

# Plants

## Evolution, Characteristics and Life Cycle

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# What are Plants?



# Plants

- Multicellular
- Eukaryotes
- Autotrophs
- Oxygenic photosynthesis
- Adapted to life on land





# Life on Land: Advantages

- Plenty of light
- Plenty of CO<sub>2</sub>
- Space (at first)
- No predators (at first)



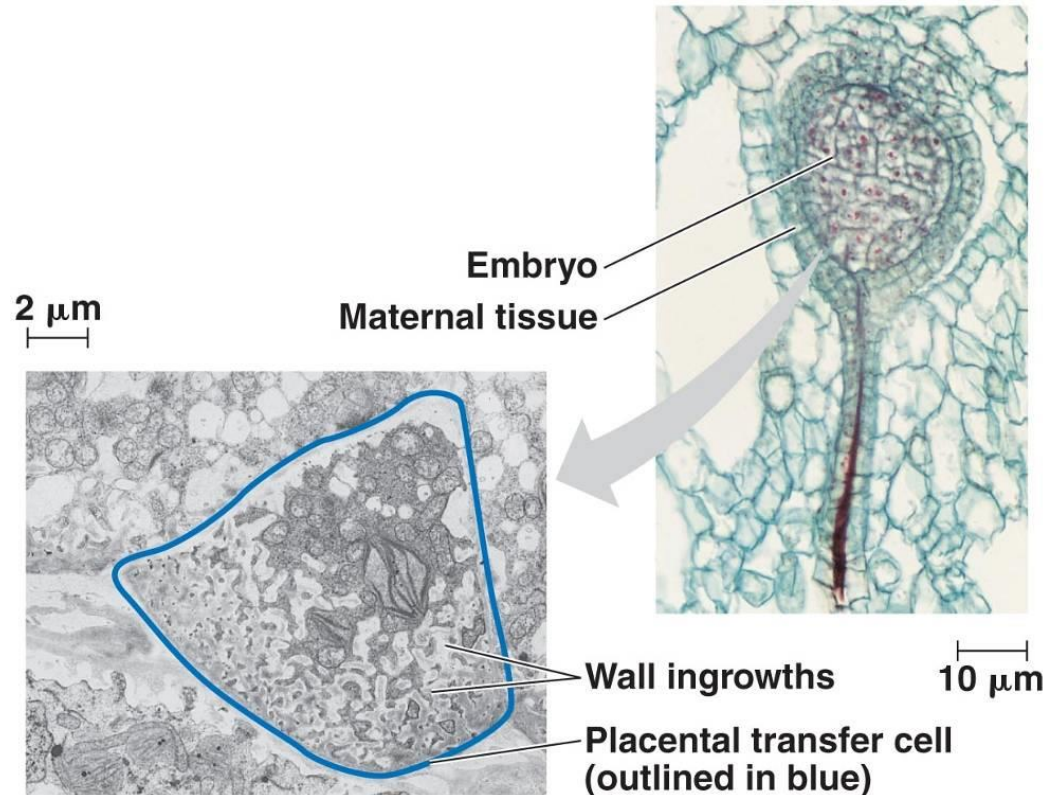
# Life on Land: Challenges

- Water availability
- Dehydration
- Support
- Location of nutrients
  - Soil
  - Atmosphere
- Light
- High UV levels



# Plant Adaptations

- Embryophytes
  - Protect embryos on parent body
  - Surrounded by protective tissue
  - Nourish embryos

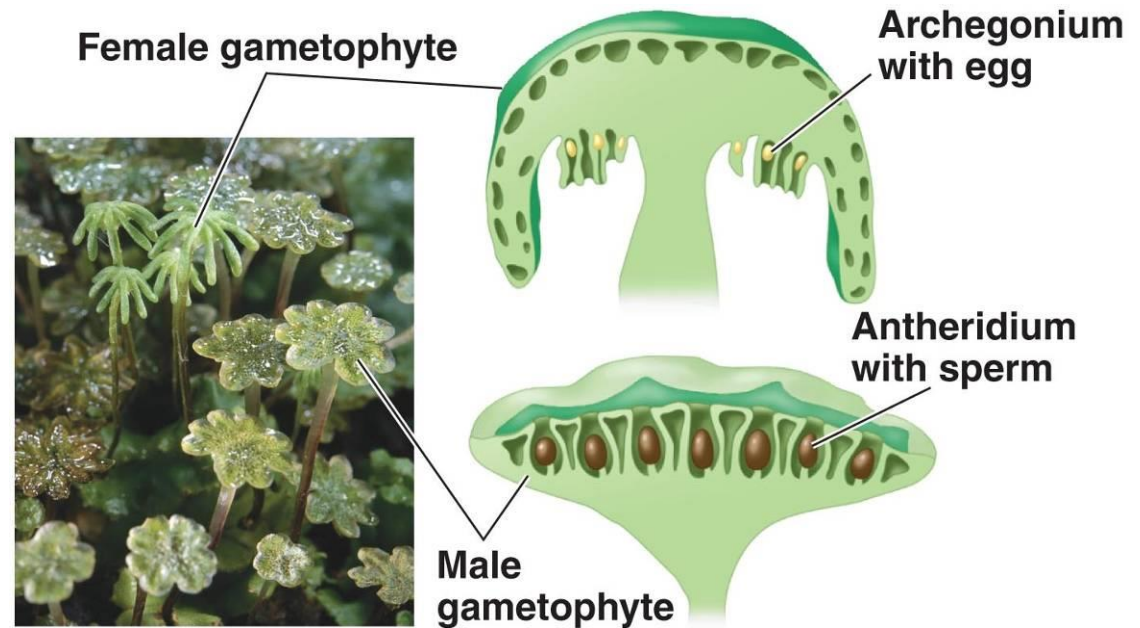


**Embryo (LM) and placental transfer cell (TEM)  
of *Marchantia* (a liverwort)**



# Plant Adaptations

- Gametangia
  - Multicellular organs
  - Produce gametes
  - Two types:
    - Archegonia  
→ eggs
    - Antheridia  
→ sperm

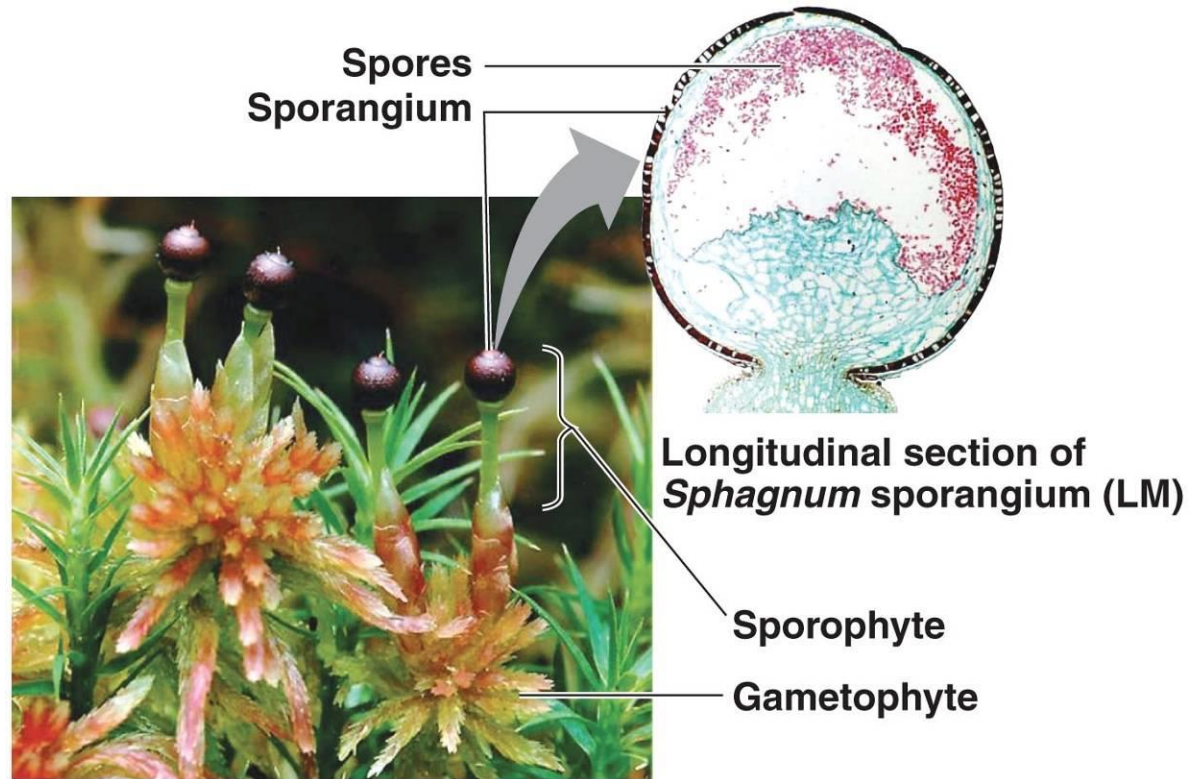


**Archegonia and antheridia of *Marchantia* (a liverwort)**

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# Plant Adaptations

- Sporangia
  - Multicellular organs
  - Produce spores

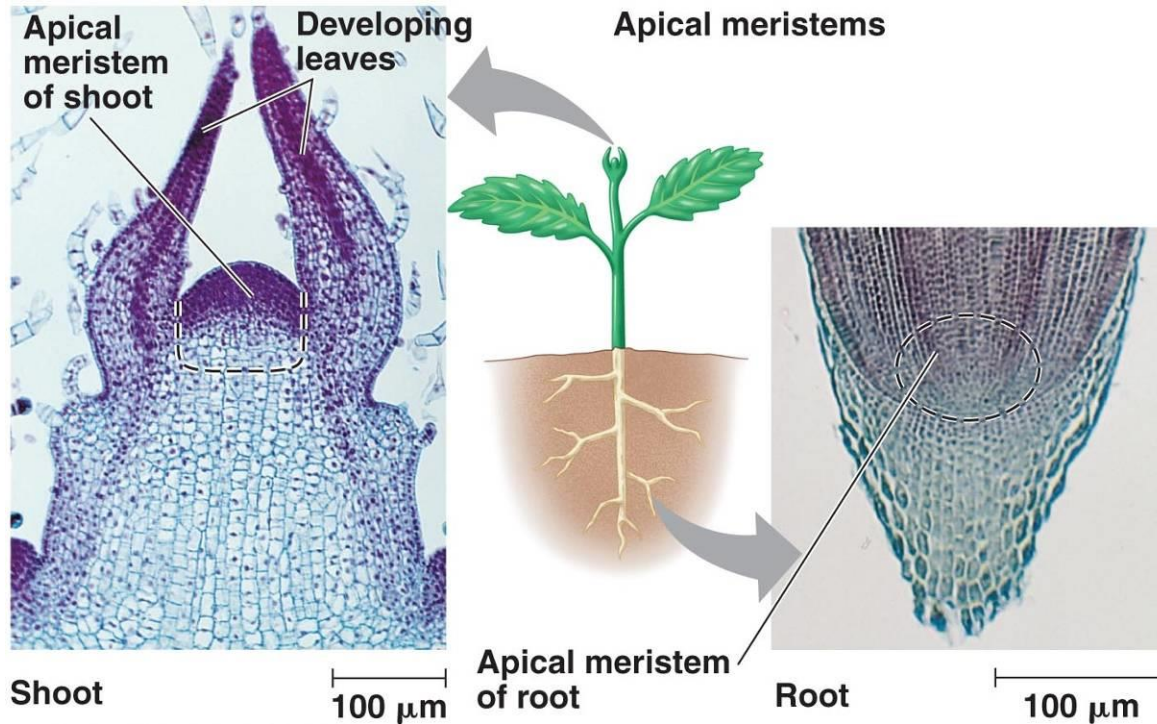


**Sporophytes and sporangia of *Sphagnum* (a moss)**

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# Plant Adaptations



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- Apical Meristems
  - Growing points
  - Located at tips of plant structures

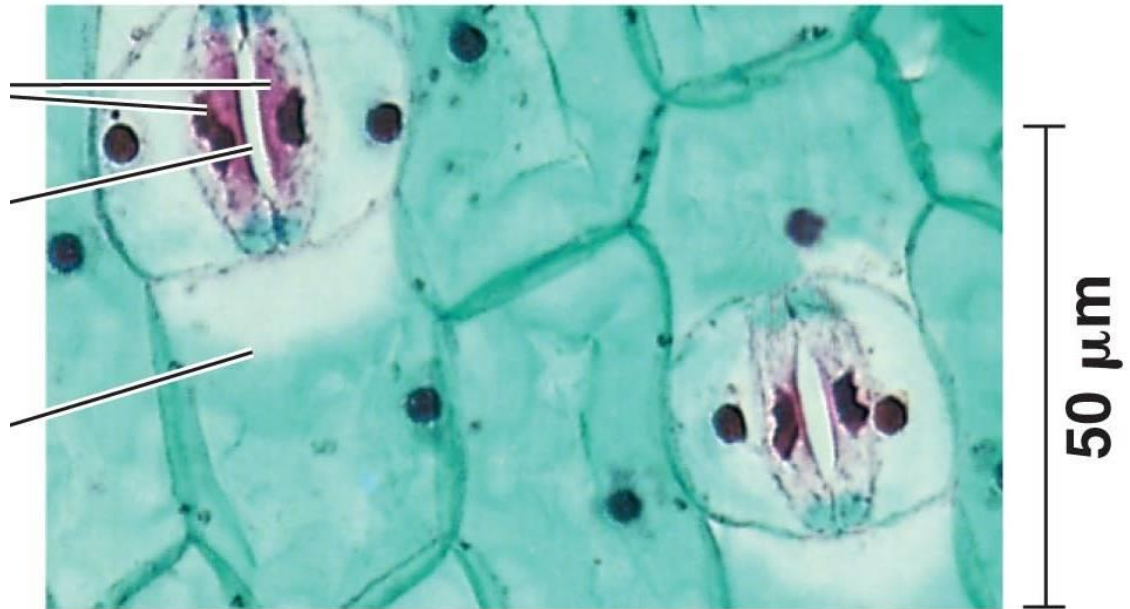
# Plant Adaptations

- Cuticles
  - Waxy Coat
  - Plant surfaces above ground



# Plant Adaptations

- Stomata
  - Pores in leaves and other photosynthetic organs
  - Gas exchange



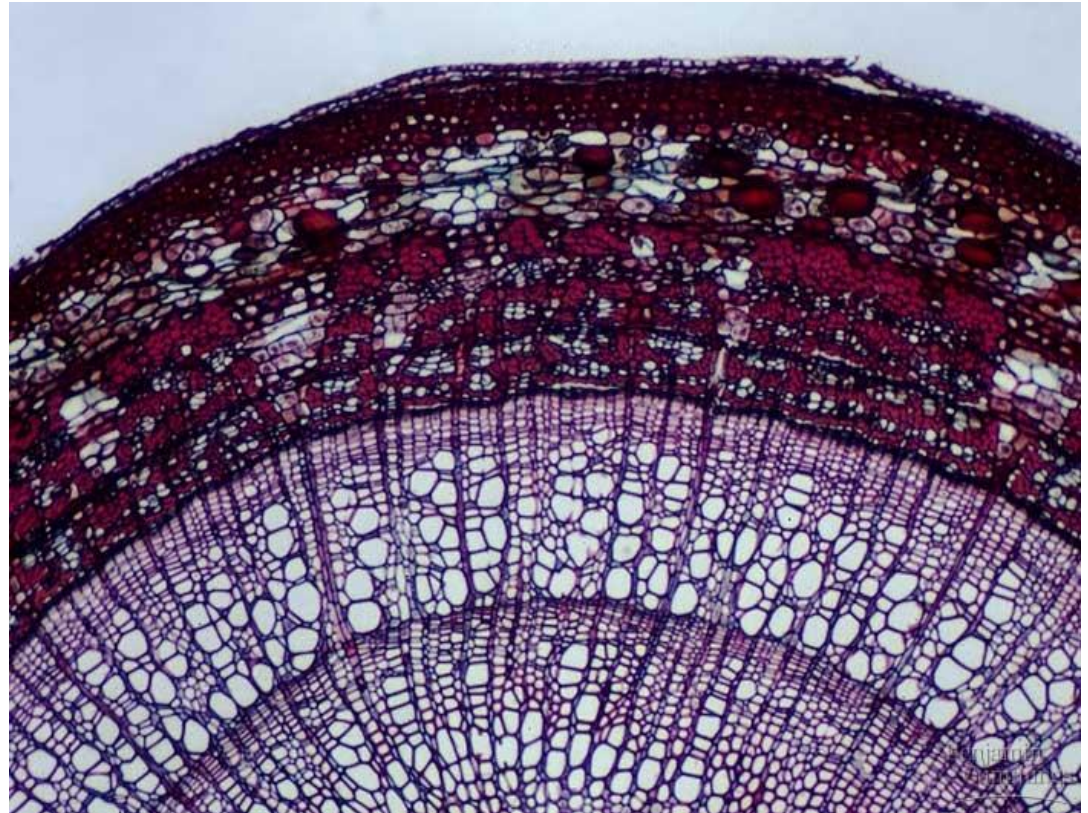
**(b) Surface view of a spiderwort (*Tradescantia*) leaf (LM)**

Cummings.



# Plant Adaptations

- Vascular Tissue
  - Support
  - Transport
  - Two Types:
    - Xylem
    - Phloem

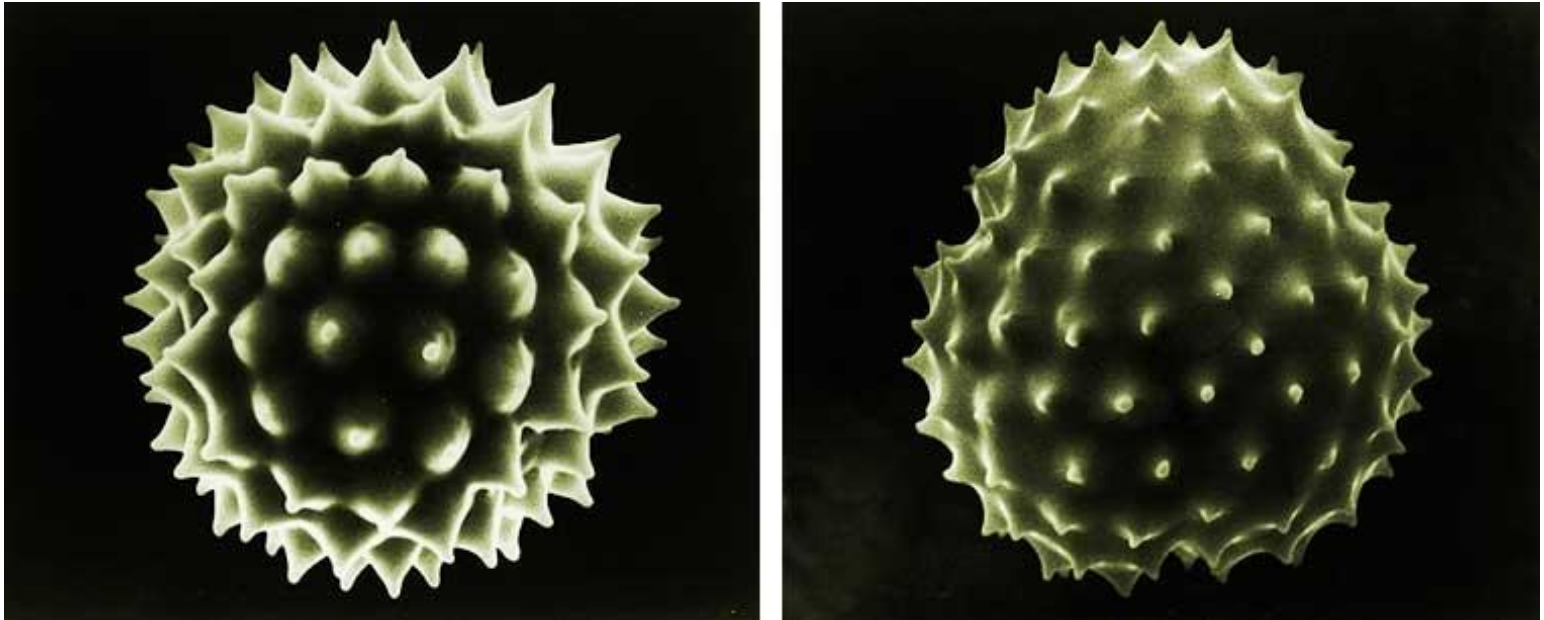


# Plant Adaptations

- Secondary Compounds
  - Defense
    - Toxins: Digitalis
    - Antifeedants: Tannins
  - Support
    - Lignin
  - UV Protection
    - Flavonoids

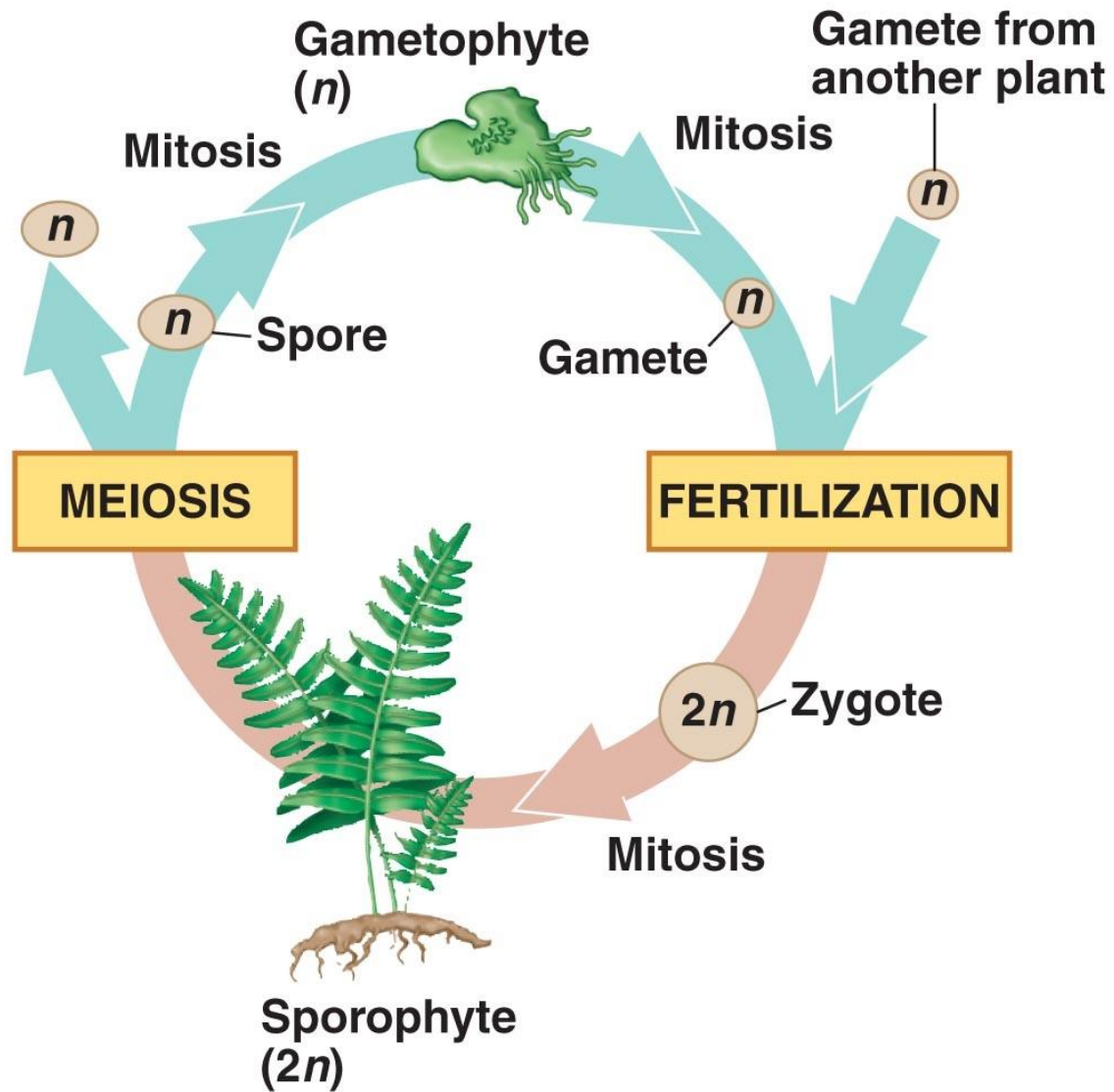


# Plant Adaptations

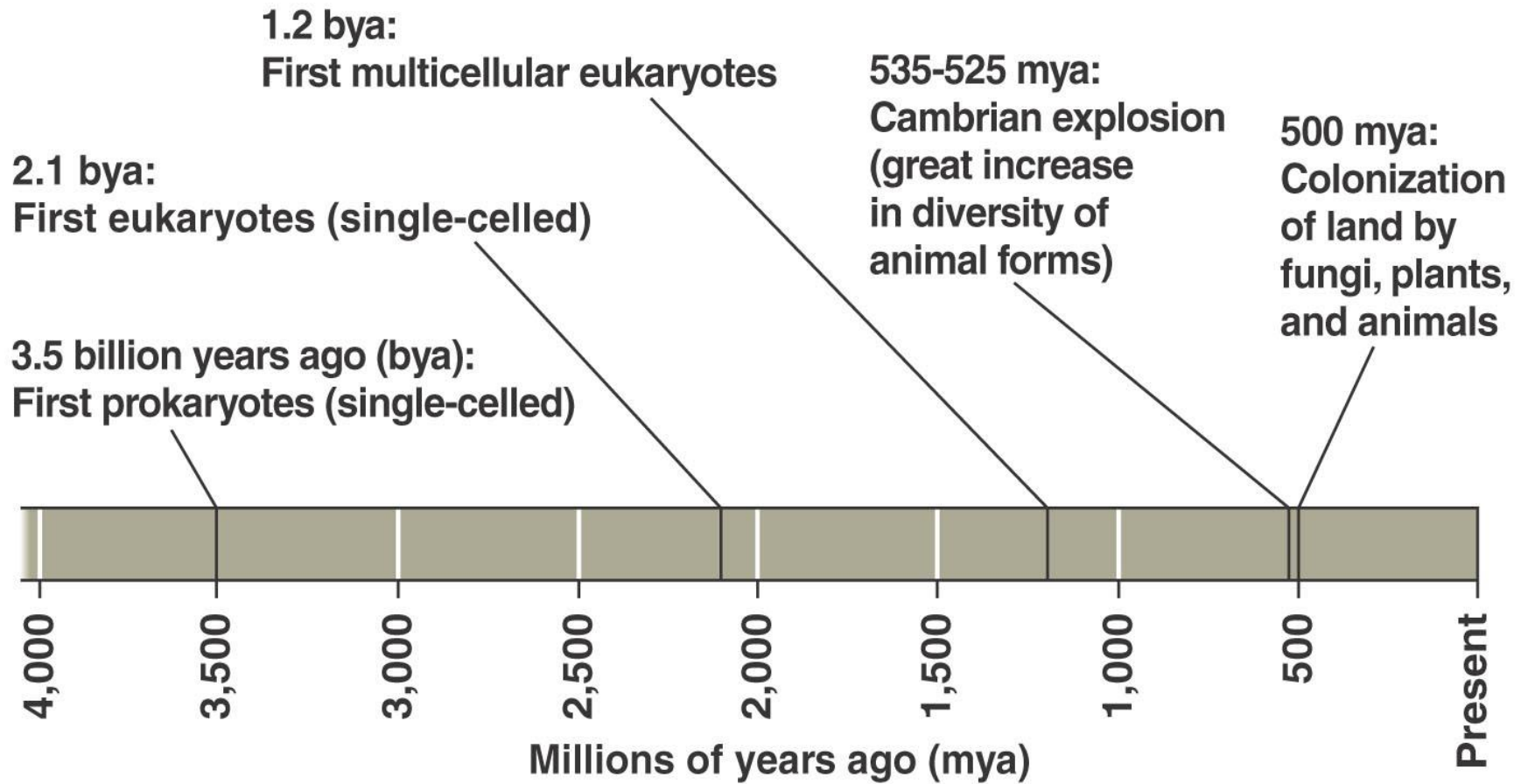


- Secondary Compounds
  - Sporopollenin
    - Spore coat
    - Pollen coat



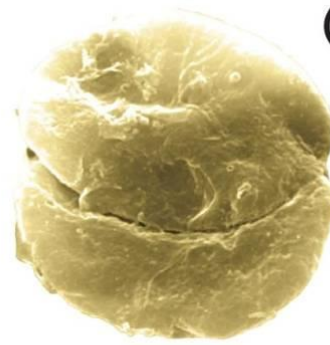


## Alternation of generations



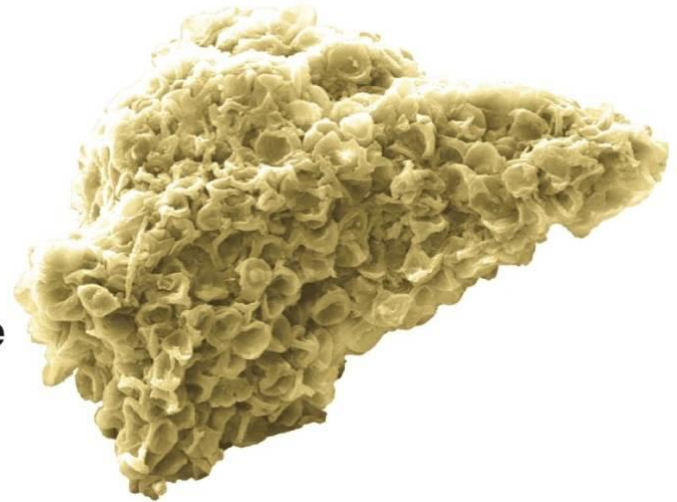
# Plant Evolution

- Earliest body fossils of plants
  - 475 mya
  - Plant spores in plant sporophyte tissues

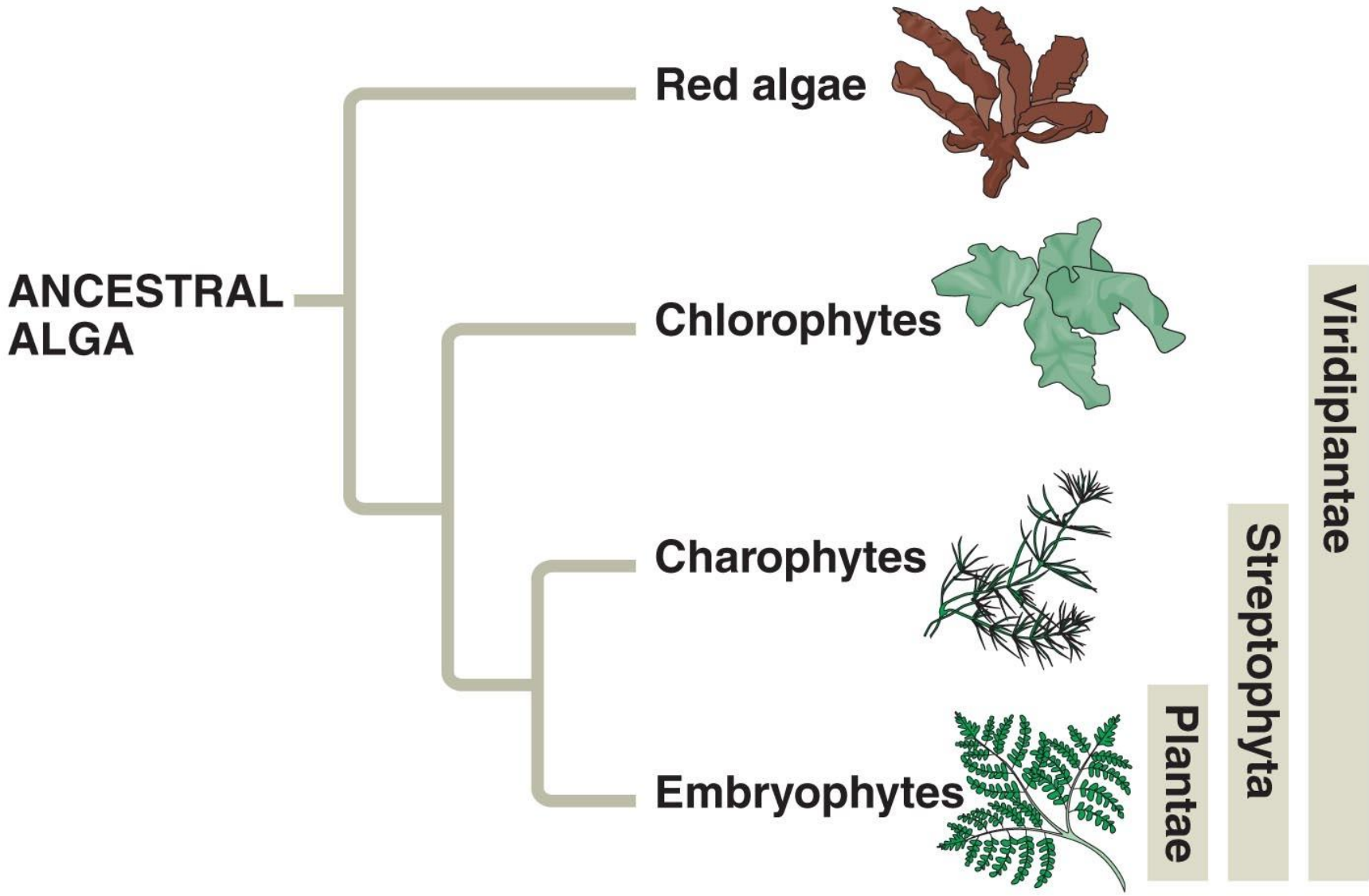


(a) Fossilized spores

(b) Fossilized sporophyte tissue

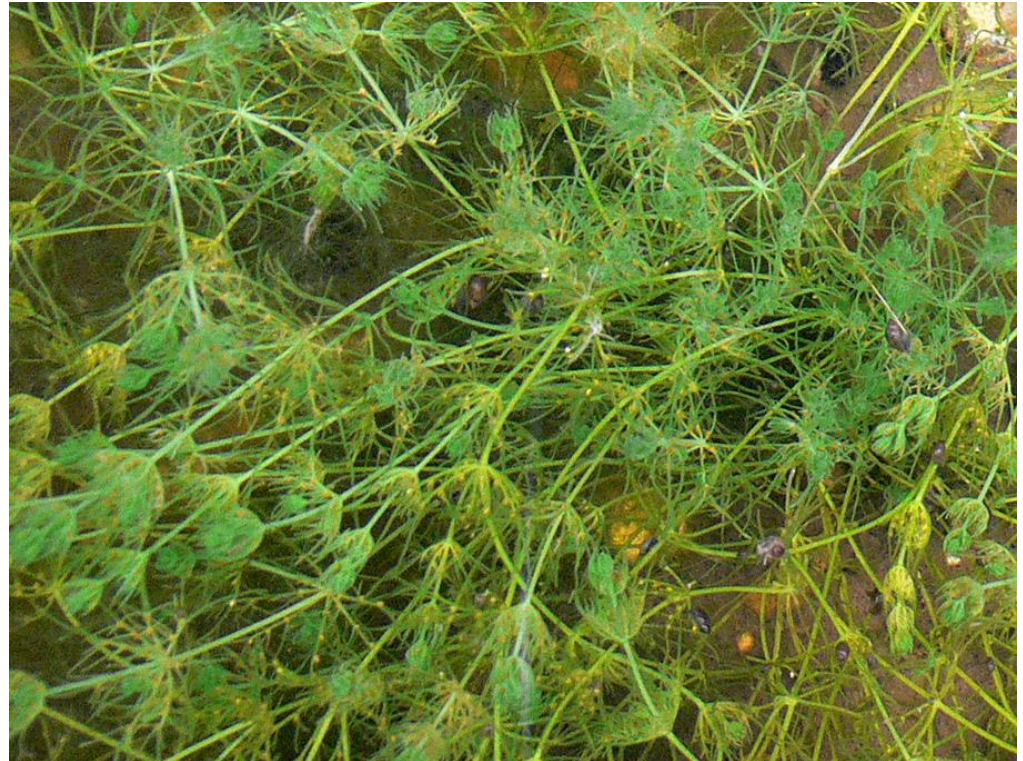






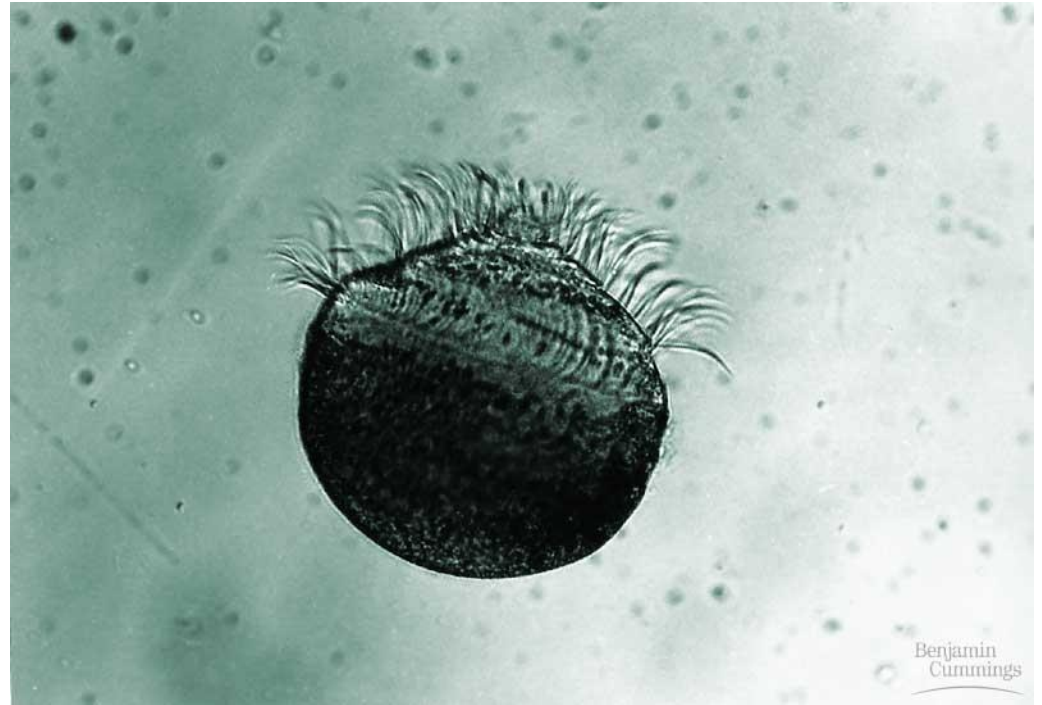
# Charophyceans

- Sister taxon
- Molecular evidence
  - Nuclear DNA
  - Chloroplast DNA

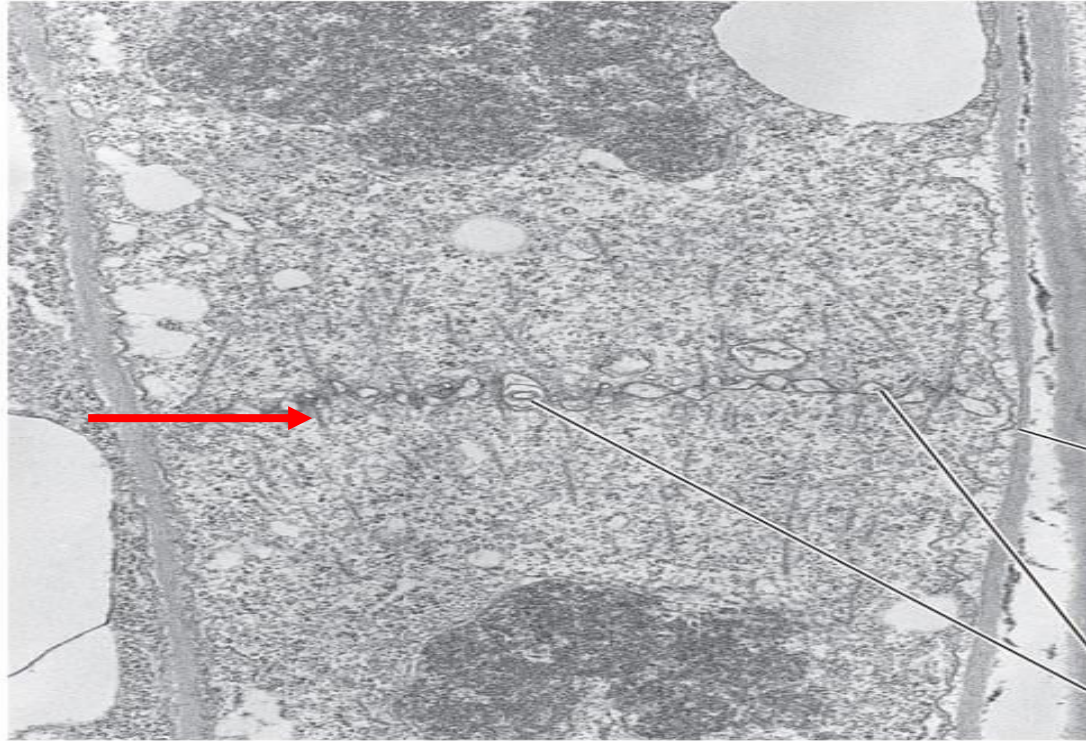


# Charophyceans

- Shared Traits
  - Peroxisome enzymes
  - Flagellated sperm



# Charophyceans

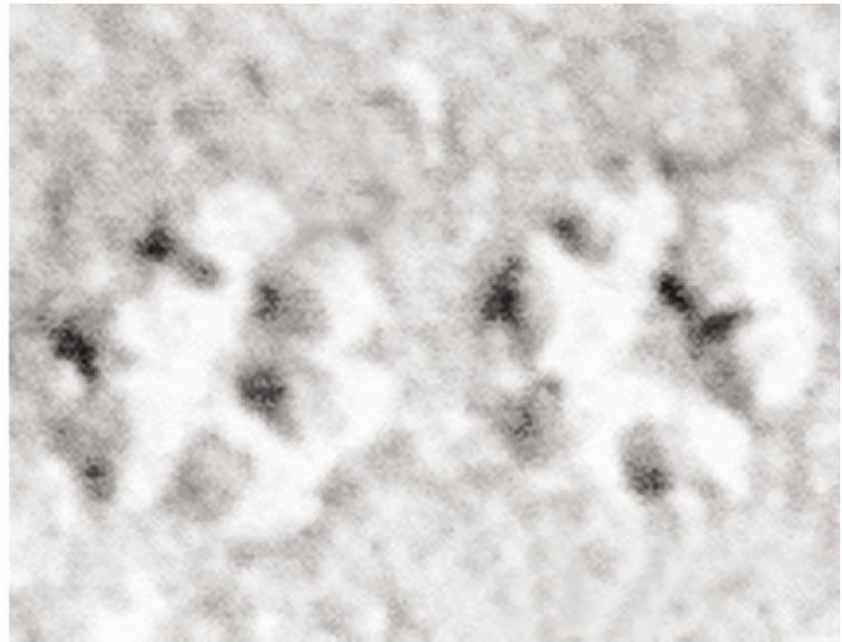


- Shared Traits
  - Phragmoplasts

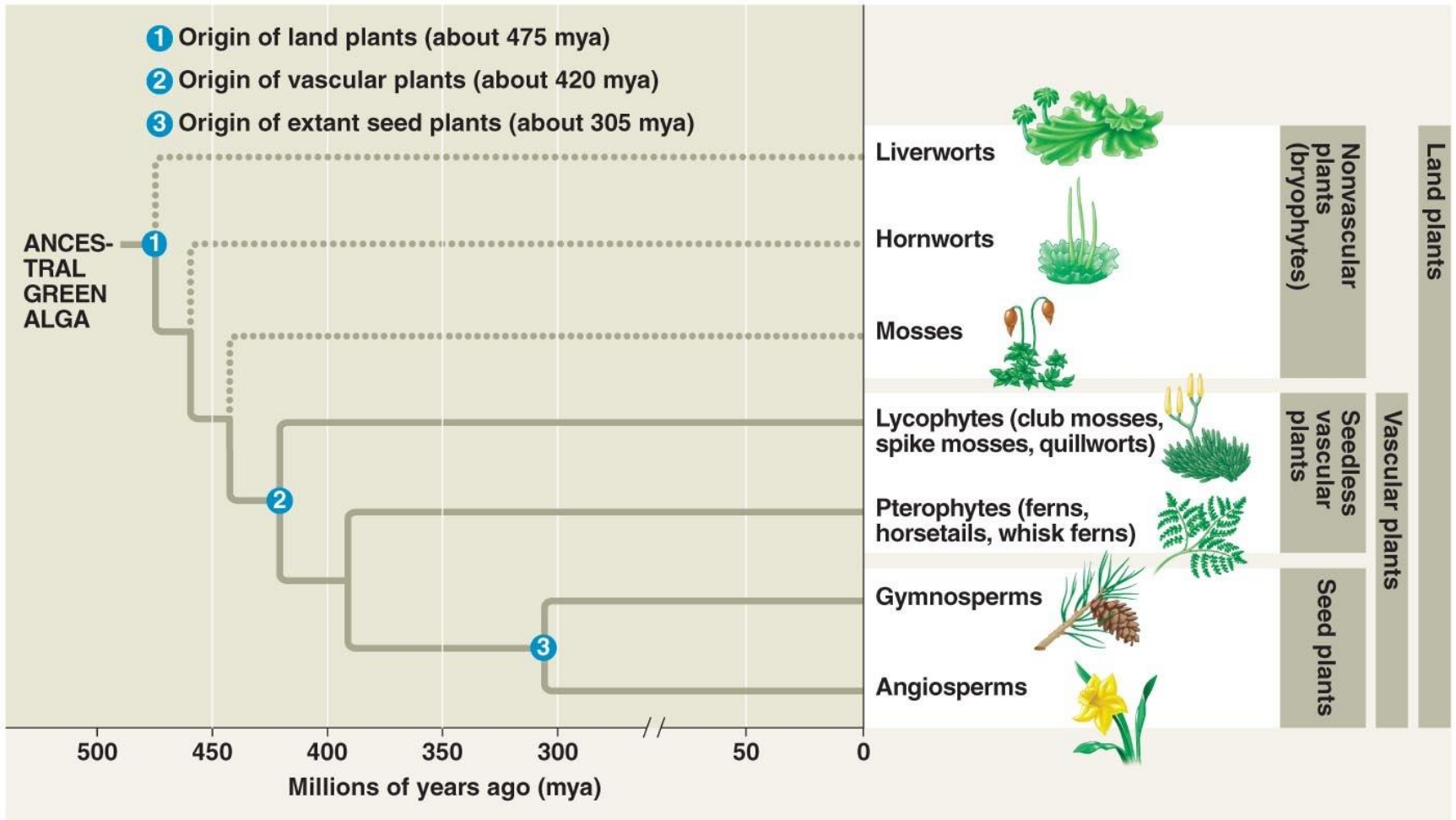


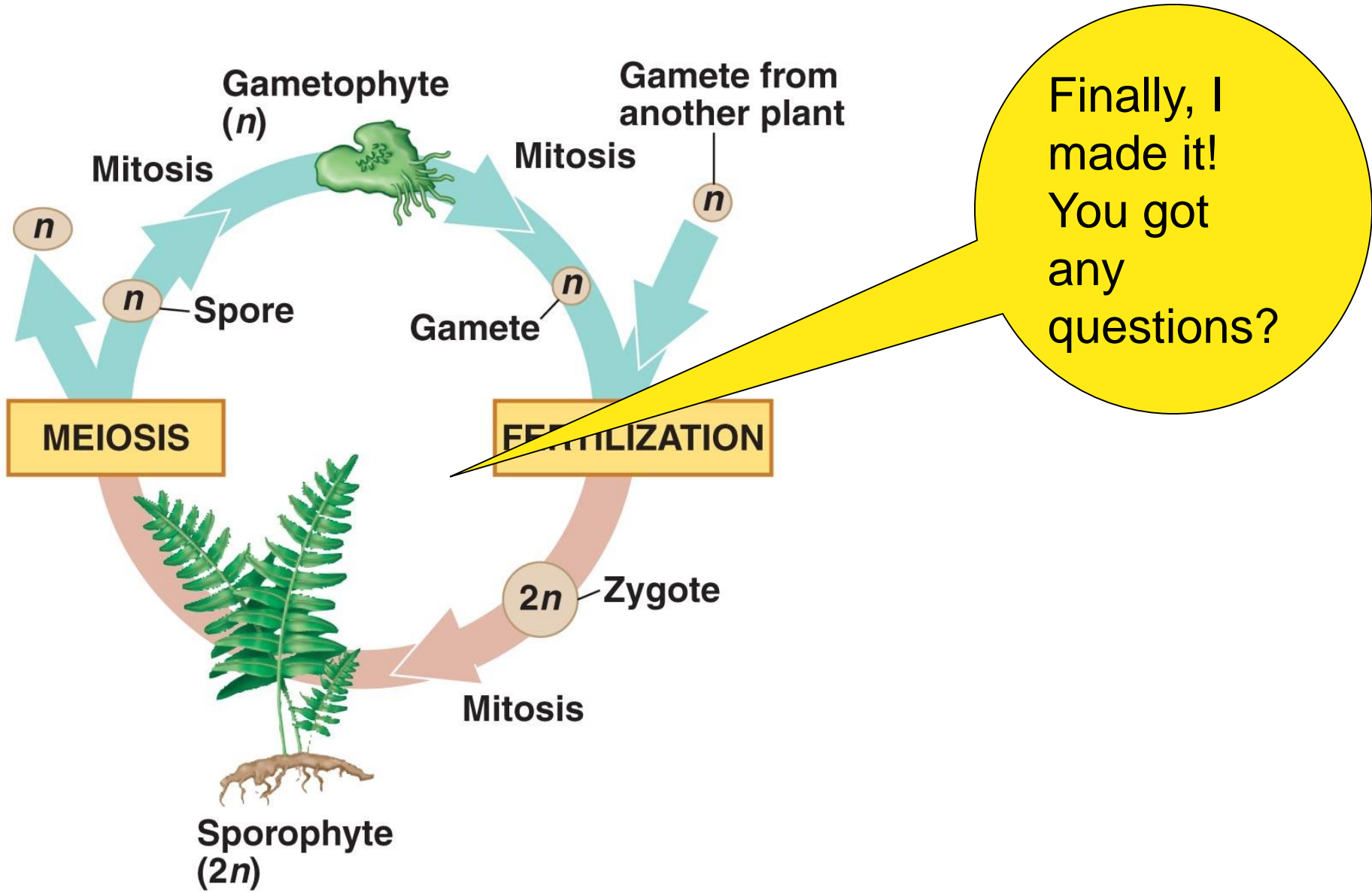
# Charophyceans

- Shared Traits
  - Rosette-shaped cellulose synthesizing complexes



30 nm





# Alternation of generations

THANK YOU FOR YOUR  
ATTENTION

