

Plant Evolution



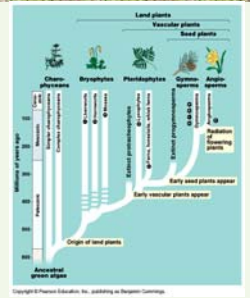
- Chapter 29 ~
Plant Diversity I: The Colonization of Land

Plant Evolution

- **Plants:** multicellular, eukaryotic, photosynthetic autotrophs, Chlorophyll a, Chlorophyll b (accessory pigment), cellulose, starch storage, embryophyte, terrestrial

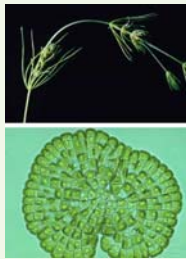
Questions to answer today . . .

- When did the most recent ancestor of plants move onto land? (also what was that ancestor?)
- What challenges/benefits did land present to these early ancestors of plants? And, what evolutionary adaptations resulted?



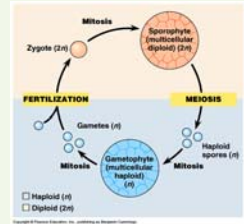
Plant origins

- **Charophytes:** green algae (closest plant ancestor)
- **Similarities:**
 - 1-Homologous chloroplasts: chlorophyll a & b
 - 2- Biochemical similarity cellulose composition; peroxisomes
 - 3- Cell division similarity mitosis; cytokinesis
 - 4- Sperm similarity ultrastructure
 - 5- Genetic relationship nuclear genes; rRNA



Characteristics that separate plants from algae ancestors

- Apical meristems: localized regions of cell division
- Multicellular, dependent embryos (embryophytes)
- Alternation of generations
- Walled spores produced in sporangia
- Multicellular gametangia



Terrestrial Benefits

- Spacious
 - 3 billion years of life adapting and living in the oceans
- Unfiltered Sunlight
- CO₂ abundance
- No predators
- Soil rich in mineral content



Terrestrial Challenges

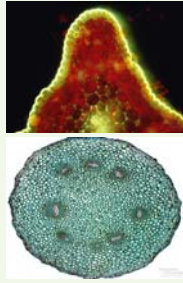
Land was **SCARY!!!**

- Gravity
- less water (below ground too!)
- Desiccation
- sunlight/heat
- harsh UV



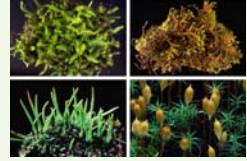
Terrestrial Solutions

- Stem/Root systems
 - Xylem and phloem
 - Stomata
- Reproduction
 - Embryophyte (gametangia)
 - Alternation of Generations
 - Dominance of sporophyte
- Secondary compounds
 - Cuticle
 - Lignin
 - Sporopollenin



Bryophytes

- Mosses, liverworts, and hornworts
- 1st to exhibit the embryonic condition (male = antheridium; female = archegonium)
- Flagellated (water) sperm
- No vascular tissue (imbibe water)
- No lignin (short stature)
- Haploid gametophyte is the dominant generation



Pteridophytes: seedless vascular plants

- Ferns, club 'moss', horsetails
- True roots and leaves
- Roots have lignified vascular tissue
- Sporophyte-dominant life cycle
- Homosporous plants: a single type of spore....
- Sporophyte---->Single type of spore
---->Bisexual gametophyte
---->Eggs; sperm (flagellated; damp locations)
- Carboniferous period plants

