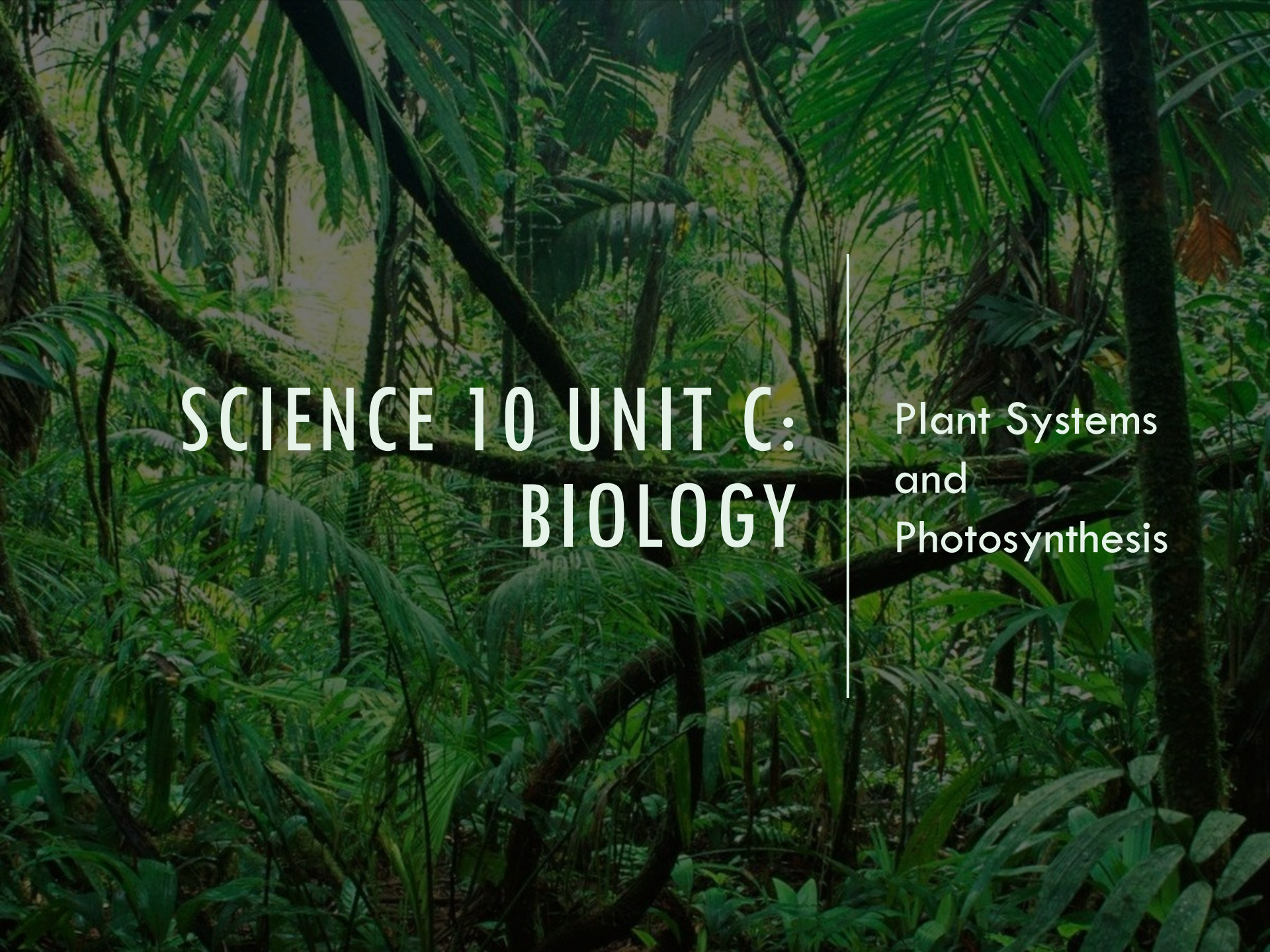


SCIENCE 10 UNIT C: BIOLOGY

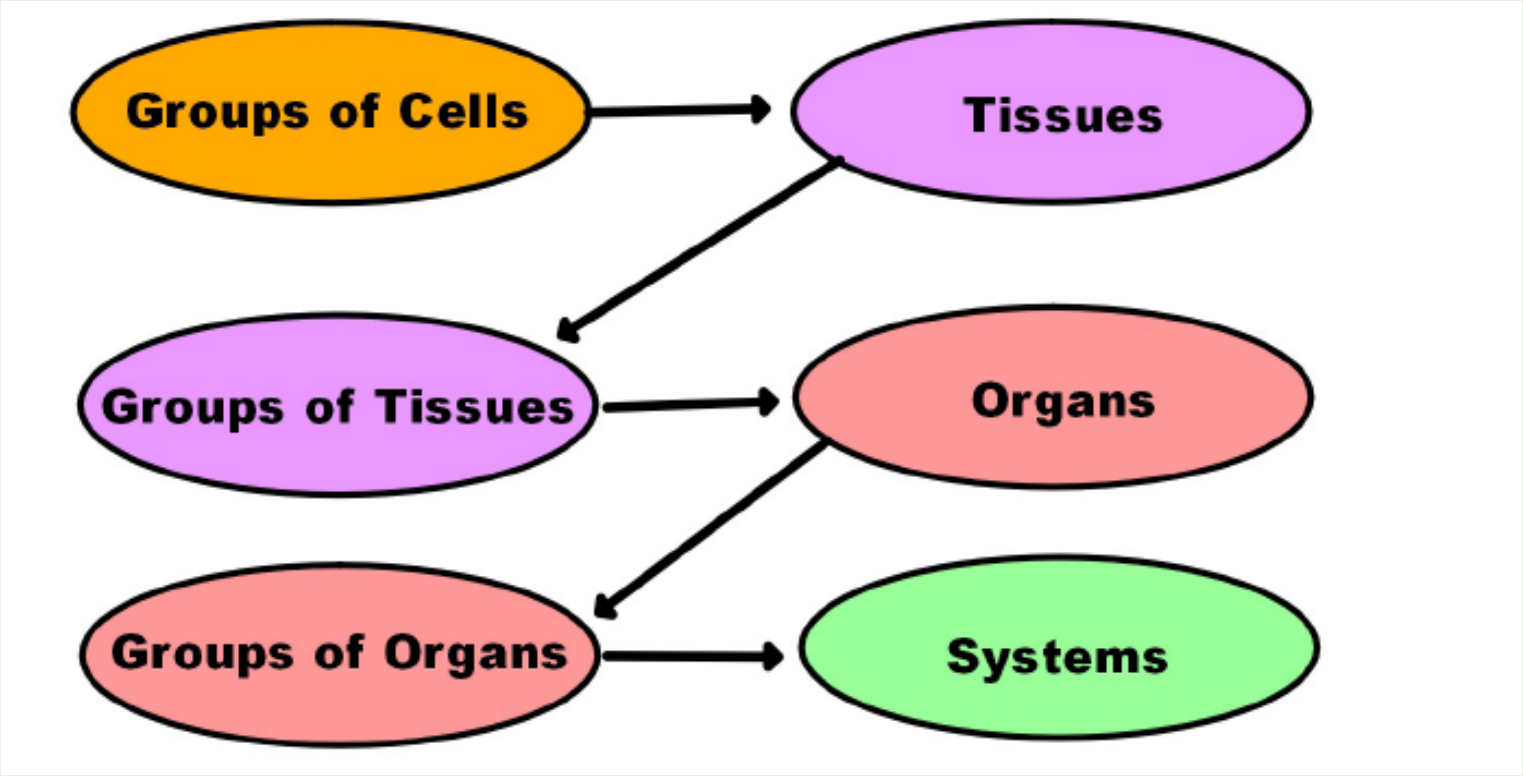
Plant Systems and Photosynthesis

CELLS TO SYSTEMS

- We've examined cells, and noted that parts of the cell are **specialized** to carry out specific tasks needed to sustain life
- Multicellular organisms show the same trend, with **specialized groups of cells** enabling them to grow much larger
- Life doesn't rely on just one cell, they can die without killing the multicellular organism

ORGANISM STRUCTURE

- All multicellular life has the same general structure



SYSTEMS IN A PLANT

- We will be learning about plants as a model for how **systems** function in an organism
  - You'll learn about human systems if you take Bio 20
- Plants have two main systems
  - The **shoot system**
  - The **root system**

THE SHOOT SYSTEM

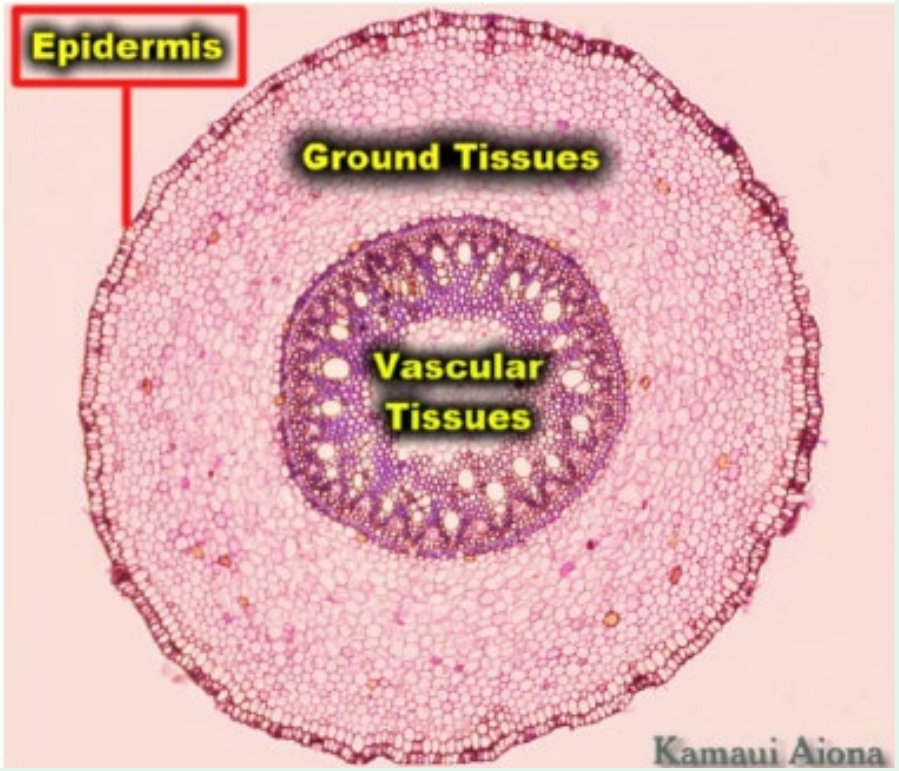
- Every part of the plant that is **above ground**
- Includes stems, leaves, buds, flowers, and fruit
- **Specialized for gas exchange and photosynthesis**

THE ROOT SYSTEM

- Every part of the plant that is **below ground**
- Includes aerial roots even though they are above ground
- **Specialized for transport of materials**
  - Water, minerals, nutrients

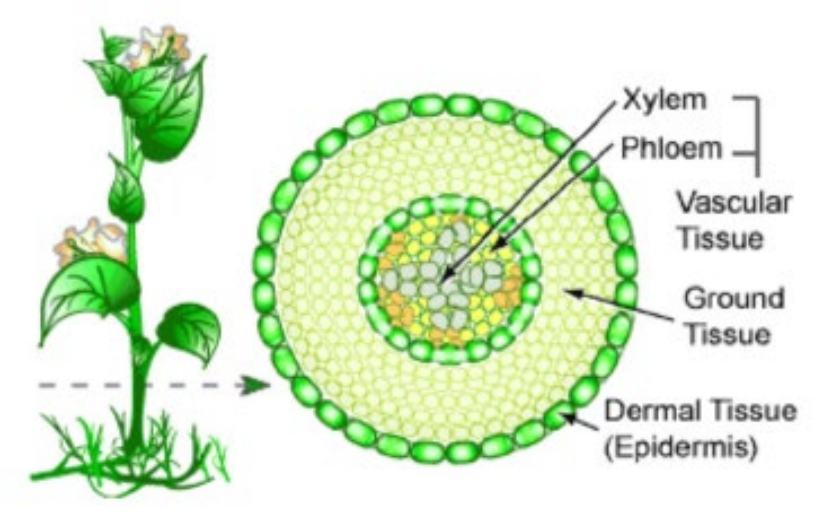
PLANT TISSUES

- There are three main types of plant tissues
  - **Dermal tissue**
  - **Ground tissue**
  - **Vascular tissue**
- These tissues grow out of **meristems**



DERMAL TISSUE/EPIDERMIS

- Outer layer of cells that covers all **herbaceous** (non-woody) plants
- Also called the **epidermis**
- Plays roles in the shoot system and the root system

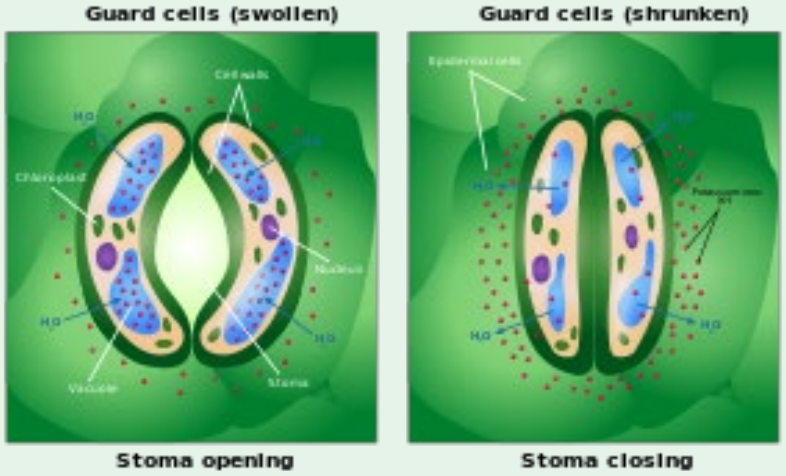


DERMAL TISSUE: ROOT SYSTEM

- In the root system, dermal tissue forms **root hairs** to increase **SA:V** and allow better absorption
- It's also responsible for the uptake of water and nutrients from the soil

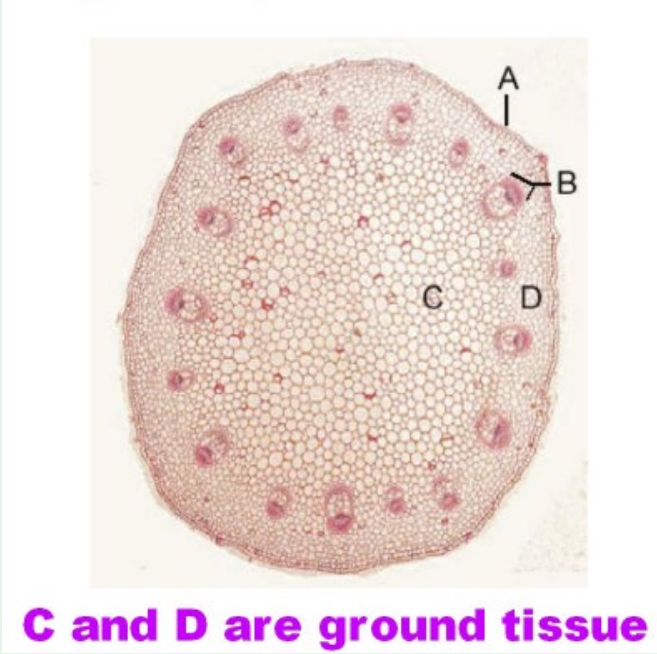
DERMAL TISSUE: SHOOT SYSTEM

- In the shoot system, dermal cells secrete the **cuticle**
  - Waxy substance that resists micro-organisms and reduces water loss by evaporation
- Also form **guard cells** on the underside of leaves
  - Form holes called **stomata**, which allow leaves to **exchange gas**



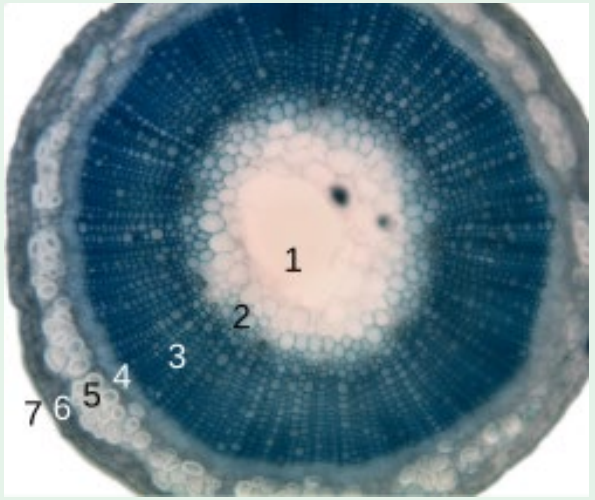
GROUND TISSUE

- Layer beneath the epidermis, includes all tissue that isn't dermal or vascular
- Loosely packed together, allowing air to diffuse through the spaces

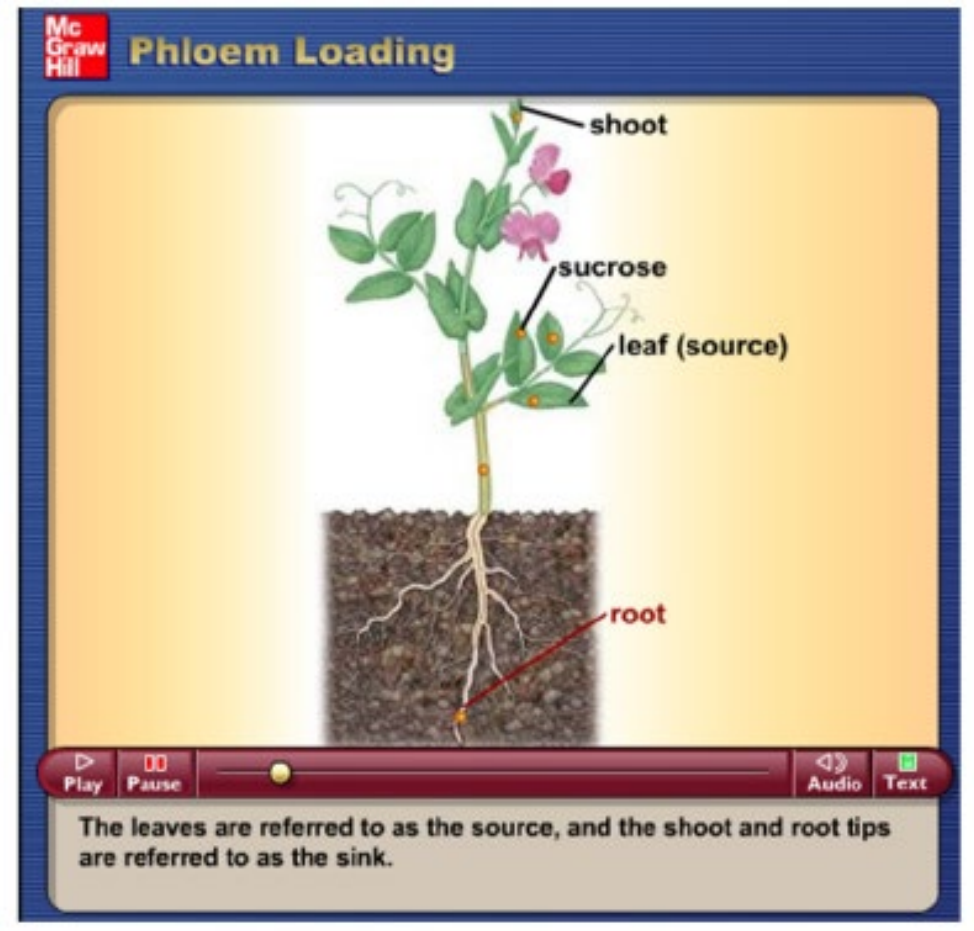


GROUND TISSUE: SYSTEMS

- In the shoot system
  - Gives the stem strength and support
  - Is the site of **photosynthesis** in the leaves
- In the root system
  - Stores food and water



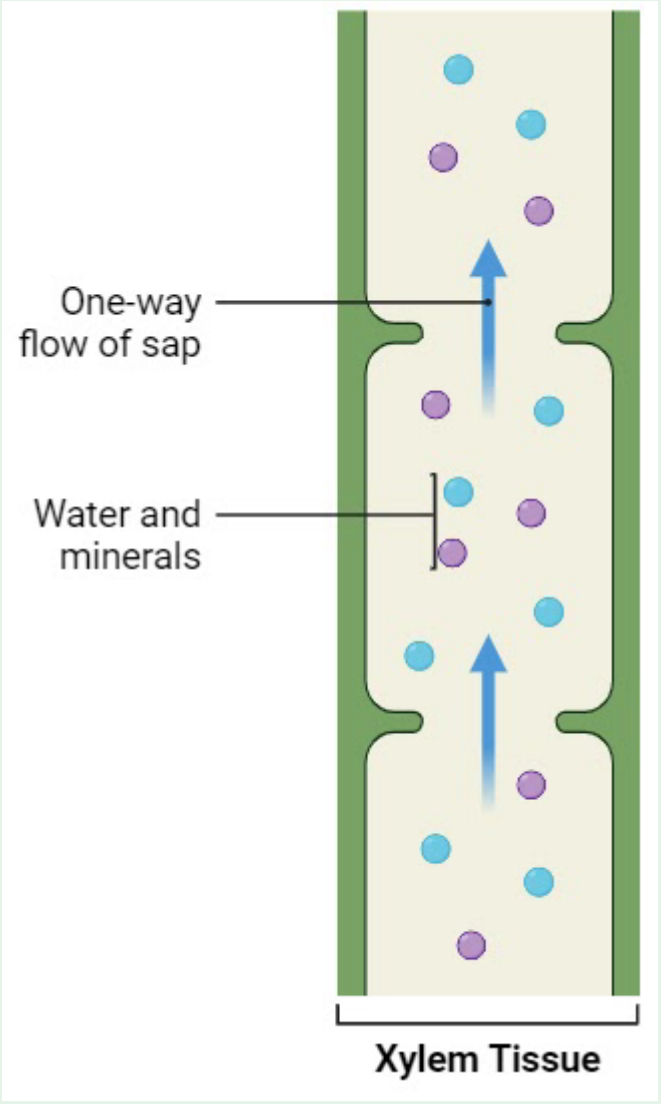
VASCULAR TISSUES VIDEO



Phloem Loading

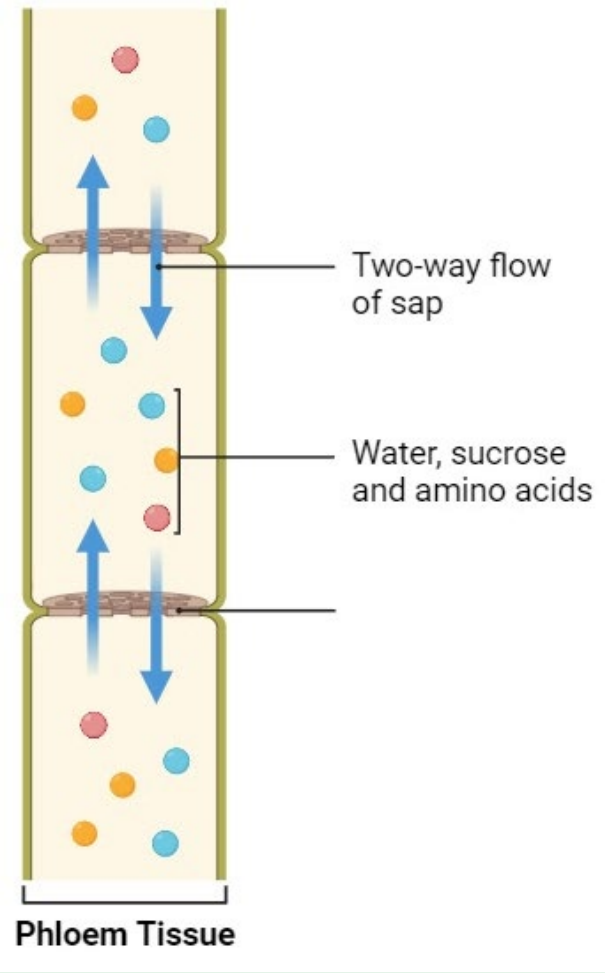
VASCULAR TISSUE

- Two kinds of vascular tissue with different roles
- 1. **Xylem**
  - Thick-walled tubes made of cellulose
  - **Non-living** cells, like straws
  - **Move water/minerals** from the roots to the leaves



VASCULAR TISSUE

- Two kinds of vascular tissue with different roles
- 2. **Phloem**
  - Tube cells with companions that control their activity
  - **Living** cells with tiny holes
  - **Move sugars** from the leaves to the rest of the plant



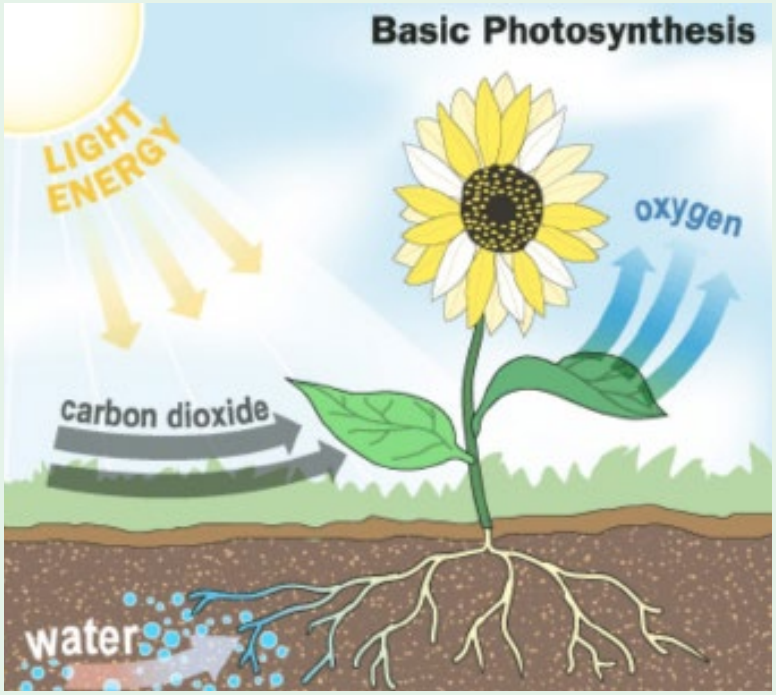
All these systems need energy. Let's talk about where they get it.

Photosynthesis and Cellular Respiration

https://www.youtube.com/watch?v=QImCId9YubE

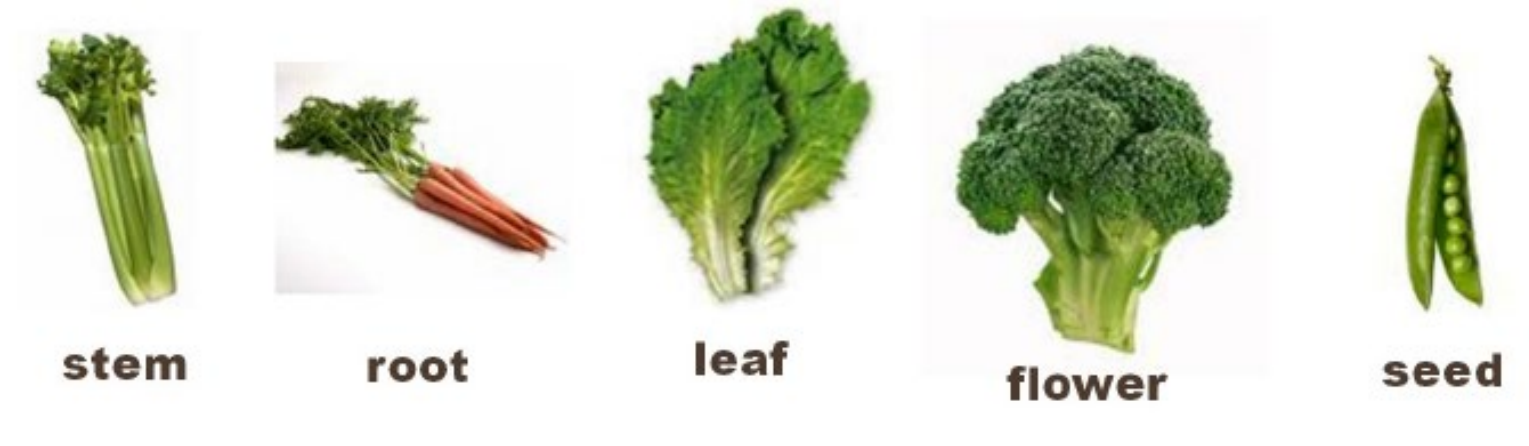
PHOTOSYNTHESIS

- "Light" + "combination"
- Combines
  - Energy (from sunlight)
  - Carbon dioxide (from leaves)
  - Water (from the roots)
- Creates
  - Glucose ($C_6H_{12}O_6$)
  - Oxygen



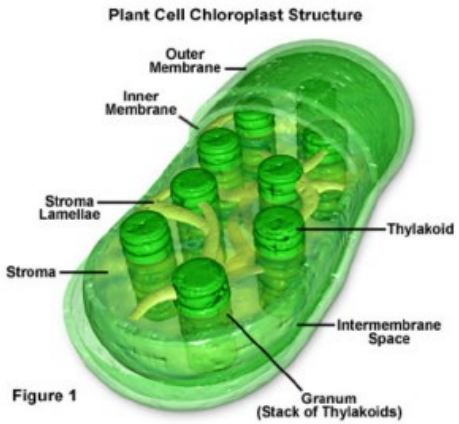
PHOTOSYNTHESIS

- The chemical equation for photosynthesis is
  - $6\ CO_2 + 6\ H_2O + \text{Energy} \rightarrow C_6H_{12}O_6 + 6\ O_2$
  - Carbon Dioxide + Water + Energy → Glucose + Oxygen
- Plants store the energy from photosynthesis in several locations, some of which are very tasty for us



PHOTOSYNTHESIS

- Photosynthesis cannot take place without **chlorophyll**
- This pigment, found in the **chloroplasts**, absorbs sunlight for use as energy



PHOTOSYNTHESIS

- Has incredible significance for our planet
  - Algae in the ocean and plants on land replenish the oxygen consumed by all life
  - Photosynthesis is the base of all food chains, showing that all calories originate in the Sun
- Only produces stored energy
  - To use the energy, plants need to burn their sugar using a process that also takes place in animals…

CELLULAR RESPIRATION

- The act of burning **glucose** into **ATP** (energy)
- Happens in the **mitochondria**
- Is done by **both** plants **and** animals

CELLULAR RESPIRATION

- Is essentially just photosynthesis in reverse
  - $C_6H_{12}O_6 + 6\ O_2 \rightarrow 6\ CO_2 + 6\ H_2O$ + Energy (ATP)
- The only difference is that the energy in question is ATP instead of sunlight