Lecture main topics

• Last Lecture
  – Eukaryote diversification
  – Eukaryote phylogeny
  – Features of major groups
• Today’s lecture
  – Green algae (Chlorophyta)
  – Introduction to land plants

Chlorophyta

• Closely related to land plants and are classified with plants by some into the ‘Viridiplantae’
• Have similar pigments as land plants
• Live in fresh or sea water
• Single celled or multicellular
• Vary in life cycle
  – Sexual vs asexual reproduction (Chlamydomonas)
  – Importance of sporophyte vs gametophyte
    • Heteromorphic alternation of generations
    • Isomorphic alternation of generations (Ulva)

Introduction to land plants

• Very successful monophyletic group with 280,000 species
• Inhabit terrestrial environments and some have returned to aquatic (e.g. duckweed) or marine environments (e.g. sea grass)
• Colonized land about 500 MYA
• Main groups include
  – Bryophytes- mosses and liverworts
  – Pteridophytes- ferns, horsetails
  – Gymnosperms- pines, gingko
  – Angiosperms- flowering plants
Charophyceae is sister group to land plants
- Charophyceans live in shallow water in ponds and lakes
- They spend most of their lives haploid (gametophyte dominant)
- They possess adaptations to survive occasional drying
- Shared derived homologies include
  - Chloroplast structure
  - Cell wall structure
  - Sperm cells
  - Peroxisomes

Derived homologies of land plants
- Apical meristems, where cells divide and differentiate into specific tissues, are found at the tips of roots and shoots
- Plant embryos are located within female plant tissues and nourished through "placental transfer tissues."
- Plants have multicellular gametangia (organs that bear gametes):
  - Archegonia- vase shaped organ with a single egg cell
  - Antheridia- bear sperm cells
- Photosynthetic tissues (leaves, etc) have a cuticle (water resistant covering) and stomata (pores in leaves for gas exchange)

Innovations in plant evolution
- Embryo develops on parent plant
- Conducting tissues to carry materials (phloem- food; xylem-water) evolved
- Evolution of seeds (embryo provisioned and protected from environment)
- Evolution of ovaries to enclose seed and aid in its dispersal (flowering plants)
**Bryophyte features**

- True mosses, liverworts, and hornworts are bryophytes.
- Tissues only a few cells thick, no need for conducting tissue to transport nutrients and water to different parts of plant.
- Rhizoids anchor plant body to ground, no bryophytes grow tall.
- Water is required for fertilization, sperm swim to archegonia after release from antheridia.
- Gametophyte is dominant, sporophyte grows out of fertilized egg.
- Meiosis occurs in sporangium and many tiny spores are released.

**Bryophyte life cycle**

- Haploid spores released and germinate to form gametophyte protonema.
- Gametangia emerge in gametophyte tissue.
- Sperm released from antheridia and spread through water to archegonia.
- Zygote divides to form sporophyte that grows out of female gametophyte.
- Sporophyte forms stalk and capsule (sporangium).
- Meiosis and spore formation inside sporangium.

**Ecology of bryophytes**

- Probably the only land plants for 100 MY.
- Spores disperse around the world.
- Mosses found mostly in moist habitats but are capable of dehydrating when dry and rehydrating when moisture returns.
- Sphagnum moss forms peat bogs in which decay is very slow due to acidity and compounds produced by moss.
- Peat moss used for wound dressing and fuel.