

# Plant Classification

## Introduction

Ask five different people what the common name is for *Liriodendron tulipifera*, and you could possibly get five different answers. As you have already learned, naming organisms can get very confusing. Over many years, scientists have created logical systems to classify and name plants.

## Key Vocabulary

angiosperms

annuals

biennials

bryophytes

capillary action

cohesion theory

conifers

cotyledon

deciduous

dicots

evergreen

ferns

fronds

gymnosperms

herbaceous

lignin

monocots

morphology

non-vascular plants

perennials

phloem

sink

source

spores

stomates

taxonomy

translocation

tracheophytes

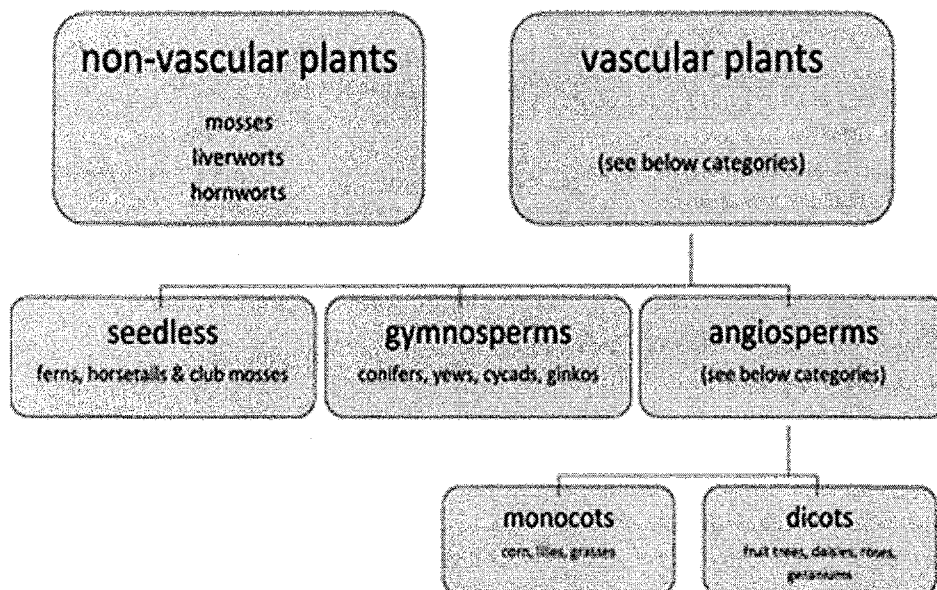
vascular plants

xylem

## Classifying Plants

The branch of biology that deals with identifying and naming organisms is **taxonomy**. Plants are classified based on the similarities of their characteristics. Plant taxonomists compare flowering patterns, stem and leaf structures, life cycles, genetic similarities, and many other characteristics in deciding which plants are the most closely related. The study of the form or shape of organisms or parts of an organism is **morphology**.

# Plant Classification



## Vascular vs Nonvascular Plants

Vascular plants have conducting tissue called **xylem and phloem**. Xylem and phloem act as a transport system for more complex plants, carrying water, glucose, and other necessary materials to the cells.

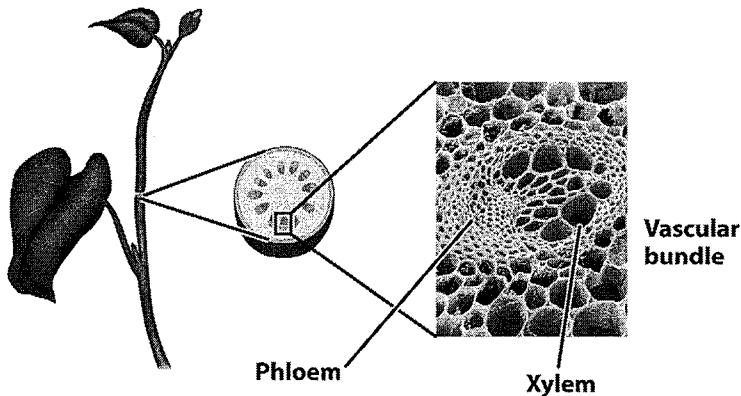
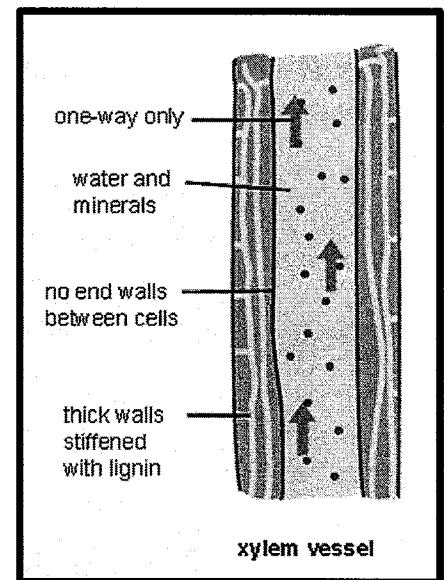


Figure 31-5 part 1 Discover Biology 3/e  
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### Xylem

- ✓ Carries water and dissolved minerals from the roots upward to the leaves.
- ✓ Found in the vascular bundle, xylem runs from the roots, through the stems, and into the leaves.
- ✓ Xylem is made up several types of cells and elements. Many of the xylem cells are dead
- ✓ Support is created through cells which contain a great deal of **lignin** (complex organic polymer) in their cell walls. The lignin makes the cell walls rigid, making the xylem as a whole very stiff so that it will support the plant and keep it upright.
- ✓ When xylem cells die, they act as part of a support network for the plant, because the lignin in the cell walls is intact.
- ✓ Dead xylem cells can also continue to conduct water through the xylem after death, because their conductive properties are purely mechanical, created by the shape of the cell, rather than being biological in nature.

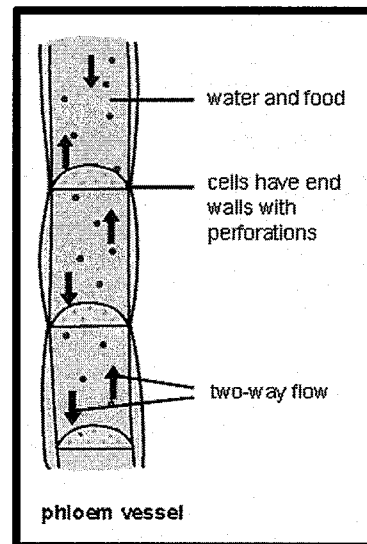
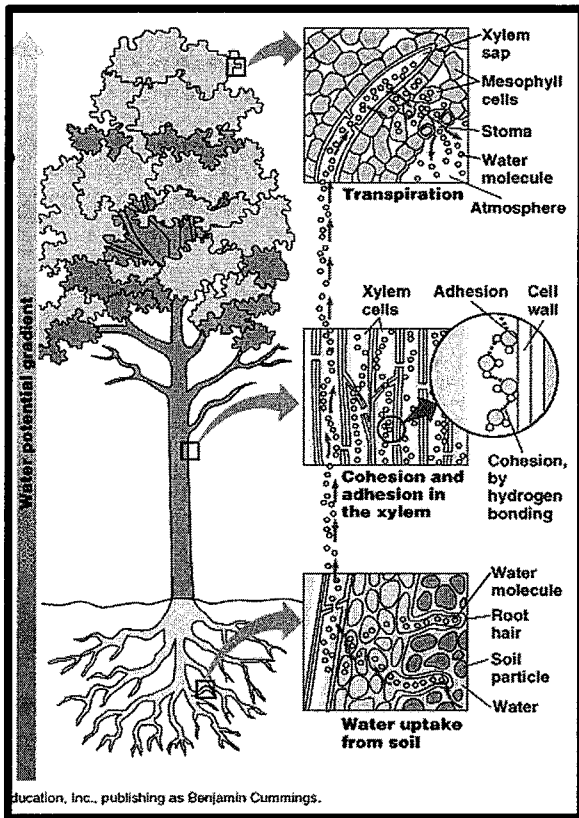


### How does Xylem Carry Water against Gravity – Cohesion Theory (transpirational pull)

Water movement in the xylem is driven upward with the help of the following forces:

- ✓ **transpiration**: the evaporation of water from leaves & stems through pores in the underside of leaves called **stomates**.
- ✓ **capillary action**: **cohesive forces** of water molecules attraction for each other (like--like) and **adhesive forces** of water molecules attraction for the walls of the xylem (like—unlike).
- ✓ --As water evaporates from the roots, more water enters the roots.
- ✓ Transpiration produces a **NEGATIVE** pressure in the xylem pulling water **UPWARD** as water evaporates out of the stomates

## Cohesion Theory of Xylem Action



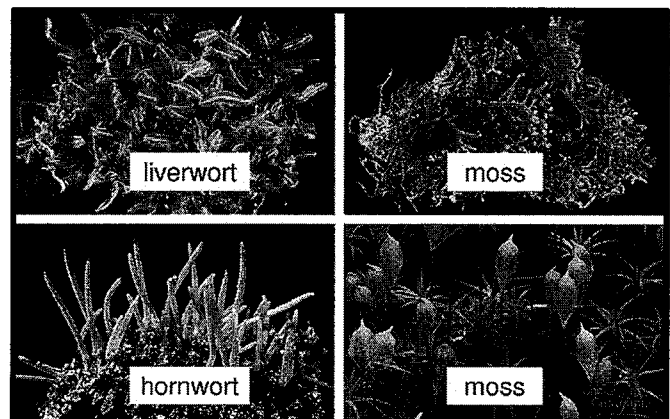
### Phloem

- ✓ conducting tissue is made up of living cells
- ✓ carries glucose from the leaves of plants to the roots (where it is stored as starch)
- ✓ in larger plants, phloem can carry glucose in both directions
- ✓ leaves where glucose is made referred to as the **source**; new shoots (growth) and the roots that use more glucose for growth and storage are referred to as the **sink**
- ✓ the process by which phloem transports sugars throughout the plant is called **translocation** (we will discuss this process later on after we learn about transport across the cell membrane)

Plants are divided into two phyla: **Bryophyta** (non-vascular plants) and **Tracheophyta** (vascular plants)

### Bryophytes

- ✓ no vascular tissue (no xylem or phloem) so these plants have no true roots, leaves, or stems and as such are limited in size
- ✓ circulation occurs by diffusion and active transport.
- ✓ Most often found in damp places
- ✓ Examples: liverworts and mosses



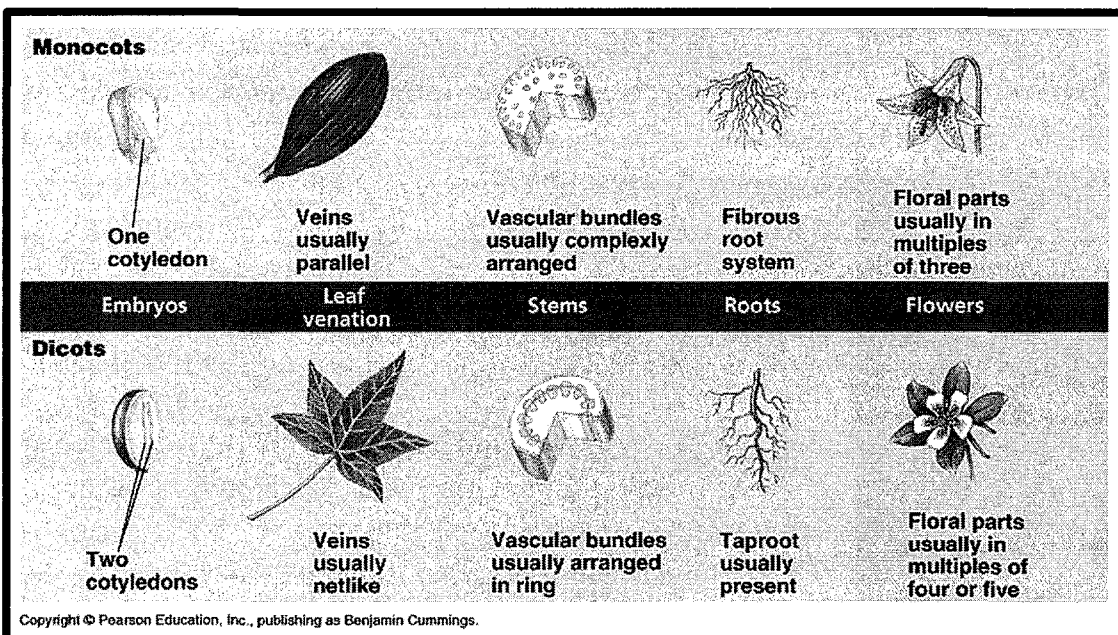
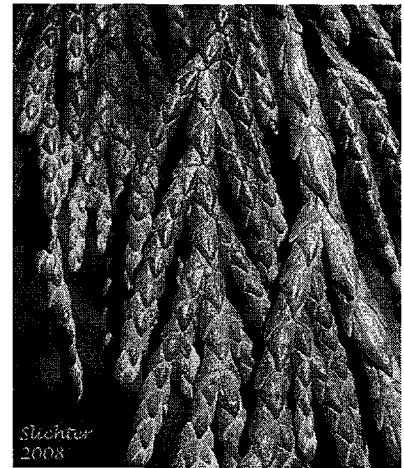
## Tracheophytes

- ✓ have vascular tissue (xylem and phloem) so has true roots, stems, and leaves.
- ✓ **Class: Ferns (first tracheophytes to evolve)**
  - reproduce by spores
  - instead of leaves they have fronds which serve a double purpose of food production & spore formation
  - need a moist environment to live and reproduce
- ✓ **Class: Gymnosperms**
  - cone bearing plants that have “naked” seeds that develop uncovered on the scales of cones
  - examples include **conifers** (cone bearing plants) that generally have leaves in the form of needles or scales (pine, fir, spruce, cedar)
  - most conifers are **evergreen** (hold their leaves all year)
  - two examples of conifers that are **deciduous**: bald cypress & larch
- ✓ **Class: Angiosperms**
  - flowering plants
  - produce seeds that develop within an ovary
  - 2 subclasses that are divided based on the type of seed produced
  - Monocots**: flowering plants with seeds that have 1 cotyledon (stored source of food for developing embryo)
  - **Dicots**: flowering plants with seeds that have 2 cotyledons

fronds with spores



Scale leaves Alaskan cedar



Plants are often classified on based on their life cycles:

- ✓ **Annuals:** complete their life cycles within one year or one growing season.  
--examples include many weeds such as crabgrass & ragweed; corn, soybeans, rice, wheat, potatoes, tomatoes, marigolds, zinnias, & petunias
- ✓ **Biennials:** normally require 2 growing seasons to produce flowers and seed before dying.  
-- examples include parsley, beet, carrots, sweet William
- ✓ **Perennials:** have life cycles that have more than 2 growing seasons to reach maturity  
-- examples include woody trees & shrubs or herbaceous plants (have soft, nonwoody stems)

**Check your Understanding (please answer on separate paper in full sentences)**

1. Define the term morphology and use it in a sentence relating to plants.
2. Differentiate between bryophytes and tracheophytes.
3. Describe the function of xylem.
4. Hypothesize how lignin aids in the growth in height of tracheophytes.
5. Describe how water can travel up the xylem.
6. What is the function of phloem?
7. Why are ferns considered the least complex class of tracheophytes?
8. How do gymnosperms differ from angiosperms?
9. Differentiate between a monocot and a dicot with respect to seeds, arrangement of vascular bundles, flower parts, and position of veins in leaves.
10. Describe the differences among annual, biennials, and perennials.