

Introduction to Botany. Lecture 30

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1 Questions and answers

2 Pteridophyta

- Heterospory
- “Ferny” ferns



1 Questions and answers

2 Pteridophyta

- Heterospory
- “Ferny” ferns



Previous final question: the answer

What is quillwort (*Isoëtes*)?



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What is quillwort (*Isoëtes*)?

- The remaining representative of giant woody Carboniferous lycophytes.
- Water heterosporous lycophyte with secondary thickening of stem.



Pteridophyta

Heterospory



Heterosporry

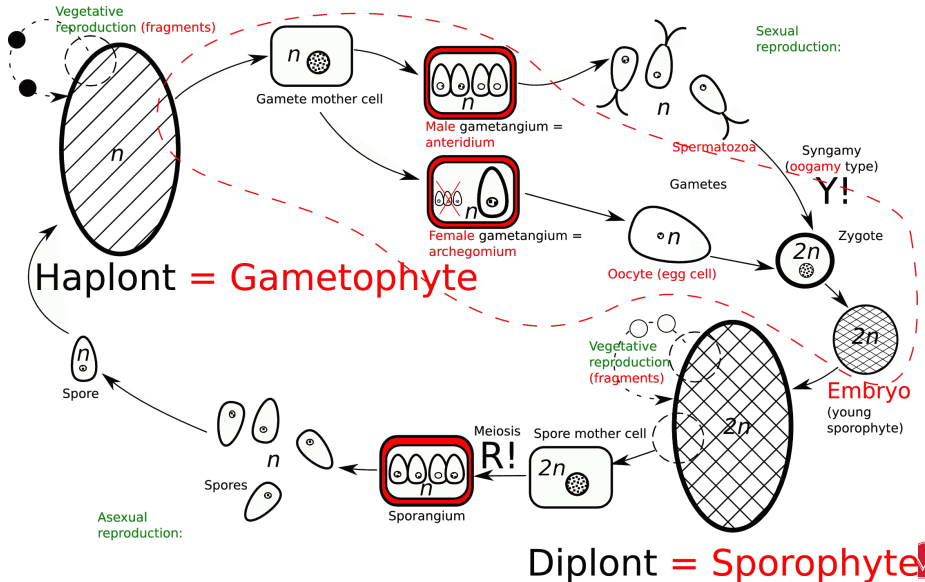
Heterosporous ferns (lycophytes *Selaginella* and *Isoetes*, monilophytes *Salvinia*, *Marsilea*, *Pilularia*, *Regnellidium* and *Azolla*) went one step further and made their spores different too. It will allow the better allocation of resources and will restrict the self-fertilization.

Terms covered:

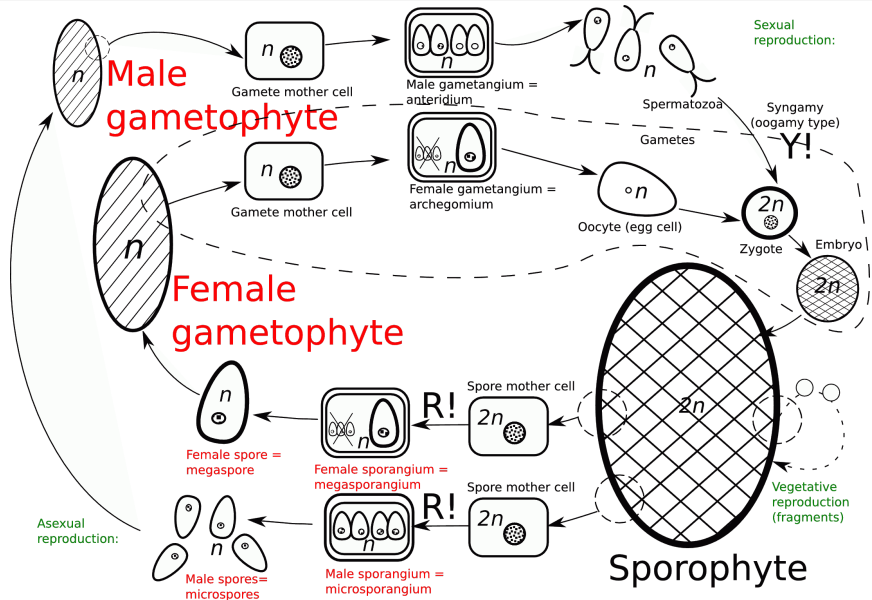
- Male gametophyte, female gametophyte
- Microspores and microsporangium
- Megaspores and megasporangium



Life cycle of land plants



Heterosporic cycle: differences



Pteridophyta

“Ferny” ferns



Psilotopsida

- Small tropical group of two genera, *Psilotum* and *Tmesipteris* and 7 species
- Have protostele (like lycophytes), underground long-lived gametophytes but multiflagellate spermatozoa (like horsetails and all ferns). Sporangia unite into **synangia**. Leaves may absent (*Psilotum*) and replaced with **enatia**.
- Externally remain fossil rhyniophytes, the oldest extinct Pteridophyta



Hawaiian *Psilotum complanatum*



New Zealand *Tmesipteris tannensis* with double synangium



Ophioglossopsida

- Small group (*Ophioglossum*, *Botrychium*, *Mankyua* and *Helminthostachys*) and ≈ 75 species
- Always have underground rhizome and aboveground bisected leaves: one half is the leaf blade and other half is **sporangiophore**. Gametophytes grow underground
- Some (*Botrychium*, grape fern) have **secondary thickening** of underground rhizome.
- *Ophioglossum vulgatum*, adder's tongue fern, has $2n = 1360$, the largest chromosome number ever.



Ophiloglossum vulgatum, $2n = 1360$ hero



Helminthostachys zeylanicum (Ophioglossopsida)



Mankyua chejuense (Ophioglossopsida)



Marattiopsida

- Tropical ferns, several genera with ≈ 100 species
- Biggest ferns, one leaf (frond) could be 6 m length, but stems are smaller. Leaves with stipules.
- Sporangia (**eusporangia** like in all other Pteridophyta except "true" ferns) usually unite in **synangia**, gametophytes 1-2 cm in diameter, photosynthetic, terrestrial, usually long-lived.
- In a past, also were dominants of Carboniferous swamp forests.



Angiopteris sp. (Marattiopsida)



Synangia of *Danaea nodosa* (Marattiopsida)

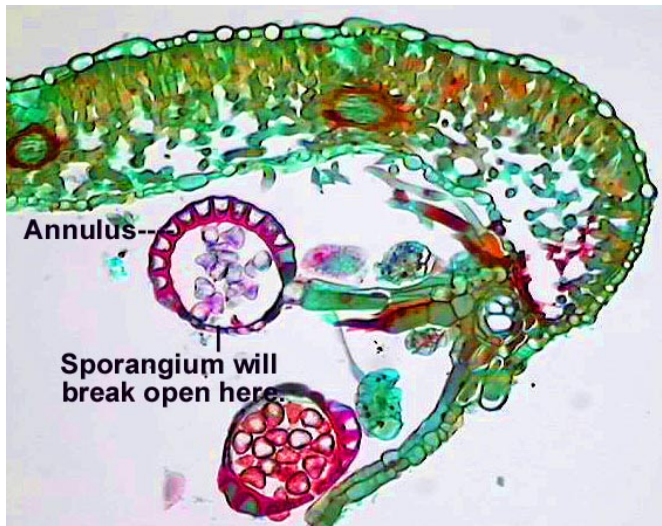


Pteridopsida

- "True" ferns, more than 10,000 species
- Leaves are fronds, with apical growth. Young leaves are coiled in **fiddleheads**.
- Sporangia have one-celled wall (**leptosporangia**) and grouped in sori (often covered with indusium)
- Gametophyte minute, grow aboveground. Some genera of ferns are heterosporous
- Bracken fern, *Pteridium aquilinum*, is the most widespread plant
- Many ferns have vegetative reproduction originated from asexual (**apospory**) or sexual (**apogamy**)



Sorus, indusium, leptosporangium and annulus



Heterosporous fern *Marsilea quadrifolia*, the Shamrock. Well, almost...



Young leaves of bracken fern: Korean "gosari"



Summary

- Heterosporous plants have two kinds of spores: female (megaspores) and male (microspores)
- Pteridophyta consist of two lineages (subphyla): microphyllous **lycophytes** and megaphyllous **polinophytes**



For Further Reading



A. Shipunov.

Introduction to Botany [Electronic resource].

2015.

Mode of access:

http://ashipunov.info/shipunov/school/biol_154

