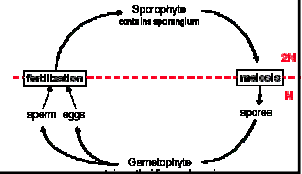


Plant Life Cycles & Algae

Alternation of Generations

Alternation of Generations

- Unlike animals, who have a direct life cycle, plants have two life stages
 - Sporophyte & Gametophyte
- One is haploid (gametophyte)
- One is diploid (sporophyte)
- Plants *alternate* between these generations
- Each a distinct plant

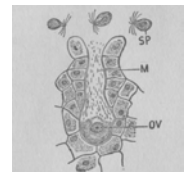


Life Cycle Terminology

- Sporophyte ($2n$)
 - Produces spores
- Gametophyte (n)
 - Produces gametes
- **Meiosis** produces **spores** (not gametes!)
 - Spores germinate into gametophyte
 - Gametophyte is already haploid
- Mitosis produces gametes

Gametophyte

- Gametophytes produce gametangia
 - Gamete-producing structures
- Antheridia produce sperm
 - Antheridium is singular
- Archegonia produce eggs
 - Archegonium is singular



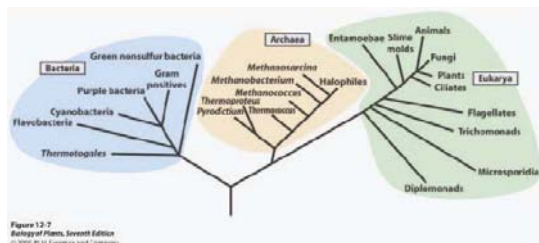
Sporophyte

- Sporophyte produces sporangia
 - Spore-producing structures
- Spore mother-cells undergo meiosis to produce haploid spores
- Spores are shed and develop into gametophytes
- And so the cycle continues
- **Increasingly dominant** phase in more derived plants

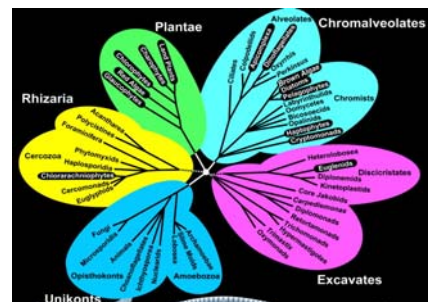
Major Groups of Algae Based on Cellular Complexity

- Prokaryotes
 - No nucleus; no organelles
- Mesokaryotes
 - Primitive nucleus; organelles present
 - Mitosis/meiosis weird or absent
- Eukaryotes
 - highly evolved nucleus & organelles
- **Only thing “algae” have in common is chlorophyll-a based photosynthesis!**

Cyanobacteria: miles away from the rest!

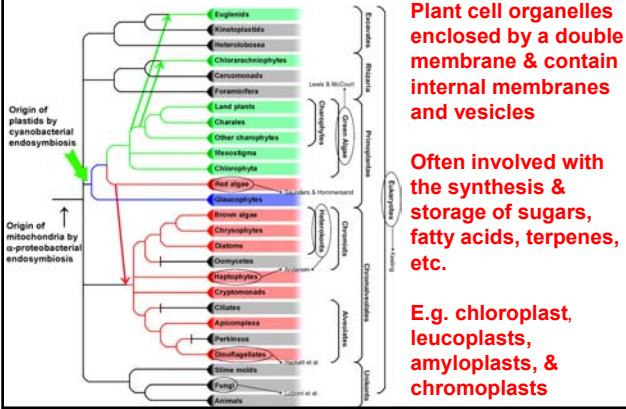


Eukaryotic Tree



From: Keeling, J.P. (2004). Diversity & evolution of plastids & their hosts, American Journal of Botany 91: 1481-1493 (available online via UNCW library for FREE)

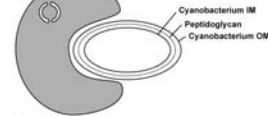
Major Extant Eukaryotes with Plastids



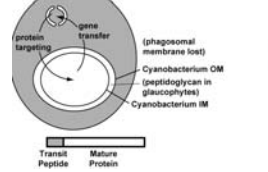
Endosymbiosis

PRIMARY ENDOSYMBIOSIS

A.

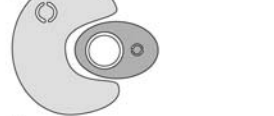


B.

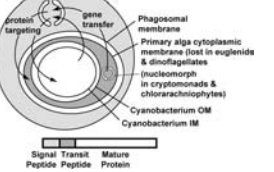


SECONDARY ENDOSYMBIOSIS

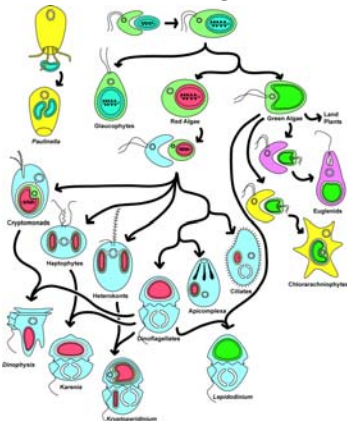
C.



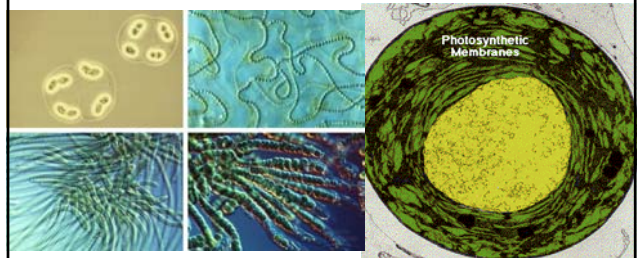
D.



Plastid Endosymbiosis



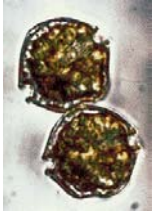
Prokaryotic Algae



Cyanophyta (blue-greens)

Prochloron (Prochlorophyta)

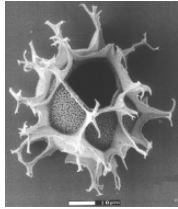
Mesokaryotes: Dinoflagellates Phylum Dinophyta



Alexandrium (red tides)



Ceratium tripoda



Spiniferites cyst

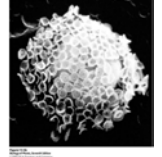
Example of Dinoflagellate Life Cycle



Biflagellated cell



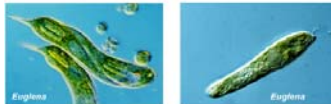
Amoeboid stage



Amoeboid cyst

Pfiesteria piscicida known life stages

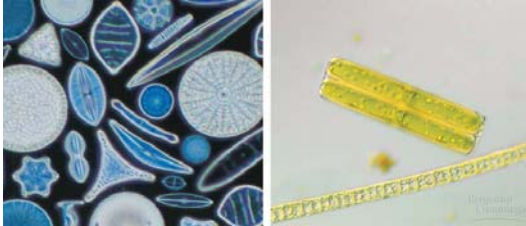
Mesokaryotes: Euglenophyta



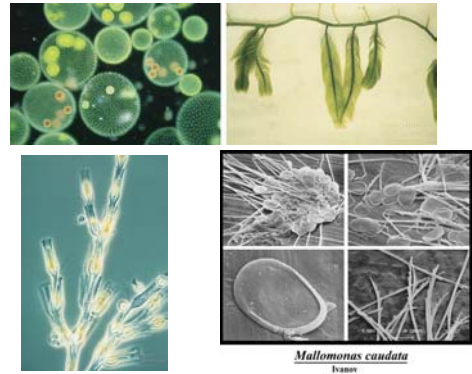
Eukaryotes: Browns & Reds



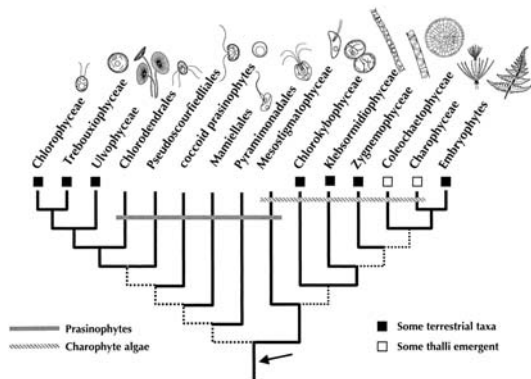
Eukaryotes: Diatoms



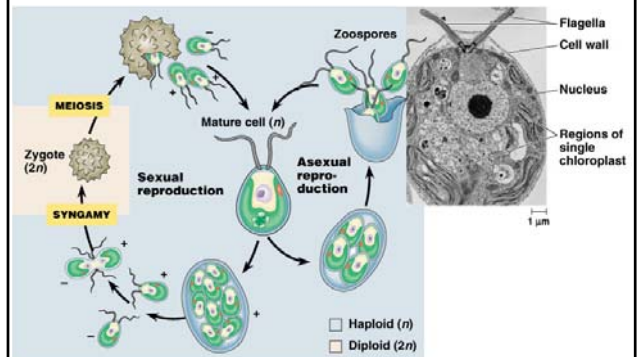
Eukaryotes: Greens & Goldens



Chlorophyte Phylogeny



Primitive Life Cycle



Advanced Life Cycle (*Laminaria*)

