

Introduction to Biology. Lecture 12

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September 21, 2012

Outline

- 1 Where we are?
 - Eukaryotic cell
- 2 Eukaryotic cell
 - Evolutionary steps towards the eukaryote
 - Cell division

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Where we are? Eukaryotic cell

ATP, carbohydrates, photosynthesis and respiration

- If organism is capable to convert sun energy into ATP, it is a phototroph
- If organism is using carbon dioxide to build its own organic (ATP is required here!), it is an autotroph
- Most of plants are photoautotrophs, because photosynthesis (combination of the above two processes) is prevalent in their life
- Animals are heterotrophs, they do respiration which is opposite to autotrophy: it breaks organic into inorganic and create ATP



Eukaryotic cell: pluses and minuses

- Flexible, but bigger and no cell wall
- Nucleus, but cell division will pose a problem
- Mitochondria are very effective, but less controlled

Eukaryotic cell

Evolutionary steps towards the eukaryote

Antibiotic resistance and actin

- Archebacteria were probably first prokaryotes who changed their biosynthetic pathways in order to become resistant to majority of antibiotics
- They also invented actin, the main protein of cytoskeleton

Ribosomes of core bacteria (A), archebacteria (B) and eukaryotes (C)



Taking mitochondria: symbiogenesis

- Mitochondria were separate organisms
- Eukaryotic cell is a “second-level” cell, cell from cells

Eukaryotic cell

Cell division

Cell cycle

- To multiple, cell should first store energy for DNA duplication
- Then—duplicate its DNA (S-period)
- And only then to divide DNA (mitosis) and the rest of cell (cytokinesis)

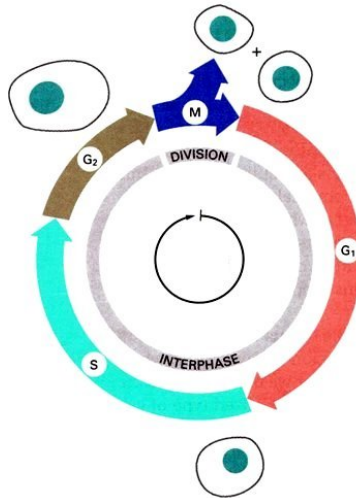
This is the **cell cycle**



Mitosis

- Mitosis is an equal division of nucleus where daughter cells will receive the same DNA information as mother cell
- **The goal of mitosis** is the equal distribution of pre-duplicated DNA
- Time between two cell divisions is called **interphase** so cell cycle = interphase + mitosis

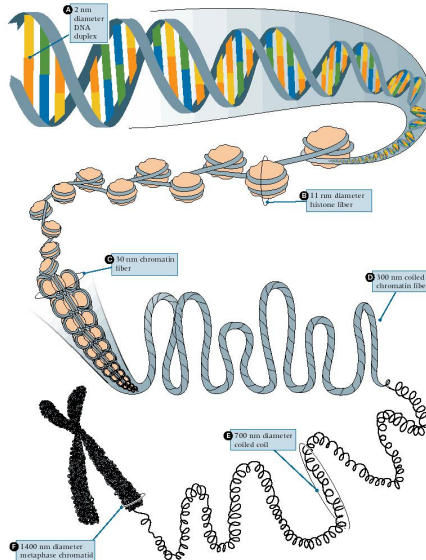
Cell cycle



Stages of mitosis

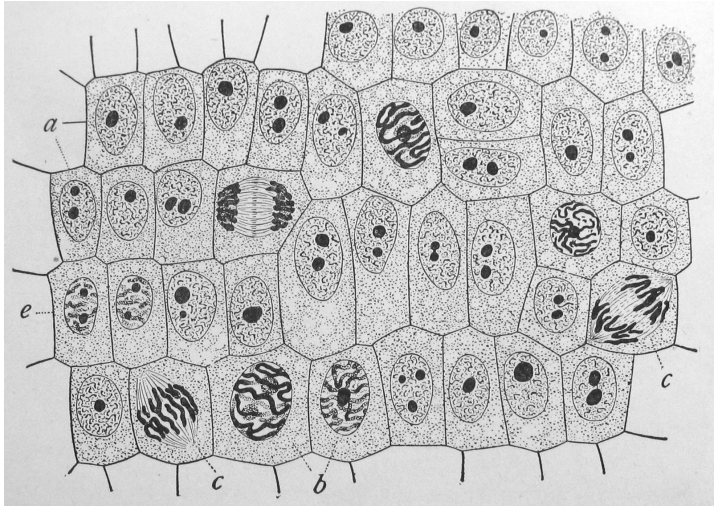
- Prophase
- Metaphase
- Anaphase
- Telophase

Super-coiling of DNA into chromosome

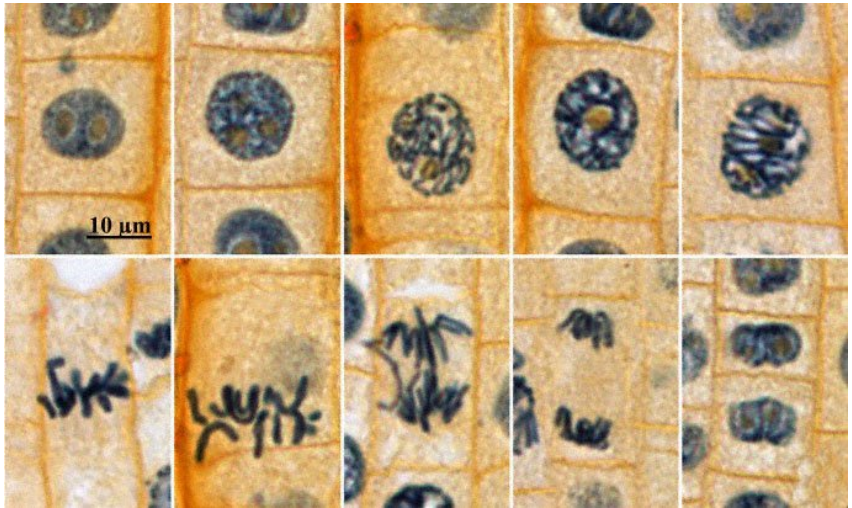


Stages of mitosis

Which stage? (drawing)



Which stage? (photo)



Summary

- Eukaryotic cell is a “second-level”, enhanced cell
- Symbiogenesis is one of evolutionary steps towards eukaryote
- Mitosis is an equal division of nucleus

For Further Reading



Symbiogenesis.

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



Mitosis.

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

