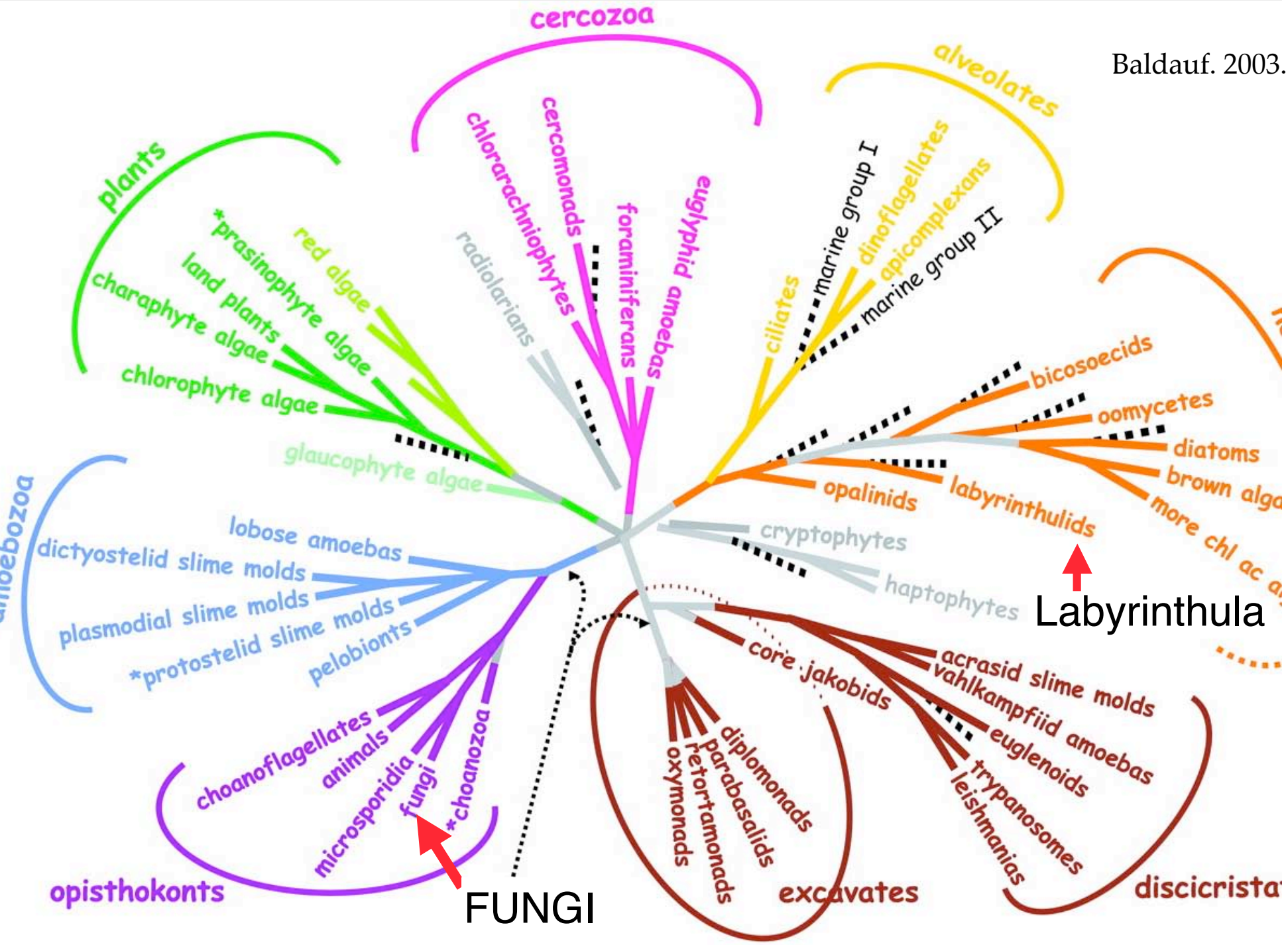


“Slime Molds”

Kingdom Amoebozoa

Myxomycota

Dictyosteliomycota

Kingdom Discicristates

Acrasiomycota

Kindgom Stramenopila

Labyrinthulomycota

Kingdom Cercozoa

Plasmodiophoromycota

"Slime Molds"

Kingdom Stramenopila

Labyrinthulomycota

Labyrinthula

Thraustochytrium

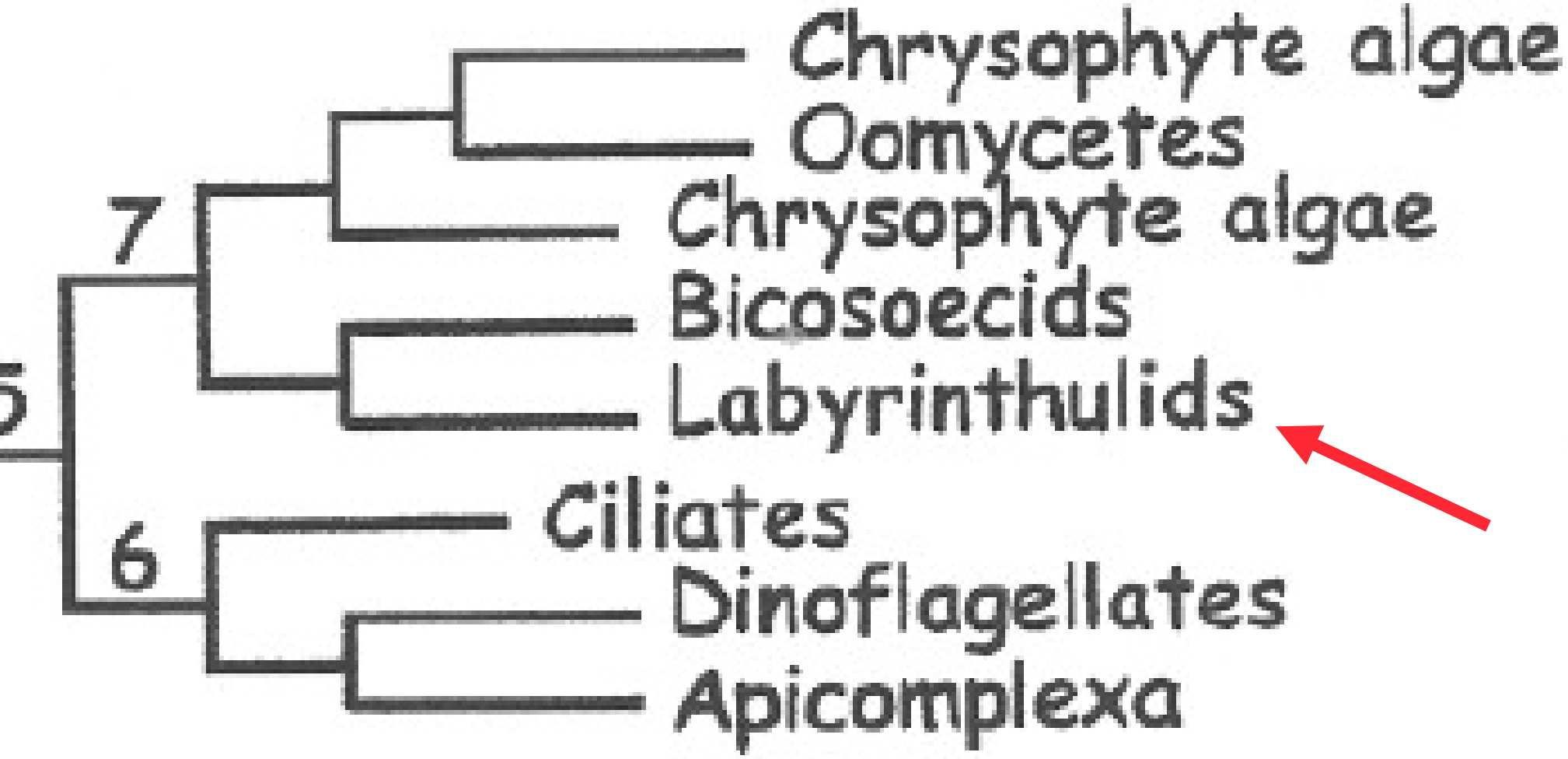
Kingdom Cercozoa

Plasmodiophoromycota

Plasmodiophora

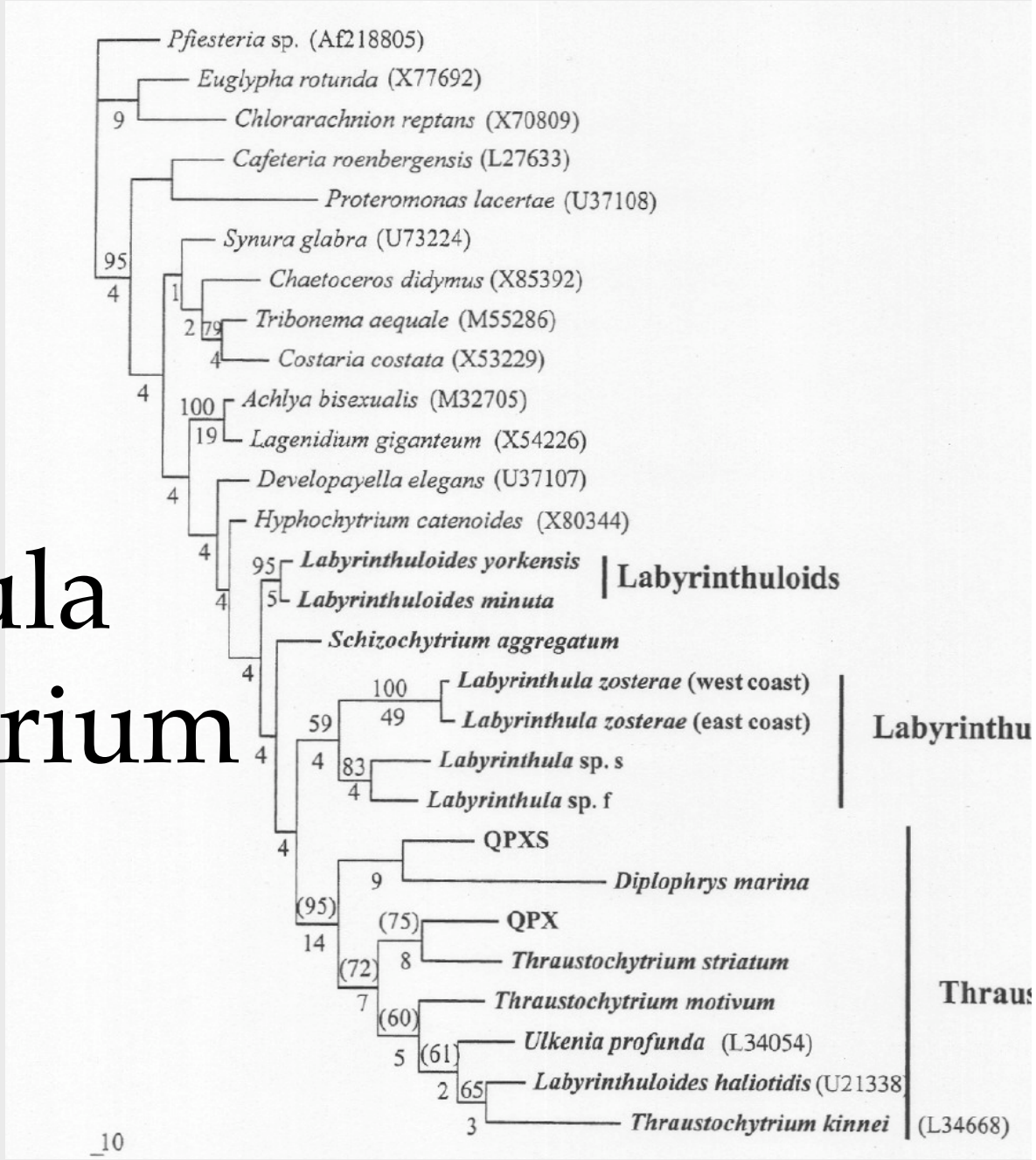
Spongospora

Stramenopiles and Alveolates

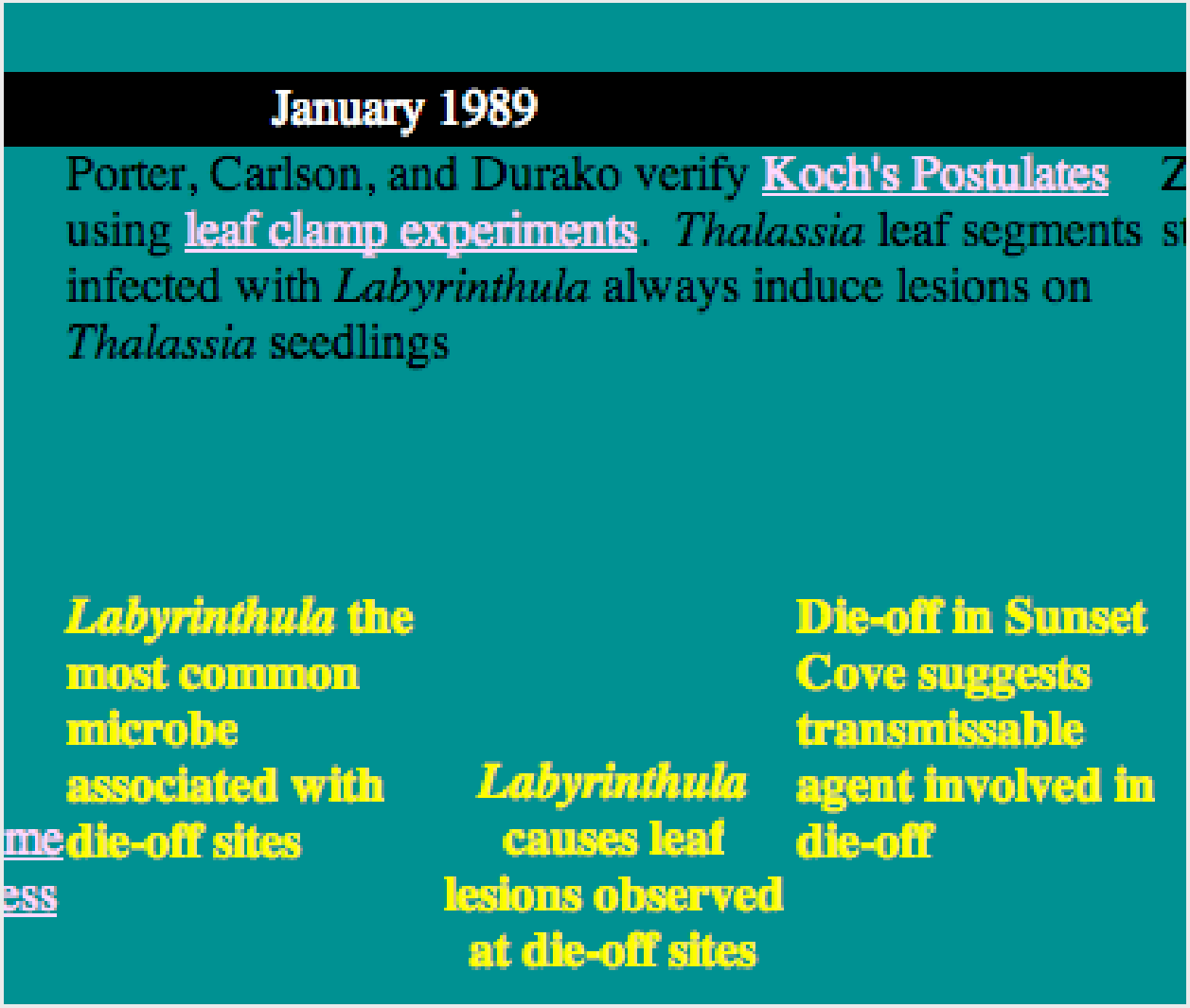


Labyrinthula Thraustochytrium

Leander and Porter
2001
Mycologia



Labyrinthula



Sea Grass Decline

people.uncw.edu/ durakom/Seagrass/b1.htm

Labyrinthula

Summer 2000

Durako measures photosynthetic characteristics of *Thalassia* in situ at Sunset Cove and Cross Bank with PAM fluorometer. Leaves with lesion have lower photosynthetic yields, but close-interval measurements indicate lesion effects localized on leaf

***Labyrinthula* lesions reduce photosynthetic Yields**

Fall 2000

Durako measures photos
Thalassia in Rabbit Key
with PAM.

FHAP fall 2000 *Thalass*
maps and fall 1995 versu
produced for *Thalassia* a

E
po
sulfi
phot

Sea Grass Decline

people.uncw.edu/ durakom/Seagrass/b1.htm

Labyrinthula

Sea Grass Decline

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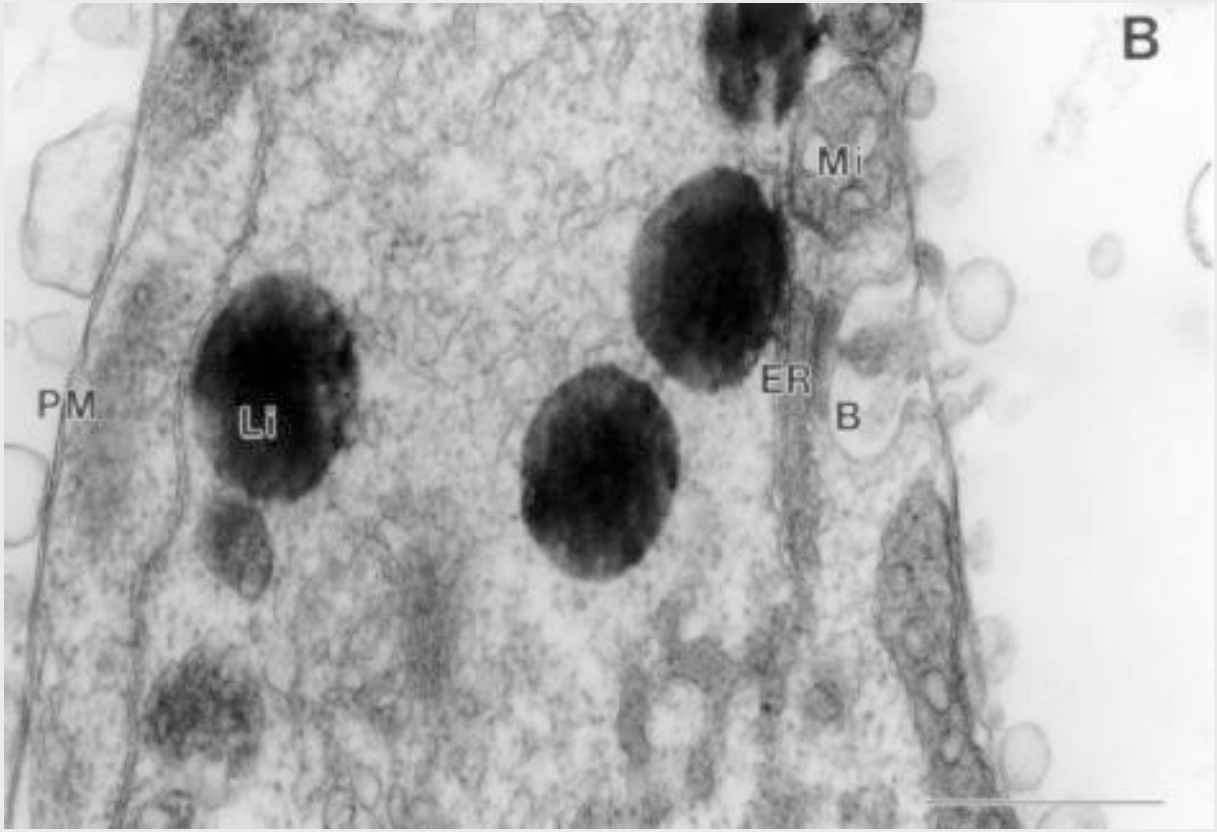
Labyrinthula

Turf grass disease.

Sudden blight on ***Agrostis capillaris*** and ***Poa annua***

www.bspp.org.uk/ ndr/july2005/2005-41.asp

Labyrinthula

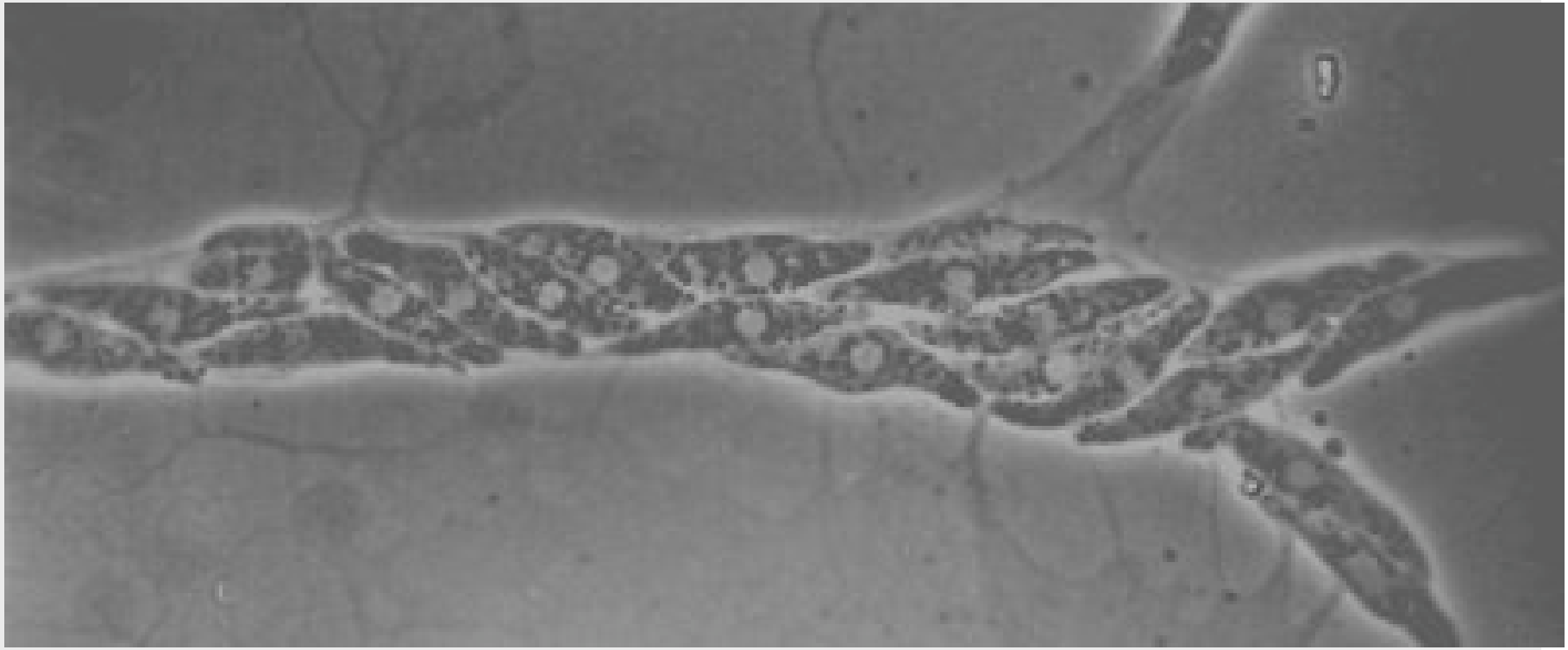


Sagenosome or Bothrosome

Labyrinthula

Spindle cells in slime net

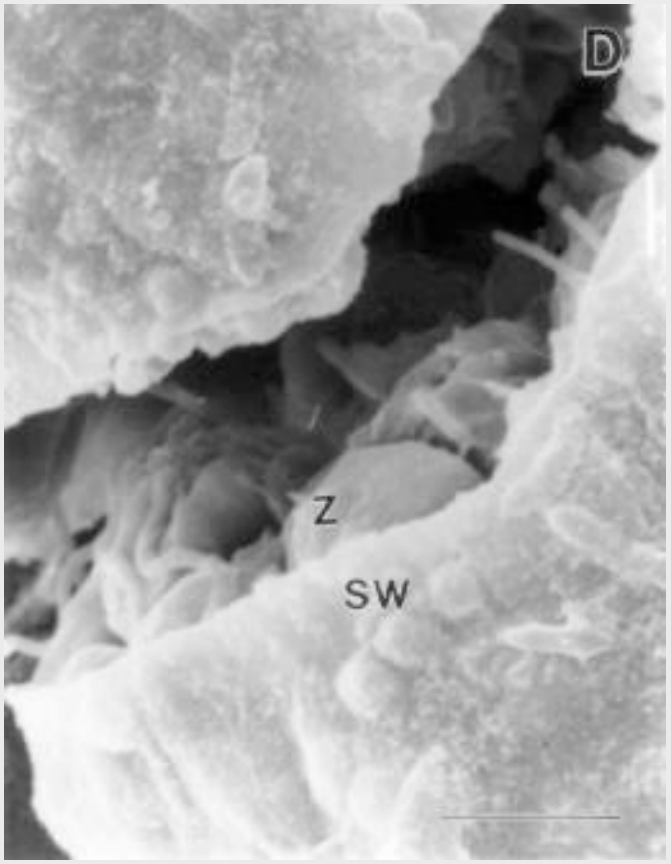
Labyrinthula



Spindle cells in slime net

UGA

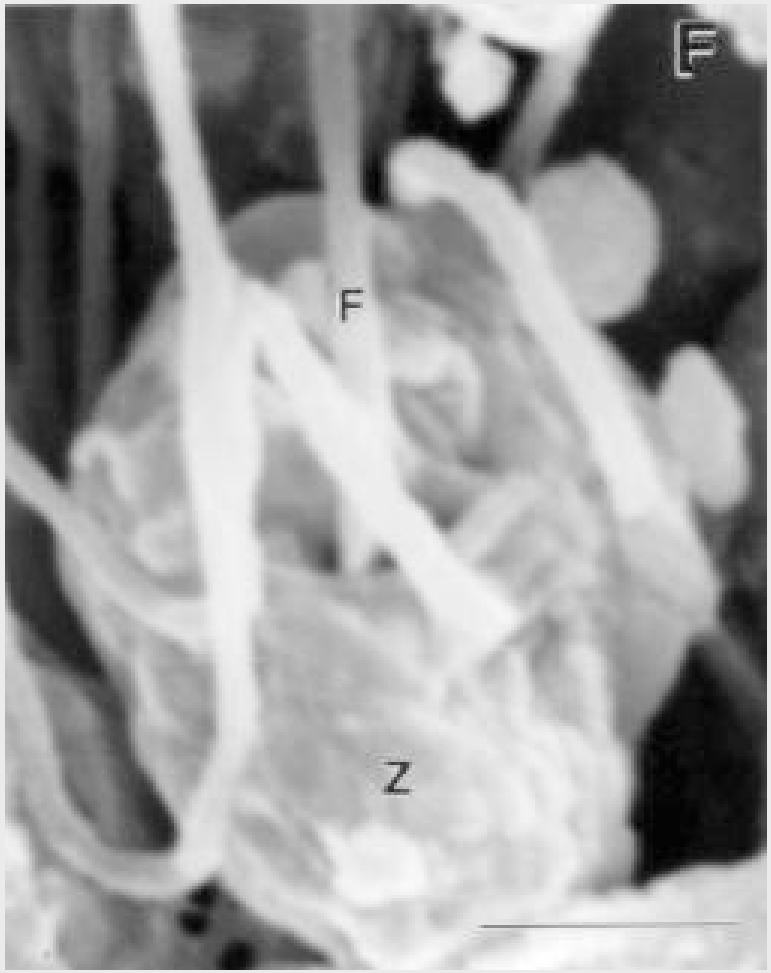
Labyrinthula



UGA

Crevice in sporangium (sorus)

Labyrinthula



Zoospore

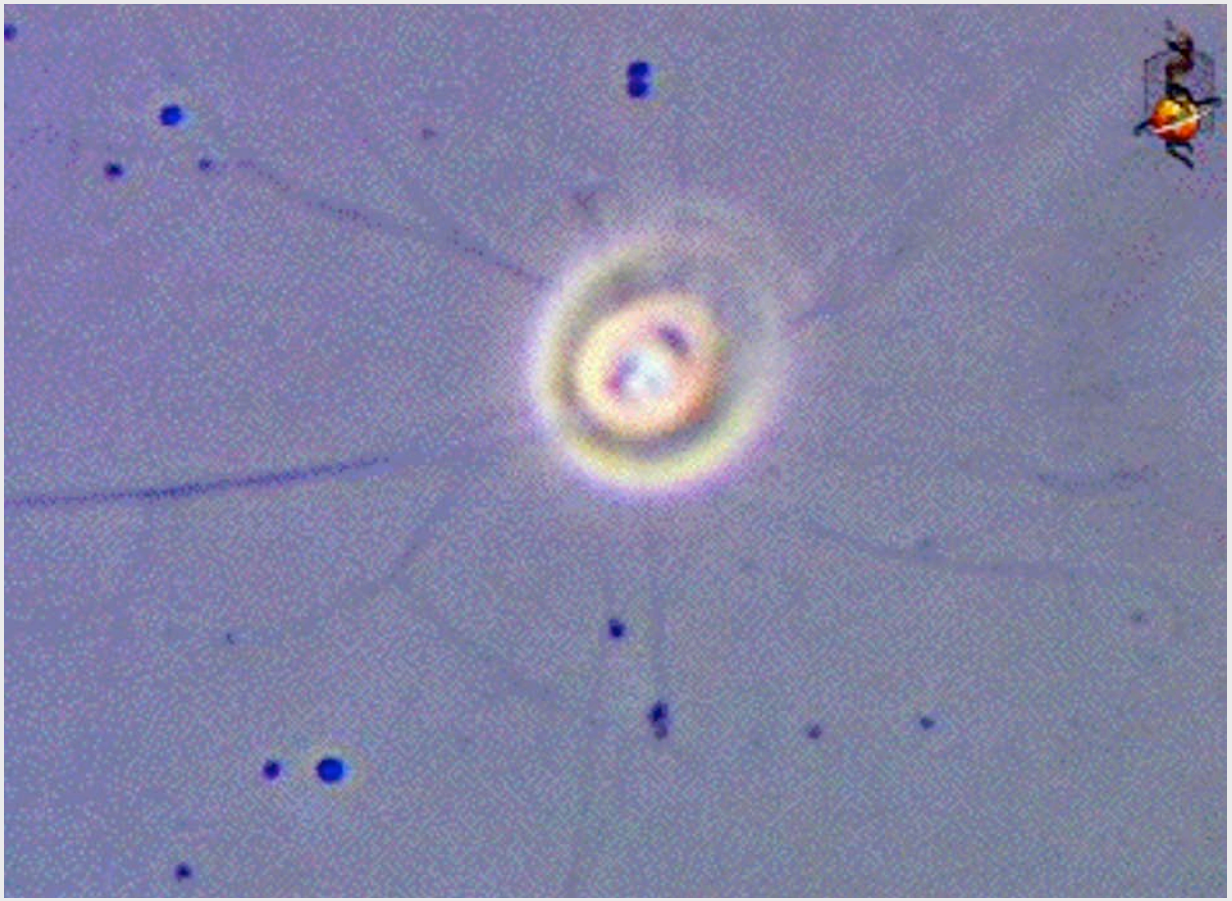
UGA

“Slime Molds”

Kingdom Stramenopila
Labyrinthulomycota
Labyrinthula
Thraustochytrium

Kingdom Cercozoa
Plasmodiophoromycota
Plasmodiophora
Spongospora

Thraustochytrium



http://microscope.mbl.edu/baypaul/microscope/lucidkeys/Xamoebae/images/LMEB_thraustochyt.jpg

Thraustochytrium

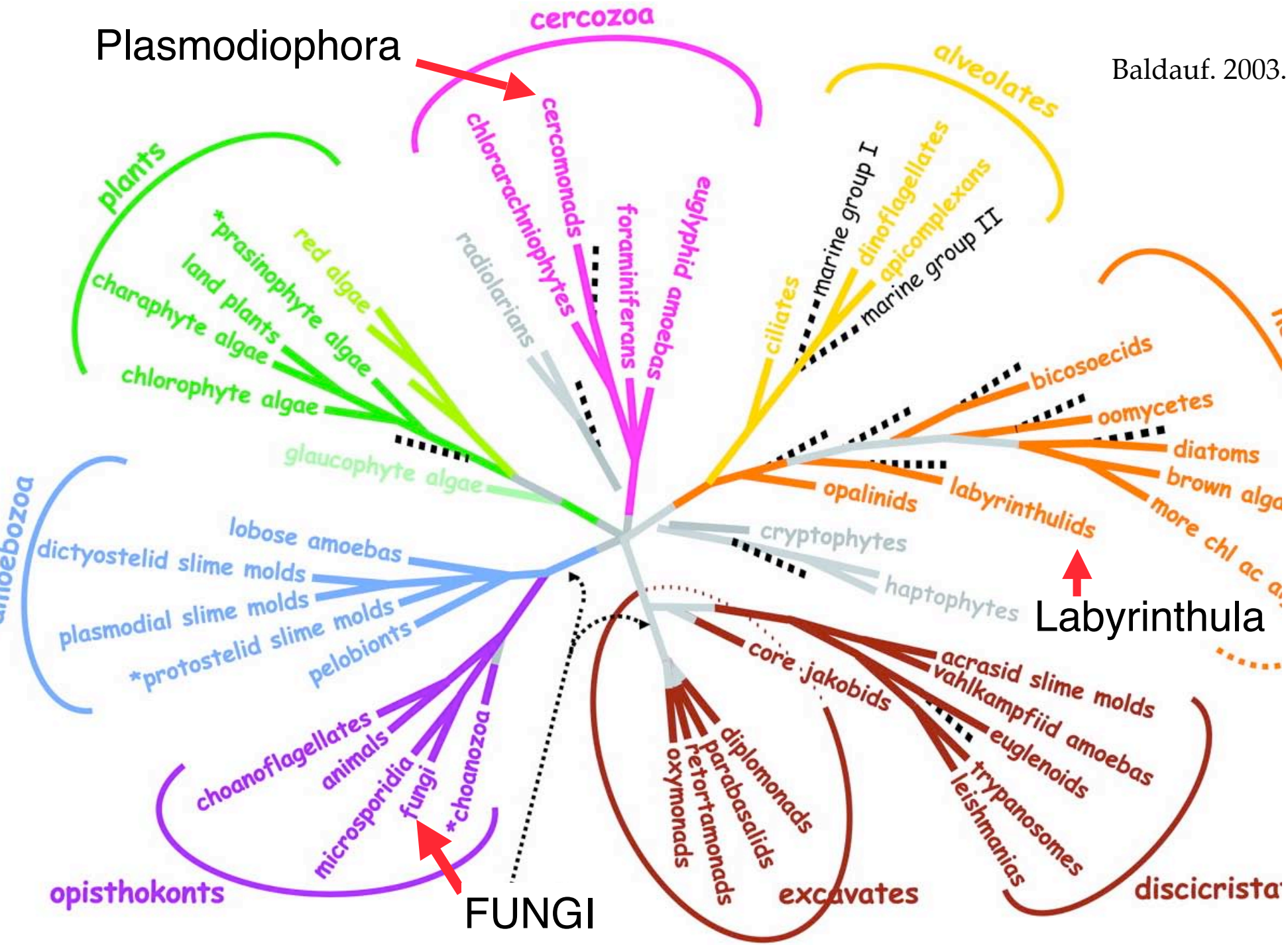
docosahexaenoic acid

Omega 3 oils

"Slime Molds"

Kingdom Stramenopila
Labyrinthulomycota
Labyrinthula
Thraustochytrium

Kingdom Cercozoa
Plasmodiophoromycota
Plasmodiophora
Spongospora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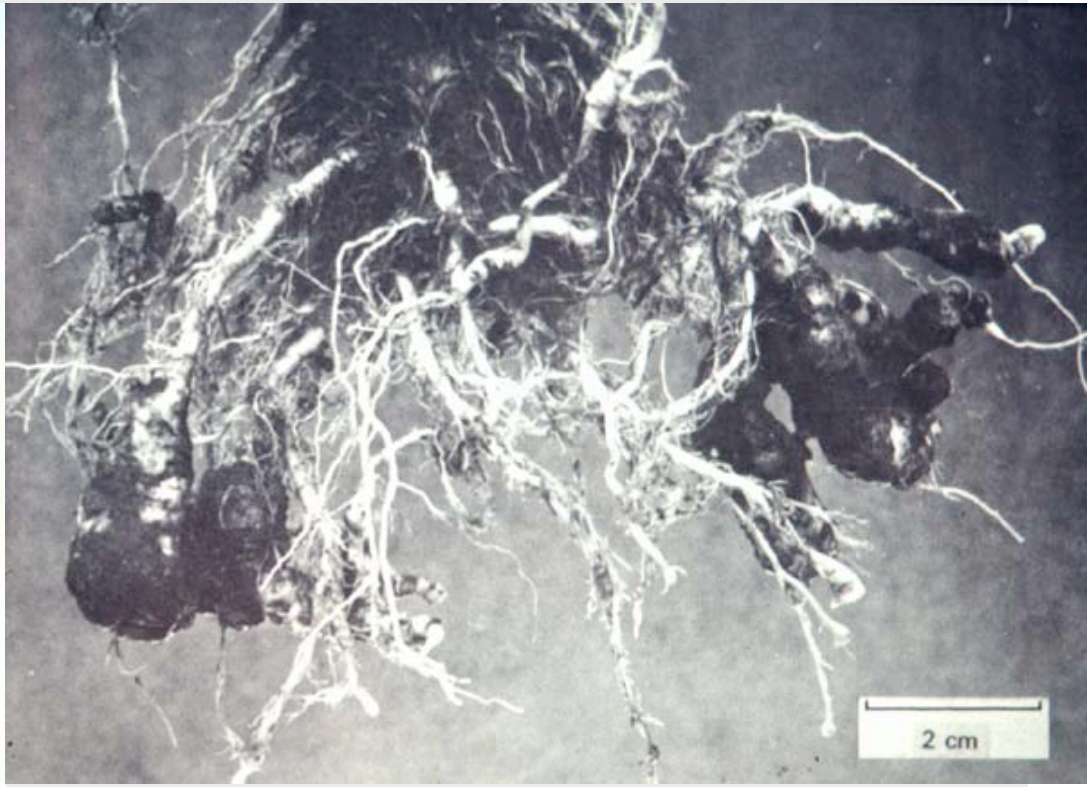
Cercozoa

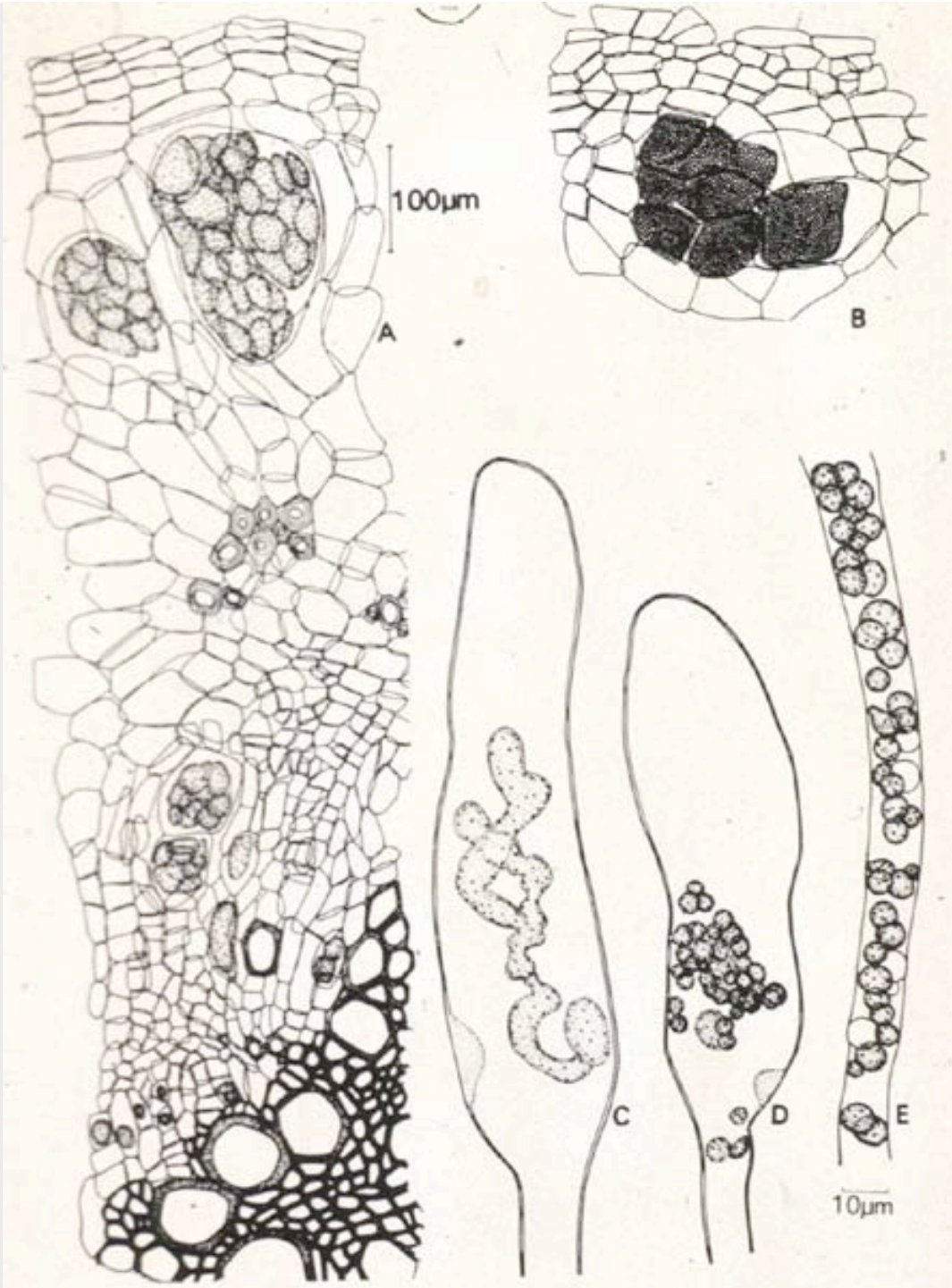
Plasmodiophoramycota

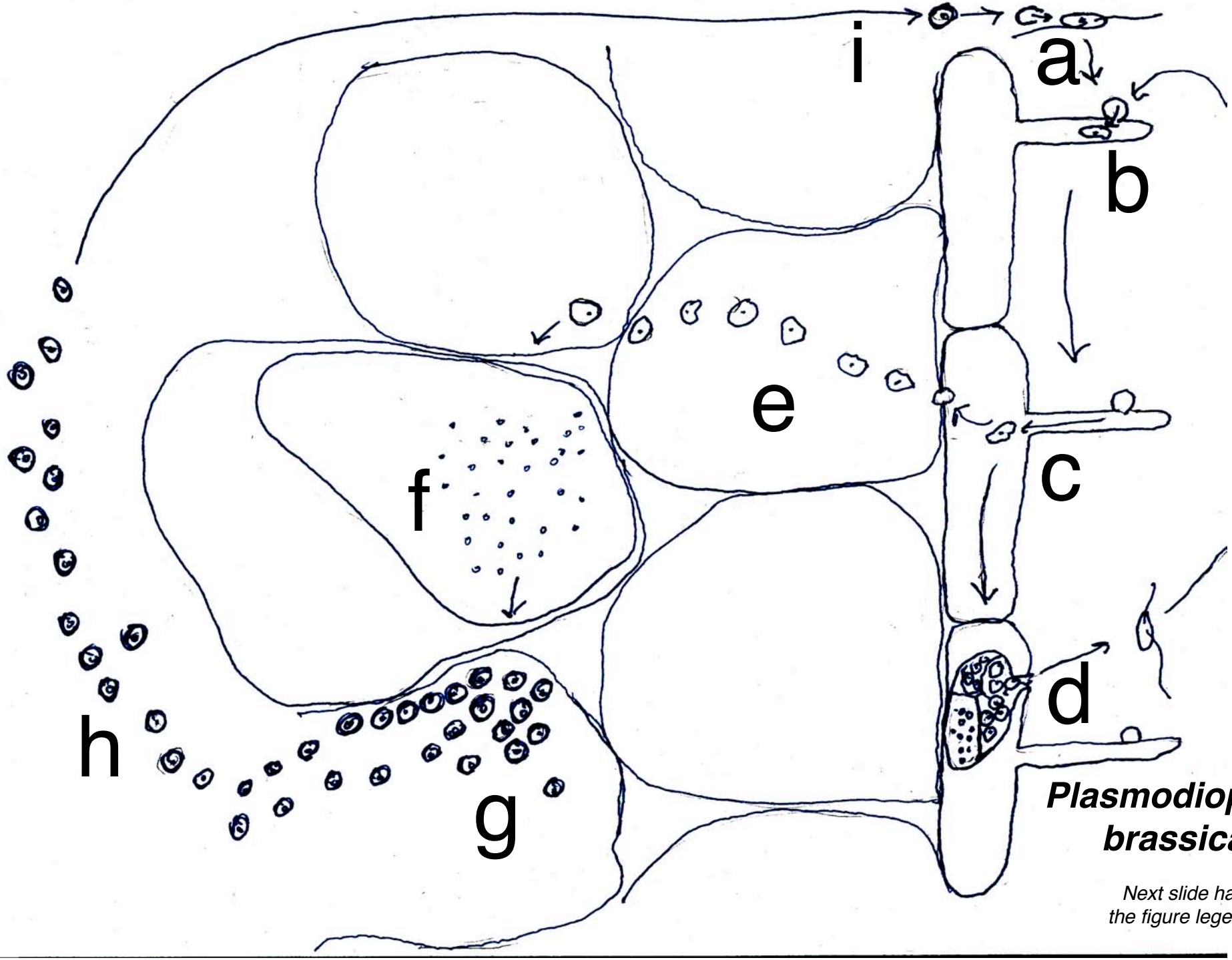
Plasmodiophora



Club root of Brassicaceae

Plasmodiophora





Plasmodiophora brassicae

Next slide has the figure legend

Revisionist life cycle of *Plasmodiophora brassicae*.

We do not know if *Plasmodiophora* is haploid or diploid, nor do we know when mating (plasmogamy and karyogamy) occurs, if at all. Therefore, this life cycle is as likely as the one in your text book and in the next powerpoint slide.

a. Zoozpore (biflagellate, moving toward shorter flagellum) emerges from resistant spore.

b. Zoospore encysts on root hair of Brassicaceae and *Plasmodiophora* cytoplasm enters plant epidermal cell using physical force and the stylet-tube-sac apparatus.

c. *Plasmodiophora* cytoplasm (amoeba?) moves into epidermal cell and makes the crucial decision to either stay in the epidermal cell (d) and produce a zoosporangium or move from the epidermis into deeper cortical cells (e) and produce a sporangium filled with resistant spores.

d. *Plasmodiophora* cytoplasm remains in the epidermis and grows using the plant as its food source. It becomes populated by many nuclei resulting from many mitotic divisions. This “plasmodium” subdivides into several sporangia and zoospores develop as membrane divides the cytoplasm into uninucleate portions. Zoospores release through the plant cell wall and can reinfect the plant (b).

e. Alternatively, the *Plasmodiophora* “amoeba” moves from epidermal cells to deeper cortical cells in the root.

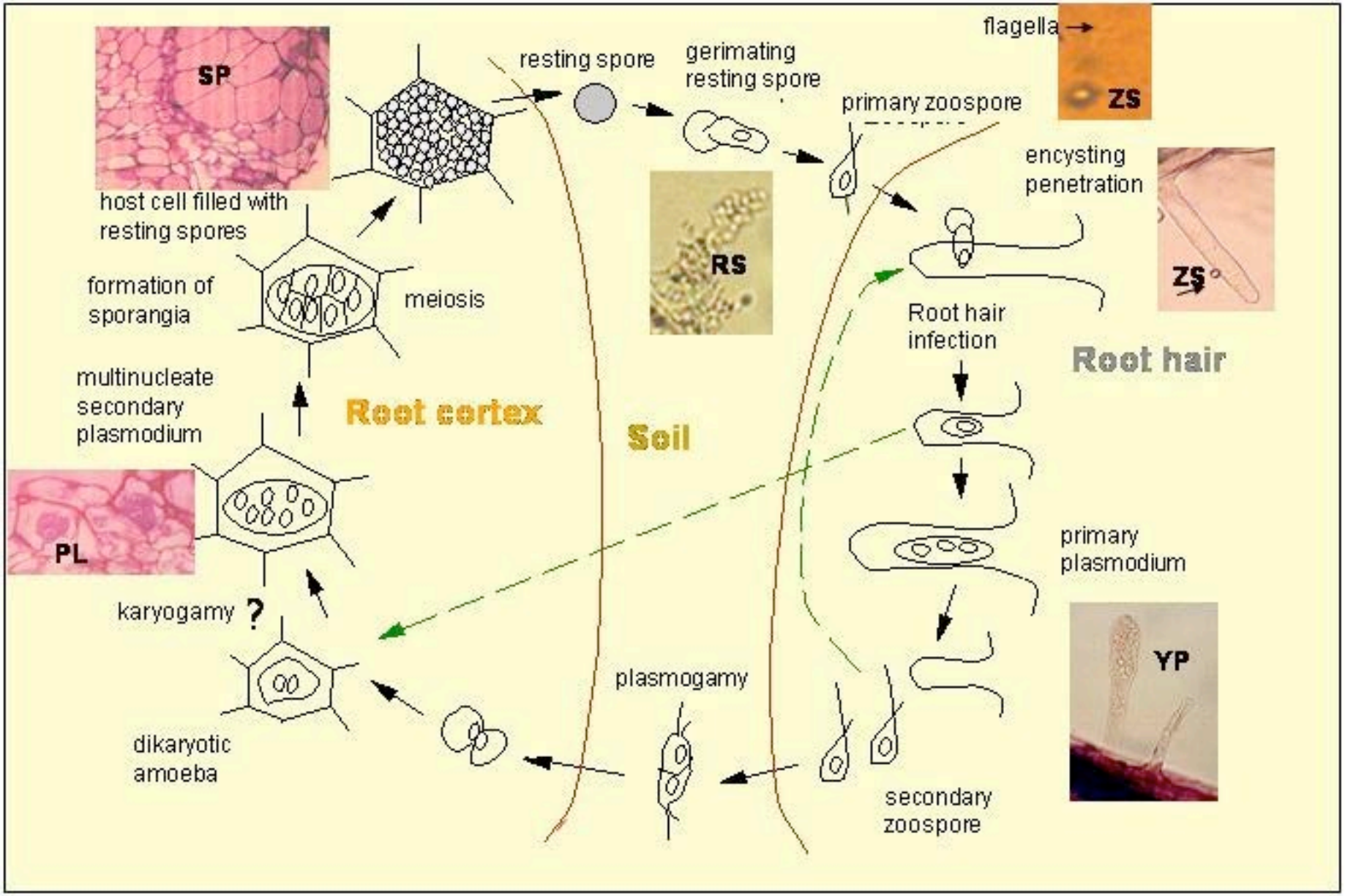
f. *Plasmodiophora* “amoeba” grows using the plant as food and improves its food supply by secreting plant hormones that cause the plant cells to enlarge. Growth into a plasmodium is accompanied by multiple mitoses.

g. Uninucleate portions of *Plasmodiophora* cytoplasm form and the nuclei divide meiotically. Thick, resistant cell walls develop around each uninucleate spore to produce resistant spores.

h. The resistant spores are released as the root rots.

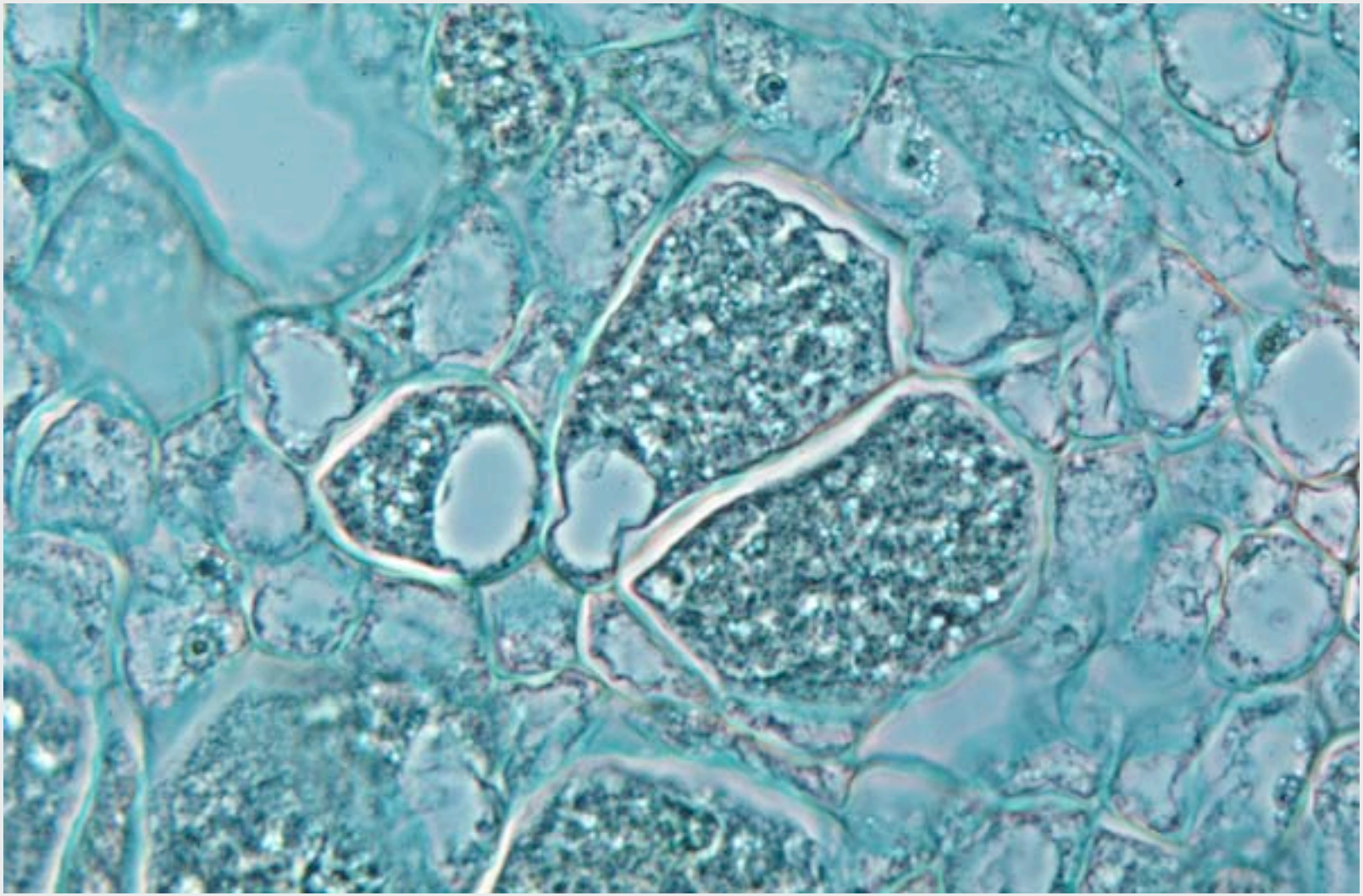
i. A single resistant spore can start an infection.

The Life Cycle of *Plasmodiophora brassicae*



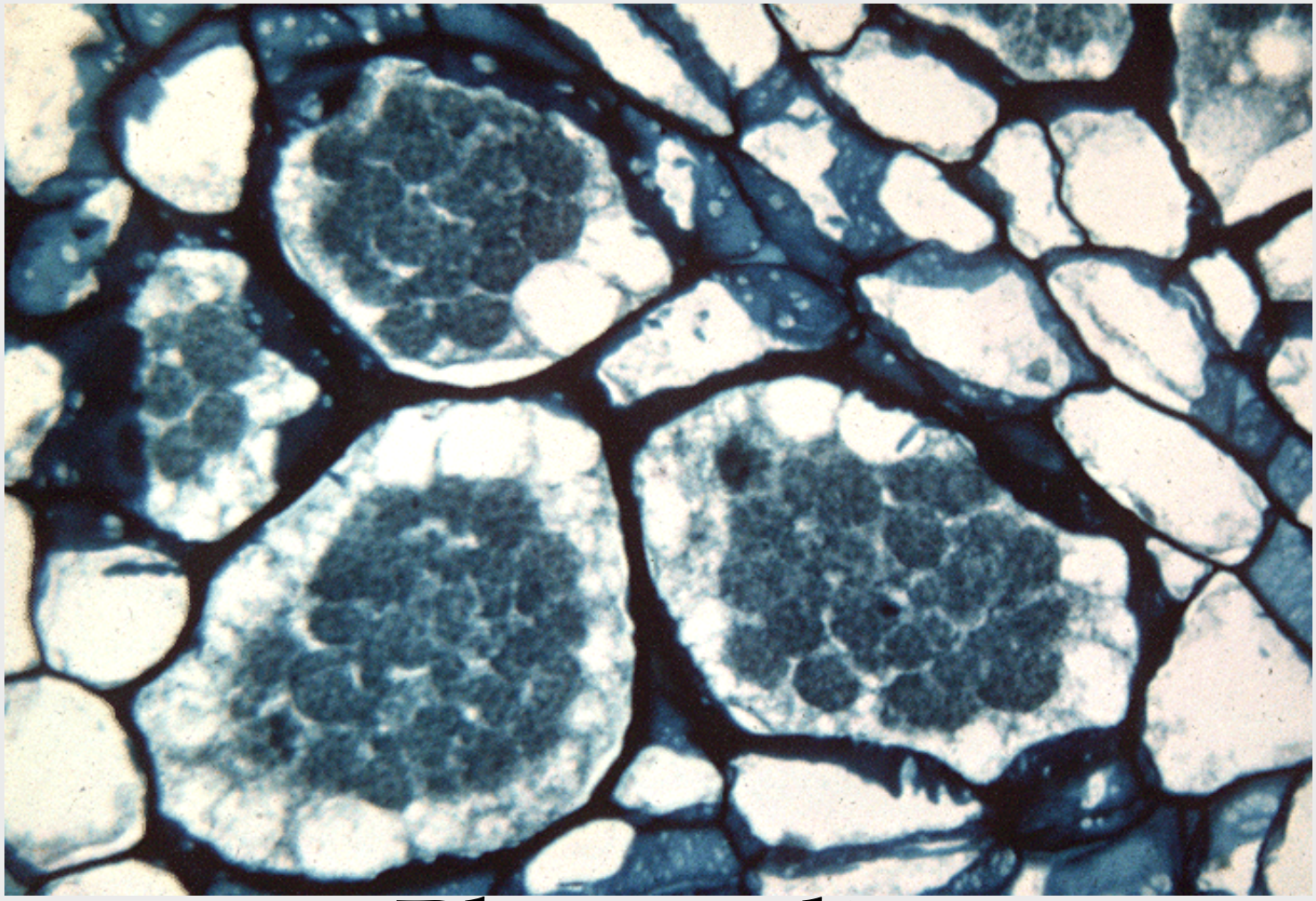
www.biologie.tu-dresden.de/botanik/LS/Physiologie

Plasmodiophora



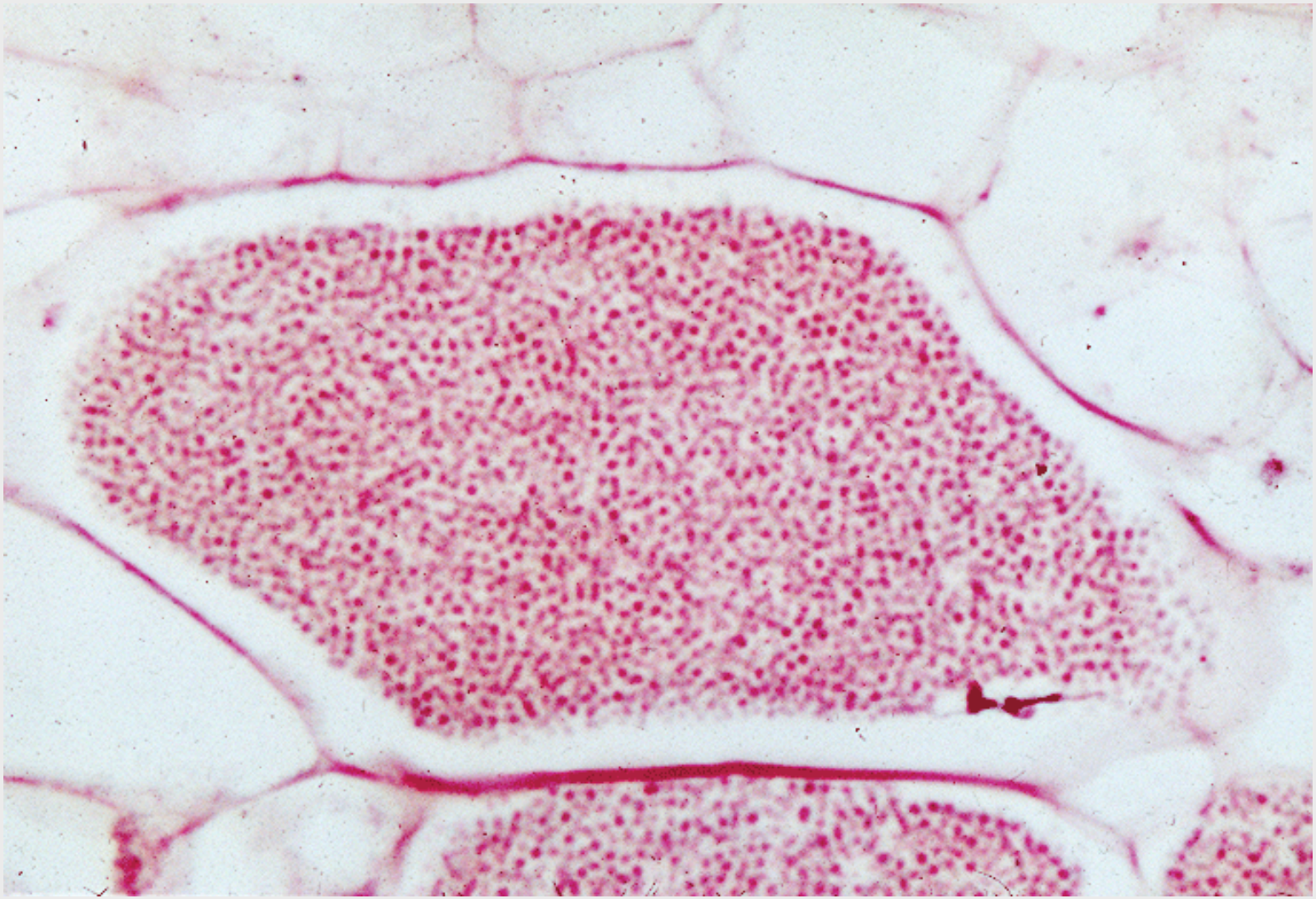
Plasmodia

Plasmodiophora



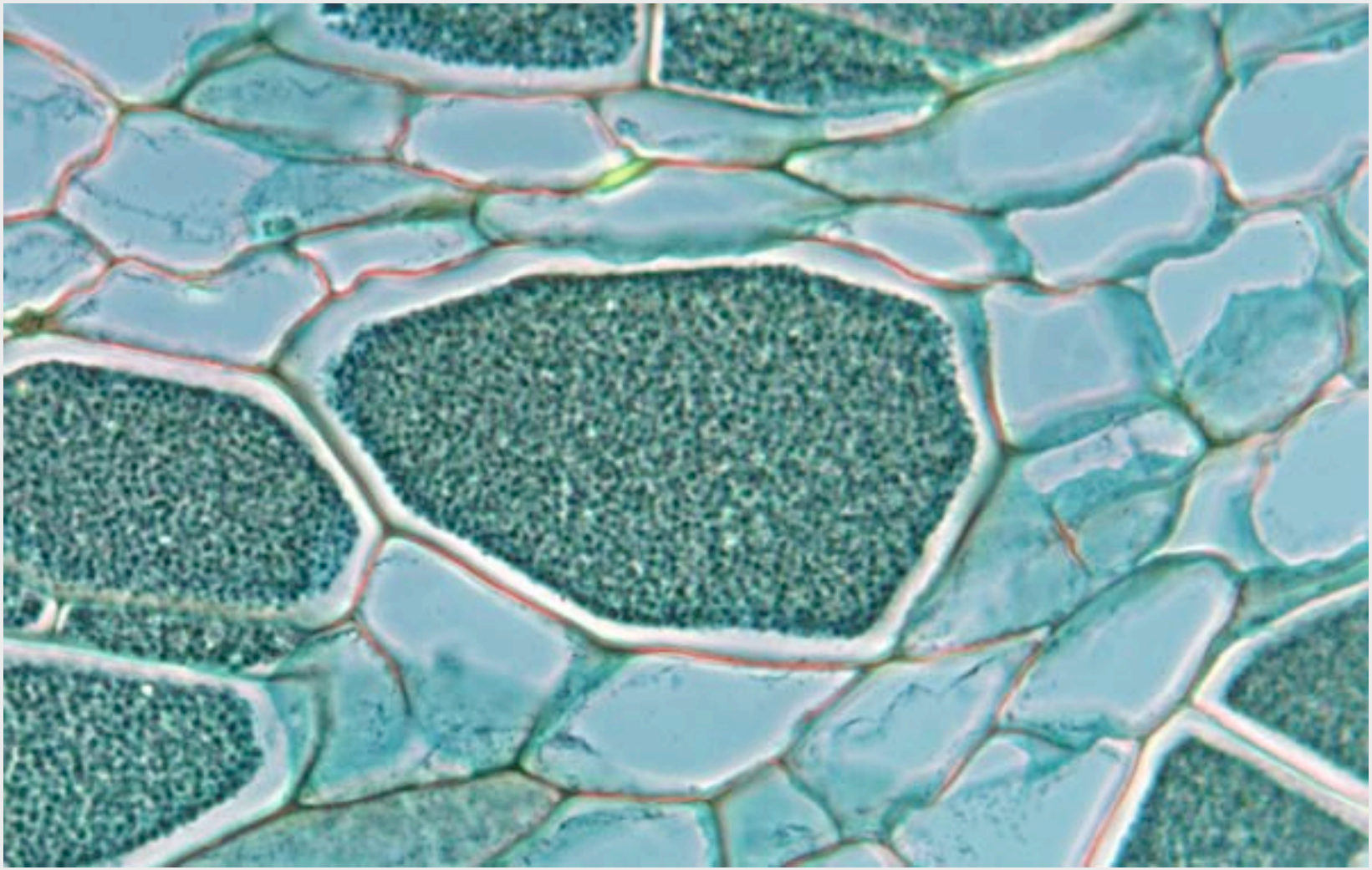
Plasmodia

Plasmodiophora



Resting spores

Plasmodiophora



Resting spores

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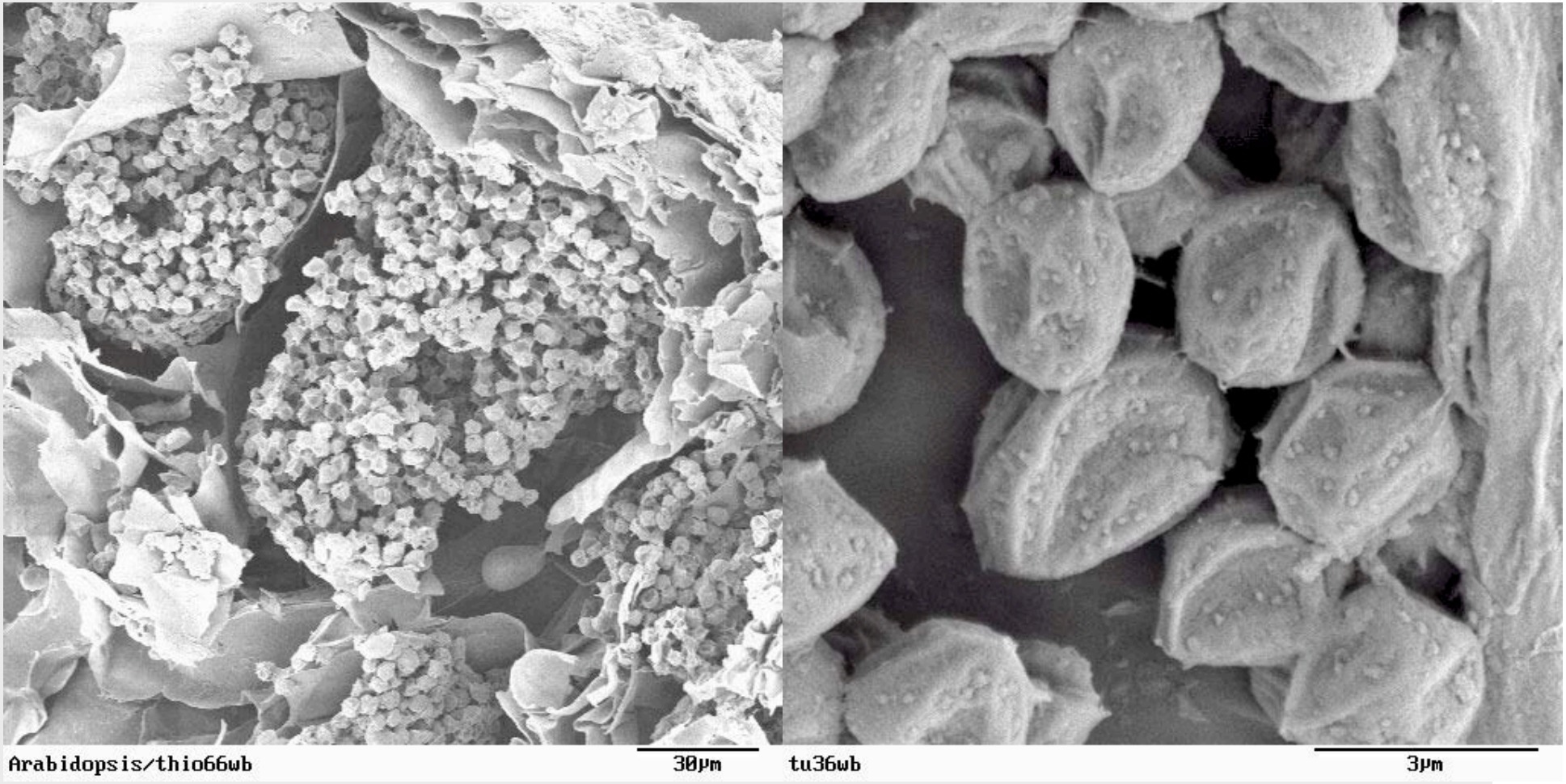
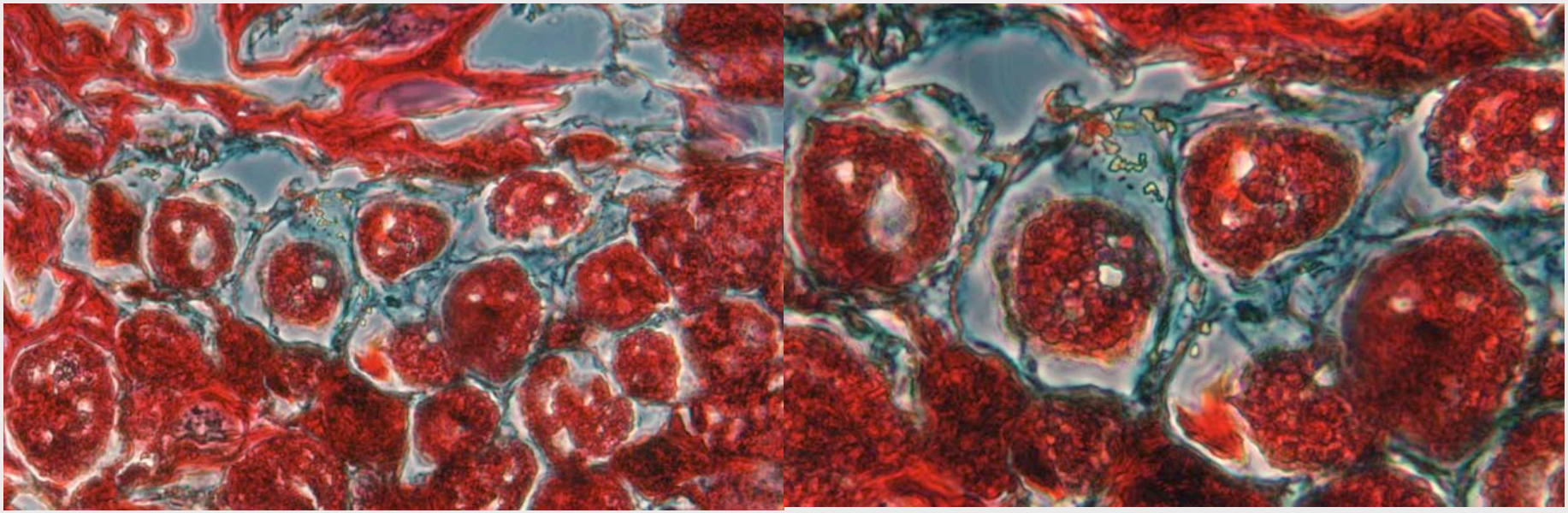


Resting spores in Arabidopsis

Spongospora

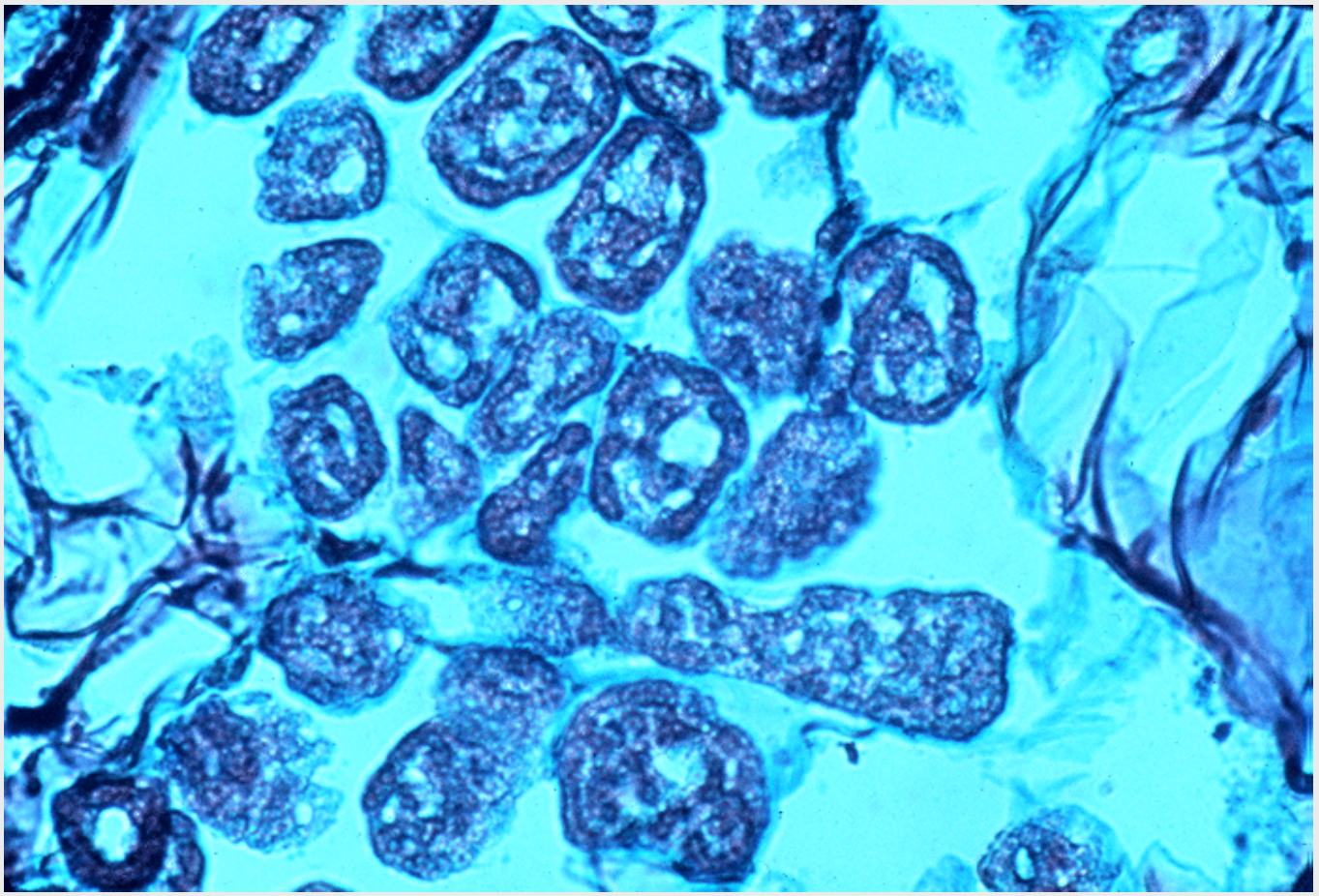
Potato Scab

Spongospora



Spore balls in potato

Spongospora



Section of spore balls

Next lecture:

More Stramenopiles: Oomycota