

Physcomitrella patens, moss

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Taxonomy

cellular organisms - Eukaryota - Viridiplantae - Streptophyta - Streptophytina - Embryophyta - Bryophyta - Moss Superclass V - Bryopsida - Funariidae - Funariales - Funariaceae - *Physcomitrella* - *Physcomitrella patens*

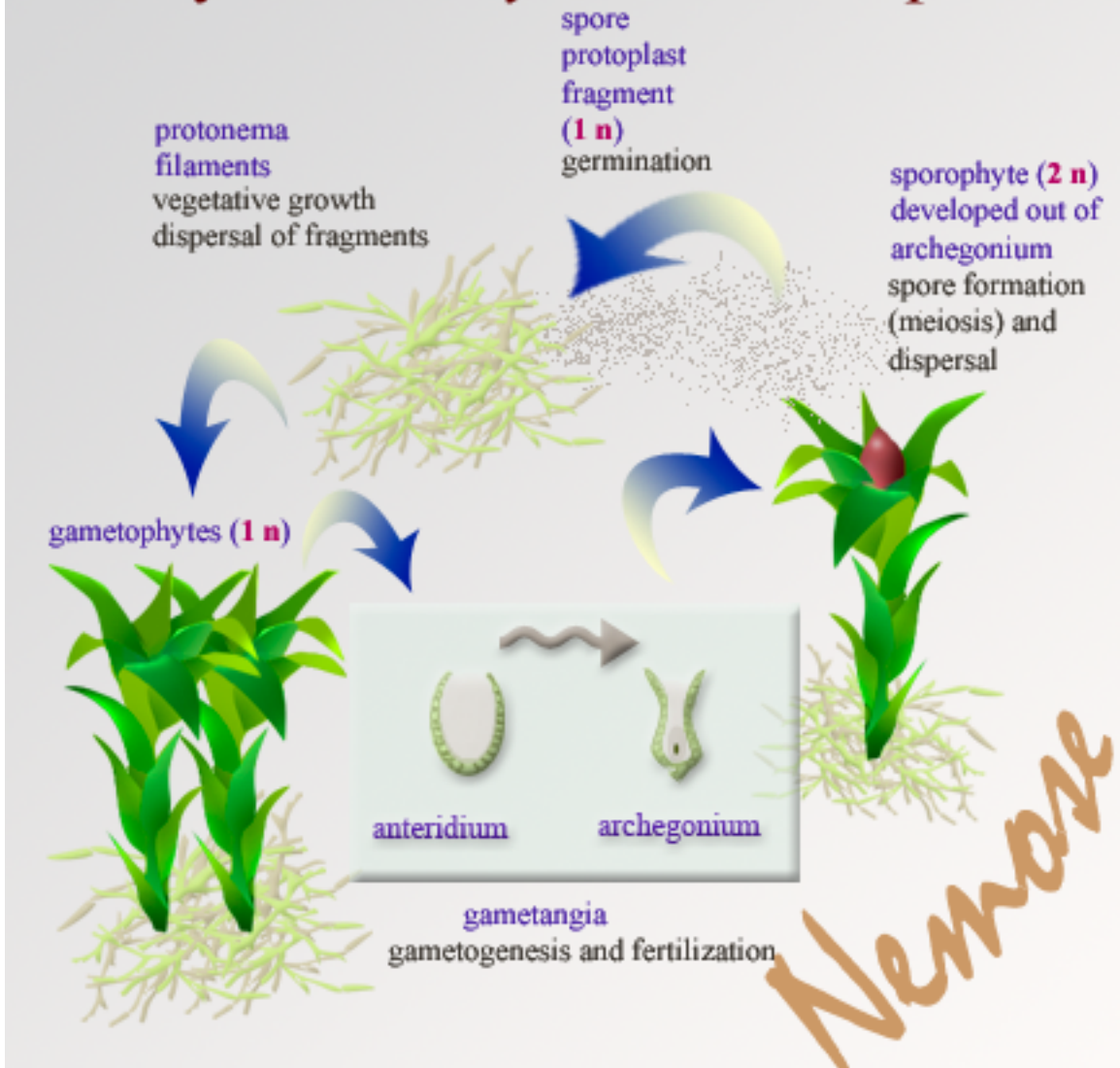
Brief facts

- ***Bryopsida*** is a class of plants within the *Bryophyta* comprising the mosses, which are found in both damp (including freshwater) and drier situations. Mosses possess erect or prostrate leafless stems, which give rise to leafless stalks bearing capsules. Spores formed in the capsules are released and grow to produce new plants. (Concise Dictionary of Biology, 1990). Many small plants bearing the name moss are in fact not mosses. The "moss" found on the north side of trees is actually a green alga (ALGAE, GREEN). Irish moss is really a red alga. Beard lichen (beard moss), Iceland moss, oak moss, and reindeer moss are actually **lichens**. "Spanish moss" is a common

name for both lichens and an air plant of the pineapple family (*Bromeliaceae*). "Club moss" is an evergreen herb of the family *Lycopodiaceae*.

- The true mosses (*Bryopsida*), together with liverworts (*Hepaticopsida*), comprise two classes of phylum *Bryophyta*. Phylogenetic studies indicate that the two classes represent distinct but related clades. Bryophytes are believed to diverge with flowering plants 200-400 million years ago (very early in plant evolution). Within the *Bryopsida*, *P. patens* belongs to order *Funariales*. Studies show that at least 66% of *Arabidopsis thaliana* genes have homologs in *P. patens*.
- *P. patens* is an ephemeral, developing in early summer, generally from overwintered spores. It is distributed widely in temperate zones but is not common; it grows in moist shady areas, beside lakes, rivers, ditches, etc.
- *P. patens* is a **monoecious** moss (i.e. both sex organs are present on the same individual) that simplify growing the organism under laboratory conditions.
- *P. patens* is the first moss to be successfully transformed.

Life cycle of *Physcomitrella patens*



Developmental stages (life cycle)

The moss *Physcomitrella patens*, like seed plants, shows alternation of generations, but its **gametophyte**, the haploid phase of the life cycle, is dominant (crucial difference from flowering plants). The whole life cycle can be achieved under optimal conditions in less than 12 weeks.

- gametophyte stage

haploid plants producing gametes

- protonema

growth of filamentous network of chloronemal and caulonemal cells, which develops by apical growth and cell division of apical and subapical cells; at this stage fragments of protonema can be dispersed by water and/or wind

- gametophore stage

leafy shoot, which differentiates by caulinary growth from a simple apical meristem (bud)

- sporophyte stage

after fertilization by swimming spermatozoids (under water), the egg cell in the archegonium develops into a small diploid sporophyte and within its capsule meiosis occurs leading to spore formation (approximately 5,000 spores per capsule)

Tissues and organs

- protonema

the filamentous gametophyte stage consisting of two cell types: **chloronema** and **caulonema**

- chloronema

assimilatory function; the first filaments produced from germinating spore; their cells are densely packed with large chloroplasts; the apical cells of

chloronemal filaments divide every 22-26 h;

- caulonema

adventitious function; caulonemal cells are produced by some chloronemal apical cells; they divide every 6-8 hours and are characterized by an oblique cell wall and a small number of chloroplasts; the side branches from most subapical cells of caulonemal filaments develop into chloronemal filaments, but a few side branches develop into either caulonemal filaments or leafy shoots (gametophores)

- sporophyte

stalked capsules growing half-parasitically on gametophyte plant; each capsule produces approximately 5,000 spores

- gametophore

a leafy shoot on which gametangia are borne; temperatures below 18 °C are required to induce gametogenesis

- leafy shoot

photosynthetic non-vascularized stem, which carries leaves

- archegoniums

female gametangia

- antheridium

male gametangia

- rhizoids

"roots"; felamentous cellular network that grows from the base of the stem

References

PubMed articles

- The moss *Physcomitrella patens*. The moss *Physcomitrella patens*. *Annu Rev Genet.* 2005; 39: 339-58. **PMID: 16285864**
- Schaefer DG, Zryd JP. The moss *Physcomitrella patens*, now and then. *Plant Physiol.* 2001 Dec; 127(4): 1430-8. **PMID: 11743086**
- Cove DJ, Knight CD. The Moss *Physcomitrella patens*, a Model System with Potential for the Study of Plant Reproduction. *Plant Cell.* 1993 Oct; 5(10): 1483-1488. **PMID: 12271042**

Websites

- [Why sequence *Physcomitrella patens*?](#)



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