Introduction to Botany. Lecture 11

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Outline

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Previous final question: the answer

What is the difference between primary and secondary cell walls?

- Secondary cell walls contain lignin and/or suberin
- Secondary cell walls cover dead cells

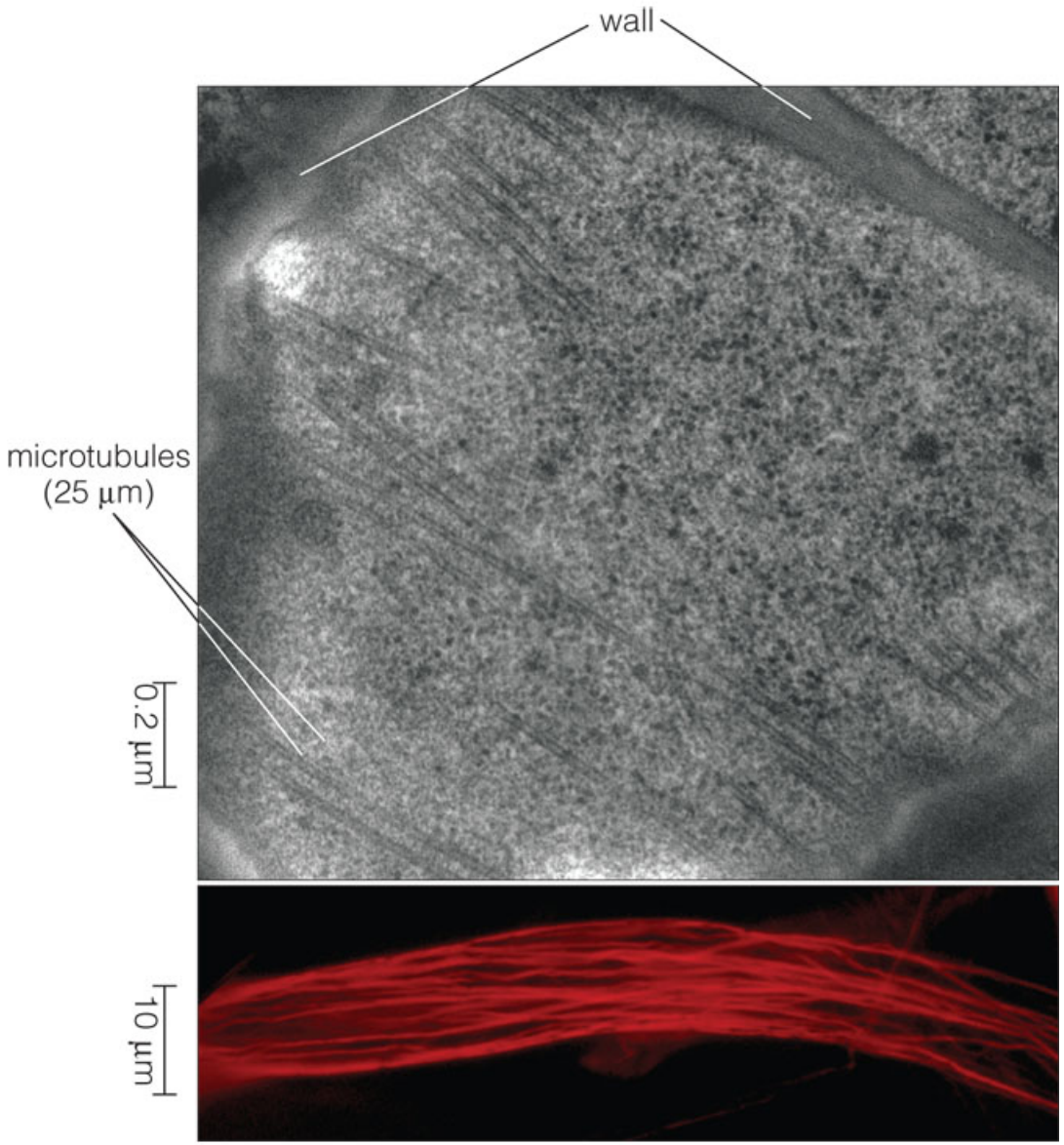
Cell
Other cell structures

Cellular skeleton

Collection of long, filamentous structures within cytoplasm:

- **Microtubules**. Movement based on tubulin-kinesins interactions. They are key organelles in cell division, form basis of cilia and flagella, serve as guides for the construction of cell wall
- **Microfilaments**. Movement based on actin-myosin interactions. Serve as guides for movement of organelles within cell

Cytoskeleton



Mitosis and meiosis

Mitosis

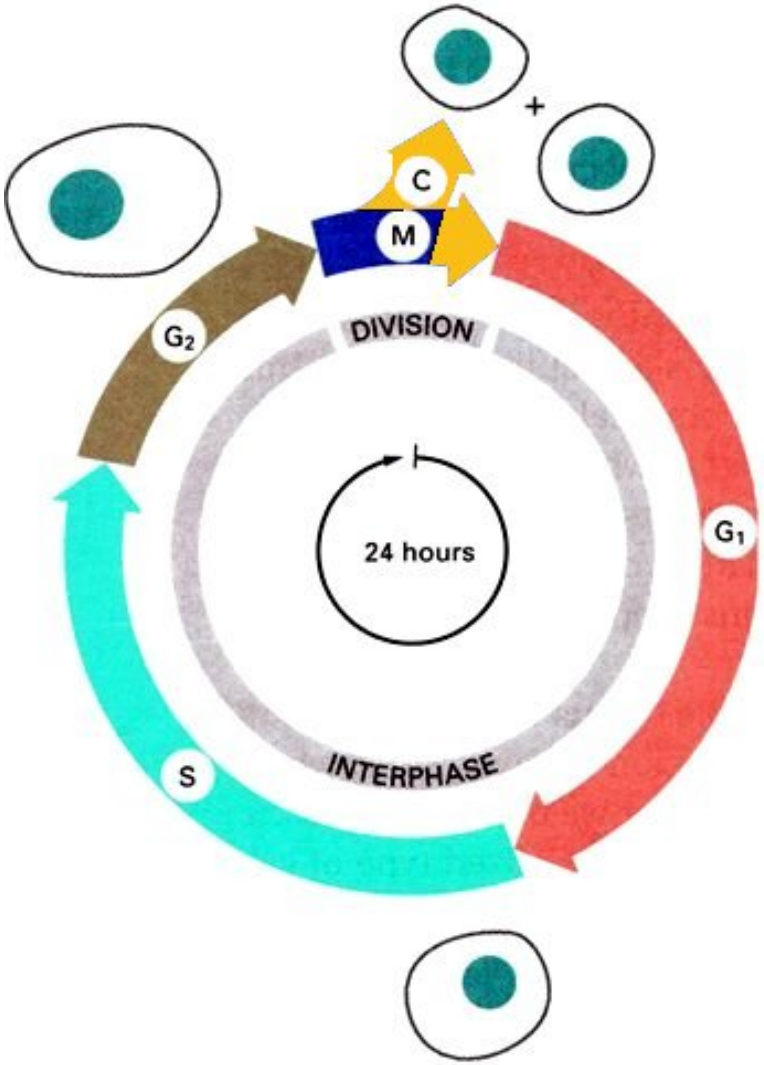
Definition of mitosis

- *Equal cell division, where each of daughter cells receives the same number of chromosomes as a mother cell*
- Chromosome formula: X $\longrightarrow$ I + I
- **The goal of mitosis** is the equal distribution of pre-synthesized DNA
- Mitosis does not change genotype of cells

Mitosis, karyokinesis and cytokinesis

- Mitosis is the kind of karyokinesis
- Cytokinesis is a different process, the part of **cell cycle**

Cell cycle

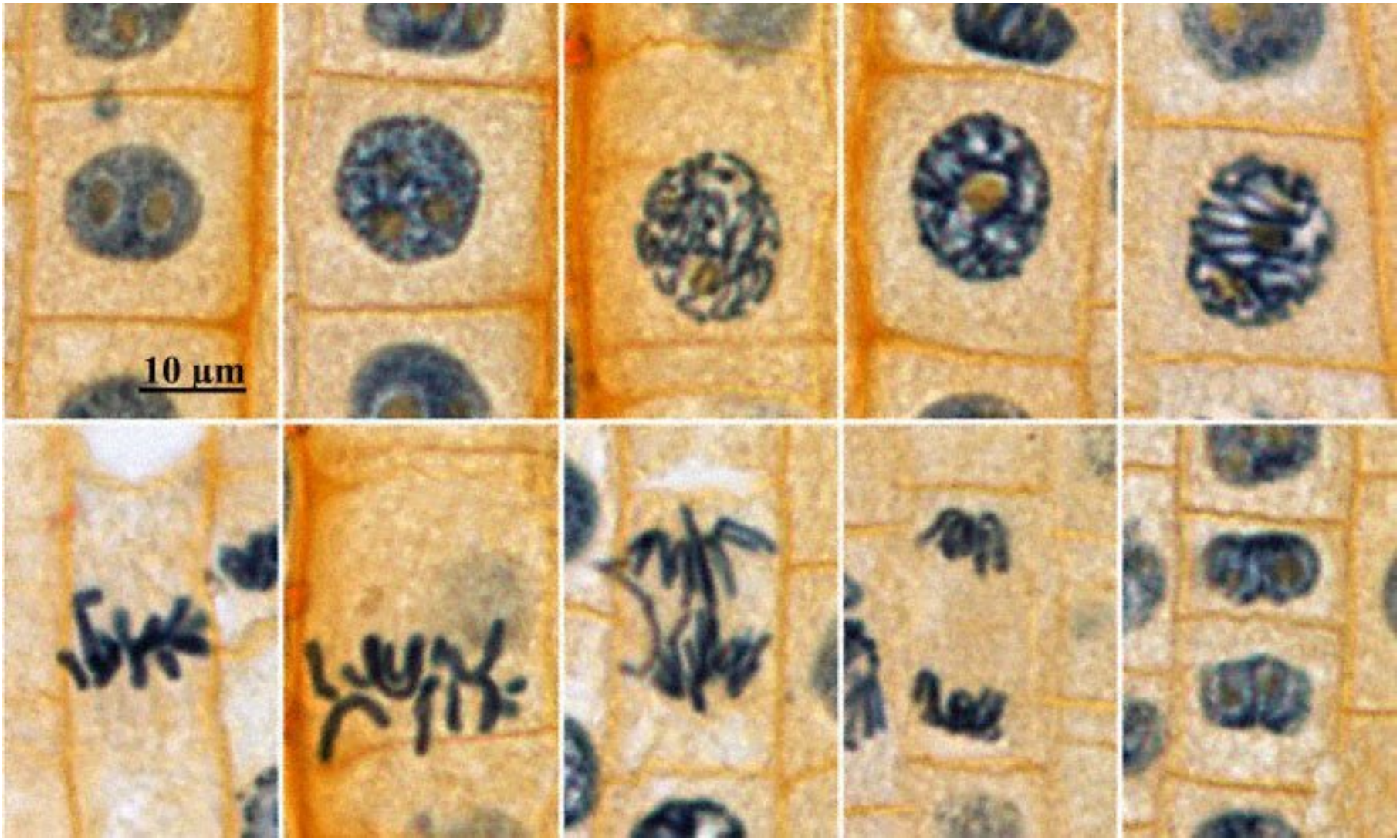


- Interphase
  - Pre-synthetic stage (G_1)
  - Sythetic stage (S): DNA duplicated
  - Post-synthetic stage (G_2)
- Mitosis
  - Prophase
  - Metaphase
  - Anaphase
  - Telophase
- Cytokinesis

Stages of mitosis

- Prophase
- Metaphase
- Anaphase
- Telophase

Which stage?



Mitosis and meiosis

Syngamy (Y!)

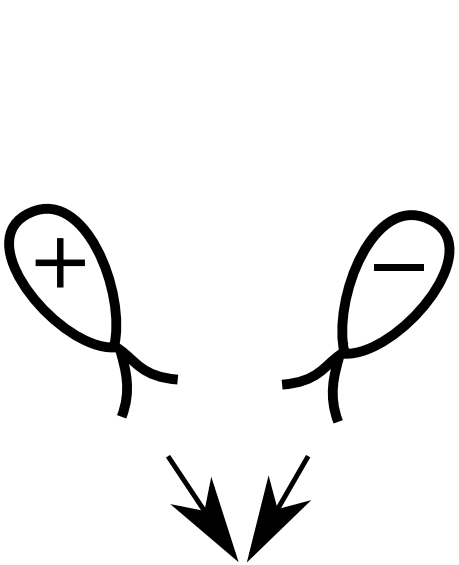
Exchange and renovation of DNA

- 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

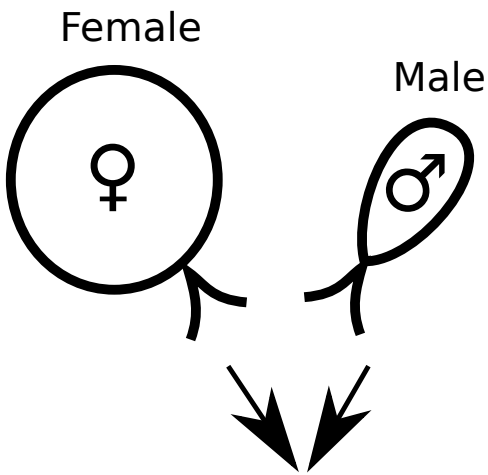
Definition of syngamy

- *Fusion of two cells, where resulted cell will have two times more chromosomes*
- Initial cells are **gametes**, resulted cell is a **zygote**
- Chromosome formula: X + X $\longrightarrow$ XX
- **The goal of syngamy** is the renovation of genetic material
- Syngamy changes genotype of cells

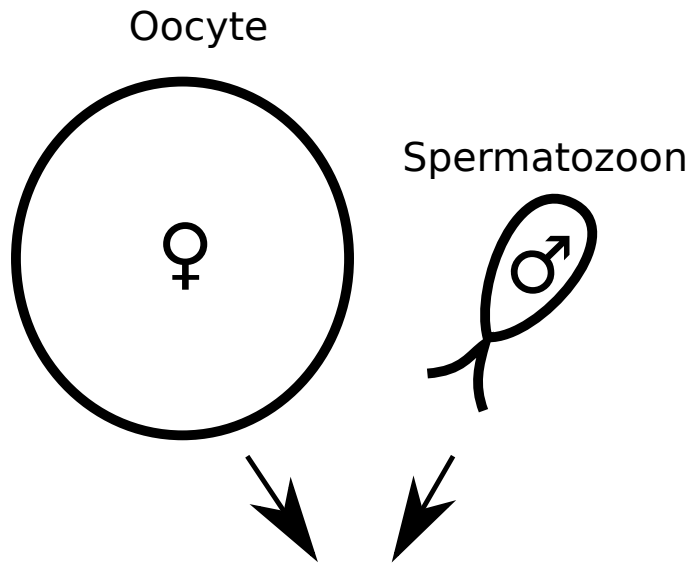
Types of syngamy



Isogamy: different genotypes



Heterogamy: different size



Oogamy: different motility

Summary

- **Mitosis** is a process of cell multiplication, ploidy stays constant, genotype does not change
- **Syngamy** is a sexual process of cell fusion, ploidy doubles, genotype changes
- **Meiosis** is a process of reduction of DNA amount, ploidy halves, genotype changes

For Further Reading

A. Shipunov.
Introduction to Botany [Electronic resource].
2015.
Mode of access:
http://ashipunov.info/shipunov/school/biol_154