Plant Diversity

The Evolution of the Photosynthetic Terrestrial Plants

Land plants Origins

- Shared ancestor with green algae. (Aquatic)
- Researchers have identified green algae called *charophyceans* as the closest relatives of land plants.
  - Common name - stoneworts

Unique Plant Adaptations
Adaptations for a terrestrial existence

1) Roots - anchor the plant and absorb water & nutrients from the soil.
2) Cuticle - a waxy coating to prevent drying out
3) Stomata - pores in the leaves and stems that allow for gas exchange.
4) Conducting vessels - for transport of water, minerals, and sugars through the plant body.
5) Lignin - stiffening and support of stems.
6) Unique reproductive structures e.g. pollen - for transporting gametes.

First true land plants were short and required water for reproduction

- Likely had only very small photosynthetic surfaces, needed to stay constantly moist. No true roots to absorb water from soil.
Alternation of Generations

The alternating life cycle of plants that involves changes between a:

1) **Sporophyte** generation

   AND

2) **Gametophyte** generation

**Sporophytes make spores**
From spores a new plant can emerge.

**Gametophytes make gametes** (egg or sperm)
Gametes cannot make a new plant by themselves. Need to join with another gamete to make a whole plant i.e., fertilization of sex cells must first occur.

**Alternating Generations**
In more advanced plants **sporophyte** generation dominant.
Contrasting the Generations

**Sporophyte**
- Diploid state (double set of chromosomes in cells – full set)
- Produces seeds in seed-bearing plants
- Makes spores
- Predominant form in higher plants e.g. trees.

**Gametophyte**
- Haploid state (half the amount of chromosomes in cells or only one set)
- Produces the gametes i.e. (sperm & egg).
- Predominant form in mosses & ferns (lower plants).

Mosses & nonvascular plants have life cycles dominated by gametophytes

Gametophyte (Green & leafy)

Life Cycle of Mosses

Characteristics of Mosses
Division Bryophytes

- The sporophyte forms on, and is nourished by, the dominant gametophyte
- Nonvascular (don’t have special methods of conducting water & minerals) – tend to be very small.
- Sperm swim through water to eggs (require moist areas e.g. under-story of forest to grow).
- Spores (rather than seeds) are the dispersal form.
Characteristics of Ferns & their kin

- Most **sporophytes** have **leaves and roots** that grow out from rhizomes (underground stems).
- Spores are dispersed from clusters of sporangia (called SORI) on lower surfaces of frond leaves. Spores give rise to gametophytes.
- **Gametophytes** make sperm & egg – still require moist environments to reproduce.
In Ferns the Sporophyte generation is dominant. (this is the part we see in a forest)

**Common Terms in Plant Reproduction**

- **Archegonia** – Enclosed female structure where eggs develop.
- **Antheridia** – Enclosed male structure where sperm develop.

**Seedless Vascular Plants**

- **Why are lower plants important?**
  - Producers in the food chain (make oxygen).
  - Provide shelter to small animals e.g. invertebrates like snails & insects.
  - Retain moisture – this can be a bad thing for roofs on our houses. Insurance companies recommend removal.
  - Ferns used in florist industry $$$
  - Peat moss in bogs is used as fuel source & burned in some northern countries e.g. Ireland.
  - Mosses in tundra climates hold in CO2 & Methane gasses so may play important role in green house gas regulation.