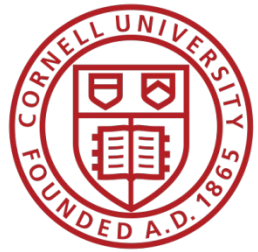
Botany

Master Gardener Volunteer Training

Cornell Cooperative Extension

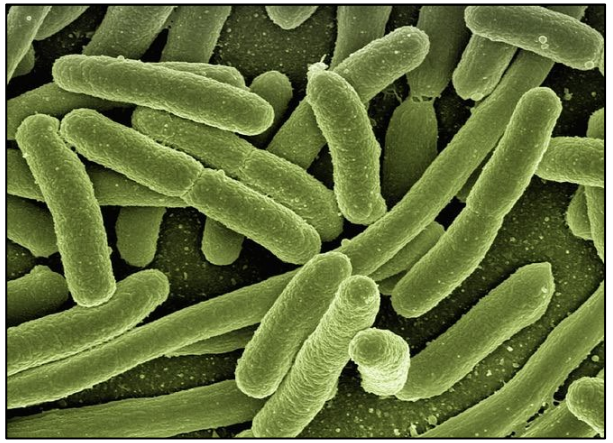
Orange County



Overview

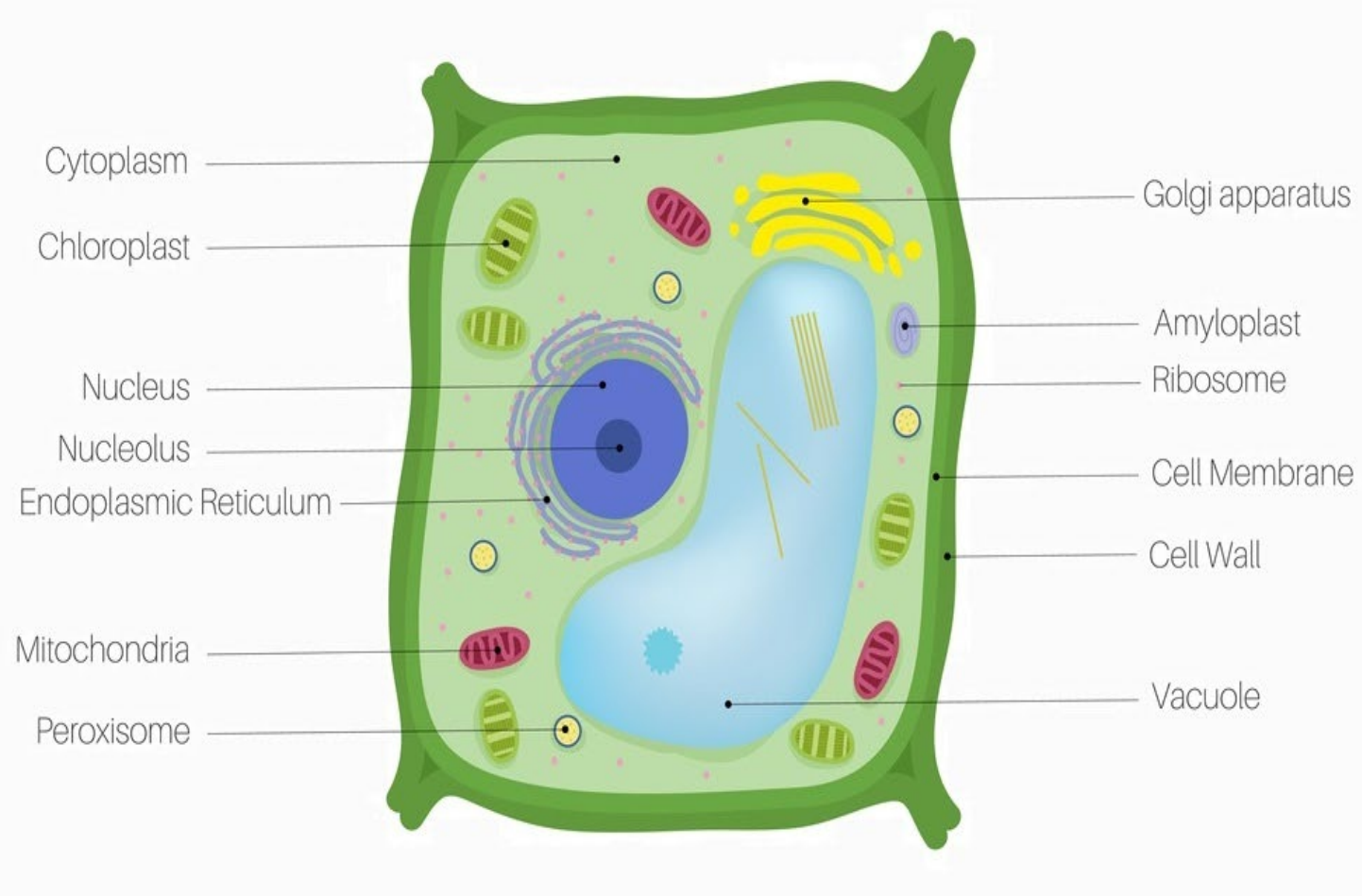
- What is a plant?
- Non-Vascular Plants
- Parts of a Plant
- Gymnosperms
- Angiosperms
- Monocots and Dicots

What is a plant?



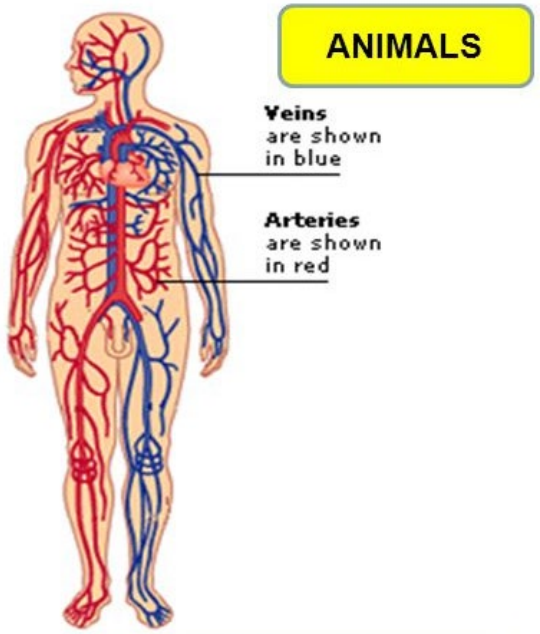
What is a plant?

- **Eukaryotes**
- **Multicellular**
- **Photosynthetic**
- **Cell Wall**
  - made of cellulose

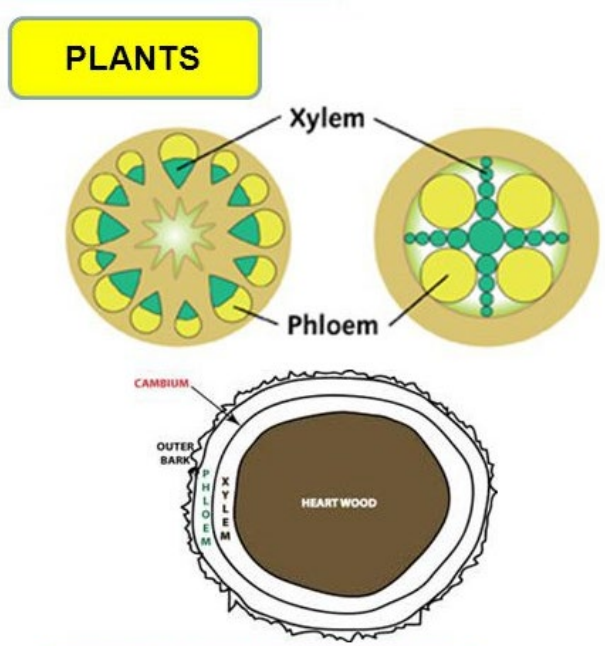


Non-Vascular Plants

- **What is a vascular system?**
  - Tissues that transport materials around an organism



ARTERIES AND VEINS



XYLEM AND PHLOEM

Non-Vascular Plants

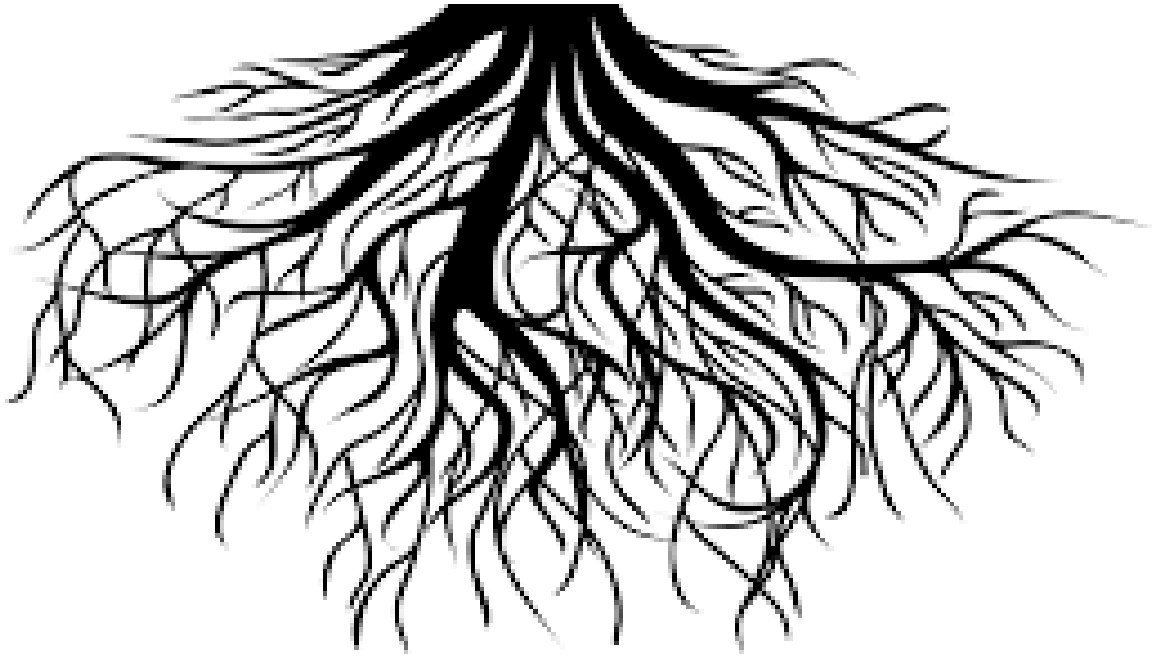
- **What is a vascular system?**
  - Tissues that transport materials around an organism
- **What types of plants lack a vascular system?**
  - **Moss**
  - **Hornworts**
  - **Liverworts**

Parts of a Plant

- Three Basic Organs
  - Leaves
  - Stem
  - Roots

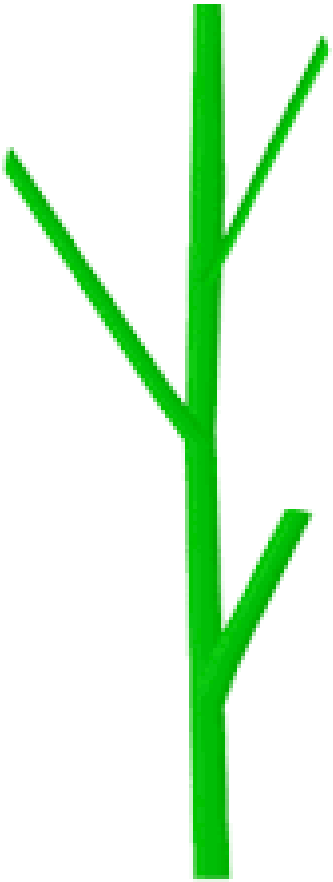
Parts of a Plant

- **Roots**
  - Anchor the plant
  - Absorb nutrients and water
  - Store food
  - Support the stem



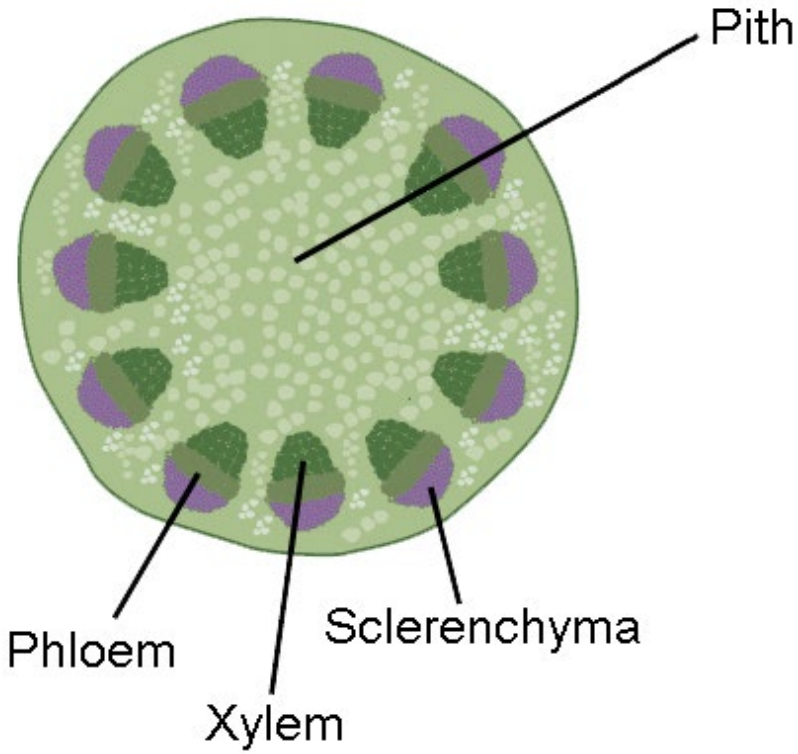
Parts of a Plant

- **Stem**
  - Supports the leaves, reproductive structures, and fruit
  - Contains the vascular system
  - Stores food
  - Asexual reproduction
    - **Bulbs**
    - **Corms**
    - **Rhizomes**
    - **Stolons**
    - **Tubers**

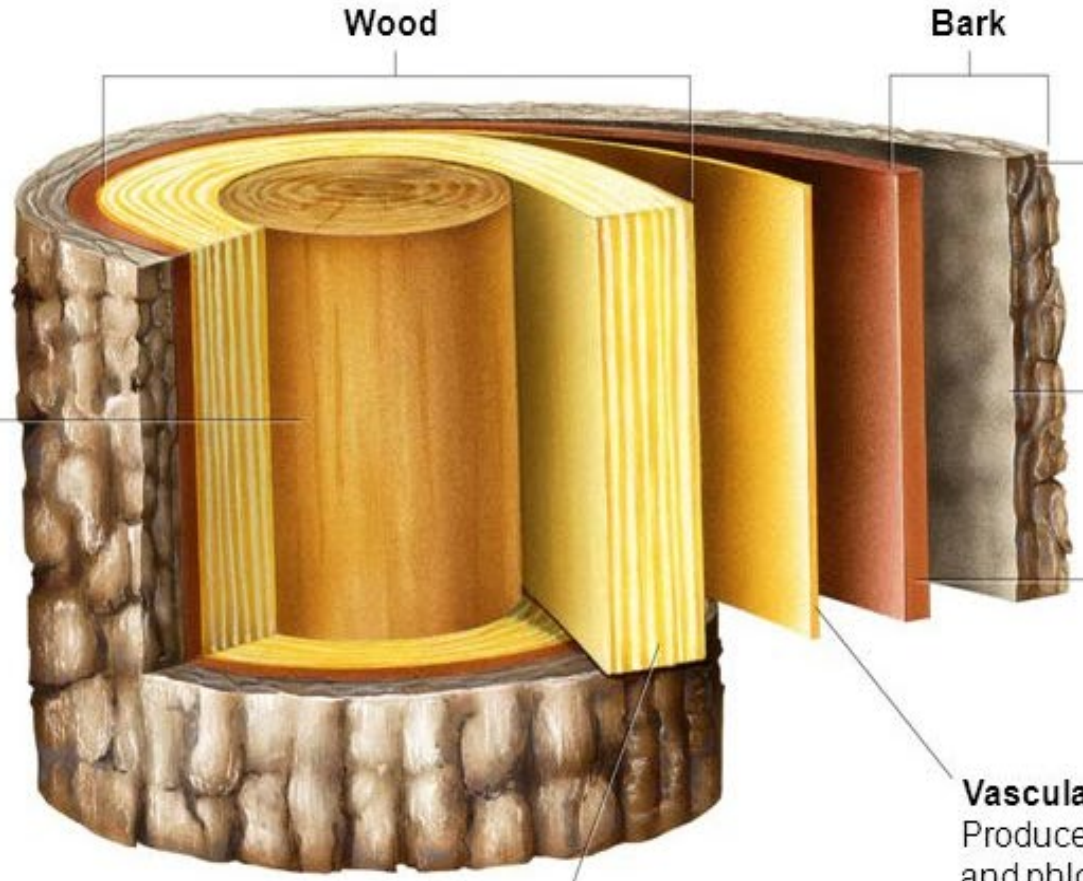


Parts of a Plant

- **Vascular System**
  - **Phloem**
    - Transports sugars
    - Living cells
    - Multi-directional (up and down)
  - **Xylem**
    - Transports water and mineral
    - Mostly dead cells
    - Unidirectional (up only)



Parts of a Plant



Cork
Contains old, nonfunctioning phloem that protects the tree

Cork Cambium
Produces protective layer of cork

Phloem
Transports sugars produced by photosynthesis

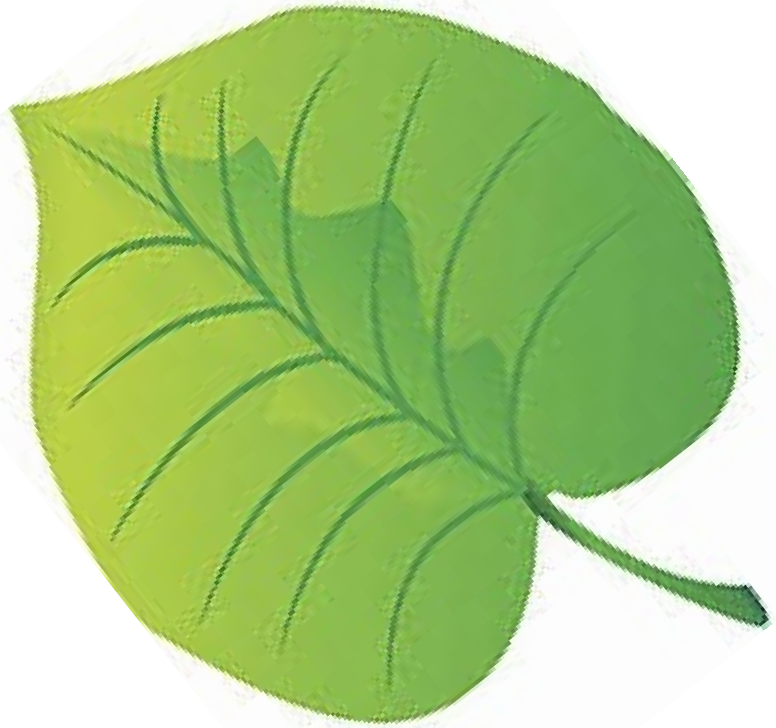
Vascular Cambium
Produces new xylem and phloem, which increase the width of the stem

Xylem: Heartwood
Contains old, nonfunctioning xylem that helps support the tree

Xylem: Sapwood
Contains active xylem that transports water and minerals

Parts of a Plant

- **Leaves**
  - Gas exchange
  - Site of Photosynthesis

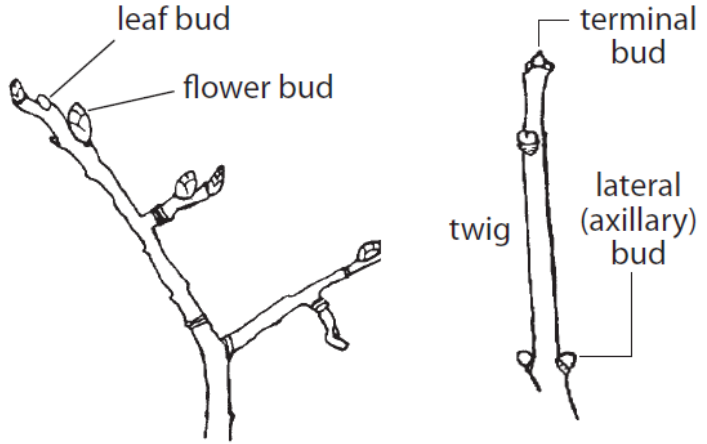


$$6CO_2 + 6H_20 = C_6H_{12}O_2 + 6O_2$$

Carbon Dioxide + Water = Sugar + Oxygen

Parts of a Plant

- **Buds**
  - Underdeveloped shoots
    - leaf bud
    - flower bud
  - Adventitious buds
    - can generate entirely new plants
    - found on parts not normally associated with bud production



Gymnosperms

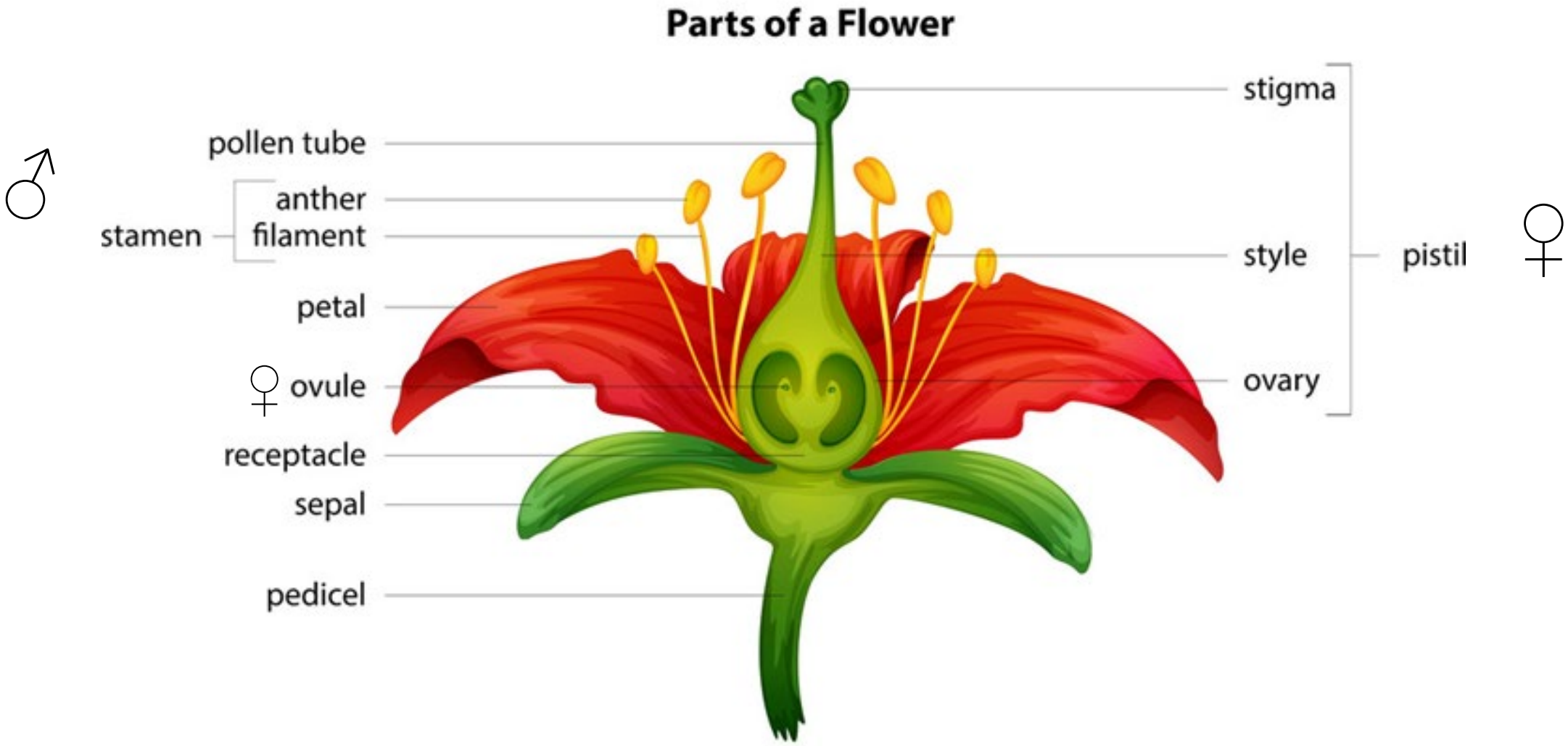
- **Gymnosperm –** ‘naked seed’
  - **Cycads** (tropical plants)
  - **Gingko** (*Gingko biloba)*
  - **Conifers**
    - Cedar
    - Cypress
    - Fir
    - Juniper
    - Larches
    - Pines
    - Hemlocks
    - Redwoods
    - Spruces
    - Yews

Gymnosperms

Seed Cone
Douglas Fir ♀

Pollen Cone
Douglas Fir ♂

Angiosperms



Angiosperms

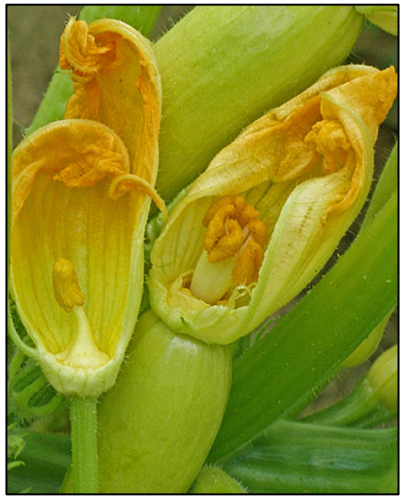
- **Flower Types**
  - **Perfect flower**: with "male" stamens and a "female" pistil

Angiosperms

- **Flower Types**
  - **Perfect flower**: with "male" stamens and a "female" pistil
  - **Imperfect flower**: (unisexual) contain a pistil or stamens, but not both
    - **Monoecious**: male and female flowers on same plant
    - **Dioecious**: male and female flowers on different plants

Gingko

♂ & ♀



Squash

♂ & ♀

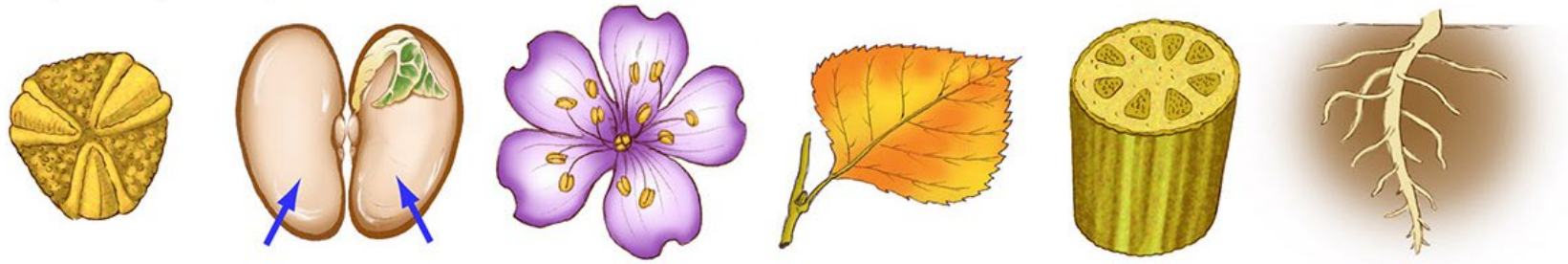
Monocots versus Dicots

- **Cotyledon** – seed leaf

	Monocots	Dicots
Pollen		
Cotyledons	**Corn**	**Beans**
Flower Petals		
Leaves		
Stems		
Roots		

Monocots versus Dicots

Dicot (two cotyledons)



Pollen grains have three pores or furrows

Seeds have two cotyledons

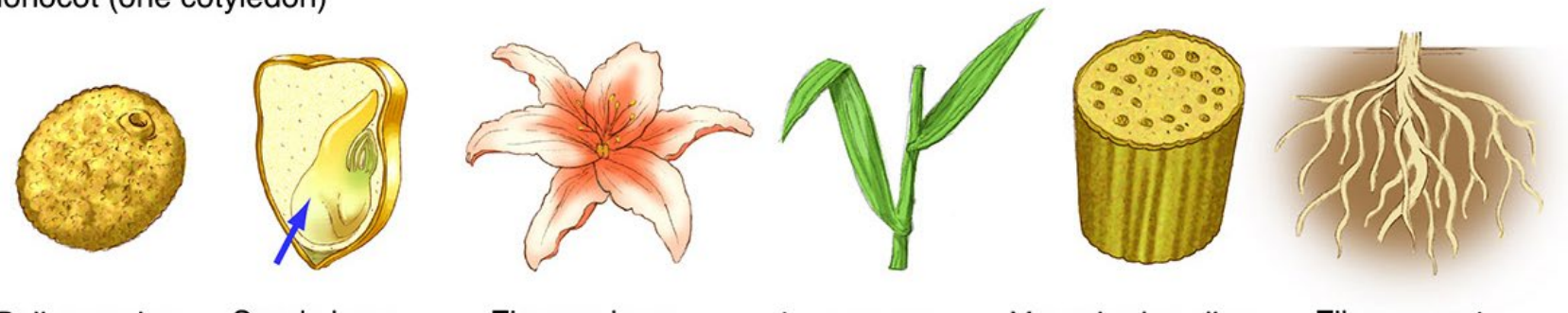
Flowers have four or five floral parts (or multiples thereof)

Leaves are oval or palmate, with net-like veins

Vascular bundles arranged in a ring around stem

Tap roots

Monocot (one cotyledon)



Pollen grains have one pore or furrow

Seeds have one cotyledon

Flowers have three floral parts (or multiples thereof)

Leaves are narrow, with parallel veins

Vascular bundles small, and spread throughout stem

Fibrous roots

Monocots versus Dicots

	Monocots	Dicots
Pollen	One pore or furrow	Three pores or furrows
Cotyledons	One	Two
Flower Petals	multiples of 3	Multiples of 4 or 5
Leaves	Parallel veins	Net-like veins
Stems	Scattered vascular bundles	Ring of vascular bundles
Roots	Fibrous	Tap

Review

- What is a plant?
- Non-Vascular Plants
- Parts of a Plant
- Gymnosperms
- Angiosperms
  - Monocots and Dicots

Botany

Master Gardener Volunteer Training

Cornell Cooperative Extension

Orange County