

Unit 11 Lecture Discussion

- Required vocabulary: transpiration, cohesion, adhesion, hydrogen bonding, vascular tissue, monocots/dicots, stomata, cuticle, guard cells, epidermis, mesophyll, xylem, phloem, osmosis, root hairs, root pressure, auxin, apical meristem, ground tissue, ethylene, gibberellins, cytokinin, and capillary action
- Revisit specialized cells and organs- roots, stems, leaves
- Adaptations- herbivory, water absorption and retention, photosynthesis, storage of food
- Tropisms- hydro, geo/gravito, thigmo, and photo
- Angiosperms vs. Gymnosperms
- Brief overview of the evolution of plants
- Structure of flowers
- Adaptations for fruit dispersal
- Transport of water
- Photosynthesis
- Hormones- auxin, ethylene, gibberellins, and cytokinin

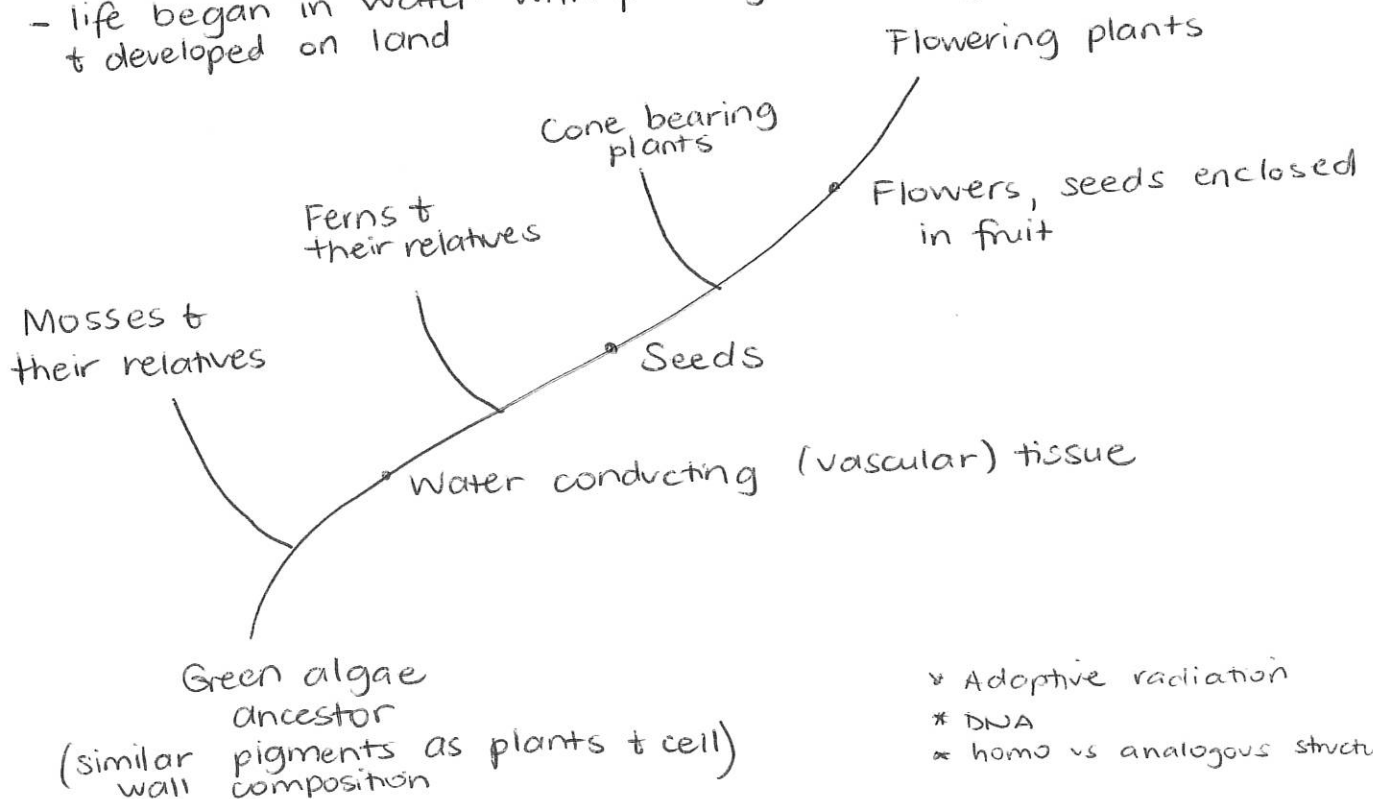
Focus: How have plants evolved

① Characteristics

- multicellular
- eukaryotes
- photosynthetic
- pigments: chlorophyll a + b

② Evolution

- life began in water with photosynthetic algae + prokaryotes + developed on land



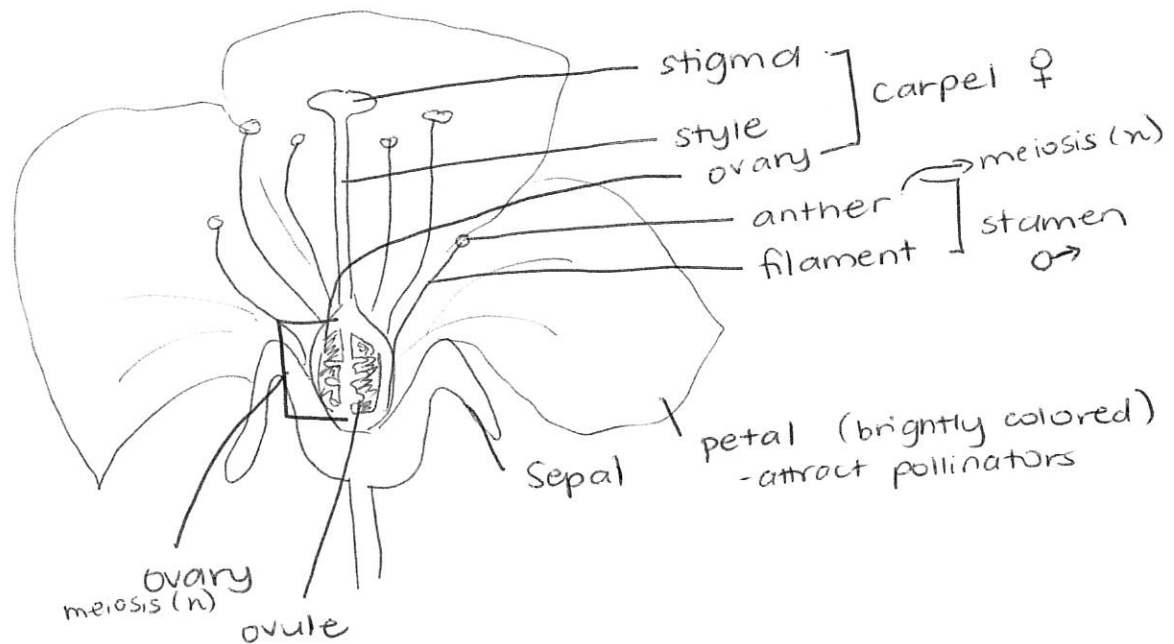
- ✓ Adaptive radiation
- * DNA
- × homo vs analogous structures

- Refer to Taxonomy plants section for more details / student info

* PPT QUES *

③ Plant reproduction

- non vascular (need H_2O) vs vascular
- gametophyte vs sporophyte (alternation of generations)
 - ↓ (n)
 - live inside sporophytes of seed plants
 - ex. pollen (male) to female
- methods of dispersal (H_2O , wind, animals/insects) of seeds
 - Adaptations for H_2O
 - light
 - bouyant
 - Adaptations for wind
 - light
 - wing-like structures
 - Adaptations for animals/insects
 - sweet, fleshy fruits
 - tough coatings in seeds
 - typically fruits for animals
- Angiosperms: reproductive organ is flower
 - attract bees, moths, & birds that transport pollen
 - flowers contain ovaries that protect the seed



- Pollination process
 - higher fitness: insect pollinated → source of food / distribute + nectar (mutualistic)
 - pollen
 - wind (less efficient than animal) → rely on favorable weather
 - adaptations: brightly colored, sweet nectar
 - * co-evolution + beaks

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- ① Pollen lands on stigma
② Pollen tube grows to style, then ovary and ovule
③ Double fertilization occurs → plant embryo + endosperm for food.

④ Plant adaptations

- Ⓐ - hormones control the division, growth, maturation, & development of cells
- * mitosis
 - hormones move from site of synthesis to target location that has a receptor where the hormone binds → if present → change metabolism, affect growth rate, activate transcription of certain genes which work differently depending on location
 - Auxins
 - produced by apical meristems
 - stimulate cell elongation
 - when light hits one side of stem, higher conc. of auxins develops in shaded region causing cells to elongate → so stem bends toward light (PHOTOTROPISM)
 - auxins build up on lower side of roots + stems → stimulate elongation → turn tree upright but in roots auxins inhibit cell growth + elongation (so roots grow downward) (GRAVITROPISM / GEOTROPISM)

- Cytokinin - produced in growing roots + developing fruits + seeds
 - stimulate cell division + growth of lateral buds + cause dormant seeds to sprout
 - effect is opposite of auxin (cause cells to grow thicker, not elongate)
- Gibberellins
 - increase plant size, particularly in stems + fruit
 - produced by seed tissue + are responsible for the rapid growth of plants
- Ethylene
 - released by fruit tissues, it stimulates fruits to ripen

(B) Tropisms

- response of plants to external stimuli
- Gravitropism / Geotropism
- Phototropism
- Thigmotropism
 - ex. vines, climbing plants

(C) Rapid responses

- "sensitive plant"
- changes in osmotic pressure - when touched, leaf pump out ions + lose H_2O due to osmosis (closing the leaf)
- ex. venus fly trap
 - electrical impulses by sensory cells + osmotic pressure changes + cell wall expansion

(D) Dormancy

- growth + activity decrease + stop
- turn off photosynthesis, transport when cold
- loss of leaves during cold

(E) Aquatic plants

- large air filled space for O_2 to diffuse ex. water lilies

(F) Salt tolerant plants

- ex. mangroves
- leaves pump out salt in plant tissues + onto surface of leaf
- roots adapted to high salt conc.

(G) Desert plants

- adapted to extreme environments - strong winds, daytime heat, sandy soil, infrequent rain
- adaptations: extensive roots, reduced leaves, thick stems that can store H_2O

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- ex. cactus (stems carry out photosynthesis)
- seeds remain dormant for years and only germinate when adequate moisture is present

④ Carnivorous plants

- plants that live in env. where little to no Nitrogen is present (bogs, wet & acidic environments) due to bacteria being unable to survive, use specialized leaves that trap & digest insects.
- ex. pitcher plants, Venus fly trap

① Chemical defenses

- used to defend against insect attack
- some as lethal poisons
- some act as insect hormones - disrupting normal growth & development & prevent insects from reproducing (found in aspirin) ex. nicotine (disrupts nervous system in insects)

⑤ Specialized tissues in plants

- ① Roots - functions
 - a) anchorage
 - b) absorption of H_2O & dissolved nutrients
 - c) prevent soil erosion
- types of tissues
 - a) dermal (root hairs)
 - b) vascular - transport
 - c) ground

- Apical Meristems - responsible for mitosis + plant growth
 - undifferentiated
 - beyond - cell differentiated → ask ques re: how?
- Types of roots
 - taproot vs fibrous
- Parts of root
 - root cap (provides lubrication for growth)
 - root hairs
 - tissues

- How it takes in nutrients + H_2O
 - active transport in root hair cell membranes of ions and H_2O follows by osmosis (Root pressure) → ensures unidirectionality of movement of H_2O .
 - root pressure, capillary action, transpiration + H_2O properties (cohesion + adhesion) move H_2O through xylem

- ⓑ Stems - functions
- produce leaves, branches, flowers
 - hold leaves to sunlight
 - transport of substances between roots + leaves

- types of tissues
- primary vs secondary growth
 - increases in width
 - "wood" is xylem - old xylem is heartwood + new is sapwood (lighter)
 - tree rings

- modified stems
 - tuber - ex. potato (stem growing underground that stores food)
 - bulb - ex. onion -
 - rhizome - ex. ginger - horizontal underground stem

- ⓒ Leaves - functions
- absorb light + engage in photosynthesis

- types of tissues
- structure of leaf
 - cuticle
 - epidermis
 - mesophyll - palisade vs spongy
 - vascular tissue
 - stomata
 - guard cells

- Transpiration / homeostasis / gas exchange

- modified leaves
 - pitcher plant - attract insects + digest them
 - cactus - non photosynthetic - protection
 - pine - needle-like to reduce transpiration
 - rock plant - clear, few stomata for hot, dry conditions