

Bryophytes  
Chapter 16

Bryophytes

- What do we already know?
- wide range of habitats
- important initial colonizers
  - with lichens

Relationships of Bryophytes to Other Groups

- transitional between charophycean green algae...
- and vascular plants

Alternation of Generations

- gametophyte
- sporophyte

Relationships of Bryophytes to Other Groups

- similar to vascular plants
  - presence of male and female gametangia with a protective layer
  - retention of zygote and embryo within archegonium
  - multicellular diploid sporophyte
  - multicellular sporangia
  - spores with walls containing sporopollenin
  - tissues produced by apical meristem
- different from vascular plants
  - no vascular tissue
  - cell walls not lignified
  - differences in life cycle
    - bryophytes have dominant gametophyte
    - vascular plants have dominant sporophyte

Comparative Structure and Reproduction of Bryophytes

- no true leaves, stems or roots
- some have cuticle with structures analogous to stomata
- usually attached to substrate by rhizoids
- cells interconnected with plasmodesmata
- cells resemble vascular plants
  - most have many small, disk-shaped plastids

- many bryophytes reproduce asexually
  - fragmentation
  - gemmae
- sexual reproduction
  - only flagellated cells are sperm
  - antheridium
    - male reproductive structure
    - usually stalked
    - sterile jacket layer surrounding spermatogenous cells
    - each spermatogenous cell forms one biflagellated sperm cell
  - archegonium
    - female reproductive structure
    - flask-shaped
    - surround a single egg
    - release chemicals to attract sperm
  - fertilization occurs in archegonium
  - zygote
- no plasmodesmata between sporophyte and gametophyte
  - placenta
- mature sporophyte
  - foot in archegonium
  - seta (stalk)
  - capsule (sporangium)
- embryophytes
  - term for all plants
  - multicellular, matrotrophic embryo
  - produce many-celled diploid sporophyte
- sporopollenin
  - most decay and chemical resistant biopolymer
  - spore walls
- spores germinate to form juvenile stages
  - protonemata (singular: protonema)

### Bryophytes

- Phylum *Hepatophyta*
  - liverworts
- Phylum *Anthocerotophyta*
  - hornworts
- Phylum *Bryophyta*
  - mosses

### Phylum *Hepatophyta*

- 6000 species
- small, inconspicuous
- believed to be helpful in treating liver ailments
- most gametophytes develop directly from spores
- three major types in two clades
- complex thalloid liverworts
  - thallus 30 cells thick at midrib, 10 cells thick in thinner portions
  - differentiated into thin, green dorsal portion and thicker, colorless ventral portion
  - rhizoids on lower portion
  - include very simple liverwort species
  - *Marchantia*
    - gametophytes unisexual
    - distinguished by gametophores
    - specialized spore dispersal mechanism
    - gemma cups
- leafy liverworts
  - >4000 species
  - abundant in tropics & subtropics
    - high humidity or rainfall
    - grow on leaves, bark, other plant surfaces
  - usually well branched and form mats
  - leaves consist of one layer of cells like mosses
    - but several ways to distinguish moss and liverwort “leaves”

### Phylum *Anthoceroophyta*

- 100 species
- gametophytes
  - somewhat similar to thallose liverworts
  - cells usually have one large chloroplast
  - usually 1-2 cm across
  - some unisexual
- sporophytes
  - foot and capsule
  - meristem between foot and sporangium
  - green with cuticle and stomata

### Phylum *Bryophyta*

- >9500 species
- three classes
  - *Sphagnidae*
    - peat mosses

- *Andreaeidae*
  - granite mosses
- *Bryideae*
  - “true mosses”
- *Sphagnidae*
  - genus *Sphagnum*, >400 species
  - diverged early from main line of moss evolution
  - distributed worldwide
  - distinctive sporophytes
  - common asexual reproduction
  - distinct from other mosses
    - unusual protonema
    - morphology of gametophyte
    - explosive spore dispersal
  - unusual properties
  - ecology of *Sphagnum*
- *Andreaeidae*
  - genus *Andreaea*, 100 species
  - small blackish-green or reddish-brown tufts
  - grow on rocks in mountainous or arctic regions
  - unique spore discharge mechanism
- *Bryidae*
  - resemble filamentous green algae but have slanted cross walls
  - multicellular rhizoids
  - leaves normally only one cell layer thick
  - hydroids
  - leptoids
  - sexual reproduction
    - similar to other bryophytes
    - produce male and female gametangia
      - some unisexual
    - unbranched sporophyte
      - embedded in gametophyte, placenta
      - usually have stomata
      - as matures, turns brown
    - specialized spore dispersal
      - operculum bursts off
      - peristome
  - asexual reproduction
  - “cushiony” or “feathery” growth patterns
  - some are epiphytes

#### Summary

- relationship of plants to green algae

- relationship of bryophytes to vascular plants
- three phyla of bryophytes
- ecological importance