

## Chapter 20 - What is a Plant?

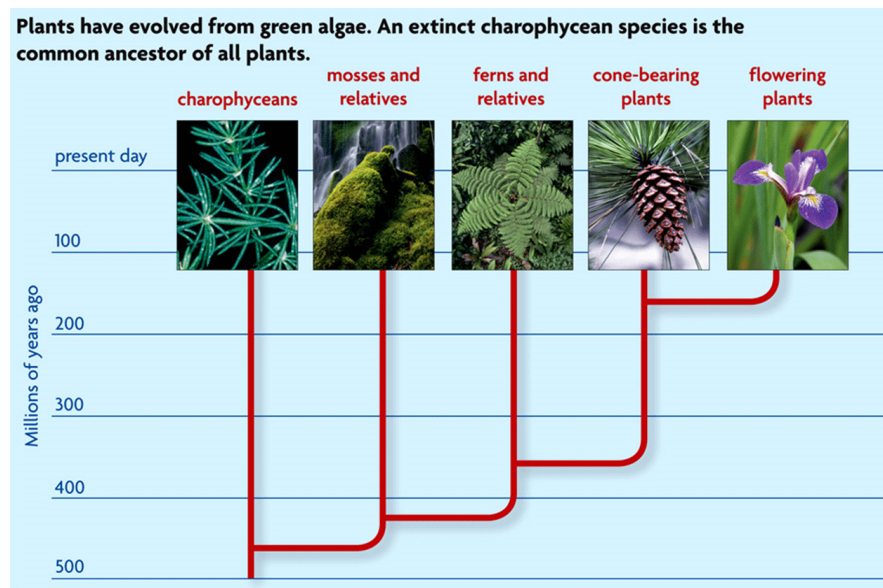
### Section 20.1 Adapting to Life on Land

#### I. Origins of Plants

- A plant is a *multicellular eukaryote*.
  - Plants can produce their own *food* through a process called *photosynthesis*.
  - Plants have cell walls made of *cellulose*.
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- The stems and leaves of most plants have a *waxy waterproof coating* called a cuticle.
  - Scientists hypothesize that all plants probable evolved from *green algae* that lived in the ancient oceans.
  - The first evidence of plants in the fossil record began to appear over *440 million* years ago.



- True plants evolved through *natural selection*.



## II. Adaptations in Plants

- *Land plants* evolved structural and physiological adaptations that help protect the *gametes from drying out*.

### A. Preventing water loss

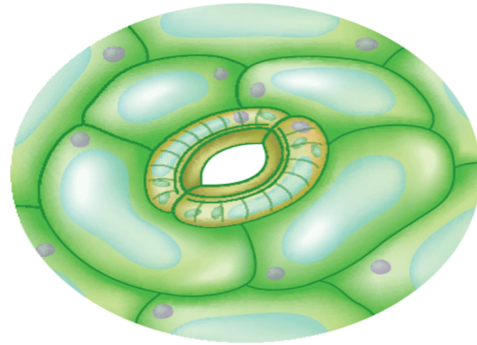
1. Most fruits, leaves, and stems are covered with a waxy layer called the *cuticle*.
2. The waxy cuticle creates a barrier that helps *prevent the water* in the plant's *tissues* from evaporating into the atmosphere.



3. *Stomata* are tiny holes in the cuticle.

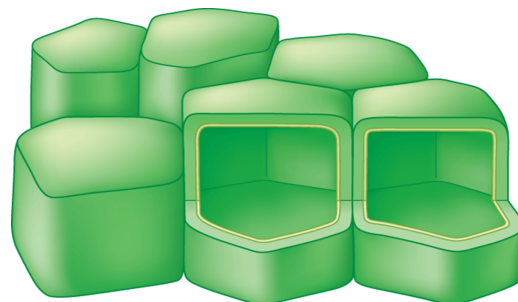
-can **open and close**

-allow **air to move in and out**



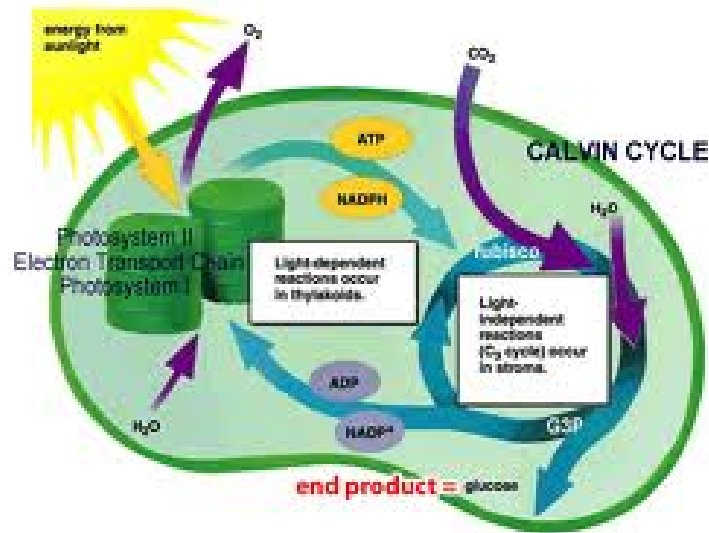
4. *Lignin* allows plants to grow upright.

- > *hardens cell walls* of some vascular tissues
- > provides *stiffness to stems*



## B. Carrying out photosynthesis

- The *leaf* is a *plant organ* that grows from a stem and is where *most photosynthesis* occurs.



## C. Putting down roots

- Most plants depend on the *soil as their primary source* for water and other nutrients.
- A *root* is a plant *organ* that absorbs *water and minerals* usually from the soil.
- Roots *anchor* a plant, usually to the ground.
- Some accumulate starch and function as *organs of storage*.

EX: radishes or sweet potatoes

## D. Transporting materials

1. *Water* moves from the *roots* of a tree to its leaves, and *sugars* produced in the *leaves* move to the roots.
2. A *stem* is a plant organ that provides *support for growth*.
3. It contains *tissues for transporting* food, water, and other materials from one place to another.
4. Some stems can serve as *food storage* and can also *carry out photosynthesis*.
  
5. Stems contain *vascular tissue* - elongated cells through which water, food, and other materials are transported.
6. Plants that possess vascular tissues are known as *vascular plants*.
7. *Nonvascular plants* do not have vascular tissues. They obtain water and mineral through *osmosis and diffusion*.

## Plant's Adaptation to Life on Land - **SHOOTS & ROOTS**

Cuticle

Leaf

- Photosynthesis

Stem

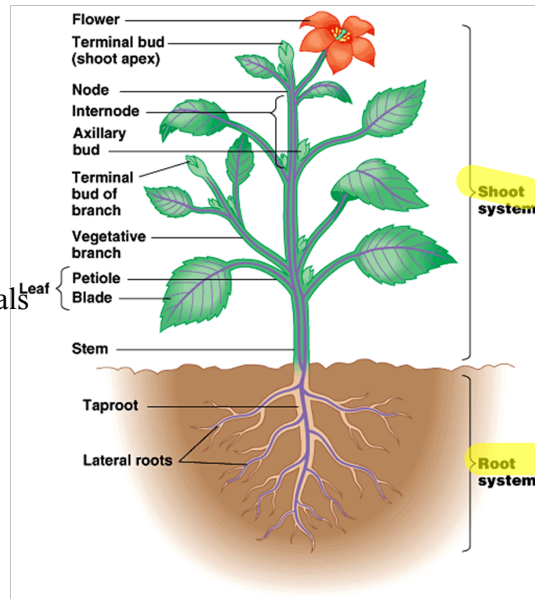
- Support

- Transporting materials

Vascular plants

Nonvascular plants

Roots



### E. Reproductive strategies

- **Pollen grains** allow for reproduction without free-standing water.

-pollen grains contain a cell that **divides to form sperm**

-pollen can be carried by **wind or animals** to female structures

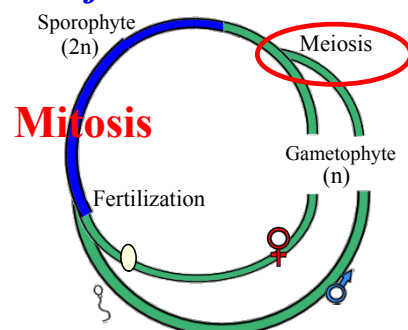


1. A **seed** is a plant organ that contains:  
an **embryo**, **food** for the embryo, and is covered by a **protective coat**.
2. Land plants reproduce by either **spores or seeds**.
3. Non-seed plants (**mosses, ferns**) the sperm require a **film of water** to reach the egg. Seed plants do **not rely on water** for the sperm to reach the egg.



## F. Alternation of generations

1. Life of plants include **two stages**.
2. The **gametophyte** generation of a plant results in the development of **gametes**. All cells of the gametophyte, including the gametes, are **haploid**.
3. The **sporophyte** generation begins with **fertilization**. All cells of the sporophyte are **diploid** and produced by **mitosis and cell division**.



## Section 20 Survey of the Plant Kingdom

### I. Phylogeny of Plants

1. Some botanists use plants characteristics to classify plants into *divisions* (remember divisions are same as phyla).
2. The production of seeds can be used as a basis to separate the divisions into two groups: *non-seed plants and seed plants*.



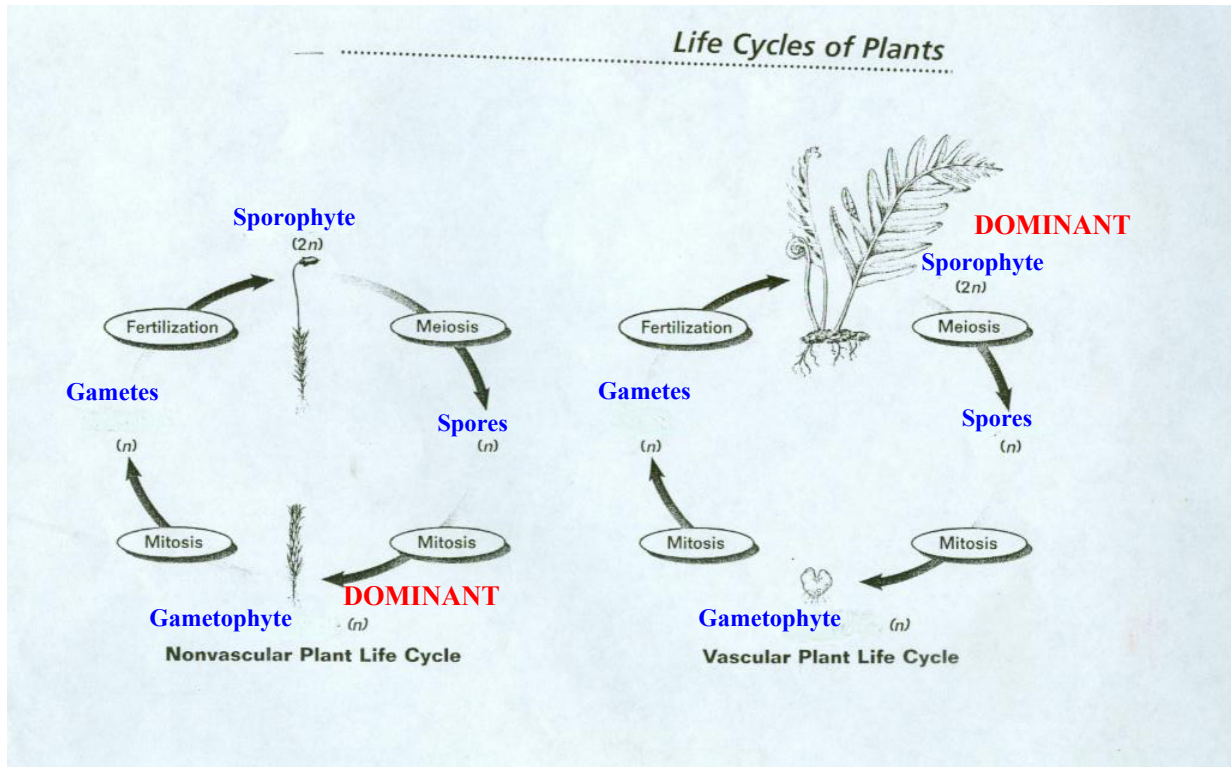
### II. Non-Seed Plants

- Produce hard-walled reproduction cells called *spores*.
- Include *vascular and nonvascular* plants.

### II. Seed Plants

- Seed plants produce seeds, which in *dry environment* are a more effective means of *reproduction* than spores.





Phylum	Number of Species	Main Characteristics
<b>Nonvascular Plants</b>		
<b>Hepatophyta</b> Liverworts	6,000	Simplest plants; small, having a dominant gametophyte with a flattened or "leafy" body that lacks vascular tissue, a cuticle, stomata, roots, stems, and leaves
<b>Anthocerophyta</b> Hornworts	100	Small, with a flattened, dominant gametophyte that has stomata but lacks vascular tissue, roots, stems, and leaves
<b>Bryophyta</b> Mosses	10,000	Small, most have simple vascular tissue, a sporophyte consisting of a bare stalk and a spore capsule, and a dominant, "leafy" green gametophyte that lacks roots, stems, and leaves
<b>Vascular Plants</b>		
<b>Psilotophyta</b> Whisk ferns	21	Seedless, with a small, independent gametophyte and a dominant sporophyte that is highly branched and has tiny leaves but is not differentiated into roots and stems
<b>Arthropophyta</b> Horsetails	15	Seedless, with a small, independent gametophyte and a dominant sporophyte consisting of roots and ribbed and jointed stems with soft needlelike leaves at the joints
<b>Lycophyta</b> Club mosses	1,000	Seedless, with a small, independent gametophyte and a dominant, mosslike sporophyte with roots, stems, and leaves

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Phylum	Number of Species	Main Characteristics
<b>Pterophyta</b> Ferns	12,000	Seedless, with a small, independent gametophyte and a dominant sporophyte consisting of roots, horizontal stems, and leaves called fronds; spores are produced in clusters of sporangia on lower surfaces of leaves
<b>Coniferophyta</b> Conifers	550	Gymnosperms (seed plants with tiny gametophytes, a large sporophyte, and ovules not enclosed by an ovary) that produce cones; mostly evergreen trees and shrubs with leaves modified as needles or scales
<b>Cycadophyta</b> Cycads	100	Gymnosperms with palmlike leaves; produce male and female cones on separate plants
<b>Ginkgophyta</b> Ginkgo	1	Gymnosperm; deciduous tree with fanlike leaves; produces cone-like male reproductive structures and uncovered seeds on separate individuals
<b>Gnetophyta</b> Gnetophytes	70	Gymnosperms, diverse group of shrubs and vines
<b>Anthophyta</b> Flowering plants	250,000	Angiosperms (seed plants with tiny gametophytes, a large sporophyte, and ovules enclosed by an ovary); a very diverse group including trees, shrubs, vines, and herbs that produce flowers and fruits

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