

Botany

OSU MASTER GARDENER TRAINING
2016



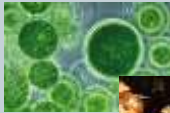
Botany

- The science of plant life
- Fundamental to the understanding of
 - Horticulture/Gardening
 - Forestry
 - Ecology



Classification of biological organisms: kingdoms

- Monera (unicellular, no nucleus)
 - i.e. bacteria
- Protista (unicellular and multicellular)
 - i.e. algae
- Fungi
- Plantae
- Animalia



Bacteria

Pseudomonas symptoms on a pepper leaf



Pseudomonas bacteria inside a leaf



Bacteria



Algae

- Very diverse group includes seaweed and kelp, as well as the green stuff on greenhouse floors
- Prefer moist environments



Fungi

- Includes yeasts, molds, mushrooms



Fungi

- Importance to plant life



mycorrhizae



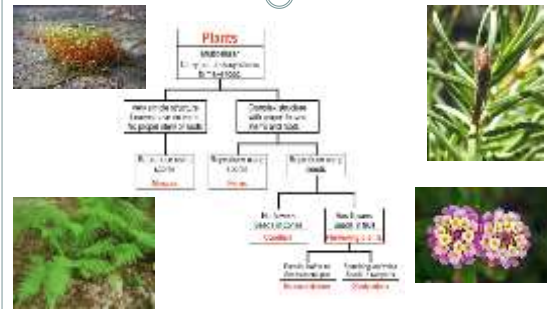
Rust fungus on pear leaf

Lichens

- Symbiotic relationship between a fungus and an alga or bacterium



Plant Kingdom



External plant parts

- Roots
- Stems and buds
- Leaves



Roots



Anchorage
Nutrient and water absorption
Hormone synthesis
Storage
Aerial support

Root structure

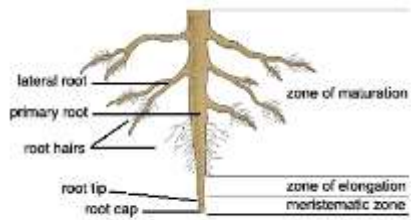
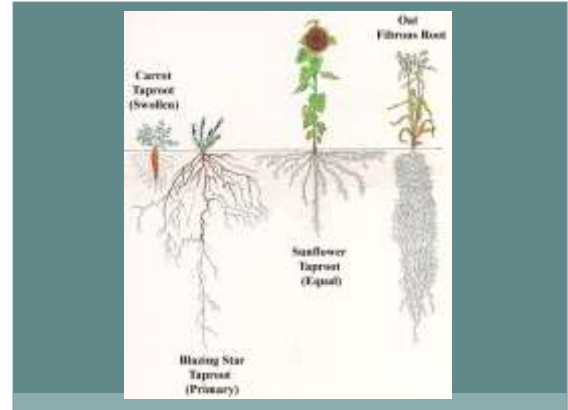


Figure 2. Root Structure

Root hairs



Provide large surface area for absorbing water and dissolved minerals



Root modifications

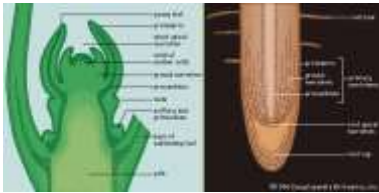


Mycorrhizae



Meristems

- Meristems are actively growing regions in the plant.
- They are located at the stem apex, leaf axils, root tips, adventitious buds, cambium



Stems

- Mechanical support
- Moves water, minerals and photosynthates
- Can be modified for storage
- Includes nodes and internodes



Woody stems



Underground stems

- Rhizomes
- Corms
- Bulbs
- Stolons
- Tubers



Leaves

- Manufacture food (photosynthesis)
- Protect buds
- Storage

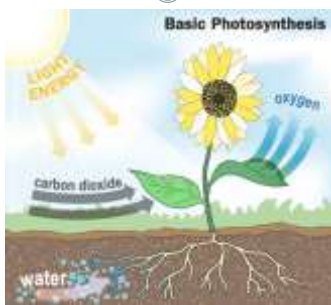




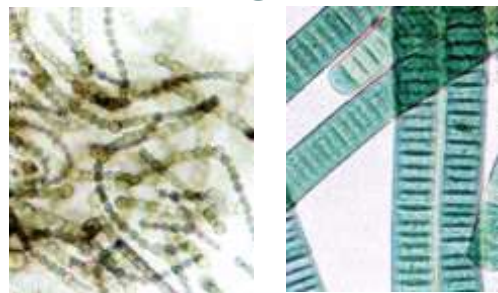
Photosynthesis rules



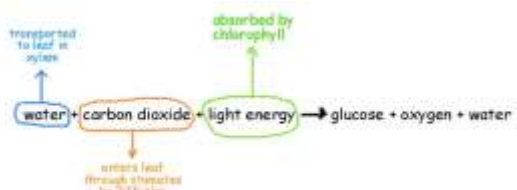
The process of photosynthesis is 3.6 billion years old



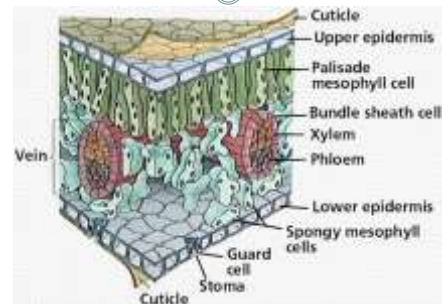
First plants were blue-green algae



Photosynthesis



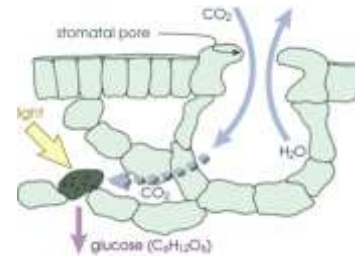
Photosynthesis happens mostly in the leaves



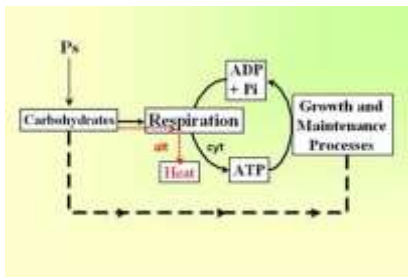
Stomata



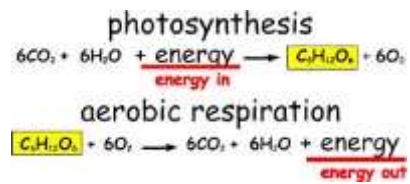
What happens inside the leaf



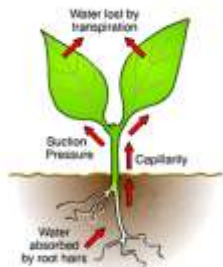
Respiration



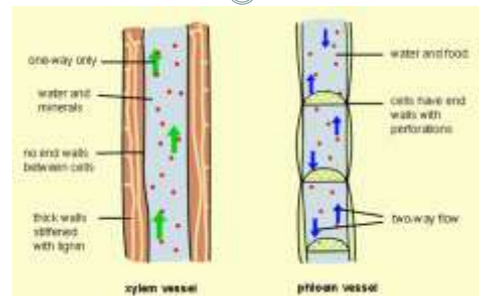
Respiration



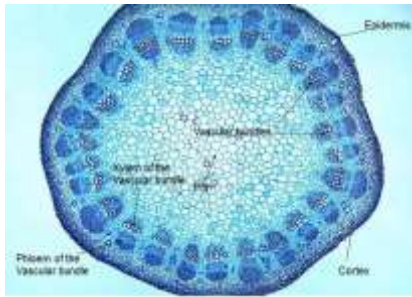
Transpiration



Vascular system: Xylem and Phloem



Herbaceous stem



Woody stem



Vocabulary exercise

- Monera
- Lateral
- Apical bud
- Xylem
- Fungi
- Primary
- Blade
- Phloem
- Plantae
- Root hairs
- Petiole
- Stomata
- Fibrous
- Node
- Cuticle
- Mycorrhizae
- Internode
- Epidermis
- Cambium
- Axillary bud

Plant reproduction

- Spore bearing plants
 - Ferns
- Flowering plants
 - Gymnosperms
 - Angiosperms

Plant Kingdom



Gymnosperms

- Also called conifers
- Mostly have needles for leaves
- Reproduce in cones



Flowers

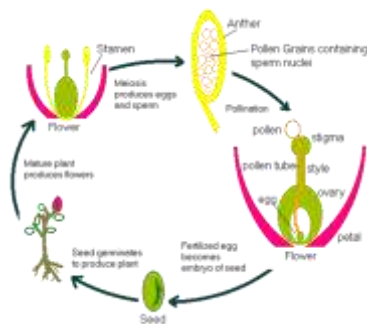
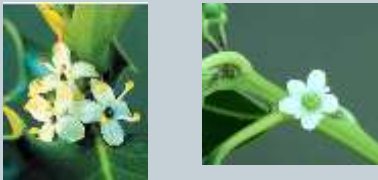


Inflorescence



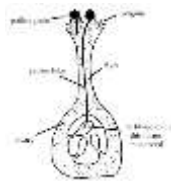
Monoecious/Dioecious

- Monoecious = male and female flowers on the same plant
- Dioecious = male and female flowers on separate plants i.e. holly



Pollination

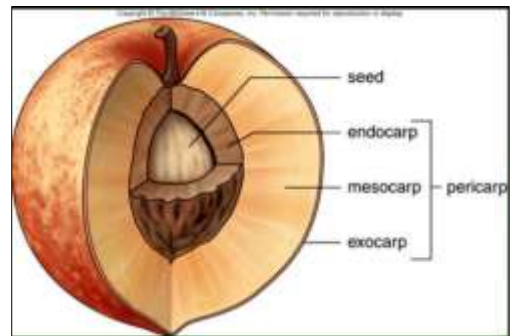
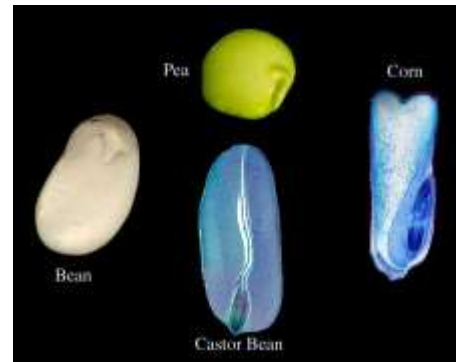
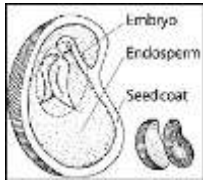
- Fertilization takes place through pollination
- Pollen grain lands on stigma
- Pollen tube grows down the style
- Sperm fuses with egg to produce an embryo
- After fertilization, seeds and fruit develop



Pollinators



Seed development: parts of a seed



Seed dispersal





Monocots and Dicots

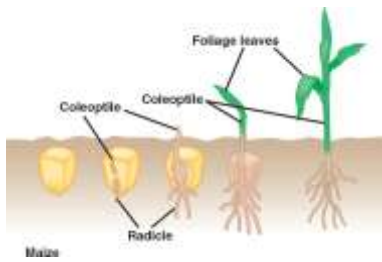
- Flowering plants (angiosperms) can be divided into two groups

- Monocotyledons
- Dicotyledons

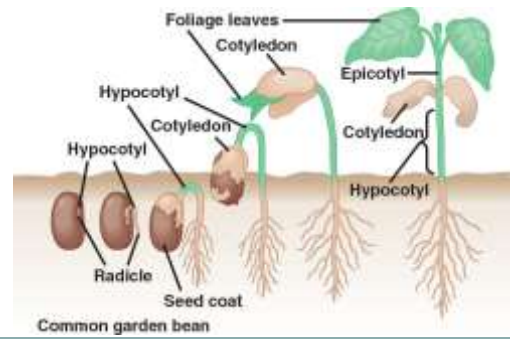


	Seed	Root	Stem	Leaf	Flower
Monocots					
		root xylem and phloem in a ring	vascular bundles scattered in stem	leaf veins form a parallel pattern	flower parts in threes and multiples of three
Eucots					
		root phloem between arms of xylem	vascular bundles in a distinct ring	leaf veins form a net pattern	flower parts in fours or fives and their multiples

Germination of a monocot



Germination of a dicot



Life cycles

- Annual
- Biennial
- Perennial



Annual



Biennial



Perennial



Botanical classification

- Kingdom
- Division
- Class
- Order
- Family
- Genus
- Species
 - Subspecies, variety, cultivar



Family Ericaceae
Rhododendron macrophyllum

Plant behavior

- Plants are rooted in place
- They have developed mechanisms to be more efficient and still remain in place
- These mechanisms are regulated by plant hormones
- Plant hormones are chemicals that regulate plant growth. Plant hormones are signal molecules produced within the plant, and occur in extremely low concentrations.

PLANT HORMONES		
HORMONE	FUNCTION	LOCATION
 Gibberellins	Increase the speed of seed germination; promote stem elongation; induce early blooming of flowers; increase fruit size	Shoot and root apical meristems; seeds
 Auxins	Stimulate stem elongation; control seedling emergence; stimulate root branching; promote fruit development	Apical meristems; promote plant tissue
 Ethylene	Decreases the speed at which fruit ripens; stimulates leaf drooping and the death of flowers	All parts of the plant protecting the fruits
 Abscissic acid	Inhibits growth and reproduction; inhibits seed germination; stimulates closure of stomata	Leaves; fruits; root tips; seeds
 Cytokinins	Cause rapid cell division, in conjunction with auxin; induce seed germination; inhibit new branches from lateral buds	Roots and fruits, primarily

Figure 19-2
Hormones that Control Plant Growth
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Plant hormones



Plant neurobiology

- New field that is “aimed at understanding how plants perceive their circumstances and respond to environmental input in an integrated fashion”
- Electrical and chemical signaling systems also regulate “brainy” plant behavior
- Interesting references:
 - “The Intelligent Plant”, Michael Pollan, The New Yorker, December 23, 2013 issue
 - “What a Plant Knows”, Daniel Chamovitz, Farrar, Straus and Giroux, 2012