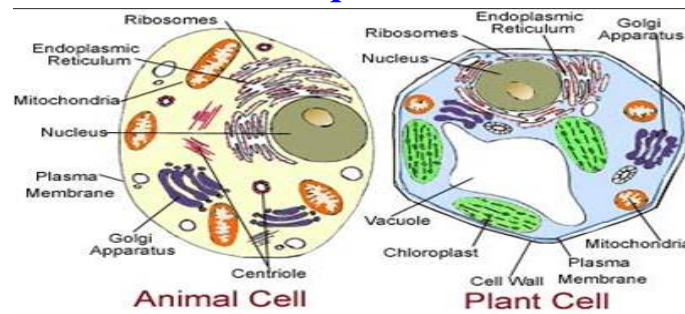


## Ch. 21: Plant Structure and Function

### Section 21.1 & 21.2 Plant Cells and Tissues

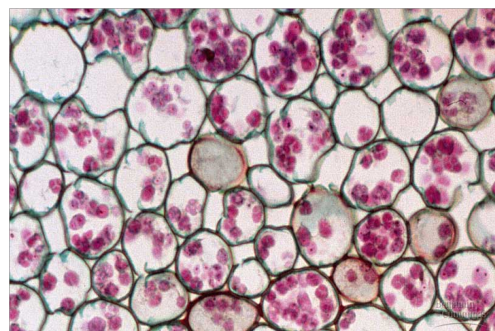
#### I. Types of Plant Cells

- Plants cells are different from animal cells because they have a *cell wall*, *a central vacuole*, *and can contain chloroplasts*.



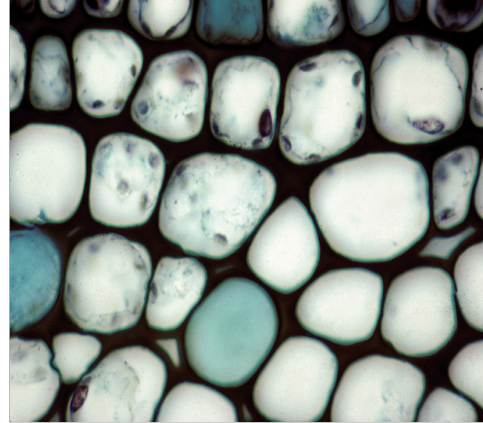
#### A. *Parenchyma* Cells

- most *abundant* kind of plant cell
- spherical cells that have *flexible* cell walls
- large* central vacuole
- store* starch, oils and water
- help *heal wounds* to the plant
- have *thin flexible* walls
- the *edible* portions of many fruits and vegetables
- contains many *chloroplasts*.

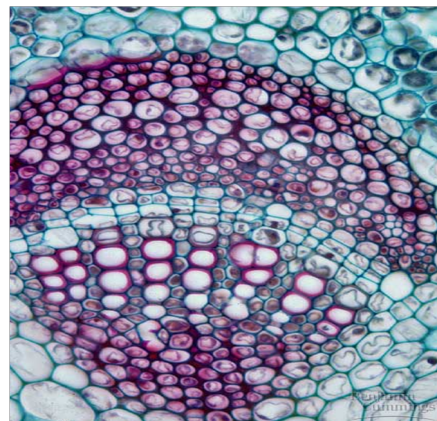


**B. *Collenchyma* Cells**

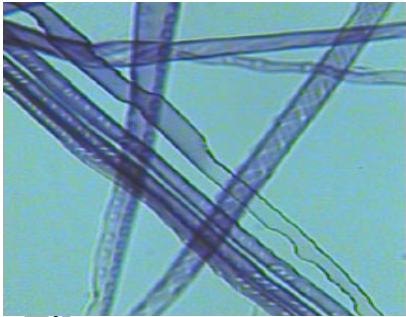
- long cells with *unevenly thickened* cell walls; allows cell to **grow**
- cell walls can **stretch** as the cells grow while providing *strength and support*
- arranged in *tube like* strands or cylinders  
(ex: celery)

**C. *Sclerechyma* Cells**

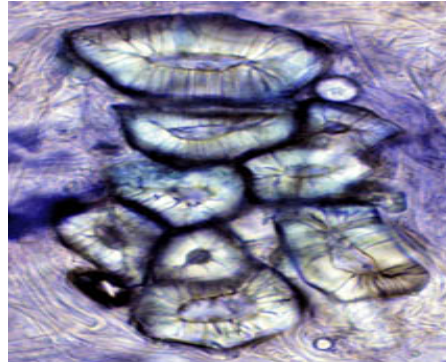
- *strongest* plant cell type.
- cell walls are very *thick and rigid*, hardened by **lignin**
- when mature, often *die*
- *cytoplasm* disintegrates, however, thick cell wall still provides **support** needed
- used by humans to make **linen and rope**
- Two types of sclerechyma:
  1. **Fibers**
  2. **Sclerids**



- **Fibers** are **long, thin** cells that form strands, which provide **support and strength**
- **Sclerids** are **irregularly** shaped and usually found in **clusters**



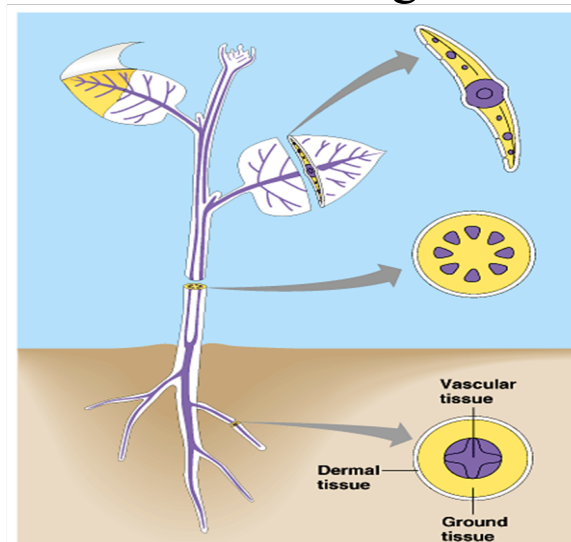
**Fibers**



**Sclerids**

## II. Plant Tissues

- ***Tissue*** = group of cells that function together to perform an activity.

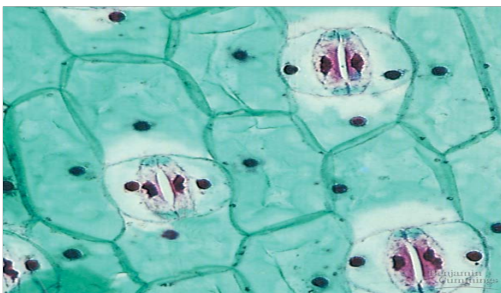


## A. Dermal Tissues

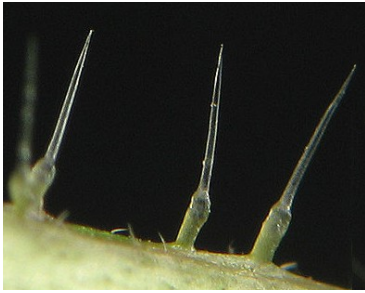
- or *epidermis*, composed of *flattened* cells that cover all parts of the plant
- functions much like the *skin of an animal*, covering and protecting the body of plant
- produces a waxy *cuticle* that prevents water loss



- *stomata* (stoma, pl.) located here, openings in tissue that control gas exchange.
- *guard cells* control the opening and closing of stoma



- on roots, *root hairs* are located, increase *surface area* to absorb water and dissolved minerals

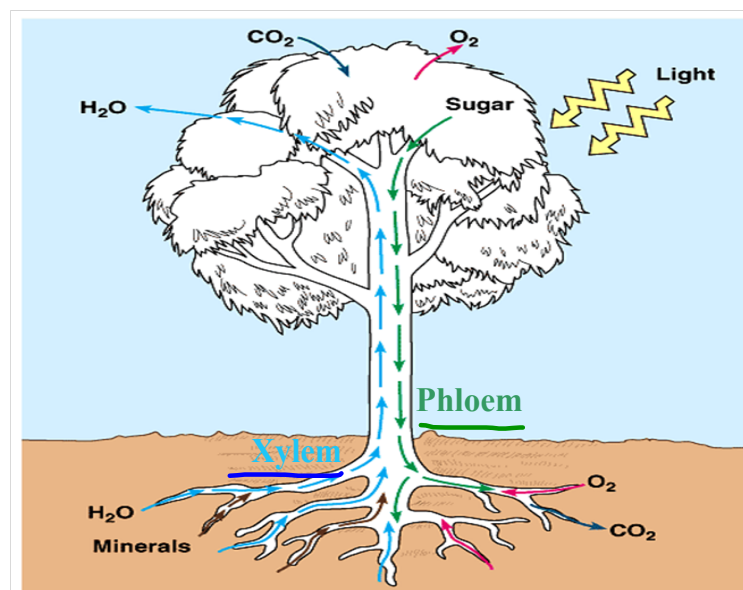


- *trichomes*, on stems and leaves, hair like **projections** that give a “fuzzy” appearance to plants, help **reduce** the evaporation of water  
-some cases, trichomes are **glandular** and secrete **toxic substances** that **protect** the plant from predators

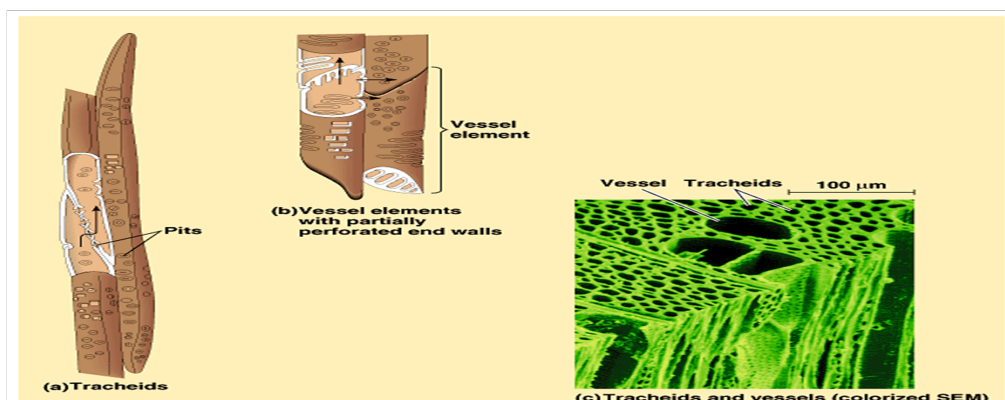


## B. Vascular Tissues

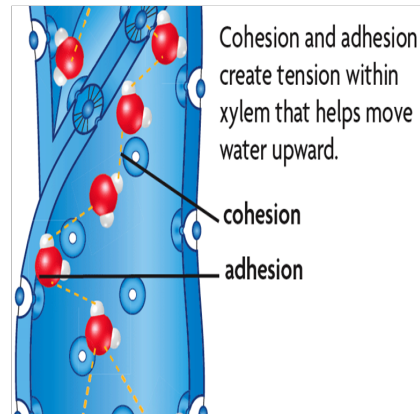
- **Food, dissolved minerals, and water** are transported throughout the plant by vascular tissue



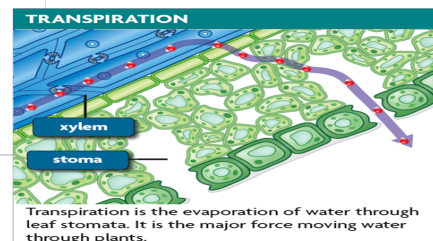
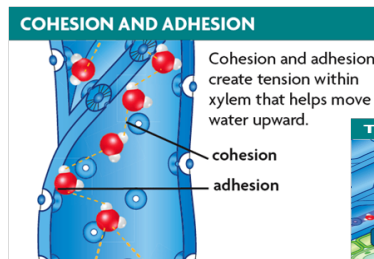
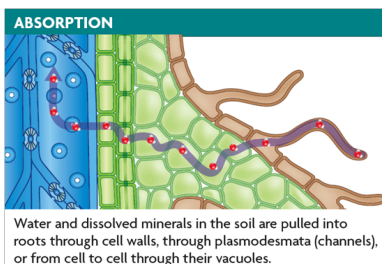
1. **Xylem** = plant tissue composed of **tubular** cells that **transport water** and **dissolved minerals** from the roots to the rest of plant.
  - a. **Tracheids** = tubular cells tapered at each end and have pits through which water and dissolved minerals flow.
  - b. **Vessel elements** = tubular cells that transport water throughout plants, these cells are wider and shorter than tracheids and have openings in their end walls.
  
- Almost **all** vascular plants have **tracheids**, however **vessel elements** are most commonly found in **anthophytes** (flowering plants).
- **Water** flows more freely through the openings of **vessel elements**, causing them to be **more efficient** than tracheids



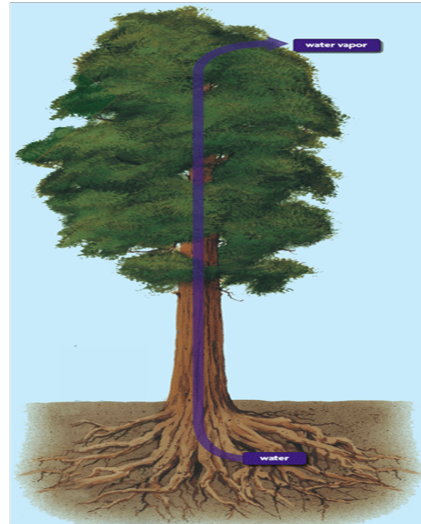
- The **cohesion-tension theory** explains *water movement*
  - Plants *passively transport* water through the xylem.
  - Cohesion** is the tendency of water molecules to bond with each other.
  - Adhesion** is the tendency of water molecules to bond with other substances



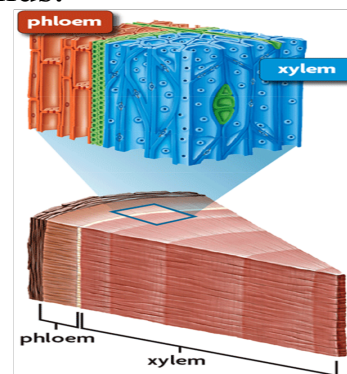
- Water travels from roots to the top of trees.
  - absorption** occurs at roots
  - cohesion and adhesion in **xylem**
  - transpiration** at leaves



- **Transpiration** is the *loss of water vapor* through leaves
  - water vapor *exits* leaf stomata
  - helps pull water* to the top branches

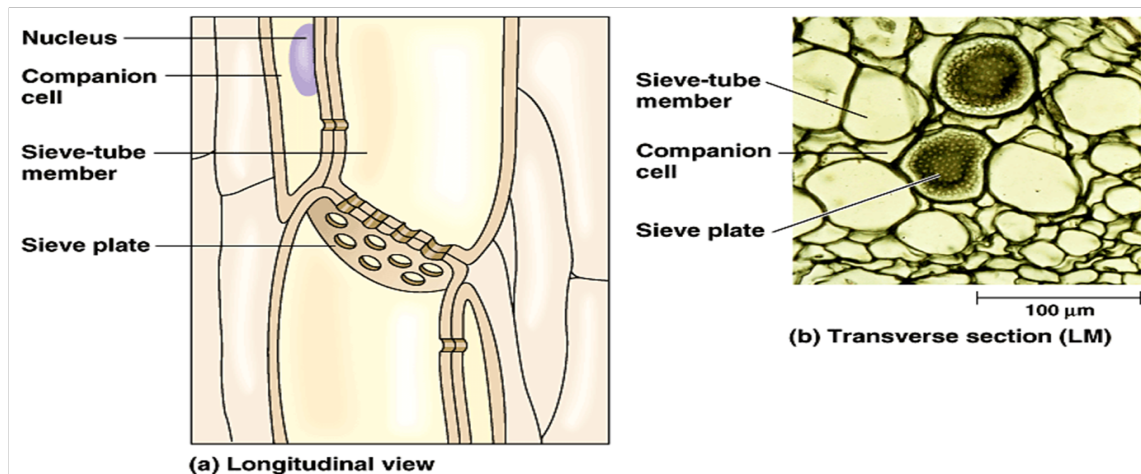


2. **Phloem** = tubular cells joined end to end transporting **sugars** and **other organic compounds** throughout the plant.
  - a. **Sieve tube members** = cells that are alive at maturity, contain cytoplasm, but **don't** have a nucleus or ribosomes.
  - b. **Companion cells** = located **next** to each **sieve tube member**; nucleated cells that **help** with the transport of sugars and other organic compounds.

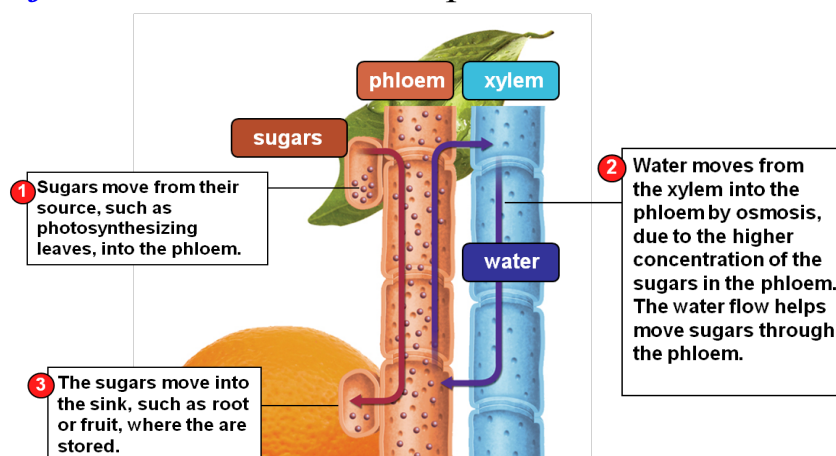




- c. **Sieve plates** = found in anthophytes, are **end walls** between two sieve tube members, have **large pores** and allow sugar and organic compounds to move from each cell.

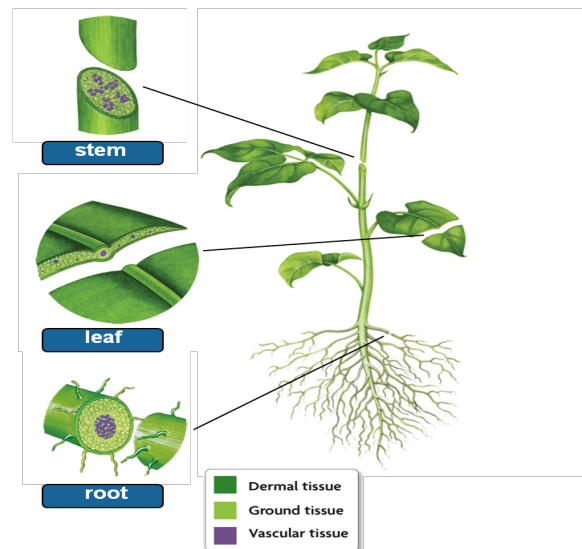


- The **Pressure-flow model** explains **sugar movement**.
  - plants **actively transport** sugar from the source
  - sugar **flows to the sink** due to pressure differences



### C. Ground Tissue

- Ground tissue consists mostly of *parenchyma* cells.
- The functions of ground tissue include:  
*photosynthesis,*  
*storage,*  
*and support.*
- The cells contain *numerous chloroplasts.*
- Ground tissue cells in some stems and roots contain *large vacuoles* that store starch grains and water.



### D. Meristematic Tissue

- A growing plant produces **new cells** in areas called *meristems*.
- **Meristems** are regions of *actively dividing* cells that **contain parenchyma cells** with large nuclei.
  1. *Apical Meristems* = found at or near the **tips of roots and stems**. They produce cells that allow the roots and stems **increase in length**.

2. **Lateral** Meristems = located **in the roots and stems**, help **increase a plant's diameter**. In **woody plants** there are two kinds of lateral meristems:

- Vascular cambium** = produce **new xylem and phloem cells** in the stems and roots.
- Cork cambium** = produce cells with tough cell walls, (**sclerechyma cells**) and cover the surface of stems and roots. The **outer bark** is produced by the cork cambium.

