Plant Diversity:
Chapt. 29 – How Plants Colonized Land

Land plants evolved from **Charophyceans** (multicellular, eukaryotic, green-algae protists)
[See Fig. 29.7]

The evidence consists of many derived homologies of cellular microstructure and biochemistry (DNA, chlorophyll, *etc.*)

Evolutionary innovations of land plants:

Colonization of land by the first **bryophytes**

Advent of a **vascular system** with the origin of **vascular plants**

Origin of **seeds** (embryo packaged with a supply of nutrients inside a protective coat)

Evolution of **flowers** (seeds develop inside chambers called ovaries, which originate in flowers that mature into fruits)

Alternation of generations

Review of **chromosome number**
A **diploid nucleus (2n)** has two of each kind of **chromosome**
A **haploid nucleus (n)** has only one of each kind of **chromosome**

Animal Life Cycle [See Figs. 13.5 & 13.6]
No alternation of generations
Diploid phase is dominant

Fungal Life Cycle (shared by some algae) **[See Fig. 13.6]**
No alternation of generations
Haploid phase is dominant

Plant Life Cycle (shared by some algae) **[See Fig. 13.6]**
Alternation of generations
Haploid or diploid phase is dominant, depending on the lineage

Spore = reproductive cell that can develop into a new organism

Gamete = reproductive cell that must fuse with another gamete

Evolutionary innovations of land plants:

Alternation of generations

Meiosis occurs in specialized cells to produce **spores**
Mitosis results in **gametophyte** growth
Mitosis occurs in specialized cells to produce **gametes**
Fertilization
Mitosis results in **sporophyte** growth

Further Adaptations of Land Plants **[See Fig. 29.5]**

Apical meristems

Multicellular, dependent **embryos** with **placental transfer cells**

The **spore mother cells** of diploid **sporangia** produce protected (walled) haploid **spores**

Multicellular, **haploid gametangia** produce **gametes** (in all but angiosperms)

Archegonium: **female gametangium** (produces **eggs**)

Antheridium: **male gametangium** (produces **sperm**)

Characters for conserving water

E.g., waxy **cuticle** coating the **epidermis**

Characters for moving water

E.g., **lignified vascular tissues** (found in all but bryophytes)

Phloem and **xylem**

Phylogeny of plants [See Fig. 29.7]

I. Non-vascular Plants (Bryophytes)

Dominant plants on Earth through the first 100 million years of land plants' existence

II. Vascular Plants

A. Seedless

Dominant plants in Carboniferous, *i.e.*, today's fossil fuels

B. Seed Plants

Dominant plants on Earth today

i. Gymnosperms

ii. Angiosperms

BRYOPHYTES [See Fig. 29.8]

Gametophyte dominant; sporophyte dependent; gametophyte independent

Gametophytes produce **gametes** by **mitosis**

A **zygote** begins the **sporophyte** generation

Mature **sporophytes** produce **spores** by **meiosis**

Thin structure allows distribution of materials without vascular system

Rhizoids anchor, but do not play a primary role in water and nutrient uptake

3 main clades:

Phylum Anthocerophyta - hornworts

Phylum Bryophyta - mosses

Phylum Hepatophyta - liverworts

SEEDLESS VASCULAR PLANTS [See Fig. 29.12]

Sporophyte dominant; sporophyte initially dependent; gametophyte independent

Gametophytes produce **gametes** by **mitosis**

Fern **prothallus** = **gametophyte**

A **zygote** begins the **sporophyte** generation

Mature **sporophytes** produce **spores** by **meiosis**

Sori = clusters of **sporangia**

Homosporous vs. heterosporous spore production [See diagram on pg. 586]

Evolution of:

Leaves (principal photosynthetic organs of vascular plants)

Roots (principal organs that anchor vascular plants and absorb water & nutrients)

Vascular tissues (conduits that distribute water & nutrients within vascular plants)

2 main clades (of seedless vascular plants):

Phylum Lycophyta - "Club mosses"

Phylum Pterophyta

3 main clades (of pterophytes):

Horsetails

E.g., *Equisetum*
Strobilus – a group of **sporophylls** forming a **cone**

Whisk ferns

Ferns

Terrestrial species are found on the ground
Resurrection fern is an epiphytic example, *i.e.*, it grows on other plants

NOTE: The file "LifeCycles.pdf" is also available for download from the course website as a study guide of animal, fungal, and plant life cycles.