Chapter 29
The Plant Kingdom: Seedless Plants

I. Plant Adaptations: Terrestrial Living

A. Cuticle
B. Stomata
C. Multicellular gametangia
   1. The archeogonium produces a single egg
   2. The antheridium produces many sperm
   3. The fertilized egg develops within the archegonium
D. Sporopollenin in spore walls
E. Root and shoot systems with apical meristems

*The success of plants on land allowed invasion by animals

II. Life Cycle: Alternation of Generations

A. Plants alternate between multicellular haploid and diploid stages
   1. The haploid portion is the gametophyte generation
      a. It produces haploid gametes
      b. The gametes fuse to form the diploid zygote
   2. The diploid portion is the sporophyte generation
      a. The zygote develops within the archegonium
      b. It produces haploid spores
      c. The spores divide → the gametophyte generation
   3. Gametophyte generation is dominant in the mosses, liverworts, and hornworts
   4. The sporophyte is dominant in the ferns, whisk ferns, horsetails, club mosses, and the seed plants

III. Nonvascular Plants: The Bryophytes

A. Includes mosses, liverworts and hornworts
   Note: not a direct lineage to the vascular plants.

B. Phylum Bryophyta: Mosses
   1. colonial plants
   2. lack true leaves, roots and stems
      a. possess rhizoids
      b. Some possess conducting cells
   3. Life cycle:
a. The haploid **gametophyte** (the dominant generation) bears the gametangia
   May be **monoecious** or **dioecious**

b. Sperm transport: commonly splashing raindrops and swimming
   i. Sperm may also be transported by insects
   ii. Sperm attraction: **chemotaxis**

c. The diploid zygote → multicellular diploid **sporophyte**
   i. sporophyte dependent on the gametophyte
   ii. sporophyte parts: foot, seta, capsule (with sporogenous cells)

d. sporogenous cells → haploid spores

e. spore → protonema

f. protonema → gametophyte

C. Phylum Hepatophyta: Liverworts
   1. body form = **thallus**
   2. life cycle resembles mosses
   3. can reproduce asexually with **gemmae**

D. Phylum Anthocerophyta: Hornworts
   1. thallus-like gametophyte
   2. gametangia embedded in thallus
   3. sporophyte develops into a horn-like projection above gametophyte

IV. Seedless Vascular Plants: Ferns and Fern Allies

A. Evolved about 420 million years ago
   1. Prehistoric ferns of much larger size than extant ferns

   2. Fern allies: whisk ferns, club mosses, and horsetails
      a. These plants have vascular tissue for conduction and support
      b. Most have true roots and leaves

   3. **Megaphylls** and **microphylls** are the two types of leaves
      a. **Microphylls** are small and have a single vascular strand
      b. **Megaphylls** are larger and have more than one vascular strand

   4. **Sporophylls** are modified leaves that bear **sporangia**
      a. most seedless vascular plants are **homosporous**
      b. some seedless vascular plants are **heterosporous**
         have **microsporangia** that produce **microspores**
         have **megasporangia** that produce **megaspores**

B. Phylum Lycophyta: Club mosses (ground pines)
1. possess true roots, stems, and leaves
   a. stems rhizotomous or aerial
   b. leaves are scale-like

2. spores born in sporangia within strobili

3. Some species bear microsporangia and megasporangia

C. Phylum Pterophyta

1. Whisk ferns
   a. simplest vascular plants: lack true roots and leaves but possess vascular stems
   b. stem exhibits dichotomous branching
   c. homosporous

2. Horsetails
   a. possess true roots, stems, and leaves
   b. hollow, jointed stems with silica
   c. stem is main photosynthetic organ
   d. leaves small, whorled, and fused at each node
   e. life cycle similar to fern's but produces terminal strobili containing sporangia and spores (homosporous)

3. Ferns
   a. primarily occupy moist, tropical habitats; a few are aquatic
   b. Fern bodies consist of a rhizome (an underground stem), roots and leaves
   c. Newly emerging fronds are fiddleheads
   d. All structures contain vascular tissues
   e. Spore in sporangia; clusters called sori
      Most species are homosporous but some are heterosporous: bear microsporangia and megasporangia.
   f. Spores germinate and grow by meiosis into gametophytes called the prothallus