Introduction to Botany. Lecture 28

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Outline

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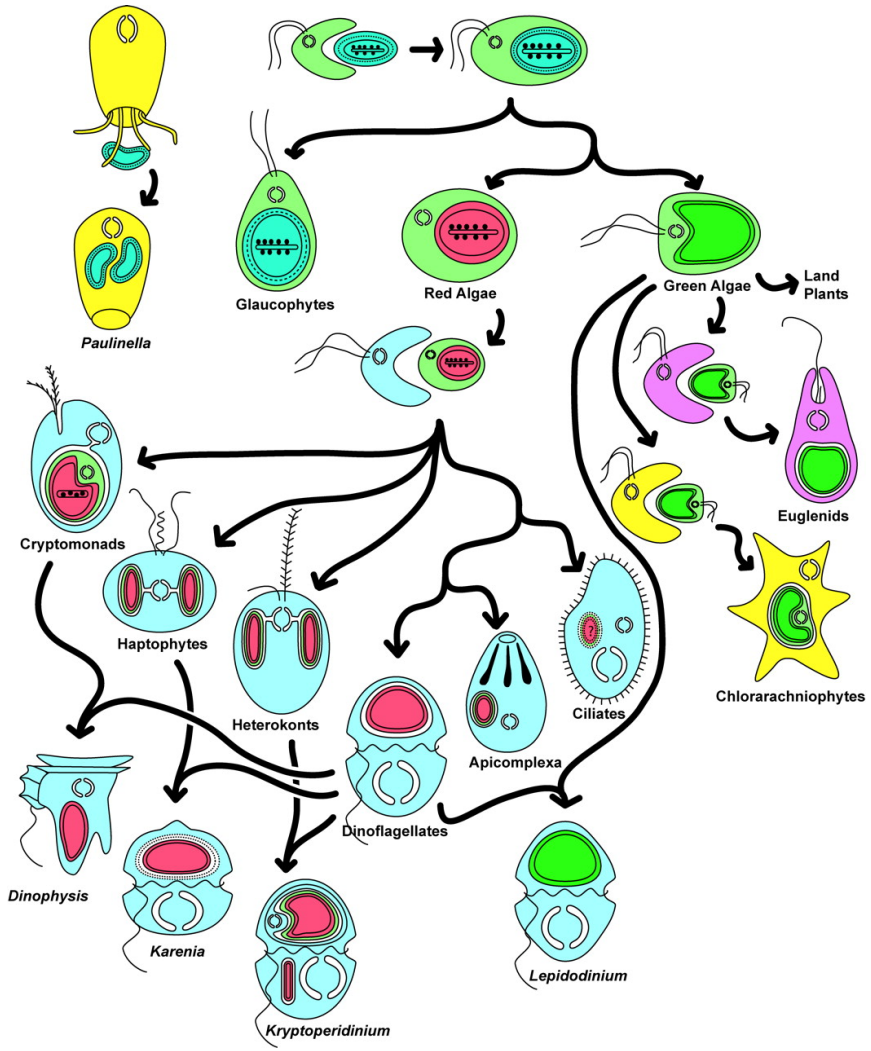
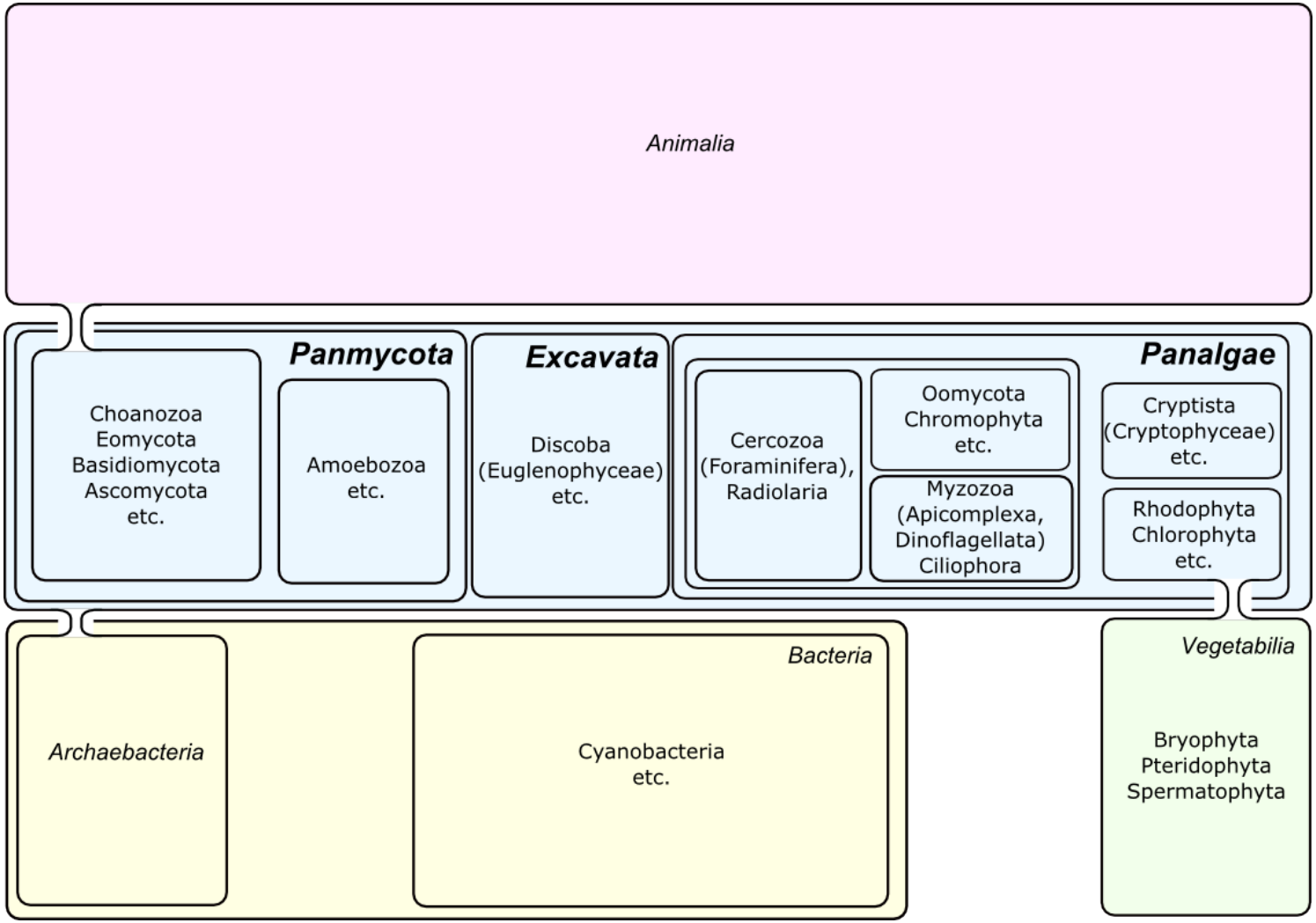
Endosymbiosis Pacman game



Subkingdoms, some phyla and classes



“True fungi” and lichens

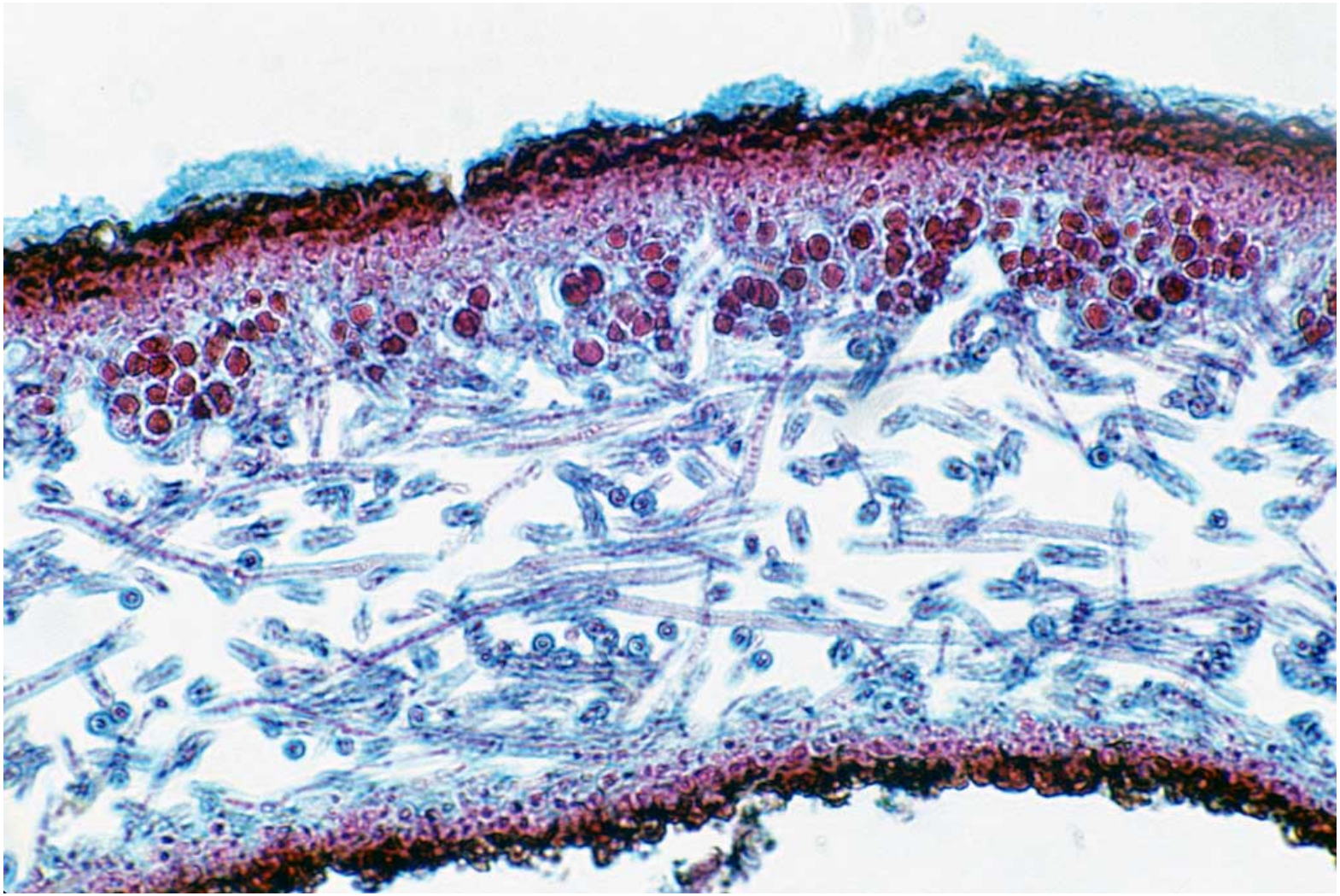
- “True” fungi are close to animals, much closer than green algae and plants. However, there are other groups with fungal lifestyle (like Oomycota which are close to Chromophyta)
- **Eomycota** (“non-cellular”) fungi have hyphae without septa and zygotic life cycle and sometimes flagellar stages (other fungi have no flagellar stages)
- **Basidiomycota** (basidiomycetes) have hyphae with septa, sporic life cycle with predominance of diploid (dikaryophase) and spores on stalks (basidia)
- **Ascomycota** (ascomycetes) have hyphae with septa, zygotic life cycle with predominance of haploid and spores inside sporangium (ascus)
- More than 60% of ascomycetes form lichens, the terrestrial symbiotic form of fungus + alga.

Ascospores

Basidiospores

Lichen

Lichen cross-section



Chromophytes and their place

- **Chromophyta** (chromophytes) is an algal phylum consists of different classes, all with secondary endosymbiosis (typically 4-membrane chloroplast), chlorophylls c_1 and/or c_2 and xanthin pigments
- Chromophyta are most close to alveolates ("protozoans" like ciliates and dinoflagellates).
- Chrysophyceae (golden algae), Xanthophyceae (yellow-green algae which sometimes included in brown algae) and Phaeophyceae (brown algae) are classes of Chromophyta.
- Several Phaeophyceae are independently developed tissue-like structures in several lineages (e.g., in kelp, *Laminaria* and bladderwrack, *Fucus*).

Chlorobionta, or Archeplastids

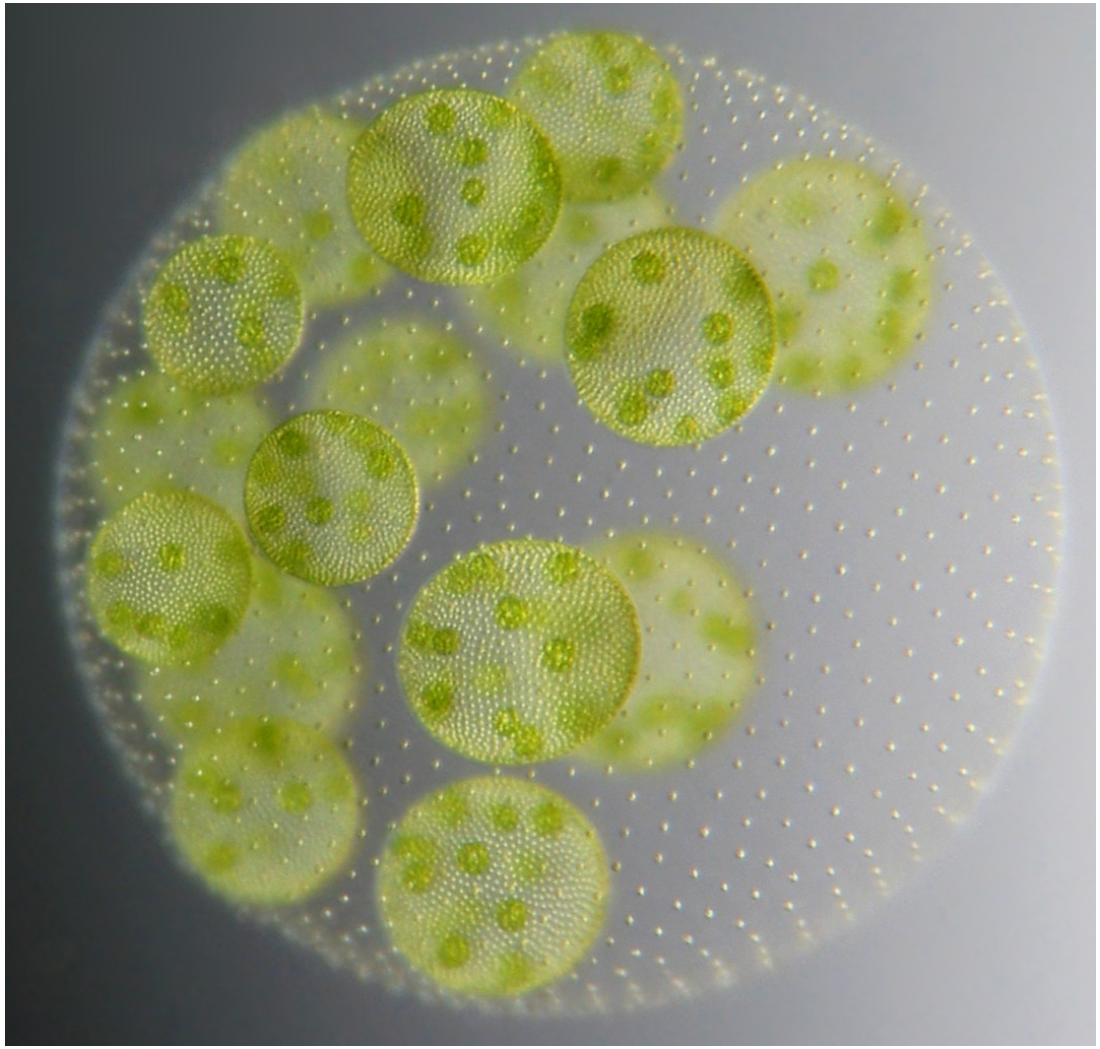
- Several algal phyla with primary endosymbiosis and no chlorophyll *c*
- They are very close to plants
- Red algae (**Rhodophyta**) are more ancient, they have no flagellar stages and have phycobilins like cyanobacteria (from which their chloroplasts were taken)

Red alga *Palmaria* sp.

Green algae

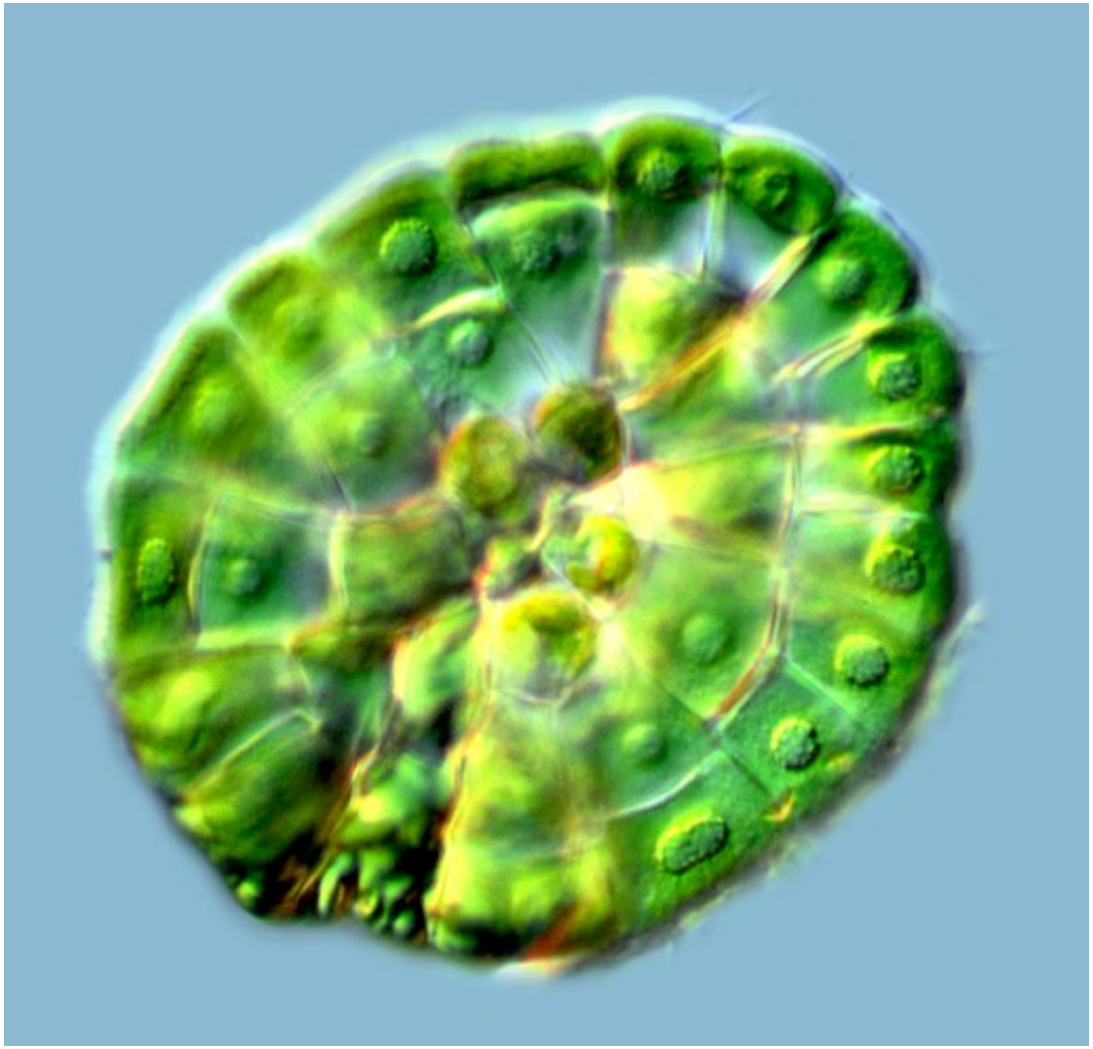
- Green algae (**Chlorophyta**) have flagellar stages, primary endosymbiosis (double-membrane chloroplast), chlorophylls *a* and *b*
- Some classes:
  - Chlorophyceae like flagellate *Chlamidomonas* or colonial *Volvox*
  - Ulvophyceae like filamentous *Ulotrix* or syphonous *Codium*
  - Trebouxiophyceae like coccoid *Chlorella*
  - Charophyceae, or stoneworts – the closest group to land plants. Like land plants, they have asymmetric spermatozoon and phragmoplast.

Colonial flagellate alga *Volvox*

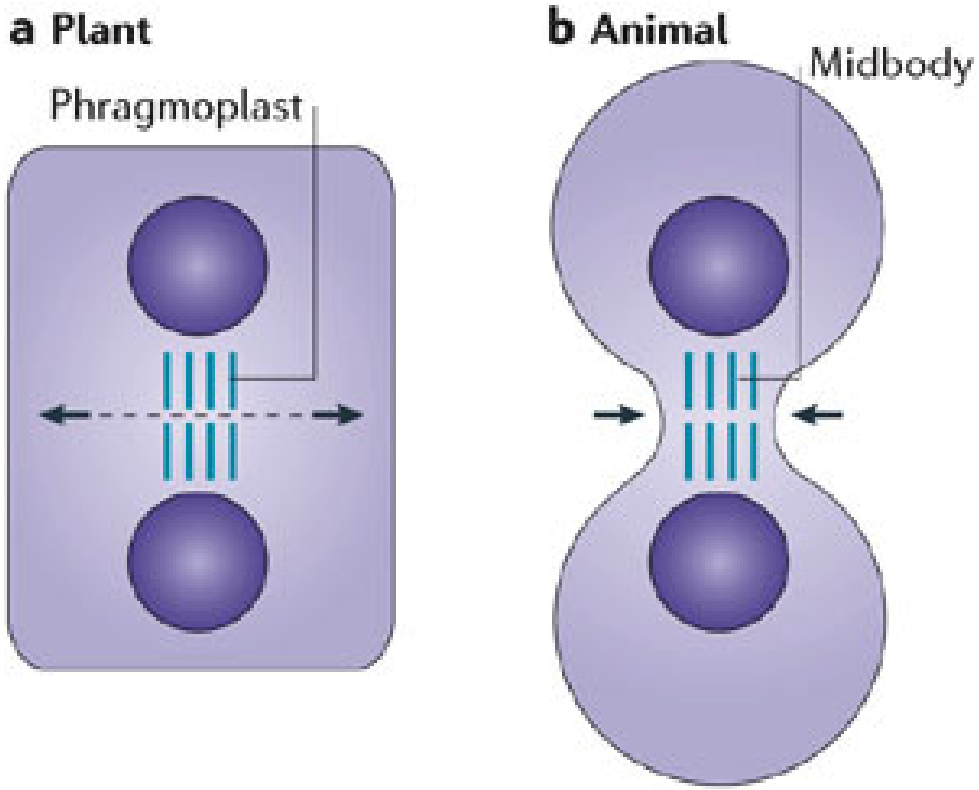


Siphonous alga *Codium*

Stonewort alga, *Coleochaete scutata*



Phragmoplast



Three main phyla

- **Bryophyta**: gametophyte predominance
- **Pteridophyta**: sporophyte predominance, no seed
- **Spermatophyta**: sporophyte predominance, seed

Mosses: phylum Bryophyta

- $\approx 20,000$ species
- Sporic life cycle with gametophyte predominance*
- Sporophyte reduced to sporogon (sporangium with seta), usually achlorophyllous, parasitic
- No roots, only rhizoid cells (long hairy dead cells capable for apoplastic transport)
- Poikilohydric plants
- Gametophyte starts development from protonema

Protonema

Summary

- Bryophyta, Pteridophyta and Spermatophyta are three main phyla of plants.
- Bryophyta are only plants with gametophyte predominance.

For Further Reading

Th. L. Rost, M. G. Barbour, C. R. Stocking, T. M. Murphy.
Plant Biology. 2nd edition.
Thomson Brooks/Cole, 2006.
Chapter 21.1, 21.6, 21.8.

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