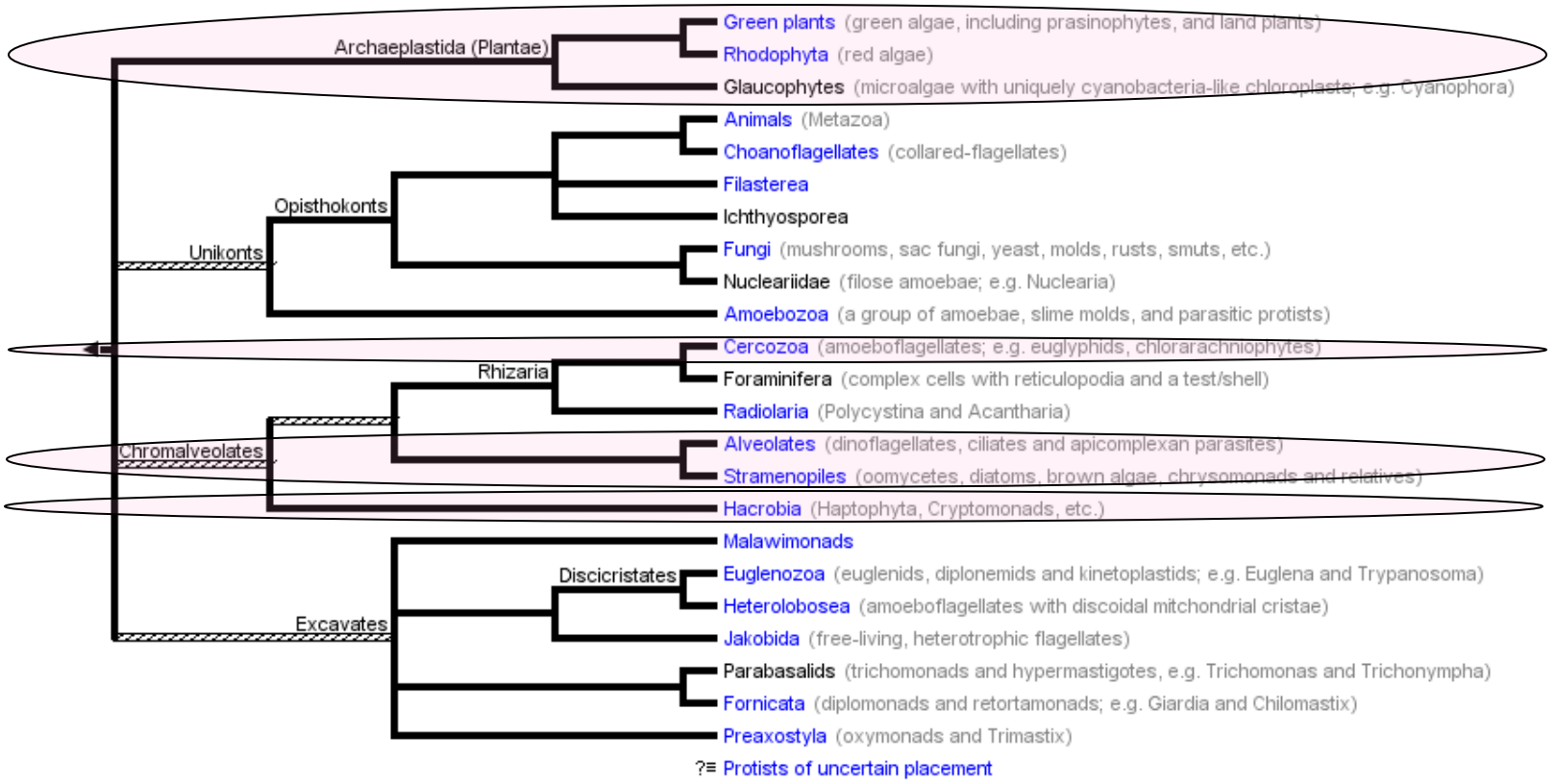
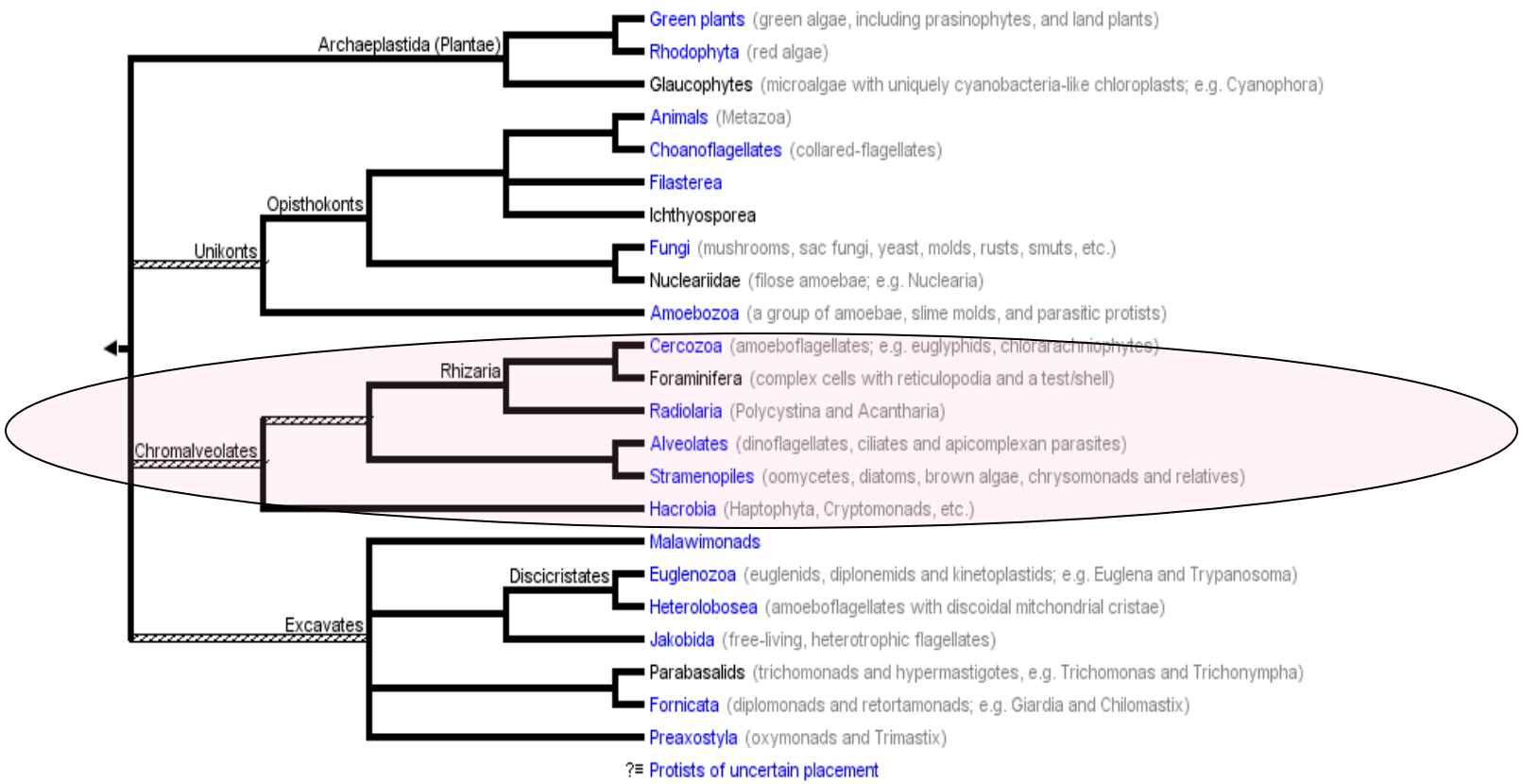
Superkingdom *Eukaryota*
(NCBI Taxonomy Browser + Tree of Life)



http://tolweb.org/Eukaryotes/3

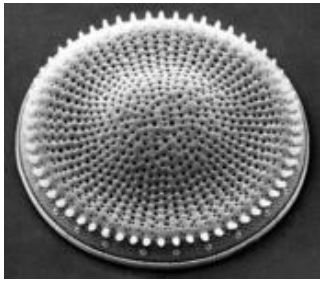
“Kingdom” *Chromalveolata*



http://tolweb.org/Eukaryotes/3

"Kingdom" *Chromalveolata*

Macrocystis
Stramenopiles
Phaeophyta



Stephanodiscus
Stramenopiles
Bacillariophyta

Gymnodinium
Alveolata
Dinophyceae

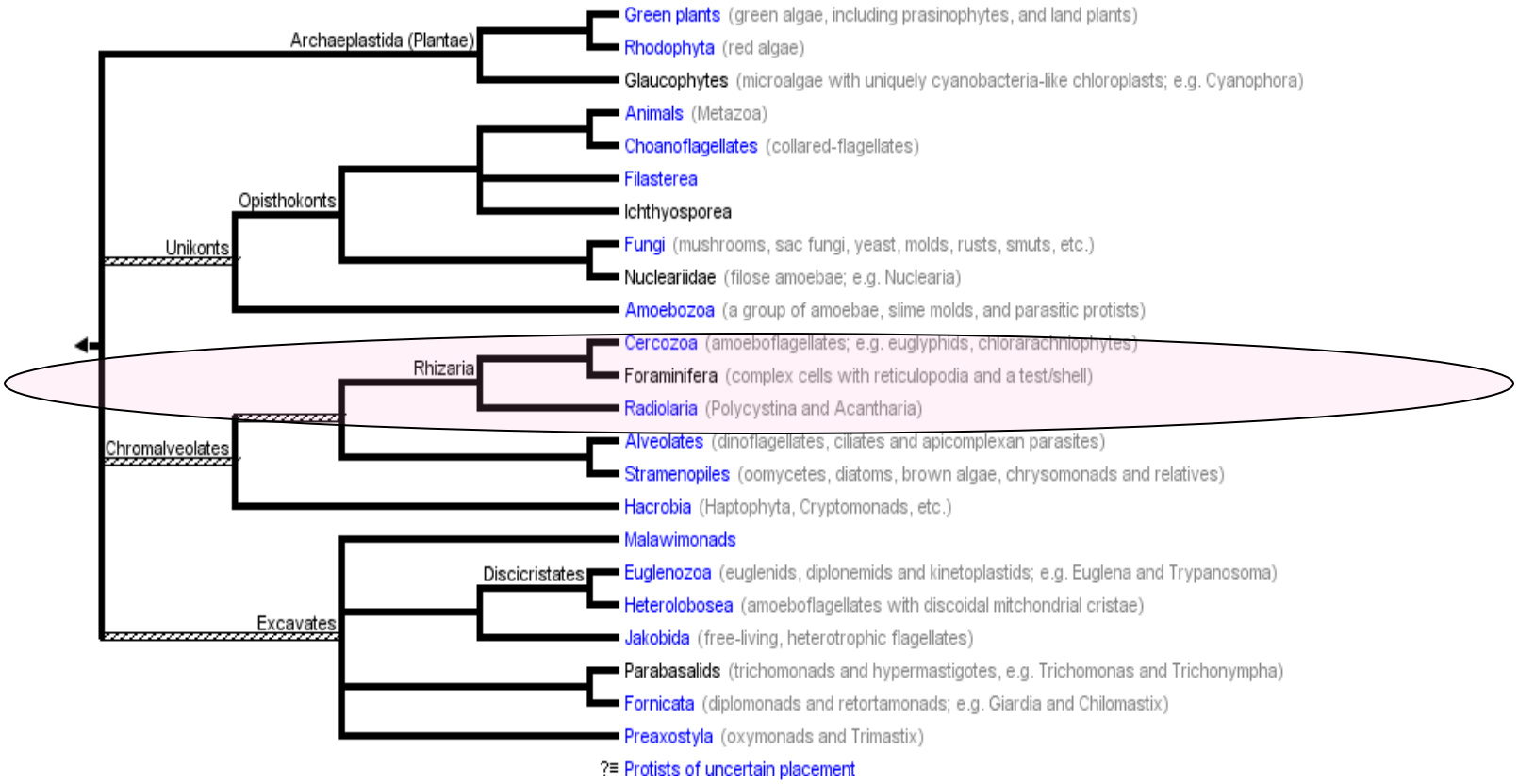
Bursaria
Alveolata
Ciliophora

Gymnochlora
Cercozoa
Chlorarachniophyta

- predominantly unicellular eukaryotes with auto- and heterotrophic sub-lineages
- chloroplast mainly by endosymbiosis with a rhodophyte that has become a cryptoplast or that has been lost in heterotrophic sub-lineages
- genes shared with unusual evolutionary histories (e.g., horizontal gene transfer, HGT)

http://tolweb.org/Eukaryotes/3

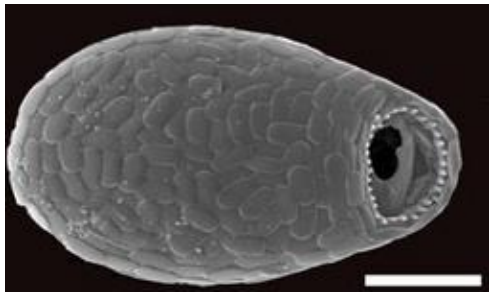
“Kingdom” *Chromalveolata*



http://tolweb.org/Eukaryotes/3

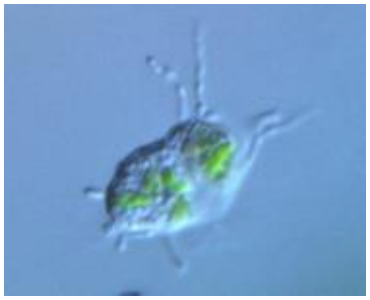
Lineage *Rhizaria*

Euglyphid amoebae



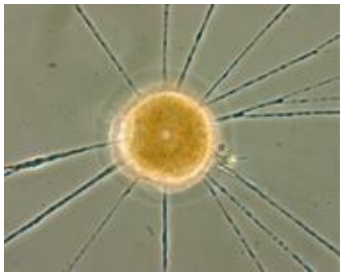
Corithion dubium

Cercozoa

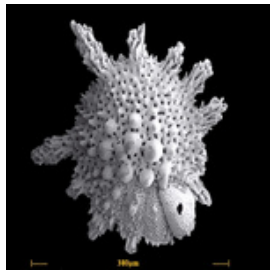


Gymnochlora

Foraminifera



Allogromia

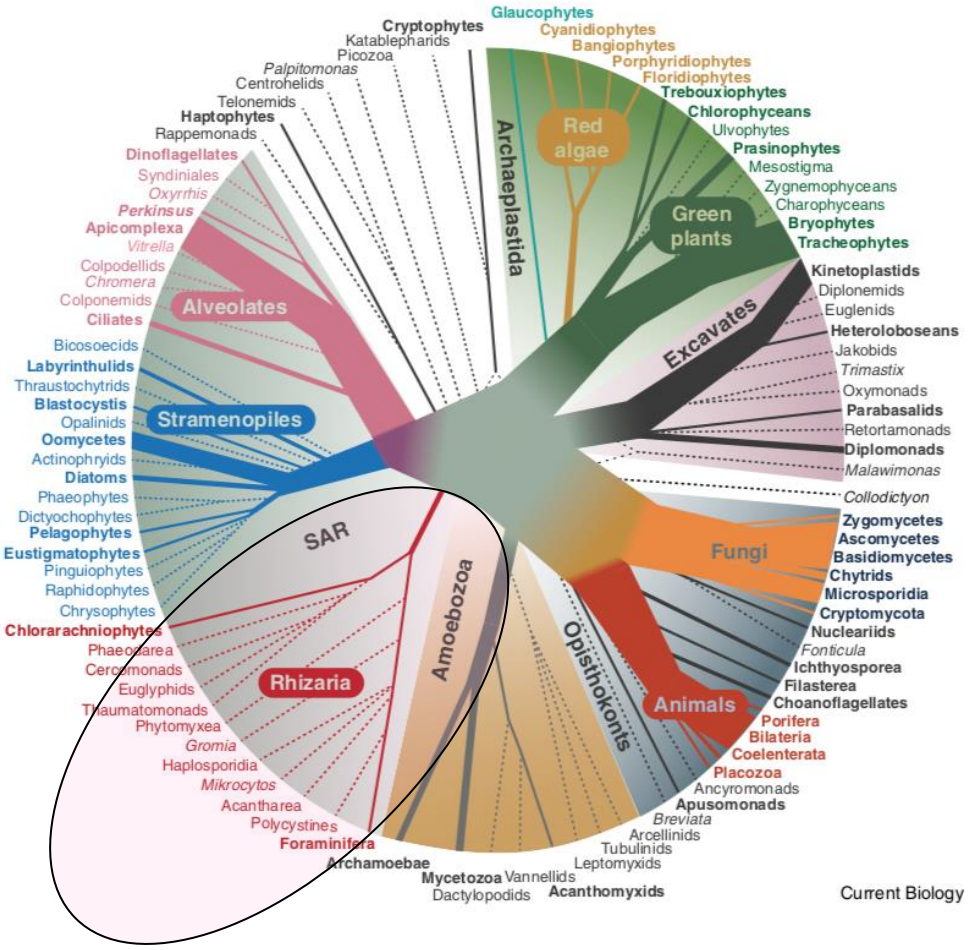


Calcarina spengleri

- Lineage recognized very recently almost exclusively via molecular taxonomy
- Includes amoebae with narrow pseudopodia rather than broad, flagellates and amiboflagellates
- includes also the Radiolaria

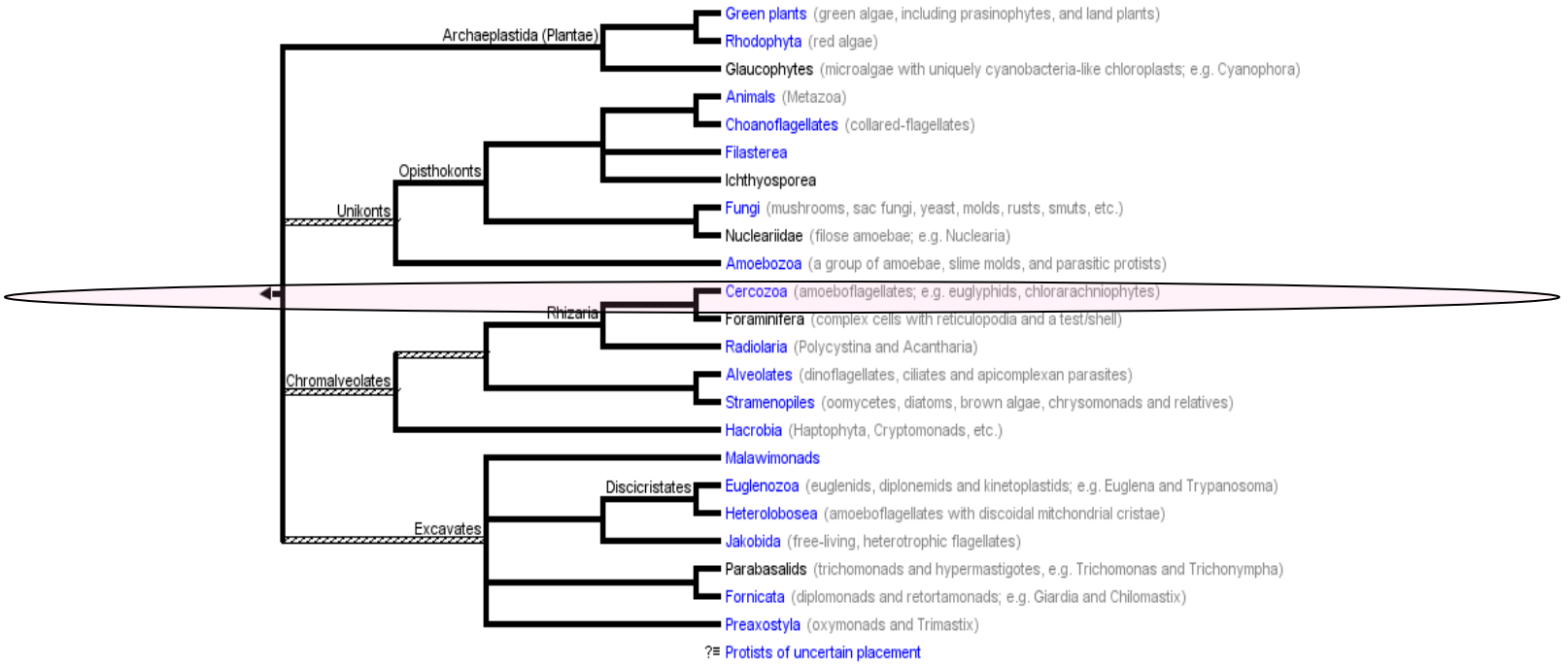
http://tolweb.org/Eukaryotes/3

Lineage *Rhizaria*



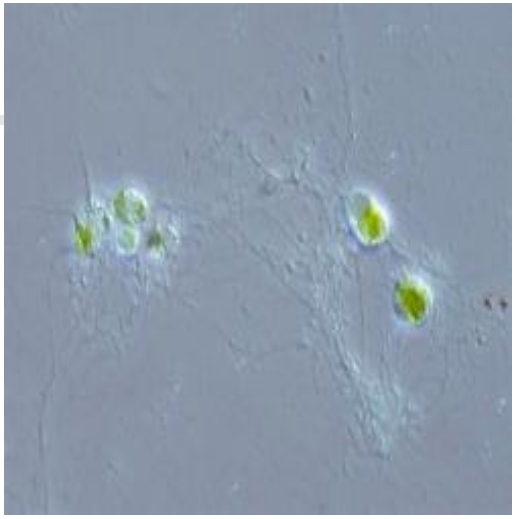
https://www.sciencedirect.com/science/article/pii/S0960982213015844

“Kingdom” *Chromalveolata*



http://tolweb.org/Eukaryotes/3

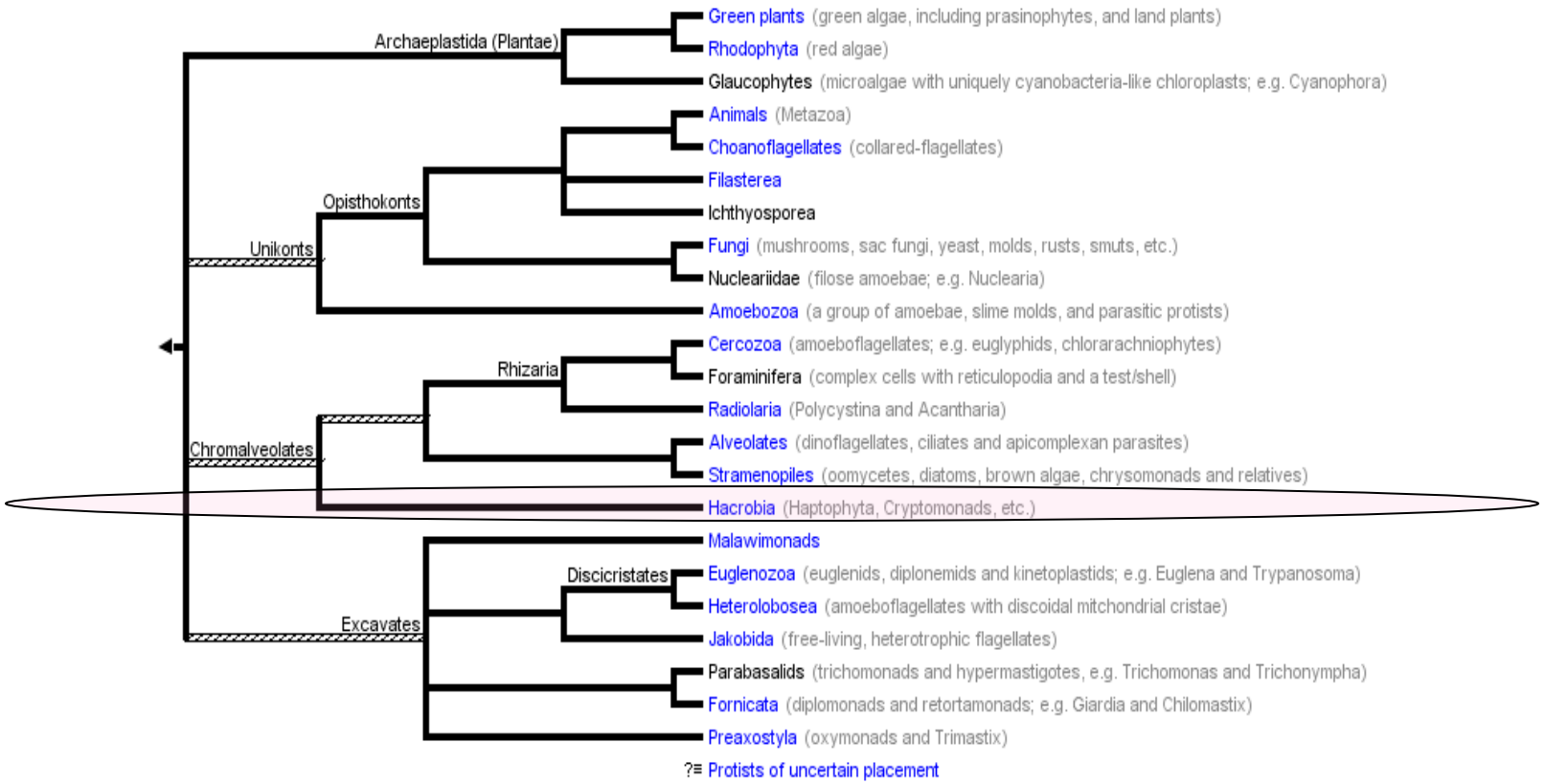
Lineage *Cercozoa*
(Phylum *Chloraracniophyta*)



- Ameboids with pseudopodia
- Chloroplasts
- Chlorophyll *a, b*
- Captured an euglenoid alga?
- Chloroplast retains a residual nucleus called "nucleomorph"

Keeling (2009), http://tolweb.org/Chlorarachniophytes

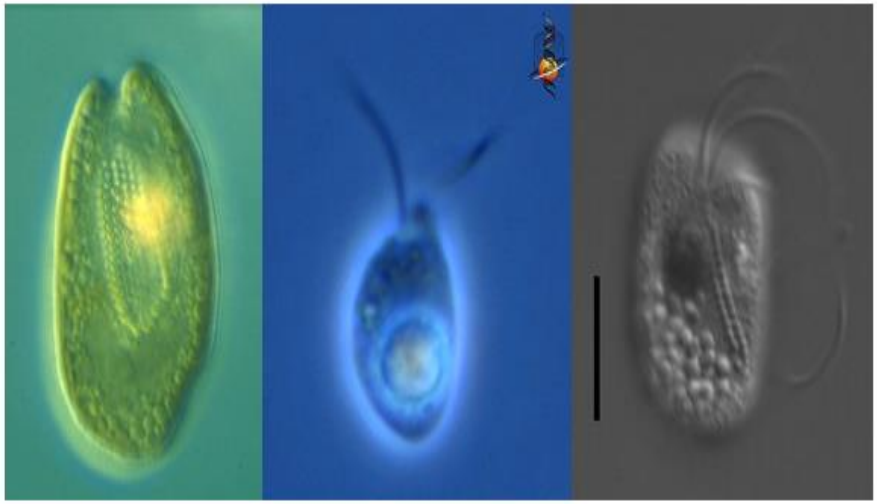
“Kingdom” *Chromalveolata*

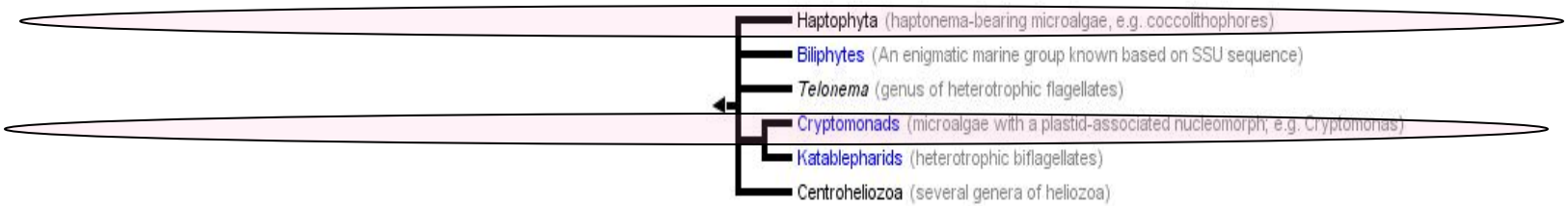


http://tolweb.org/Eukaryotes/3

Lineage *Hacrobia*

Lineage with varied morphology and trophy based on molecular phylogenetic studies (e.g., sharing a [*rbl36*] gene of bacterial origin in chloroplasts)





http://tolweb.org/Hacrobia/124797

Lineage *Haptophyta*

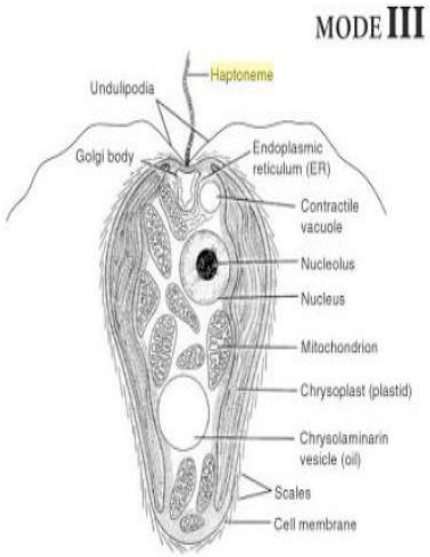


Figure D *Prymnesium parvum*, the free-swimming haptonemid stage of a haptomonad. The surface scales shown here are not cocoliths form. [Drawing by R. Golder.]

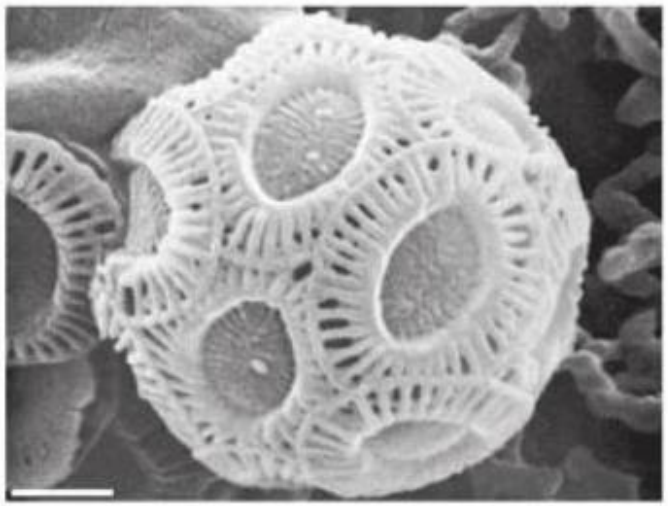


Figure B *Emiliania huxleyi*, a coccolithophorid from the Atlantic. It was not realized until the 1980's that Coccolithophorids are the resting stage of haptomonads. SEM, bar = 1 μm. [Courtesy of S. Honjo.]

Margulis, L. & Schwartz, K. (1999) *Five Kingdoms: an illustrated guide to the phyla of life on earth.* W.H.Freeman, NY, pp. 194-195.

Lineage *Cryptophyta*

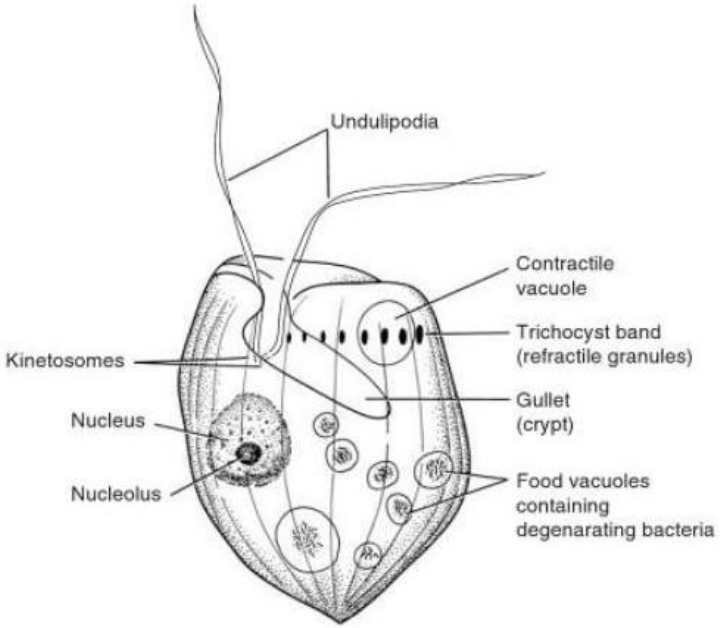
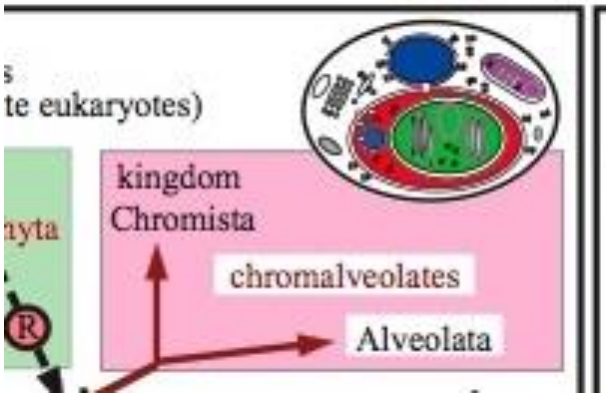
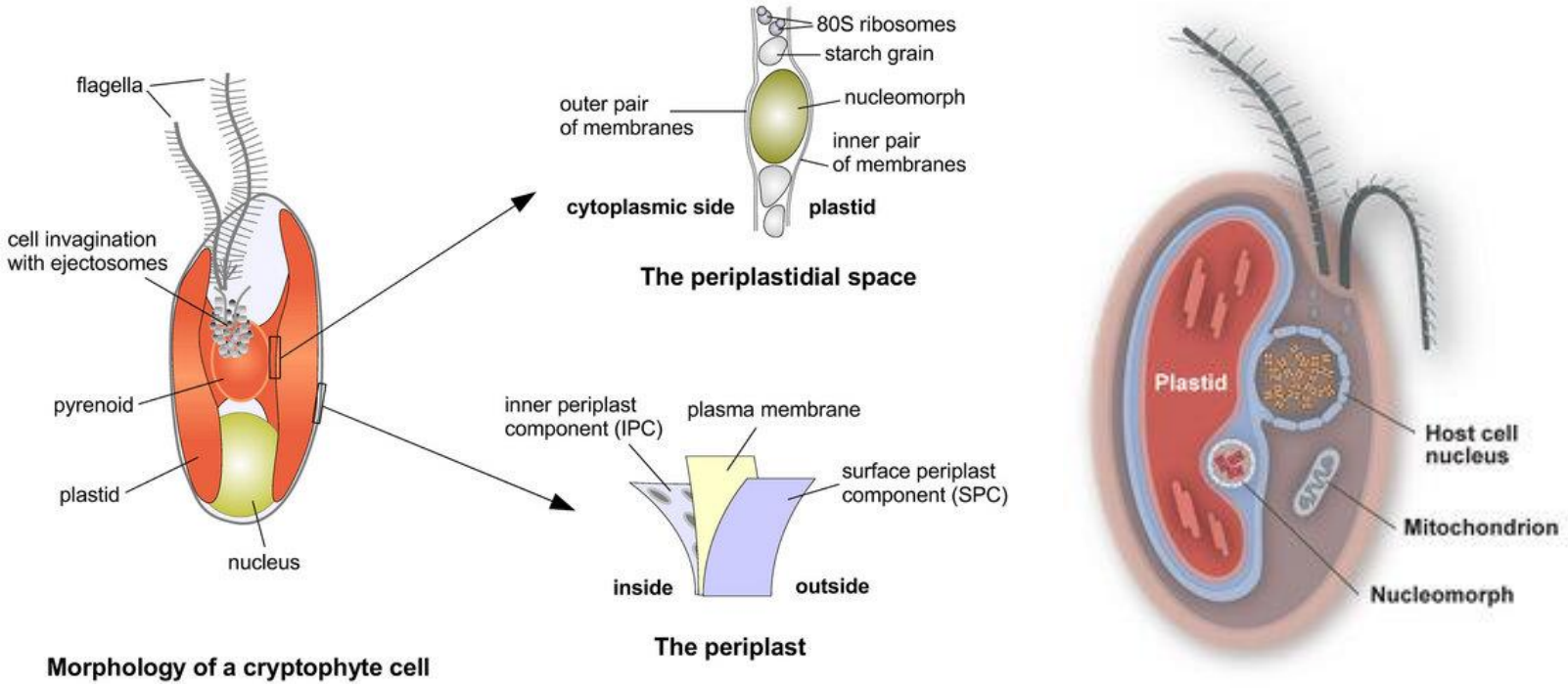


Figure C *Goniomonas truncata.* [Drawing by M. Lowe.]



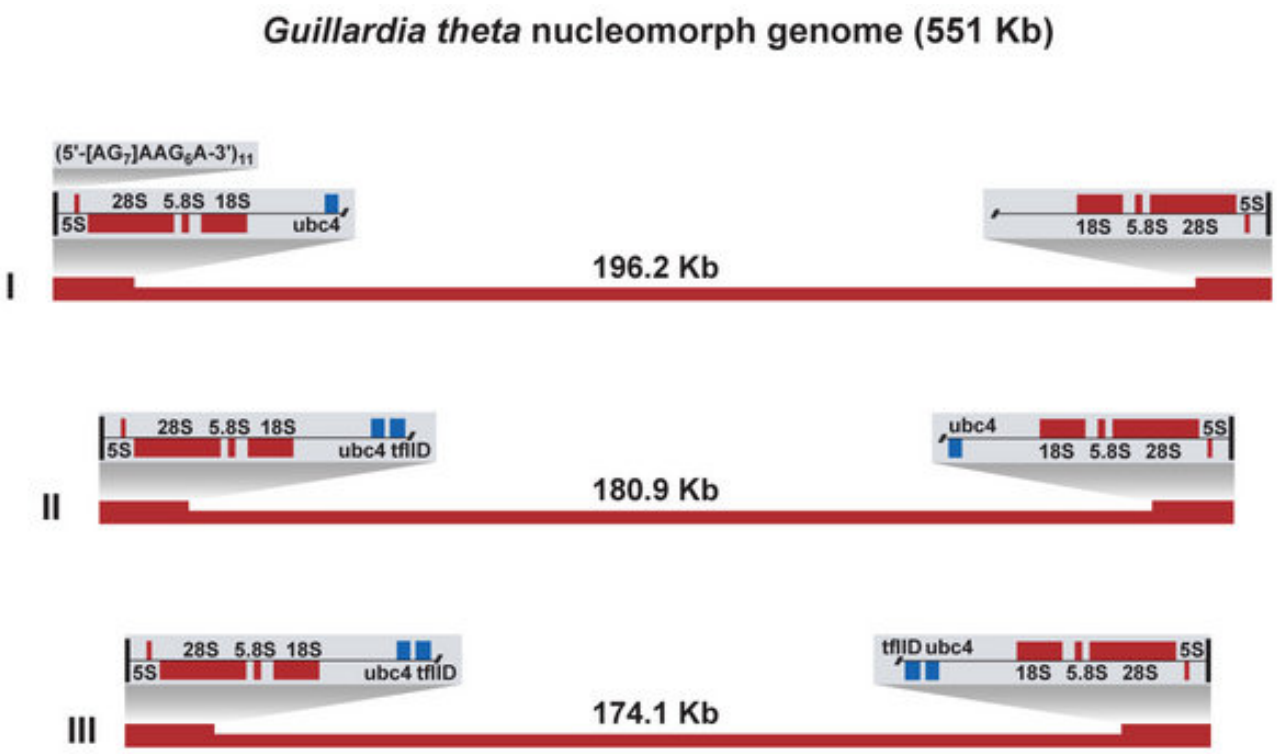
Margulis, L. & Schwartz, K. (1999) *Five Kingdoms: an illustrated guide to the phyla of life on earth.* W.H.Freeman, NY, pp. 196-197.

Lineage *Cryptophyta*



http://tolweb.org/Cryptomonads/2396

Nucleomorph Genome



http://tolweb.org/Cryptomonads/2396

Crypt of the cryptophytes

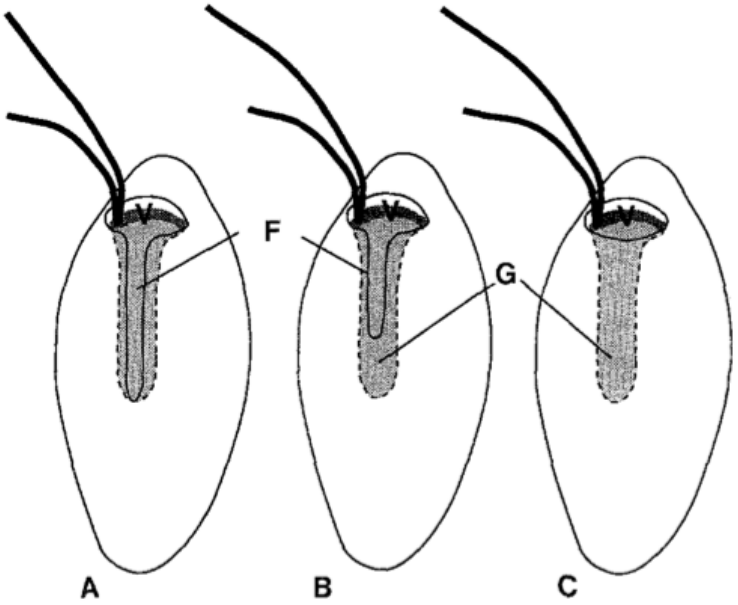
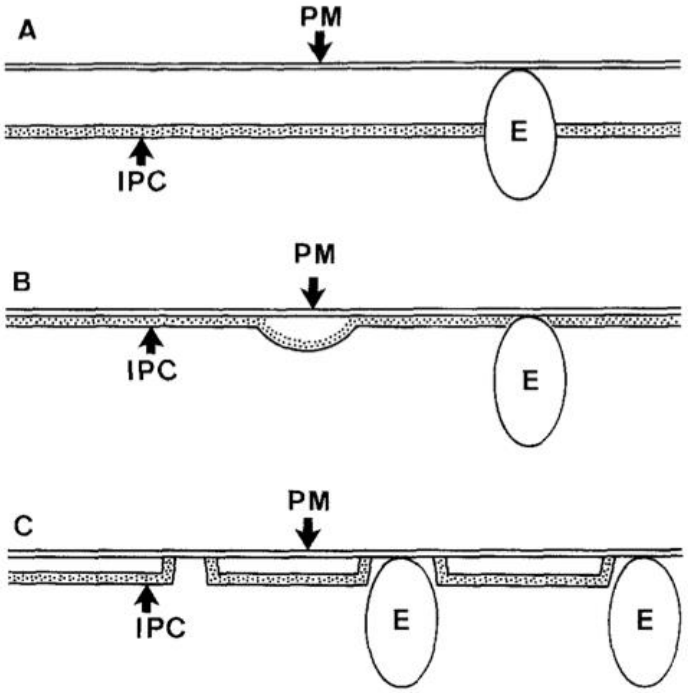


Fig. 1 A–C. Organization of the vestibulum (*V*), furrow (*F*), and gullet (*G*) in the Cryptophyceae. **A** In *Proteomonas, Falcomonas, Plagioselmis*, and *Teleaulax* a furrow progresses along the ventral surface from the vestibulum. **B** *Rhodomonas, Cryptomonas, Capylomonas,* and *Geminigera* possess both furrow and gullet. **C** The vestibulum extends internally to form a gullet in *Komma, Chroomonas, Rhinomonas, Hemiselmis, Guillardia*, and *Storeatula*

V – Vestibulum (vestíbulo)
F – Furrow (sulco)
G – Gullet (garganta)

Brett et al. (1994)
Protoplasma **181**, 106.

Types of periplasts



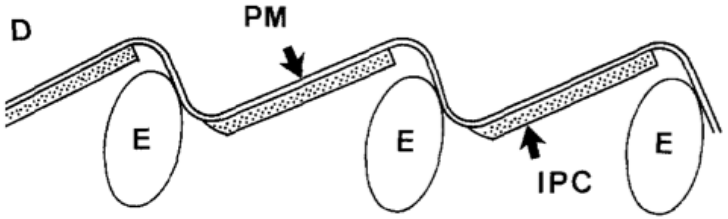


Fig. 2 A–D. Variations in inner periplast component (ICP) morphology throughout the Cryptophyceae. **A** ICP comprising a continuous sheet of material which is never closely associated with the PM. Ejectisomes (*E*) pass through pores in this sheet to contact the PM. **B** IPC comprising continuous sheet of material, closely appressed to the PM. This sheet may occasionally appear separated from the PM. **C** IPC consisting of discrete plates which are strongly attached to the PM at their edges. **D** IPC of discrete anteriorly stepped plates closely appressed to the PM. Ejectisome vesicles associate with PM adjacent to the anterior corners of plates

Brett et al. (1994)
Protoplasma **181**, 106.