

## Plants without seeds: From Sea to Land

Chapter 28

### Plant characteristics

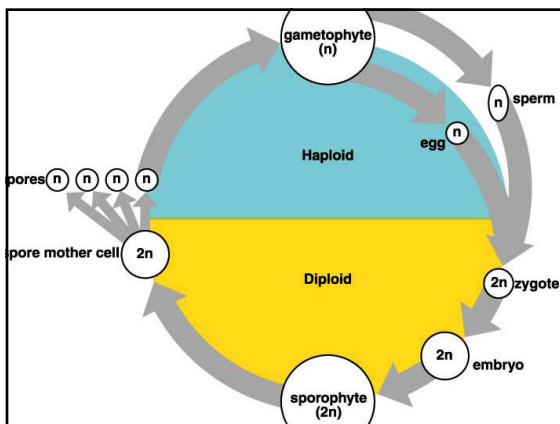
- ✓ Chlorophylls a and b
- ✓ Stores carbohydrates (starch)
- ✓ Embryo (protected by tissues)
- ✓ Historically - 2 whiplash flagella

### 12 phyla of plants

PHYLUM	DIAPYCNOME	CHARACTERISTICS
<b>SPERMATOPHYTES</b>		
Gymnosperms	Living	No alternation of generations (diploid sporophyte)
Angiosperms	Living	Embryonic sac (diploid sporophyte) in ovule
<b>FERNS</b>		
Polypodiophytes	Living	Simple leaves in whorls, strobili
Marattiophytes	Living	Simple leaves in whorls, strobili
Polypodiophytes	Living	No true leaves, roots absent
Polypodiophytes	Living	Complex leaves, strobili at tips of leaves
<b>Mosses</b>		
Equisetum	Living	Compound leaves, strobili
Cyanophytes	Living	Deciduous, fan-shaped leaves, strobili
Cyanophytes	Living	Mosses in vascular tissue, simple leaves
Cyanophytes	Living	Stems in cones, needle-like or scale-like leaves
<b>Algae</b>		
Charophytes	Living	Embryonic sac, roots, vascular tissue, seeds in fruit

### Alteration of generations

- ✓ A sexual life cycle in which the alternating haploid and diploid phases are both multicellular.
  - Gametophyte - haploid stage (1n)
  - Sporophyte - diploid stage (2n)



### Movement to land

- ✓ Plants came from protists
  - The algae *Chara* is the ancestor of modern plants
- ✓ Advantage on land
  - More light
  - More CO<sub>2</sub>
  - More reliable supply of minerals & nutrients

## Adaptations to colonize the land

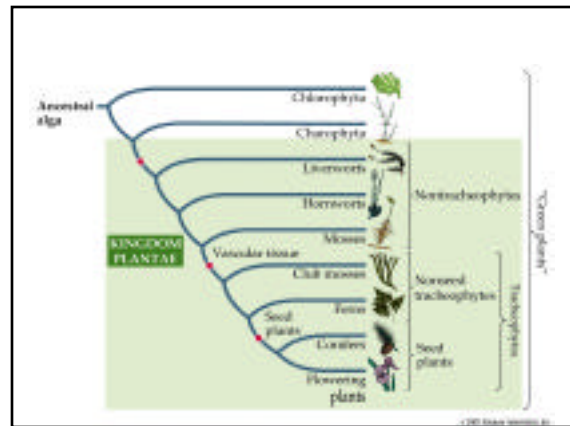
- ✓ A waxy cuticle
- ✓ Gametangia - closed reproductive organs
  - Eggs - archegonium
  - Sperm - antheridium
- ✓ Embryos - provides young sporophyte protection
- ✓ Absorb water - dew, rainwater, or ground water
- ✓ Pigments for UV protection
- ✓ Thick spore wall that prevent desiccation

## Nontracheophytes vs. tracheophyte

- ✓ Nontracheophytes
  - No water transporting tissue
  - Leaf-like structures catch water
  - Mineral diffuse
- ✓ Tracheophytes
  - Well developed Vascular system
    - Phloem - sugars and other photosynthetic products down
    - Xylem - water and mineral up

## Nontracheophytes

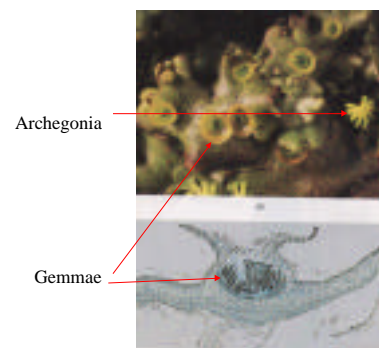
- ✓ Most terrestrial, wetlands
- ✓ Worldwide distribution
- ✓ Gametophyte phase is the most obvious
  - Haploid spores germinate into the gametophyte
  - Male and female spores
- ✓ Spongelike



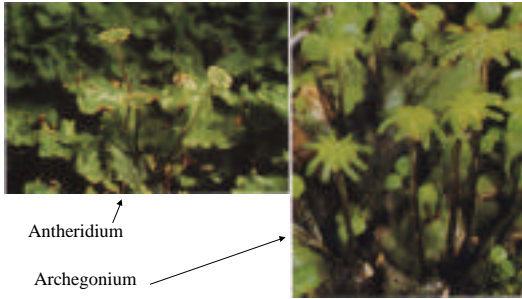
## Hepatophyte (liverworts)

- ✓ Gametophyte is green, leafy, flat layers
- ✓ Rhizoids - anchor
- ✓ Asexual reproduction
  - Fragmentation
  - Gemmae
- ✓ Sexual reproduction
  - Antheridia - male
  - Archegonia - female

## Liverwort



## Liverwort



## Anthercerophyta (Hornworts)

- ✓ Similar to liverworts
  - Horn-like sporophytes
- ✓ Gametophyte structure consists with flat plates a few cells thick
- ✓ First of have stomata
- ✓ Large plate-like chloroplasts
- ✓ Indefinite growth of sporophyte

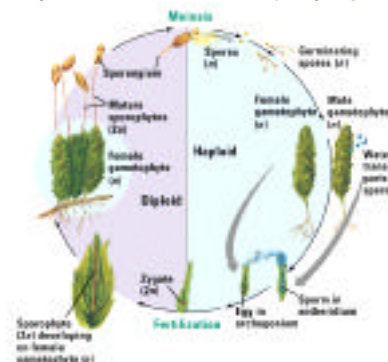
## Hornwort

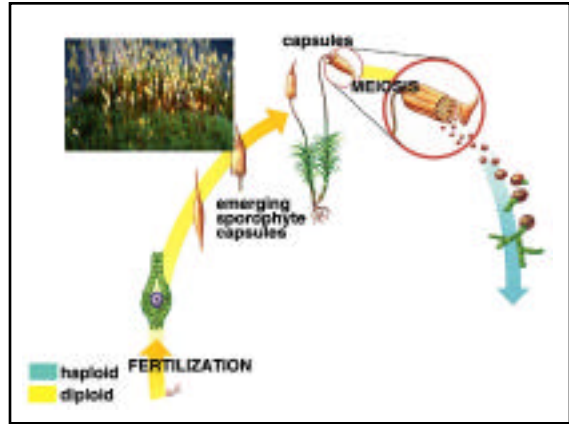
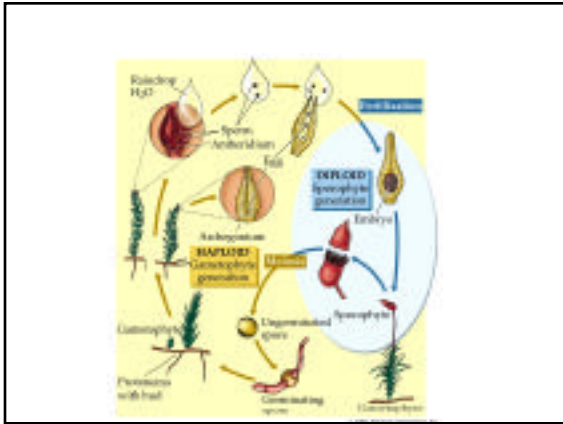


## Bryophyta (mosses)

- ✓ Damp, cool ground
- ✓ Hydroid - channels water
  - Lack a xylem and phloem
- ✓ Apical cell division
  - growth at the tip
- ✓ Protonema
- ✓ Rhizoids anchor

## Life cycle of a moss (Bryophyte)

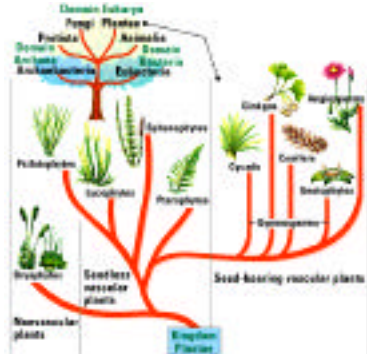




Spaghnum -true moss

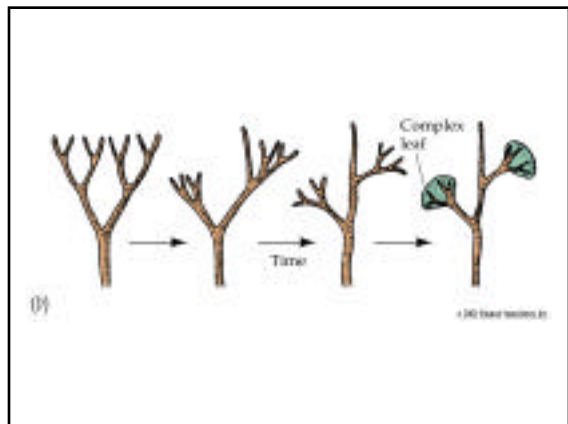
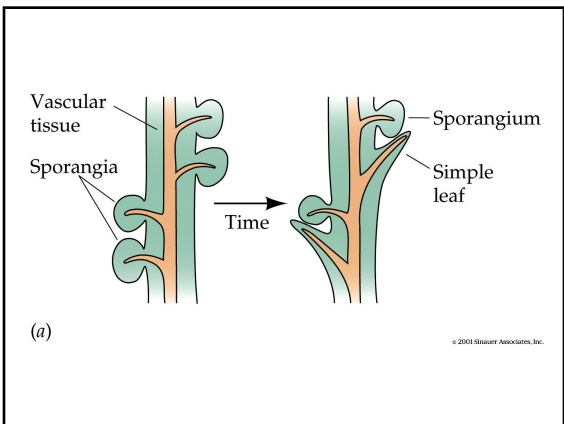
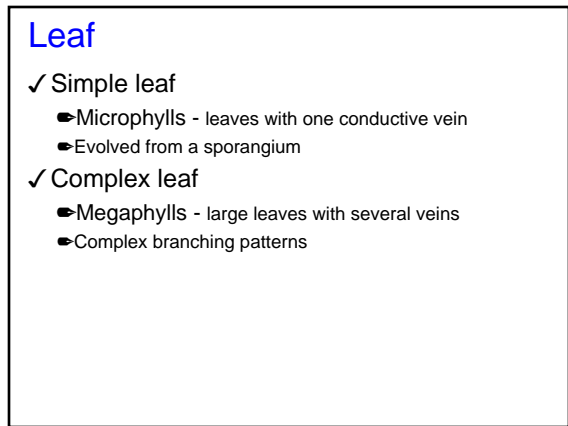
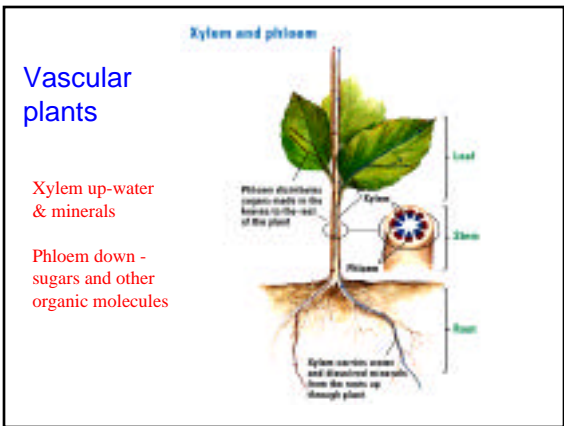
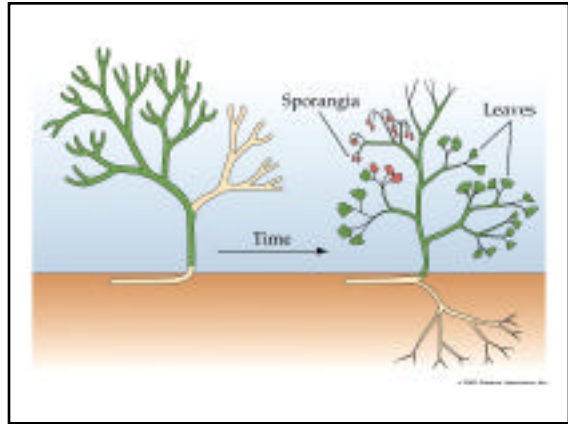
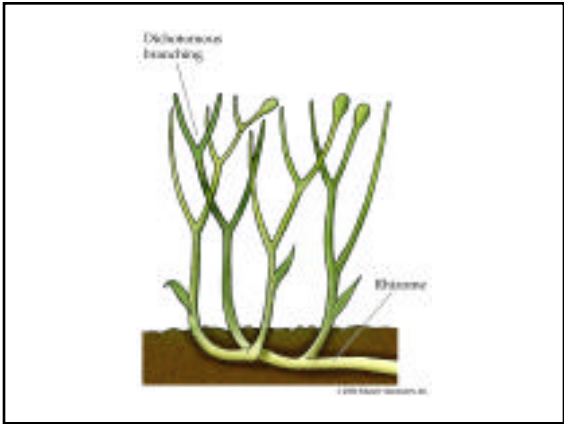


Kingdom Plantae



Tracheophytes

- ✓ Tracheid - conducts water in all tracheophytes except angiosperms
  - Transports water and minerals distantly
- ✓ Branching, independent sporophyte
  - More spores
- ✓ Nonseed and seed groups
- ✓ Earliest lacked roots
  - Rhizomes anchored the plants
    - Horizontal stems
  - Roots - branch underground
- ✓ 2n is life cycle is more prominent



## Tracheophytes

### ✓ Homosporous

- Produce a single type of spore (1n)
- The gametophyte produces both male and female reproductive organs

### ✓ Heterosporous

- Two spore types
  - Megaspore - megagametophyte
  - Microspore - microgametophyte

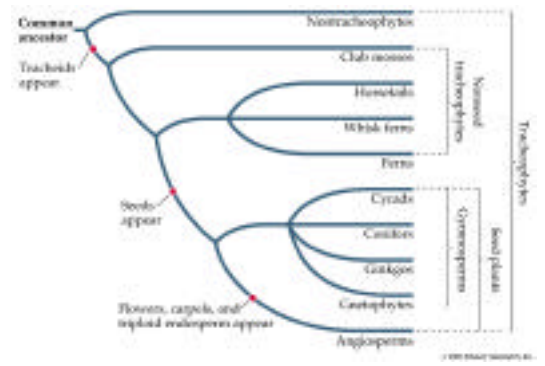
## Homosporous



## Heterosporous



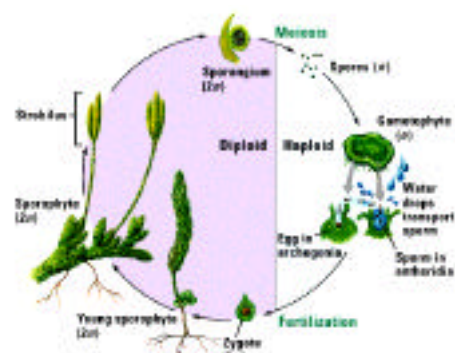
## Tracheophytes



## Lycophyta (Club mosses)

- ✓ "lycopods"
- ✓ True roots (dichotomous branching, stems, and leaves)
- ✓ Simple xylem and phloem
- ✓ Microphylls
- ✓ Strobili (strobilus) - spore producing cones
- ✓ Homo and heterosporous species

## Club moss (Lycophyta)



## Lycophyta



## Sphenophyta (horsetails)

- ✓ "horsetails", scouring rushes (silica)
- ✓ Single genus, *Equisetum*
- ✓ True roots, stem, and leaves
- ✓ Xylem and phloem
- ✓ may have joints (snake grass)
- ✓ Small scaly microphyll leaves in whorls
- ✓ Homosporous

## Equisetum



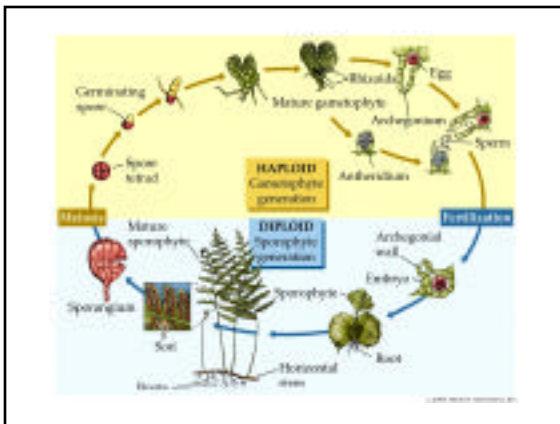
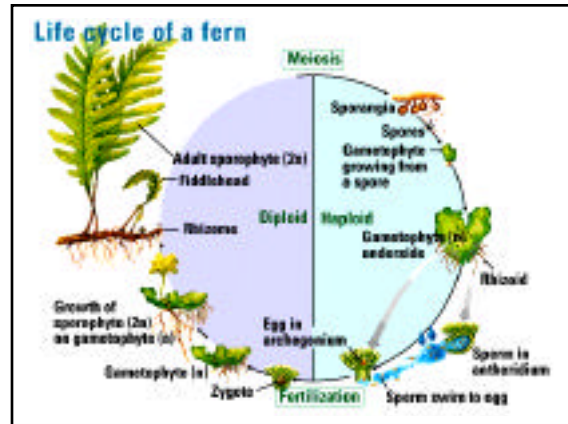
## Psilotophyta (Wisk ferns)

- ✓ Two genera
  - *Psilotum* and *Tmesipteris*
    - Leaflike scales
      - ✦ Not true leaves
  - Lacks true roots
    - Rhizomes
  - Homosporous

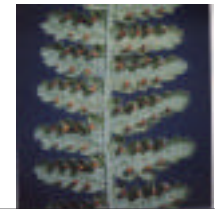


## Pterophyta (True ferns)

- Sporophyte dominant
- cm to 30-m
- True leaves, stems, and roots
- Most are homosporous
- Fronds (leaves)
  - megaphylls
- sporophylls - sori
- True roots with rhizomes



## ferns



## Plant divisions

- Bryophyta (mosses, liverworts, hornworts)
- ✓ Tracheophytes -seedless
  - Psilotophyta
  - Lycopodophyta
  - Equisetophyta (horsetails)
  - Pteridophyta (ferns)
- ✓ Gymnosperms (seeds, but no flowers)
  - Coniferophyta (conifers)
  - Cyadophyta (cycads, "palms")
  - Ginkgophyta (ginkgo)
  - Gnetophyta
- ✓ Magnoliophyta (flowering plants)
  - Monocots
  - Dicots

### Linnaeus equated flower parts with the sexual parts of animals



### Terms

- ✓ Gymnosperms - seed plants without fruits or flowers
  - Pine trees, palmlike cycads
- ✓ Angiosperms - (vessel + sperm) Flowering plants - seed is enclosed in fruit
  - Dicots - broadleaf plants (roses, poppies, oaks)
  - Monocots - grasses, lilies, onions, cattails, daffodils
  - Deciduous - leaves fall off seasonally