

Topic: The Diversity of Plants

Reading: Chapter 21

Main concepts:

- Plants are a diverse group that includes all multicellular, non-motile autotrophs which have cell walls made of cellulose.
- Key features of plants:
 - Life cycle that includes the alternation of generations, with haploid gametophyte and diploid sporophyte phases.
 - Multicellular embryos that are dependent on the parent organism.
 - Capture sunlight to use as an energy source to synthesize organic molecules. These molecules are metabolized for energy or are used to build cell structures.
- Green algae also have cell walls made of cellulose and have the same photosynthetic pigments as plants. Ancient green algae probably gave rise to modern plants. Some taxonomic systems put green algae in the Plant Kingdom.
- Evolutionary trends in land plants:
 - Stronger cell walls give support outside of the water
 - Vascular tissue carries water up the plant stem, also gives support
 - Containing sperm cells inside pollen grains frees plants from dependence on water for reproduction.
 - Increased prominence of the sporophyte phase over the gametophyte phase.
- Major groups of plants:
 - Bryophytes: mosses and liverworts
 - No vascular tissue
 - No true roots
 - Reproduce by means of an egg and a free-swimming sperm.
 - Gametophyte phase is most prominent.
 - Limited in size by lack of vascular tissue and by their reproduction.
 - Spores used for asexual reproduction when conditions are dry.
 - Seedless vascular plants: ferns, horsetails, club mosses
 - Vascular tissue and lignin in the cell walls allows these plants to grow taller than mosses.
 - Reproduce by means of swimming sperm, so the gametophyte phase is small.
 - Spores used for asexual reproduction.
 - Seed plants
 - Gametophyte phase reduced. Male gametophyte is carried in a dry pollen grain, so reproduction can occur between individuals that are spaced far apart.
 - Gymnosperms ("naked seed"): conifers, cycads, ginkgo
 - Male cones produce pollen grains to carry sperm cells on the wind.
 - Female cones produce ovules on the cone scales.
 - Embryo is contained inside a seed carried on the cone scale.
 - Angiosperms: flowering plants
 - Ovule contained inside an ovary, which develops into a true fruit.
 - Sperm carried inside a pollen grain.
 - Pollen may be dispersed by wind or carried by insects, birds, or other animals.

Common misconceptions:

- When people think of "plants," they often think first of herbaceous flowering plants. "Folk taxonomy" places "plants," "shrubs," and "trees" in separate categories, which are often functional categories if you're discussing what to plant in your garden. Scientific classification places all multicellular non-motile autotrophs with cellulose cell walls into Kingdom Plantae.
 - Many people believe that moss is a kind of fungus and can grow in the dark. The green color of moss tells us that it is photosynthetic and needs light. Moss has all the features that place it in the plant kingdom rather than among the fungi.
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Reading notes:

- Sketch the alternation of generation in plants. Look up the terms “haploid” and “diploid” and define them in your notes.
- Compare the life cycles of mosses, ferns, and seed plants. How prominent are the sporophyte and gametophyte phases in each?
- What is meant by “dependent embryos?”
- Describe the ecological roles that plants play.
- Describe evolutionary trends in plants as ancestral green algae moved onto land and were faced with a new set of environmental challenges.
- Describe the major features of the bryophytes and the three groups of vascular plants: ferns and their allies, gymnosperms (conifers and related groups), and angiosperms (flowering plants). List some examples of each.
- Describe how the male gamete (sperm cell) reaches the female gamete (egg cell) in mosses, ferns, conifers, and flowering plants.
- What are the advantages and disadvantages of wind pollination versus pollination by an animal vector, such as insects or birds?

Useful websites:

- “Introduction to the Plantae” <http://www.ucmp.berkeley.edu/plants/plantae.html> has information on the Kingdom Plantae and evolutionary trends in plants.
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