

Concepts of Biology. Lecture 25

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1 Where we are?

2 Plants

- Origin of plant tissues

3 Genetics and inheritance

- Meiosis



Outline

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Outline

- 1 Where we are?
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- 3 Genetics and inheritance
 - Meiosis



Primordial plant cell

- Cell wall: primary (cellulose) and secondary (cellulose + lignin and suberin)
- Chloroplasts with thylakoids
- Turgor: vacuole and cell wall pressures
- Plasmodesmata



Plants

Origin of plant tissues



Origin of tissues and organs of plants: first steps

Availability of light, temperature-gases conflict and competition pushed plants to land. Two first tissues, compound epidermis and ground tissue were response to desiccation. Epidermis could be developed in advance as adaptation to spore delivery. Next stages: supportive tissues, vascular tissues and absorption tissues.



Terms associated with origin of plants

- Thallus
- Epidermis
- Cuticle
- Transpiration
- Stomata, guard cells
- Compound tissues
- Ground tissue
- Supportive tissues
- Shoot system
- Absorption tissue, mycorrhiza
- Root system



Three main phyla of plants

- **Bryophyta:** mosses
No roots, leaves thin or absent, withstand desiccation
- **Pteridophyta:** ferns and allies (like clubmosses and horsetails)
Roots adventitious, leaves are not associate with buds, stem-like or scale-like, water-savers
- **Spermatophyta:** seed plants (including conifers and flowering plants)
Body with two poles, typical leaves associate with buds, water-savers

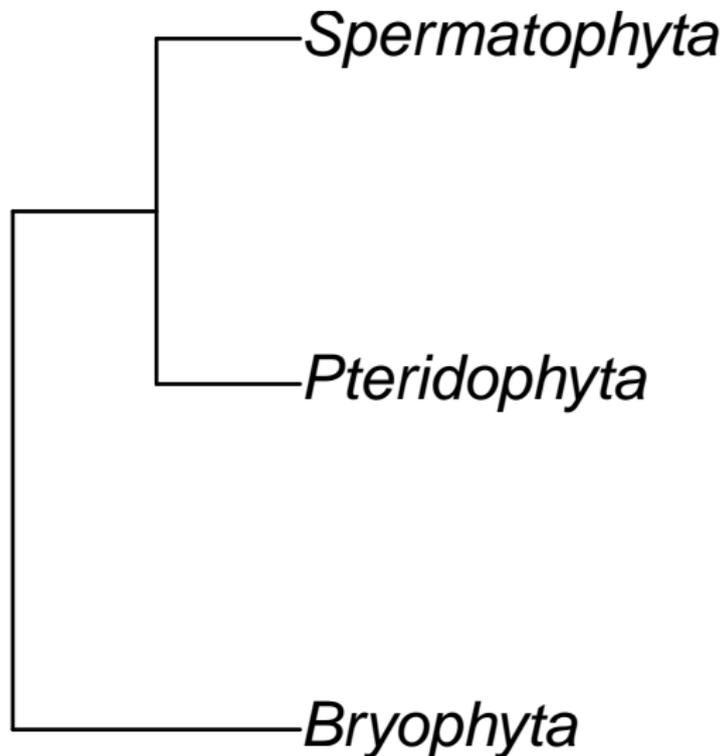


Three main phyla of plants

- **Bryophyta:** mosses
No roots, leaves thin or absent, withstand desiccation, **gametophyte dominance**
- **Pteridophyta:** ferns and allies (like clubmosses and horsetails)
Roots adventitious, leaves are not associate with buds, stem-like or scale-like, water-savers, **sporophyte dominance, no seeds**
- **Spermatophyta:** seed plants (including conifers and flowering plants)
Body with two poles, typical leaves associate with buds, water-savers, sporophyte dominance, **seeds**



Phylogeny of these three phyla



Genetics and inheritance

Meiosis



Exchange and renovation of DNA

- To sustain with the ever-changed environment, organisms must evolve
- To evolve, they need a genetic diversity: different genotypes in different organisms
- To be genetically diverse, they need a process of genetic exchange
- One of ways of exchange is a sexual process in a form of **syngamy**
- However, constant syngamy will result in constant increase of DNA amount
- Meiosis is a counterbalance to syngamy



Definition of meiosis

- Chromosome formula: $XX \rightarrow X + X \rightarrow I + I + I + I$
- **The goal of meiosis** is to counterbalance the syngamy
- Meiosis changes genotype of cells because: (1) chromosomes are **recombined** and (2) chromosomes exchange their genetic material



Ploidy, or chromosome set

- In diploid ($2n$) organisms, chromosomes form pairs
- Paired chromosomes (XX) are **homologous**
- In haploid (n) organisms, all chromosomes are single
- In mitosis, ploidy will be the same: $2n \rightarrow 2n + 2n$
- In syngamy, ploidy will increase: $n + n \rightarrow 2n$
- In meiosis, ploidy will reduce: $2n \rightarrow n + n$



Stages of meiosis

- First division: reductive part
 - Prophase I: homologous chromosomes form pairs (**synapses**) and start to exchange DNA (**crossing-over**)
 - Metaphase I
 - Anaphase I: homologous chromosomes will go *independently* to different poles
 - Telophase I becomes Prophase II, without interphase (and typically without cytokinesis)
- Second division: equal part (similar to mitosis)
 - Prophase II
 - Metaphase II
 - Anaphase II
 - Telophase II



For Further Reading



Plant tissues.

http://en.wikipedia.org/wiki/Tissue_%28biology%29#Plant_tissues



Plants.

<http://en.wikipedia.org/wiki/Embryophyte>



[For the lab]: Mendel's laws.

http://en.wikipedia.org/wiki/Mendelian_inheritance

