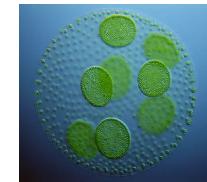


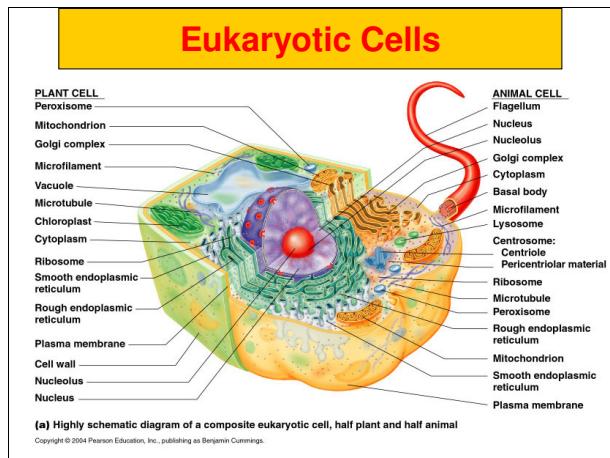
Eukaryote Form and Function

Lecture 6

Learning Outcomes

- Eukaryote cell structure
- Organelles and their functions
- Evolution of eukaryote cells





(Eukaryotic) Flagella and Cilia

- Pair of microtubules surrounded by 9 pairs
- 9 + 2
- Extensions of cytoskeleton
- Flagellum
 - Single long fiber
 - Whiplike motion
- Cilia
 - Numerous short bristles
 - Coordinated sweeping motion
 - E.g. Paramecium
 - E.g. Lining of respiratory system

(a) (b)

(c)

(d)

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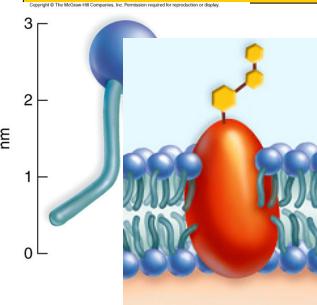
- Cellulose
 - Polysaccharide of Glucose
 - Green algae
 - plants
- Chitin
 - Polysaccharide of N-Acetyl Glucosamine (NAG)
 - Fungi
- No Cell Wall
 - Protozoa - pellicle protein layer
 - Animal cells - glycocalyx extra cellular matrix

Eukaryotic Cell Walls



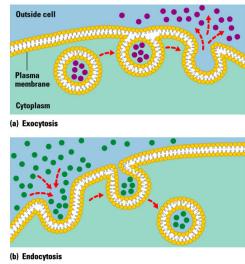
- Phospholipid bilayer and proteins
- Eukaryotic cells
 - Sterols
 - Resistance to lysis
 - Cholesterol - anima
 - Ergosterol - fungi
- Surface glycolipids and glycoproteins
 - Cell-cell attachment
 - Cell-cell recognition
- Endocytosis
 - Phagocytosis
 - pinocytosis

Plasma Membrane



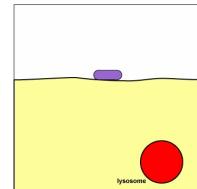
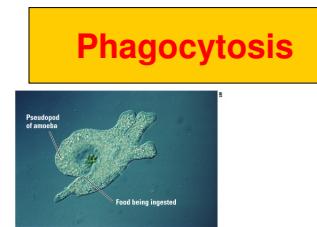
Endocytosis and Exocytosis

- Exo
 - Transport of substances out
 - Proteins
 - Mucus
 - Enzymes
 - Antibodies
 - Endo
 - Transport of substances in



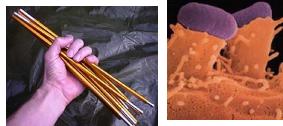
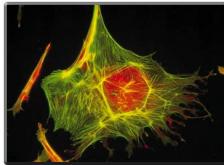
Phagocytosis

- Eating
 - Amoebas
 - White blood cells
 - Neutrophils
 - Macrophages
 - Membrane bound vacuole
 - phagosome
 - Lysosome fusion to form phagolysosome



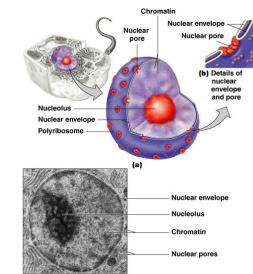
- Everything between plasma membrane and nucleus
- Cytosol
 - Only fluid
- Cytoskeleton
- Actin filaments
 - Internal structure
- Microtubules
 - movement
- Organelles
 - 'little organs'
 - Structures with specialized metabolic functions

Cytoplasm



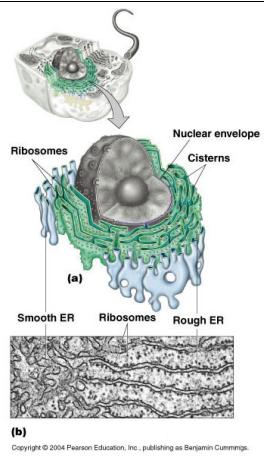
- Location of hereditary information
 - DNA
- Nuclear envelope
 - Nuclear pores
- Chromatin
 - Histones
 - Chromosomes
- Nucleolus
 - Ribosome manufacture

Nucleus



Endoplasmic Reticulum

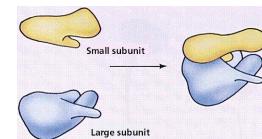
- Complex of flat membranous sacs of phospholipids
 - Cisterns
- Rough ER
 - Continuous with nucleus
 - Studded with ribosomes
 - Synthesizes secretory proteins and membrane proteins
- Smooth ER
 - No ribosomes
 - Synthesizes fats, steroids, phospholipids
 - Peroxisomes



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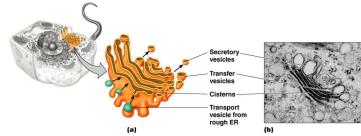
Ribosomes

- Composed of proteins and rRNA
- Larger and denser than prokaryotic
- 80s v 70s
 - Large subunit 60s
 - Small 40s
- Rough ER
 - Protein synthesis

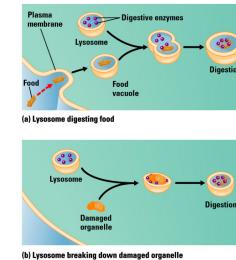


Golgi Apparatus

- Protein processing
 - 3-20 cisterns
 - Transport vesicles
 - → glycoproteins
 - → glycolipids
 - → lipoproteins
 - Secretory vesicles
 - Lysosomes

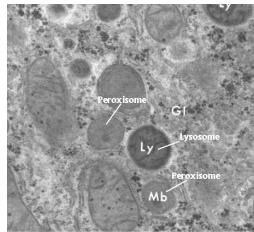


- Sacs of digestive enzymes
 - Formed in Golgi Apparatus
 - Digest
 - Old organelles
 - Molecules
 - Bacteria
 - Granular white blood cells
 - Neutrophils



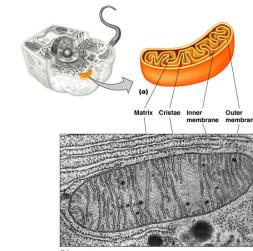
Peroxisomes

- Peroxisomes
- Oxidase enzyme
- oxidize fats, amino acids, toxins
 - create H_2O_2
- Catalase
 - $\rightarrow H_2O_2 \rightarrow H_2O + O_2$

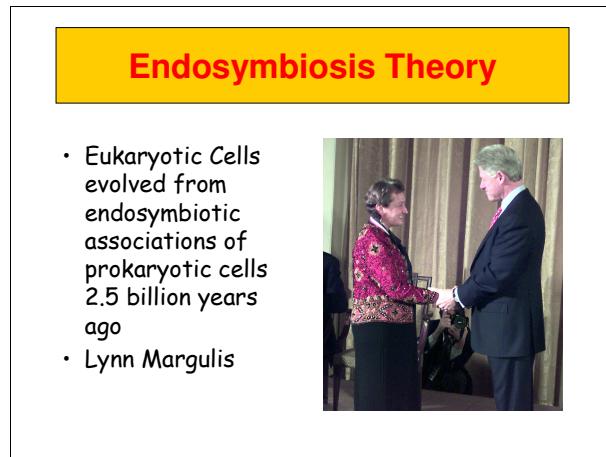
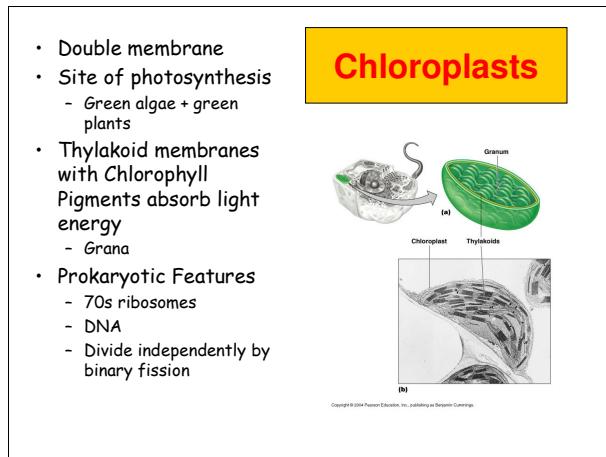


- Double membrane
- Cristae
 - Folded inner membrane
 - Studded with enzymes
- Matrix
 - Space within inner membrane
- Synthesis of ATP
- Prokaryotic Features
 - 70s ribosomes
 - MtDNA
 - Divide independently by binary fission
 - Can be affected by some antibiotics

Mitochondria

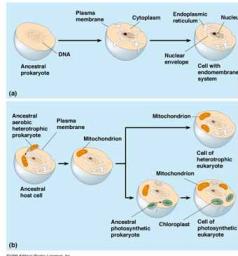


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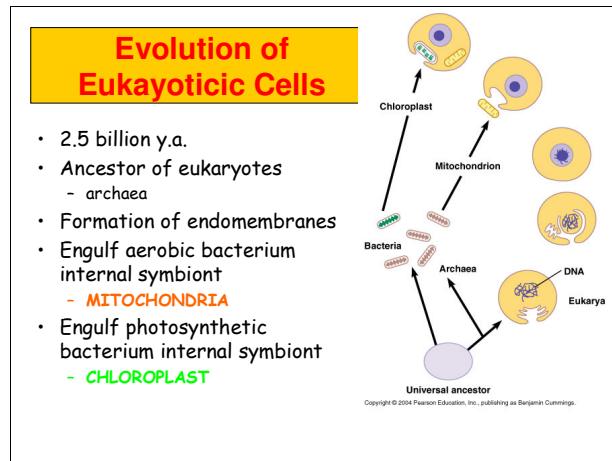
Endomembranes

- Formed from infoldings of plasma membrane
 - Nuclear membrane
 - Endoplasmic Reticulum
 - Loss of bacterial cell wall



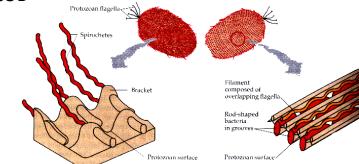
Symbiosis

- Bacteria engulfed but not digested
 - Vacuole = double membrane
 - Photosynthetic bacteria Host Cell
 - » → carbohydrate
 - » ← accommodation
 - Aerobic bacteria Host Cell
 - » → energy
 - » ← nutrients



- Termites cannot digest cellulose
- Hindgut symbionts
 - Protozoa
 - *Trichonympha shaerica*
 - Cannot digest cellulose
- Protozoal Endosymbionts
 - Bacteria
 - Digest cellulose
- Ectosymbionts
 - Spirochetes as flagella^a

Termite microfauna



Secondary Endosymbiosis

- Eukaryotes engulfing Eukaryotes
 - An algae engulfed by another protist
 - Chloroplast surrounded by 3-4 membranes
 - Many Protists evolved by secondary symbiosis
 - Red Algae - Rhodophyta

