Bryophytes consist of mosses, liverworts, and hornworts: They represent the non vascular plants

- Bryophytes are represented by three phyla:
  - **phylum Hepatophyta - liverworts**
  - **phylum Anthocerophyta - hornworts**
  - **phylum Bryophyta – mosses**
- Liverworts and hornworts may be the most reasonable models of what early plants were like.
- Mosses are the bryophytes most closely related to vascular plants.

The gametophyte is the dominant generation in the life cycles of bryophytes

- In bryophytes, gametophytes are the most conspicuous, dominant phase of the life cycle.
  - Sporophytes are smaller and present only part of the time➔very short lived
- Bryophyte spores germinate in favorable habitats (moist) and grow into gametophytes by mitosis.
- The gametophyte is a mass of green, branched, one-cell-thick filaments, called a **protonema**.
- When sufficient resources are available, a protonema produces meristems.
- These meristems generate gamete-producing structures, the **gametophores**.
- Bryophytes lack true roots and are anchored by tubular cells or filaments of cells, called **rhizoids**.
  - Rhizoids are not composed of tissues.
  - They lack specialized conducting cells.
  - They do not play a primary role in water and mineral absorption.
- Bryophyte gametophytes are generally only one or a few cells thick, placing all cells close to water and dissolved minerals.
- Most bryophytes lack conducting (vascular) tissues to distribute water and organic compounds within the gametophyte.
  - Those with specialized conducting tissues lack the lignin coating found in the xylem of vascular plants.
- Lacking support tissues, most bryophytes are only a few centimeters tall.
- The gametophytes of hornworts and some liverworts are flattened and grow close to the ground.
- The gametophytes of mosses and some liverworts are more “leafy” because they have stem like structures that bear leaf like appendages.
  - They are not true stems or leaves because they lack lignin-coated vascular cells.
- The “leaves” of most mosses lack a cuticle and are only one cell thick, features that enhance water and mineral absorption from the moist environment.

- Some mosses have more complex "leaves" with ridges to enhance absorption of sunlight.
  - These ridges are coated with cuticle.
- Some mosses have conducting tissues in their stems and can grow as tall as 2m.
  - It is not clear if these conducting tissues in mosses are analogous or homologous to the xylem and phloem of vascular plants.
  - Bryophytes do NOT produce seeds. They only produce spores.
- The mature gametophores of bryophytes produce gametes in gametangia.
  - Each vase-shaped archegonium produces a single egg.
  - Elongate antheridia produce many flagellated sperm.
- When plants are coated with a thin film of water, sperm swim toward the archegonia, drawn by chemical attractants.
  - They swim into the archegonia and fertilize the eggs.
- The zygotes and young sporophytes are retained and nourished by the parent gametophyte.
  - Layers of placental nutritive cells transport materials from parent to embryos.

Pteridophytes: Seedless vascular plants

- Consists of two modern phyla:
  - phylum Lycophyta - lycophytes
  - phylum Pterophyta - ferns, whisk ferns, and horsetails
- Most pteridophytes have true roots with lignified ***vascular tissue***.
  - Xylem – carries water and minerals up from the roots – it also provides support
  - Pholem – carries sugars, amino acids, and other organic products throughout the plant

A sporophyte-dominant life cycle evolved in seedless vascular plants

- From the early vascular plants to the modern vascular plants, the ***sporophyte generation*** is the larger and more complex plant.
  - For example, the leafy fern plants that you are familiar with are sporophytes.
  - The gametophytes are tiny plants that grow on or just below the soil surface.
  - This reduction in the size of the gametophytes is even more extreme in seed plants.
- Ferns also demonstrate a key variation among vascular plants: the distinction between homosporous and heterosporous plants.
- A **homosporous** sporophyte produces a single type of spore.
  - This spore develops into a bisexual gametophyte with both archegonia (female sex organs) and antheridia (male sex organs).
- A **heterosporous** sporophyte produces two kinds of spores.
  - **Megaspores** develop into females gametophytes.
  - **Microspores** develop into male gametophytes.
- Regardless of origin, the flagellated sperm cells of ferns, other seedless vascular plants, and even some seed plants must swim in a film of water to reach eggs.
- Because of this, seedless vascular plants are most common in relatively damp habitats.

- **Ferns** first appeared in the Devonian period and have radiated extensively until there are over 12,000 species today.
  - Ferns are most diverse in the tropics but are also found in temperate forests and even arid habitats.
- Ferns often have horizontal rhizomes from which grow large leaves (sporophylls) with an extensively branched vascular system.
  - Fern leaves or fronds may be divided into many leaflets.
- Ferns produce clusters of sporangia, called **sori**, on the back of green leaves (sporophylls) or on special, non-green leaves.
  - Sori can be arranged in various patterns that are useful in fern identification.
  - Most fern sporangia have springlike devices that catapult spores several meters from the parent plant.
  - Spores can be carried great distances by the wind.