BIOLOGICAL DIVERSITY
EX IV LECTURE & TEXTBOOK NOTES
CHPT 30-32 LECTURE & CHPT 30, 32 TEXTBOOK (in order)

BIOLOGICAL DIVERSITY
CHAPTER 30: PLANTS (lecture)
11/10

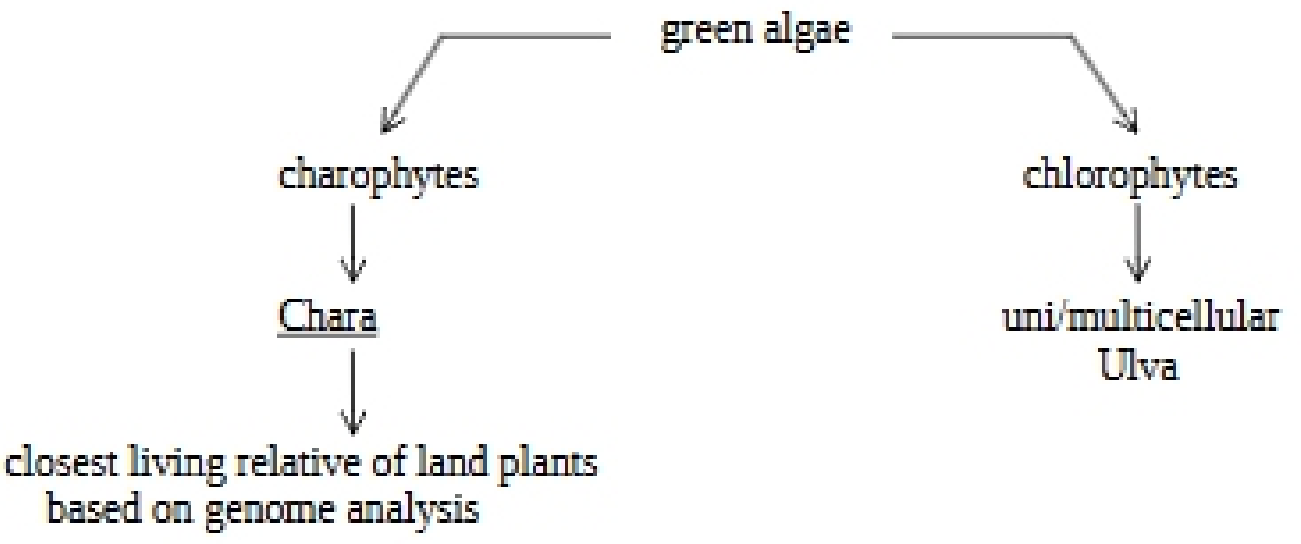
- transition between charophytes and liverworts/hornwarts/mosses from water to land
    - most ancestral

What is a Plant?

- autotrophic
    - photosynthesis for carbon and energy needs
    - selective pressure has enhanced this process
        - chlorophyll
            - different types (pigments) enhance energy production
- heterotrophic/autotrophic
    - ex. venus fly traps
    - a few plants that are strictly heterotrophic
        - tend to be parasites on other plants
        - get all energy (phosphorus, carbon) from their host plants
- complex life cycles
    - alteration of generations (see below**)
    - cell walls
        - increases rigidity of cell (increase of support)
        - have ranges of cellulose and lignin (polysaccharides)
            - compose cell wall
    - multicellular
    - eukaryotic
        - chloroplasts and mitochondria

Plant Evolution

- another billion years after the oldest definite fossils for eukaryotes for land plants to emerge
    - likely derived from aquatic protists (best hypothesis out there)



Water → Land Challenges

- water to land transition was very difficult to make
  - many things selected for in aquatic organisms that would not be helpful on land
  - water has a free-floating environment
  - land has a gravity-based environment
- capturing water
  - root systems have capacity to absorb water from the environment around them
    - roots are the core of how plants capture water
  - rhizoid: how plants without roots capture water
- retaining water
  - hydrophobic/waxy coatings on the leaves/stems
    - hydrophobic: repels water from passing through/coming out of the plant
  - storage in roots
- structural stability
  - gravity
  - rigid cell walls
    - lignin
    - structural carbohydrates
    - cellulose
    - result is "woody tissues"
  - issues with how large a plant can grow driven by structural stability
    - plants were really small to begin with
    - cellulose and lignin based cell walls allowed for extended growth
- nutrient uptake
  - in water there is a viable uptake of carbon, nitrogen, and phosphorus
  - on land plants have to "look harder" for those C, N, and P nutrients
    - symbiosis relationships with nitrogen-fixing bacteria
    - roots for uptake
- facing herbivores (eating live plant tissues) and granivores (eating grains or seeds)
  - needed to evolve new ways to resolve that issue (will die without enough living tissue)
    - toxin creations (secondary compounds: compounds toxic to those ingesting them)
    - thorns, spines
    - shells (for seeds)
      - reduces drying and desiccation of those seeds
    - grasses that enhance growth when faced with herbivory
- seasonal change
  - going into an environment with extremes
    - temperatures
    - dormancy (winter)
    - extreme growth (spring)
  - goal is to adapt life cycles to alternating periods of dormancy (shutting down/plant hibernation) and rapid growth
  - abiotic factors

Basic Plant Life Cycle

- background info:
  - common to all plants as well as to multicellular green, brown, and red algae

- terminology:
  - chromosome number: number of chromosomes for an organism
    - humans have 46 chromosomes (including sex chromosomes)
  - diploid: total number of chromosomes (46 for humans)
    - represented as 2n
      - 2n = n chromosomes from mom + n chromosomes from dad
      - 2n = n MOM egg + n DAD sperm
        - GAMETES
      - each parent provides a haploid number of chromosomes
      - 2n = embryo*
  - haploid: always half of the diploid number (23 for humans)
    - represented by n
    - gametes are ALWAYS haploid
      - unicellular*
      - n = gamete*
      - plants have independent haploid and diploid life stages
        - haploid and diploid can live on their own
        - leads to alteration of generations
- alternation of generations
  - haploid (n)
  - diploid (2n)
  - circular, loop
- gametophyte (haploid) produces egg (n) and sperm (n)
- fertilization is the joining of egg (n) and sperm (n)
  - 2n zygote
  - 2n embryo
  - 2n sporophyte (diploid)
- sporophyte goes to sporangia
  - sporangia to spore mother cell (2n)
  - through meiosis, the mother cell (2n) goes to spores (n)
  - spore goes once again into a gametophyte
  - sporophytes are only present for a short time and is an independent life stage* (n)
- alternations of generations gets more complicated with different groups

Earliest Land Plants (Charopytes to Bryophtes)

- bryophyta
  - likely came from charophytes
  - three subgroups:
    - mosses
    - hornworts
    - liverworts
  - do not have true roots
    - rhizoids: holds plant in place
      - anchor
      - capacity to absorb water
        - act like a sponge
          - does not go through specific vessels
          - water is drawn into plant along a single, long cell
  - no vascularization (directly proportional to blood vessels in humans)