Introduction to Biology. Lecture 13

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Outline

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Where we are?
Eukaryotic cell

Eukaryotic cell

- *Cytoplasm is constantly flowing*
- *Membranes are using for construction of multiple internal organelles*

Eukaryotic cell

Organelles and their functions

Cytoskeleton

- Microtubules and microfilaments
- Phagocytosis
- Motility
- No cell wall (but note that plants and fungi developed cell wall again)
- Flagella “oar” which has no similarity with “rotor” flagella of prokaryotes

Nucleus

- Transcription and translation separated
- Cell division destroys nucleus
- Pores control all ins and outs

Mitochondria

- Respiration machines, make ATP
- Mitochondrial DNA

Taking mitochondria: symbiogenesis

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

Internal membrane system

- Vesicles: vacuoles, lysosomes etc.
- ER: canals
- AG: membrane stacks
  Both ER and AG control transportation of proteins and carbohydrates

Ribosomes

- Bigger then prokaryotic
- Associated with ER

Eukaryotic cell: pluses and minuses

- Flexible, but bigger and no cell wall
- Nucleus, but so many DNA poses a problem
- Mitochondria are very effective, but less controlled

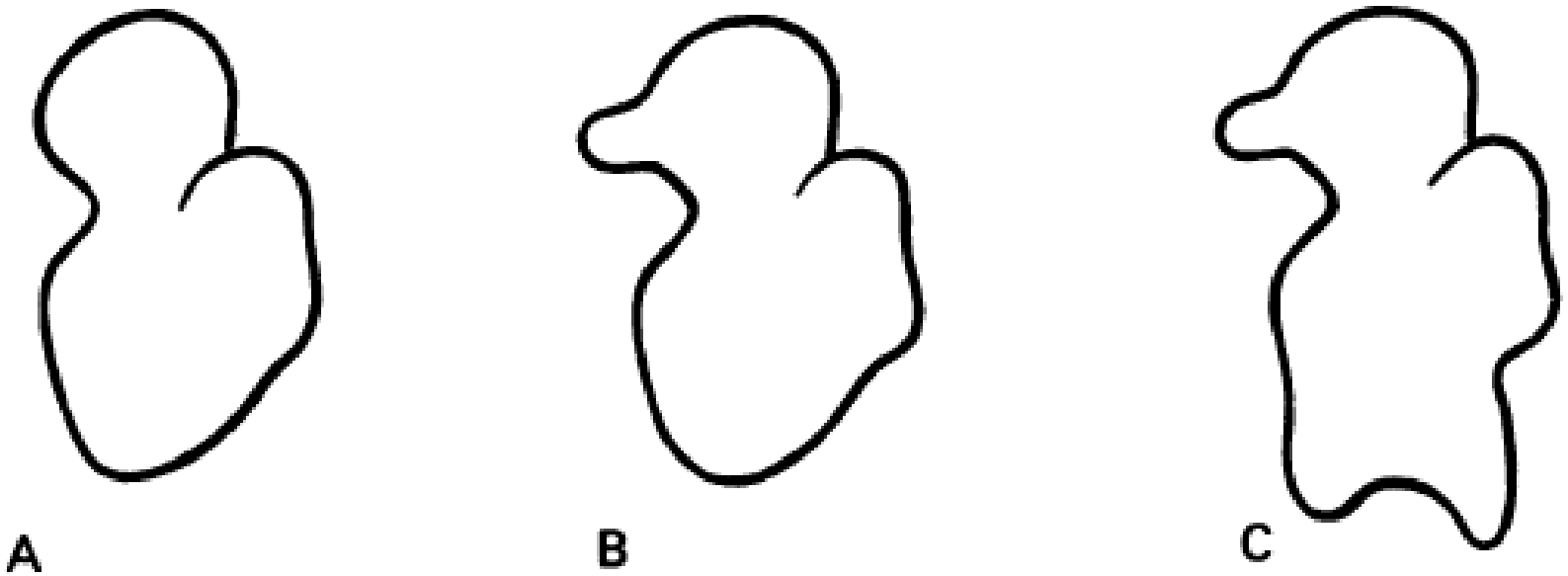
Eukaryotic cell

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)



Eukaryotic cell

Cell division

Cell cycle

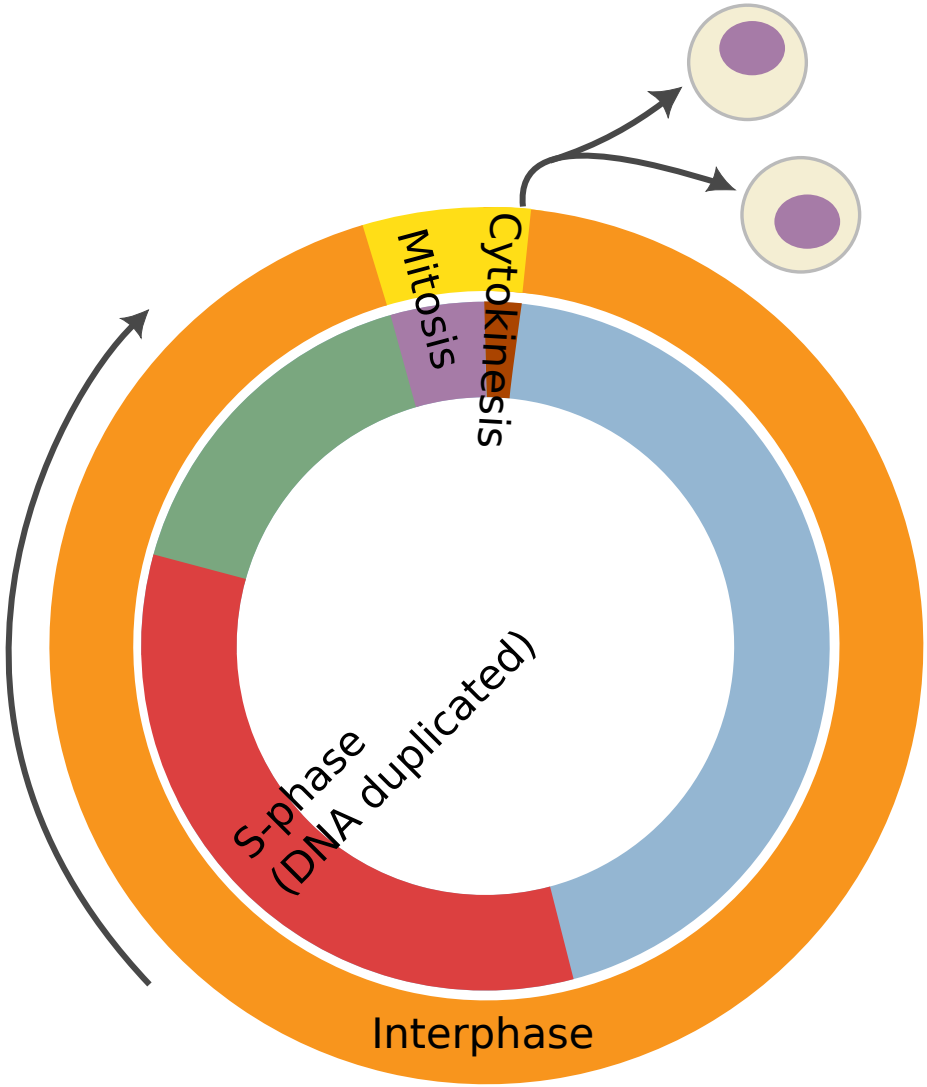
- To multiple, cell should first store energy for DNA duplication
- Then duplicate DNA during S-phase, synthetic phase (period)
- And only then to divide DNA (mitosis) and then rest of cell (cytokinesis)

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 + cytokinesis

Cell cycle



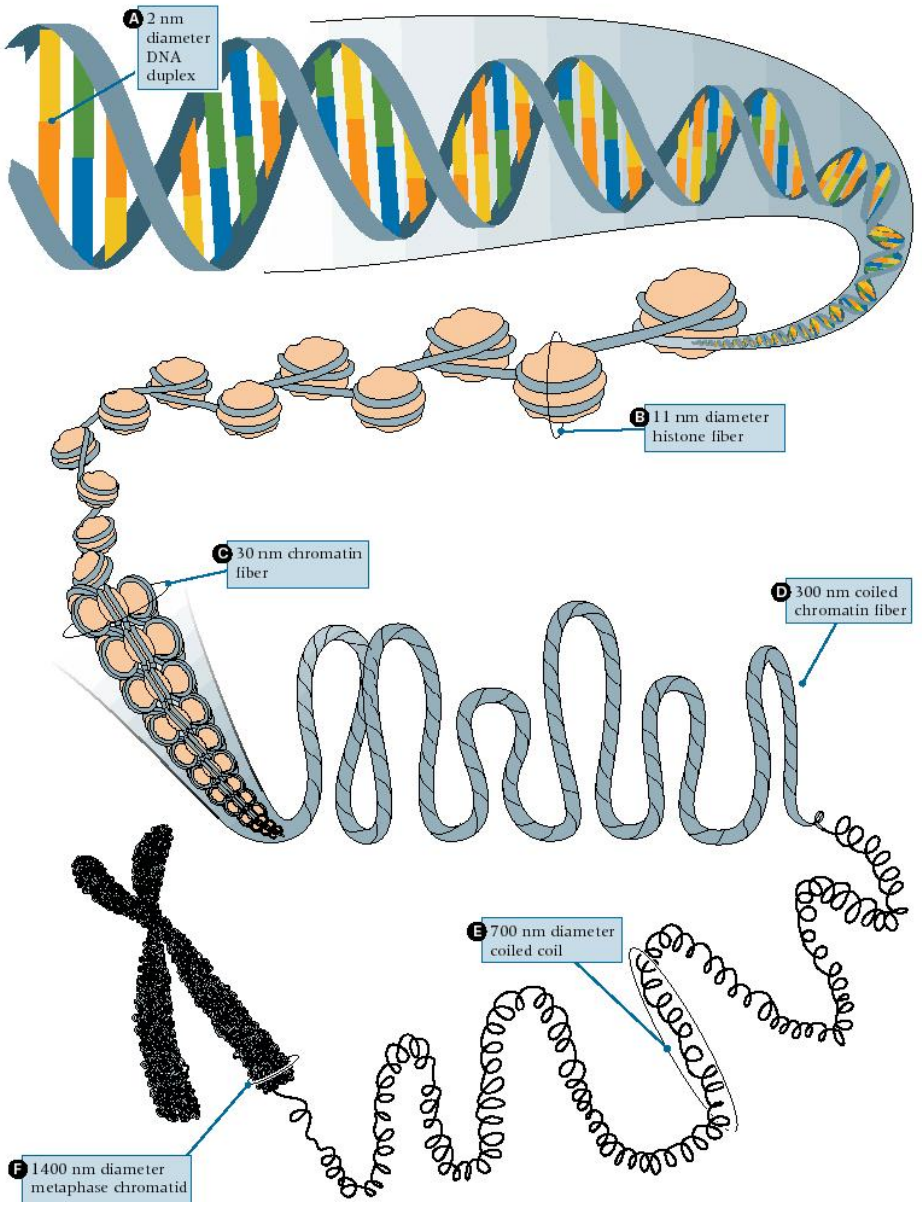
Eukaryotic cell

Mitosis

Stages of mitosis

- Prophase
- Metaphase
- Anaphase
- Telophase

Super-coiling of DNA into chromosome



Stages of mitosis

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

Eukaryote.
`http://en.wikipedia.org/wiki/Eukaryote`

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

Mitosis.
`http://en.wikipedia.org/wiki/Mitosis`