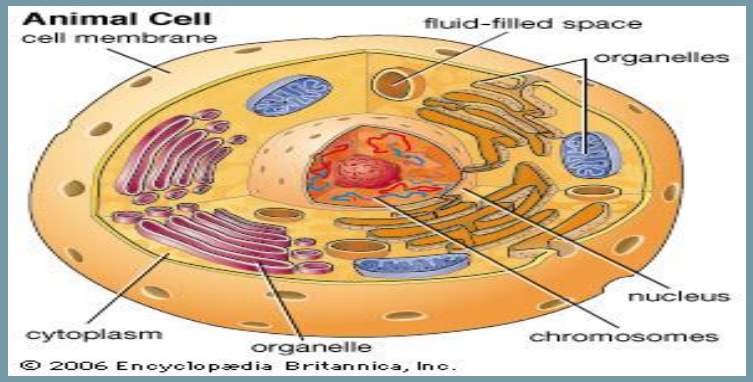
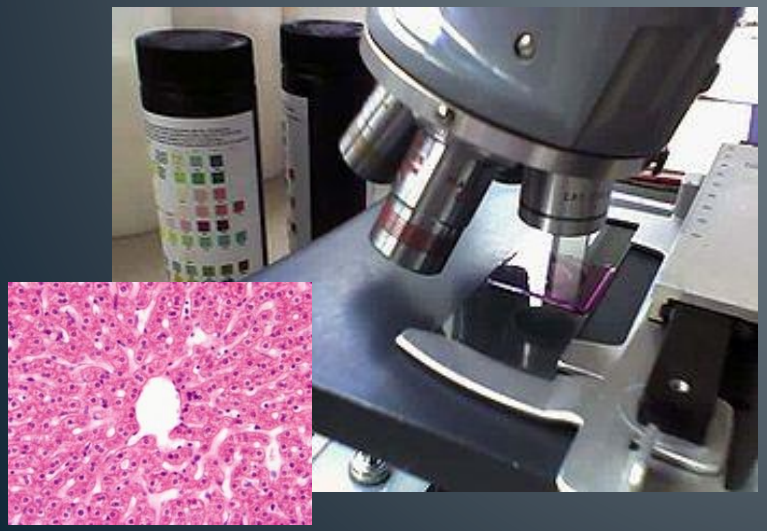
Structure of the cell

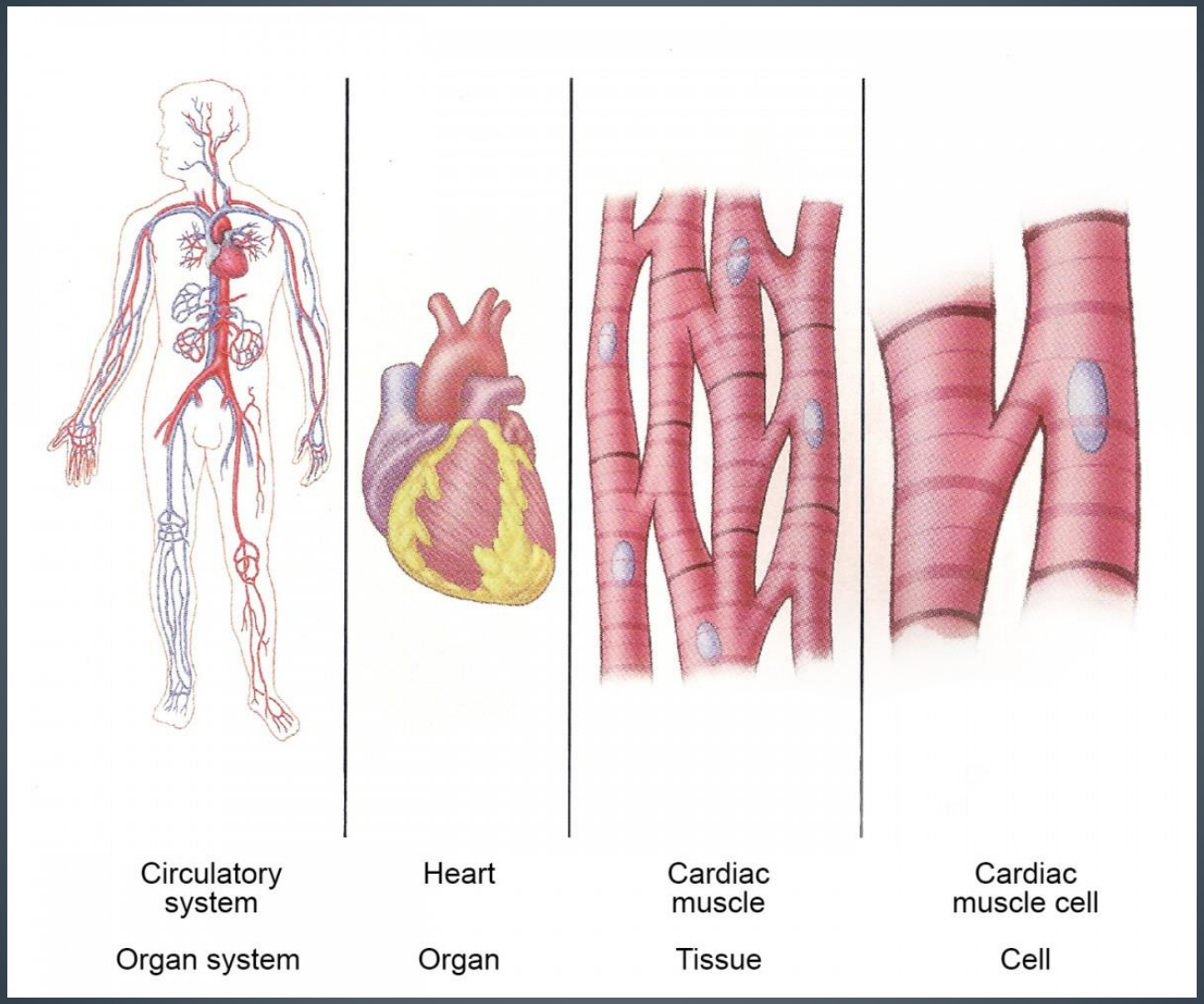


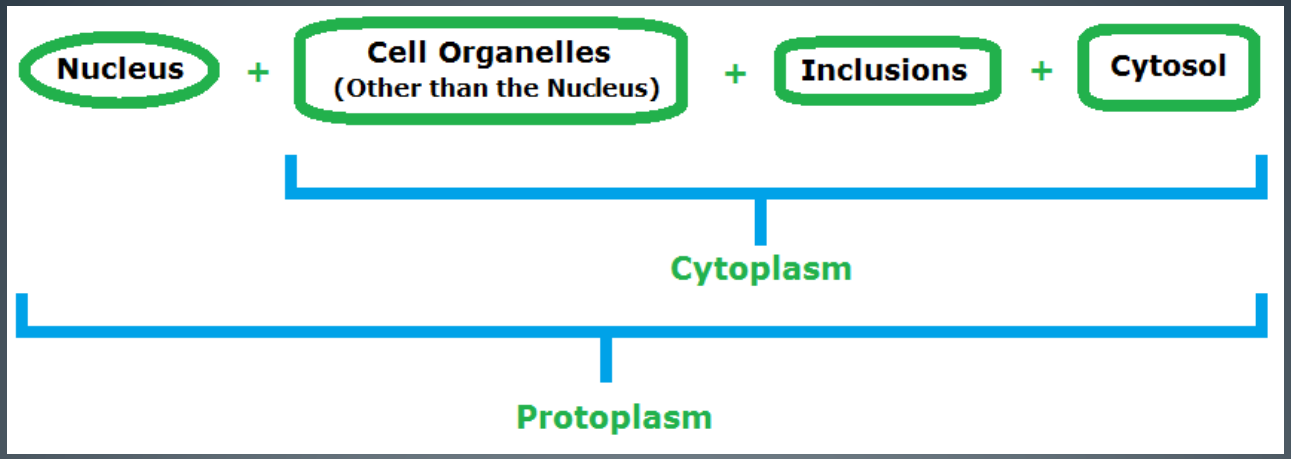
Anatomy

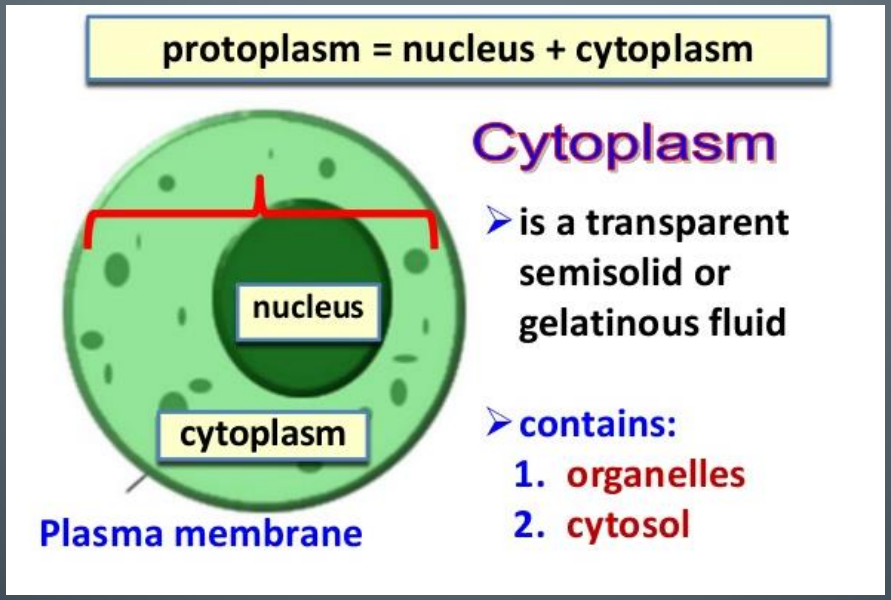
- 1-Gross anatomy (Macroscopic A.)
- 2-Histology (Microscopic A.)
- 3-Embryology
- 4-Ultra structural

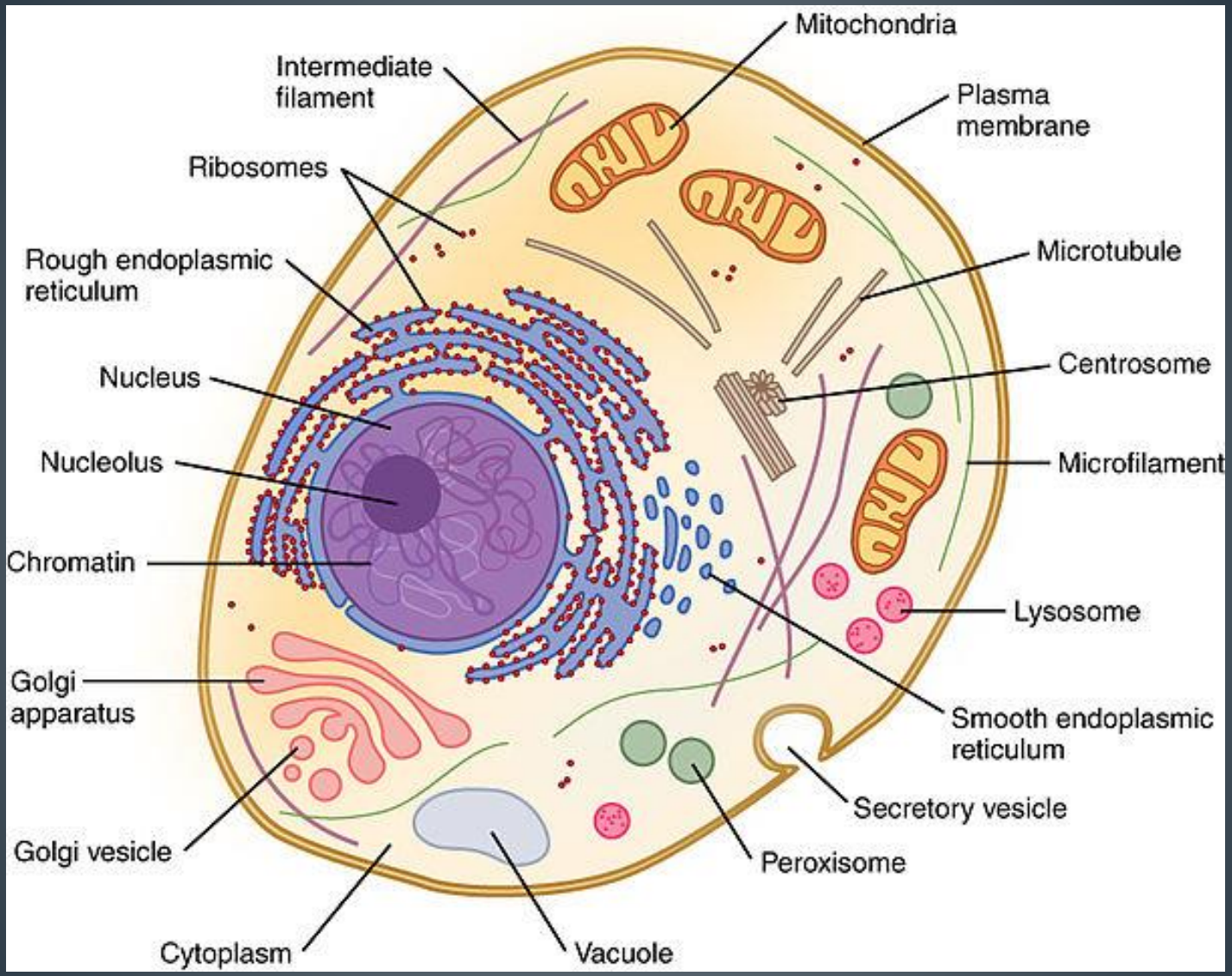
- 1-Applied A.
- 2-Topograghic A.
- 3-Systemic A.
- 4-Comparative A.
- 5.Functional A.
- 6.Radiographic A.

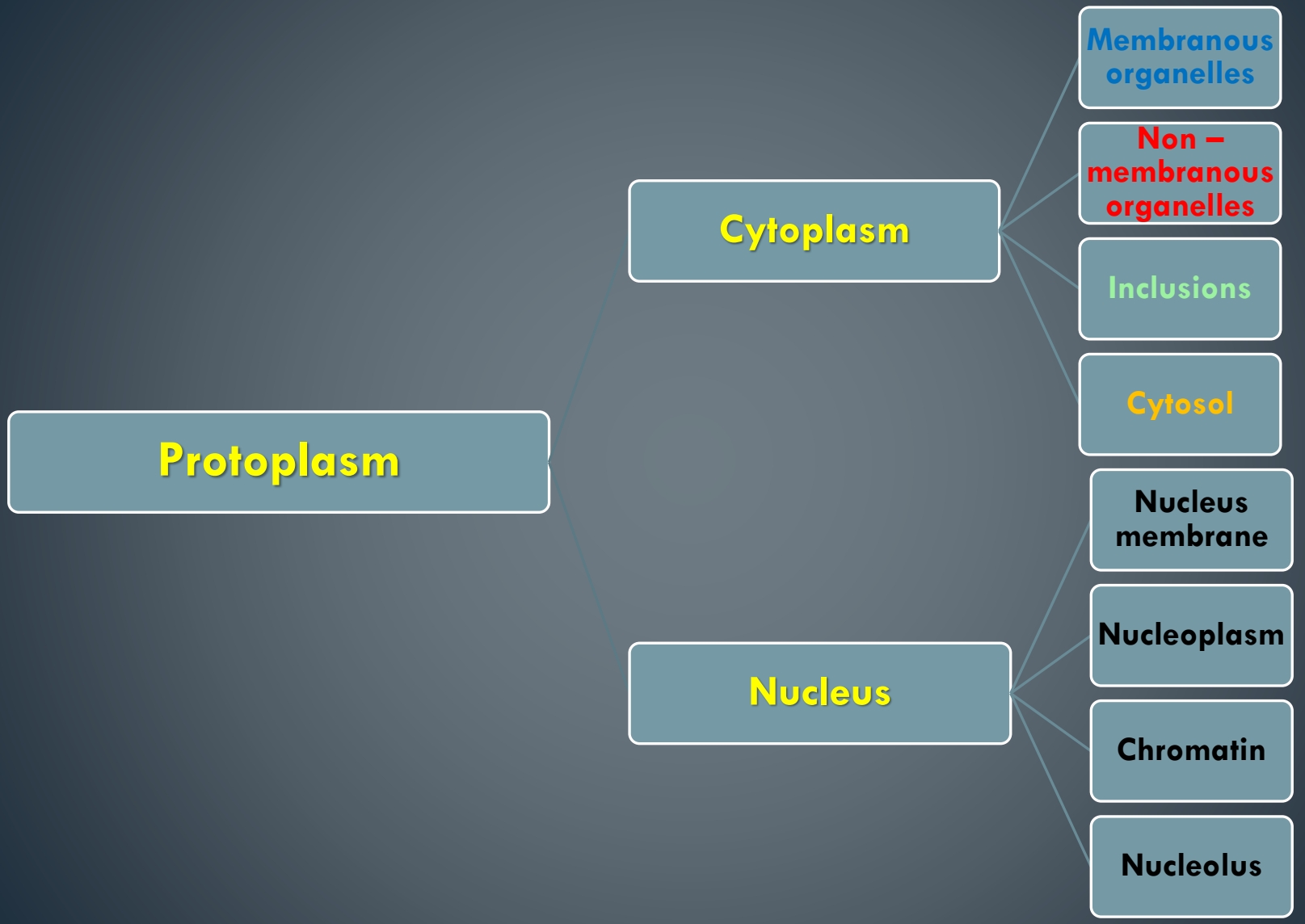



Circulatory system
Organ system
Heart
Organ
Cardiac muscle
Tissue
Cardiac muscle cell
Cell


Nucleus
+
Cell Organelles
(Other than the Nucleus)
+
Inclusions
+
Cytosol
Cytoplasm
Protoplasm

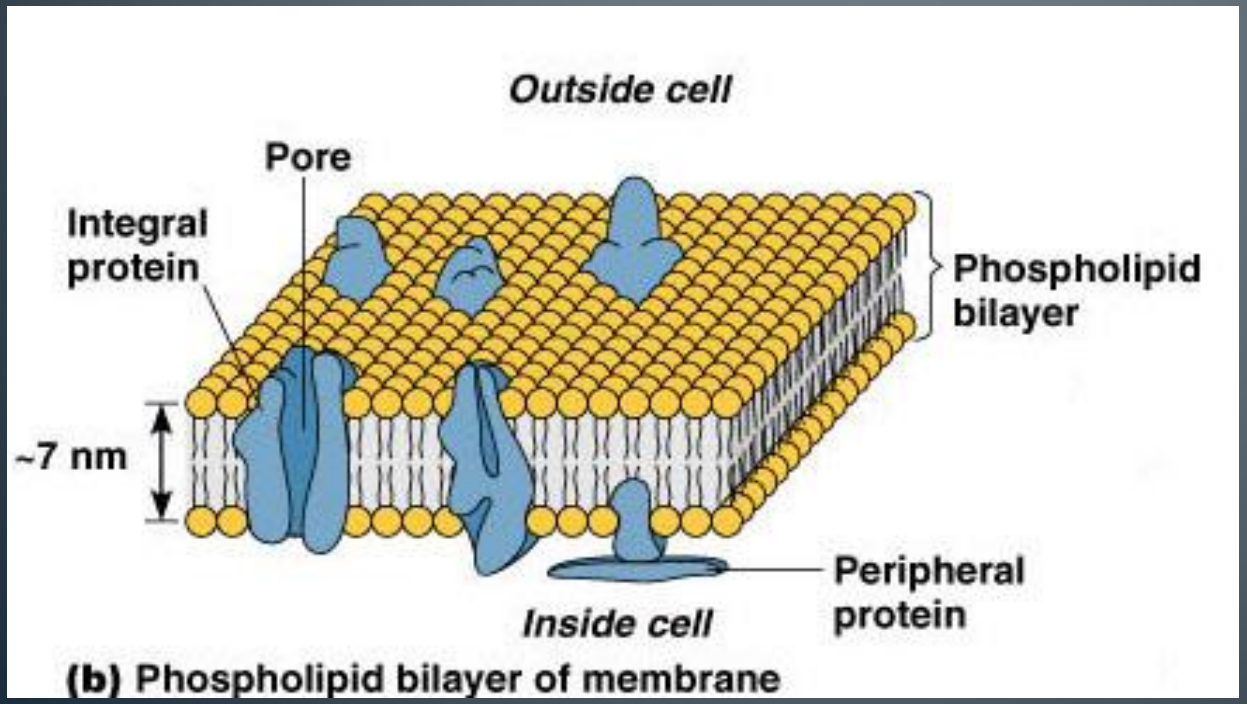

protoplasm = nucleus + cytoplasm
nucleus
cytoplasm
Plasma membrane
Cytoplasm
is a transparent semisolid or gelatinous fluid
contains:
1. organelles
2. cytosol


Mitochondria
Intermediate filament
Plasma membrane
Ribosomes
Rough endoplasmic reticulum
Microtubule
Nucleus
Centrosome
Nucleolus
Microfilament
Chromatin
Lysosome
Golgi apparatus
Smooth endoplasmic reticulum
Secretory vesicle
Golgi vesicle
Peroxisome
Cytoplasm
Vacuole

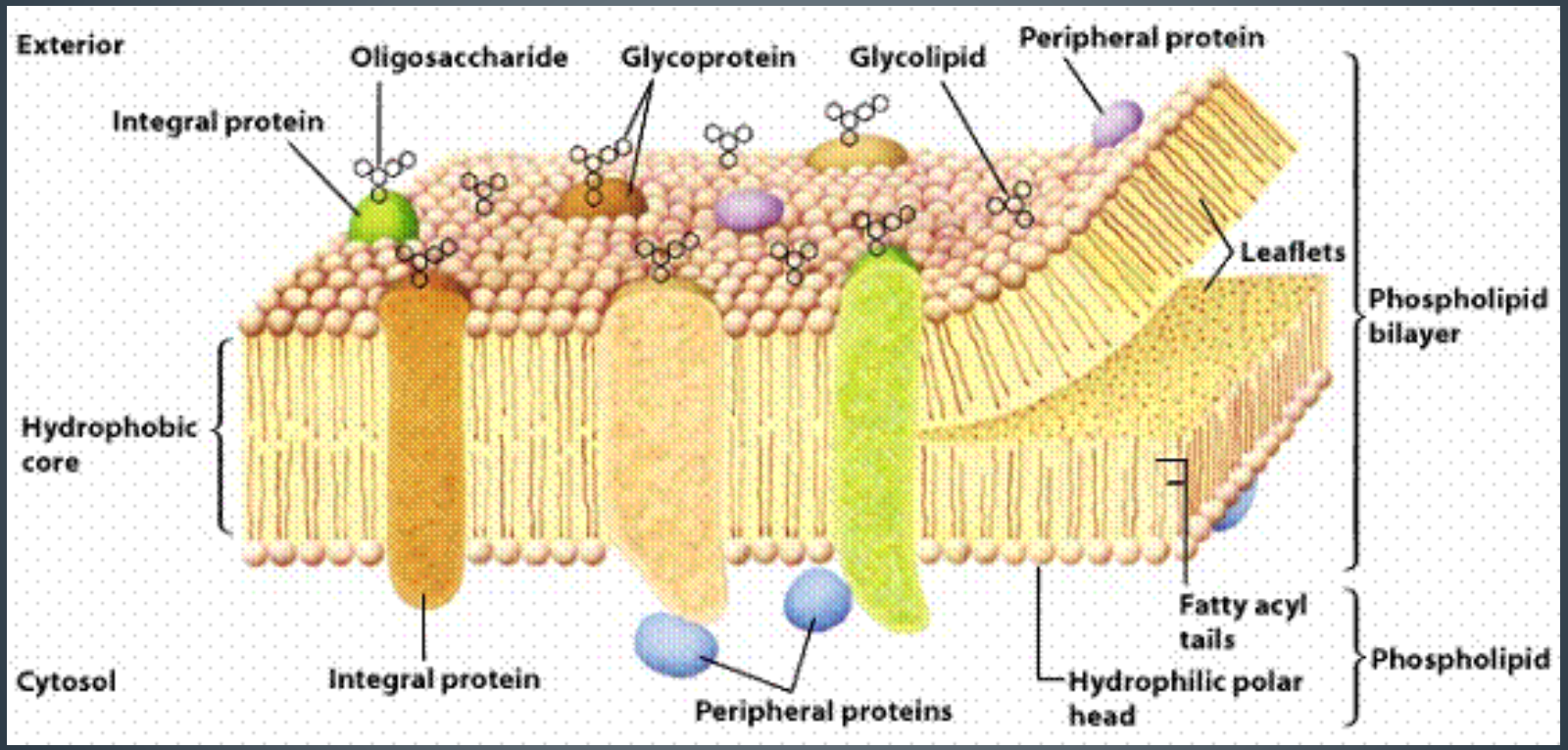

Protoplasm
Cytoplasm
Membranous organelles
Non – membranous organelles
Inclusions
Cytosol
Nucleus
Nucleus membrane
Nucleoplasm
Chromatin
Nucleolus

Cell Membrane

- Boundary of the cell
- Made of a phospholipid bilayer

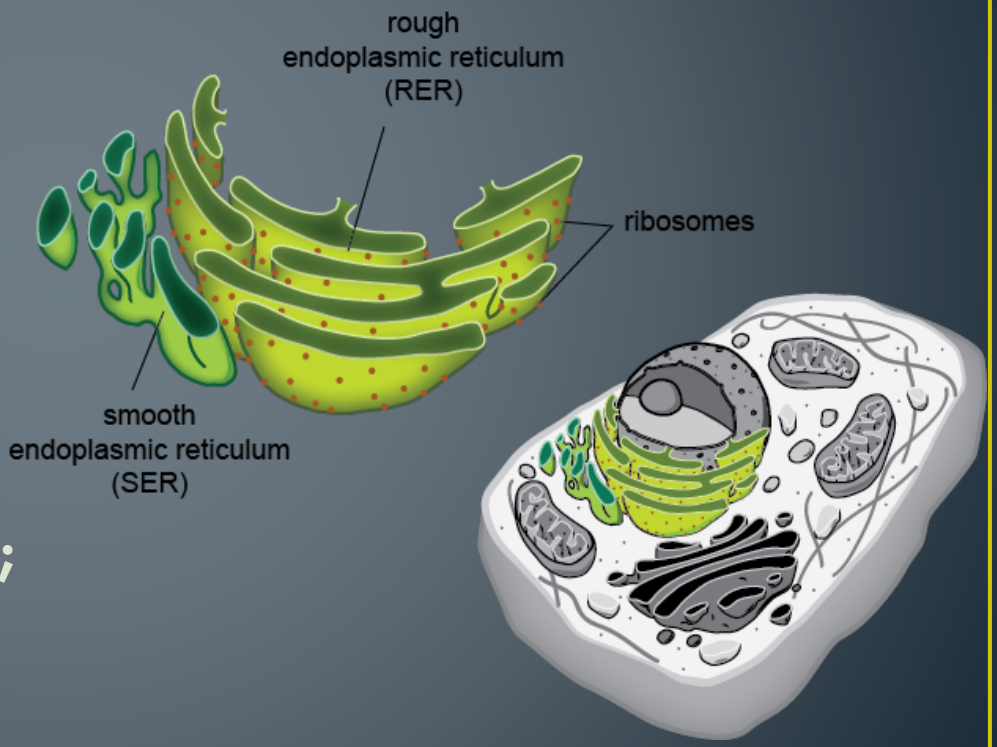


Glycocalyx


Exterior
Oligosaccharide
Glycoprotein
Glycolipid
Peripheral protein
Integral protein
Leaflets
Phospholipid bilayer
Hydrophobic core
Fatty acyl tails
Phospholipid
Cytosol
Integral protein
Peripheral proteins
Hydrophilic polar head

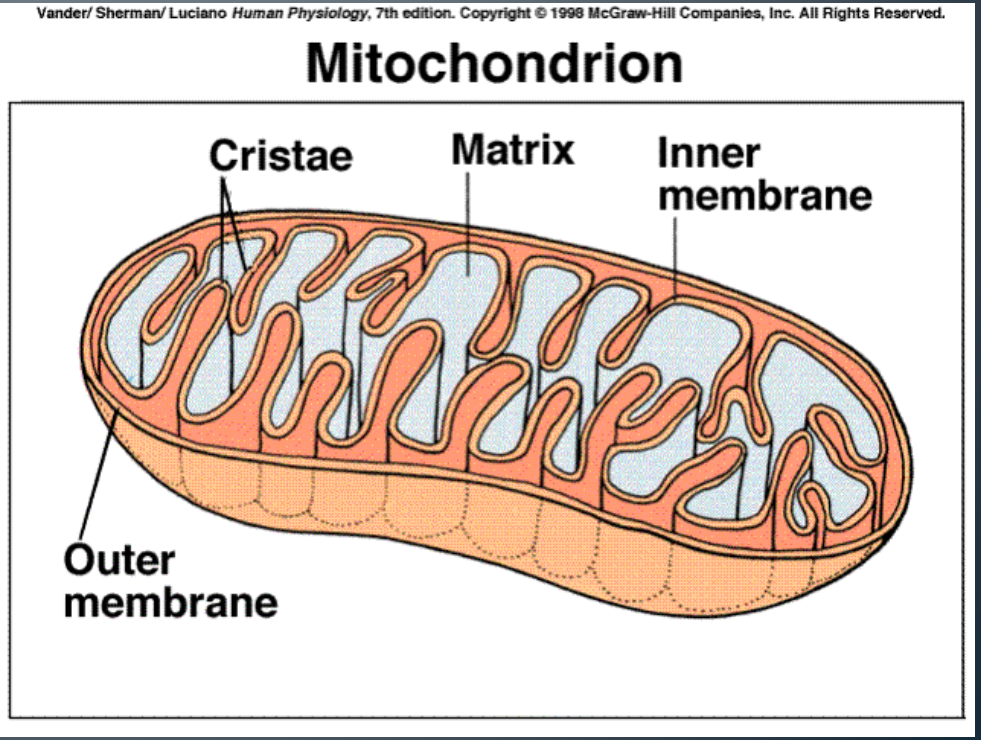
Endoplasmic Reticulum

- A.k.a. "ER"
- Connected to nuclear membrane
- Highway of the cell
- Rough ER: studded with ribosomes; it makes proteins
- Smooth ER: no ribosomes; it makes lipids



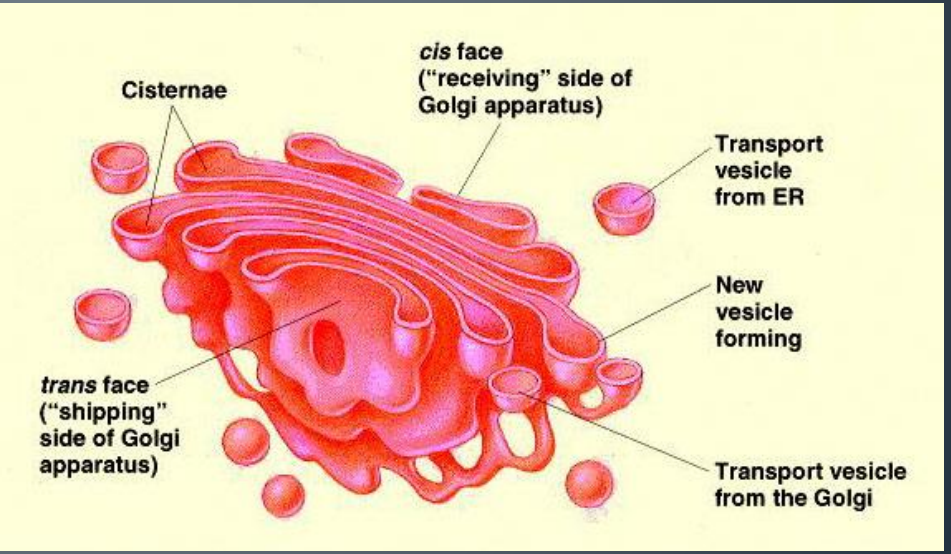
Mitochondria

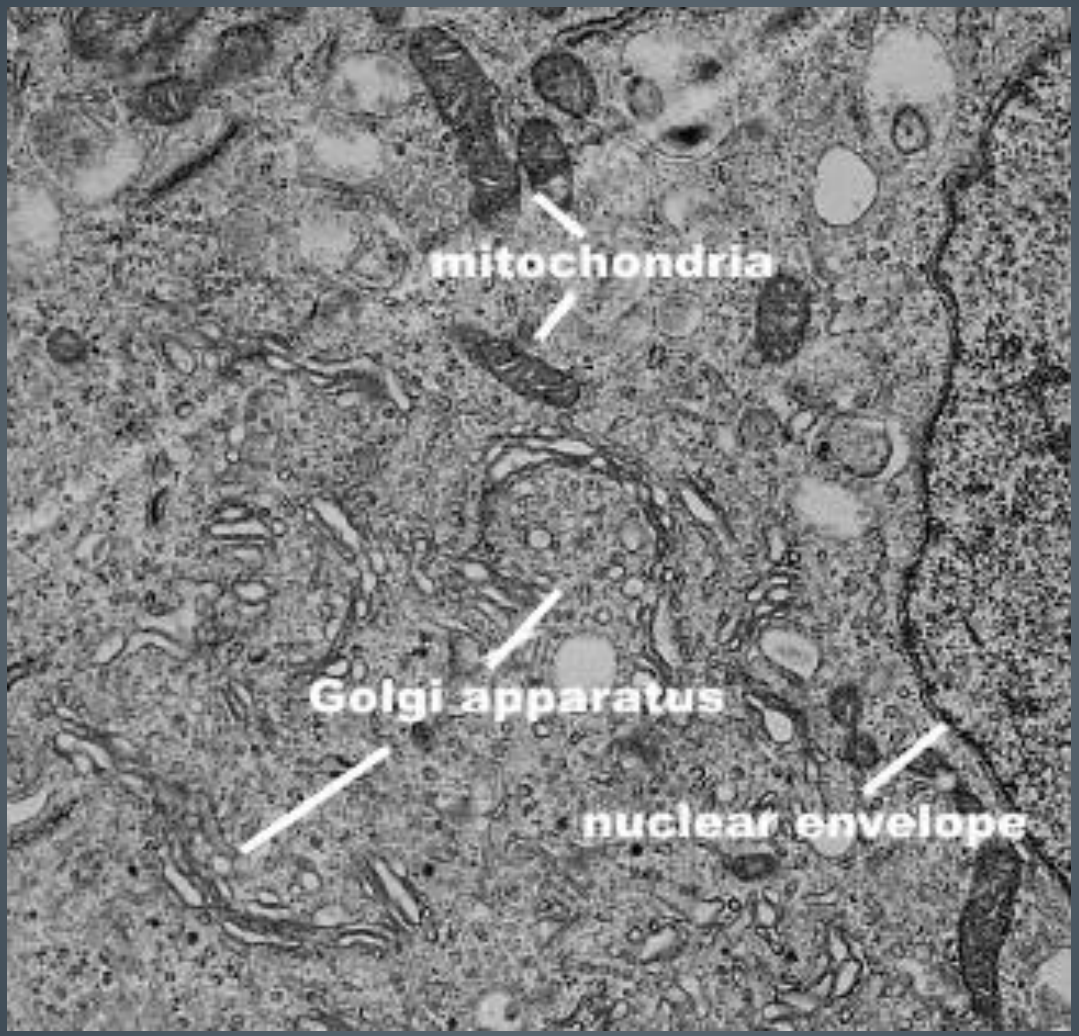
- "Powerhouse of the cell"
- Cellular respiration occurs here to release energy for the cell to use
- Bound by a double membrane
- Has its own strand of DNA



Golgi Apparatus

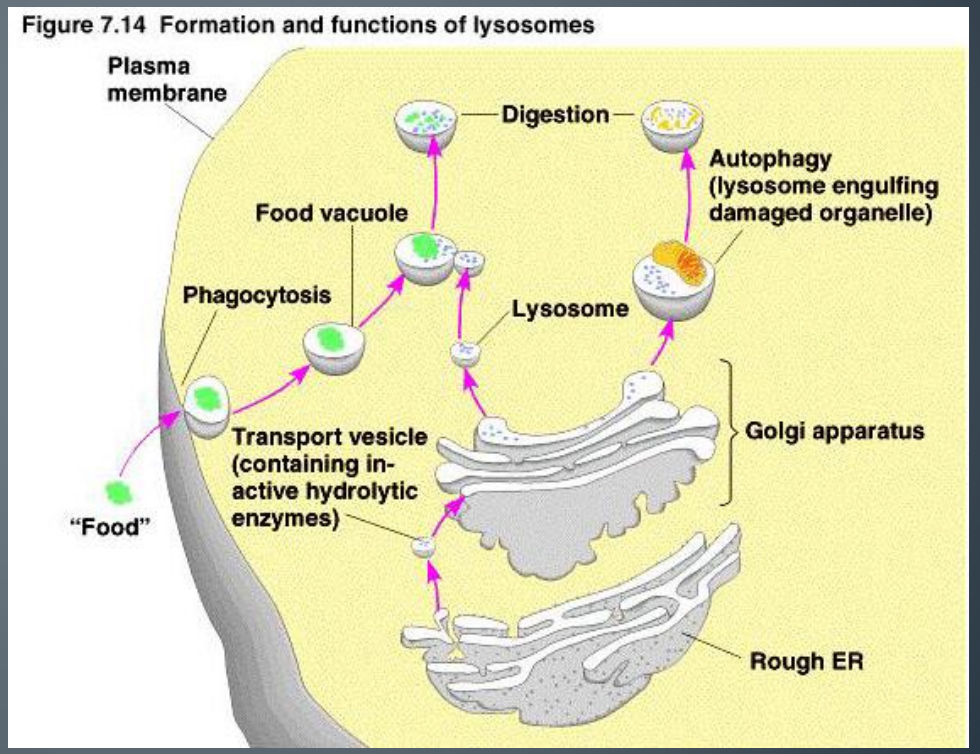
- Looks like a stack of plates
- Stores, modifies and packages proteins
- Molecules transported to and from the Golgi by means of vesicles




mitochondria
Golgi apparatus
nuclear envelope

Lysosomes

- Garbage disposal of the cell
- Contain digestive enzymes that break down wastes



Peroxisome

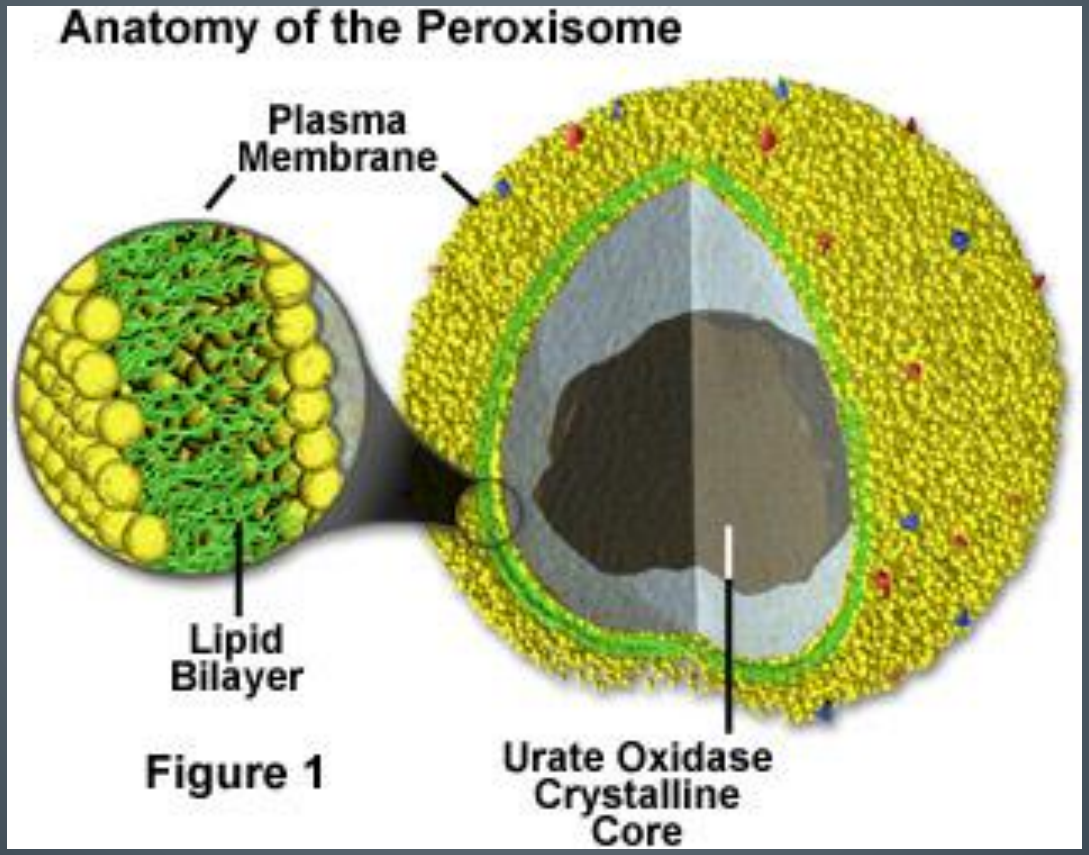
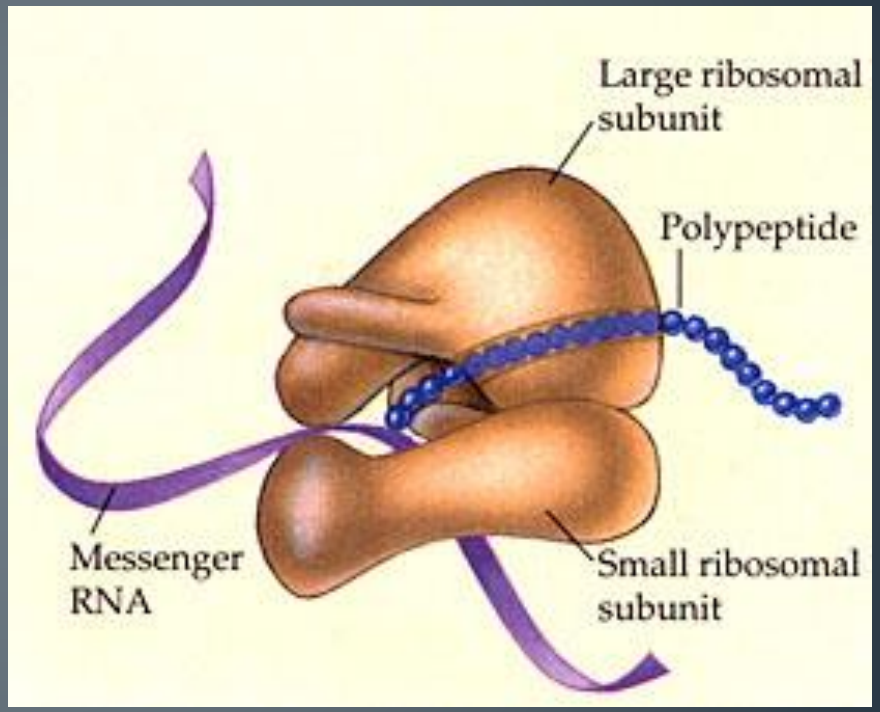


Figure 1

Ribosome

- Site of protein synthesis
- Found attached to rough ER or floating free in cytosol
- Produced in a part of the nucleus called the nucleolus



Microtubule

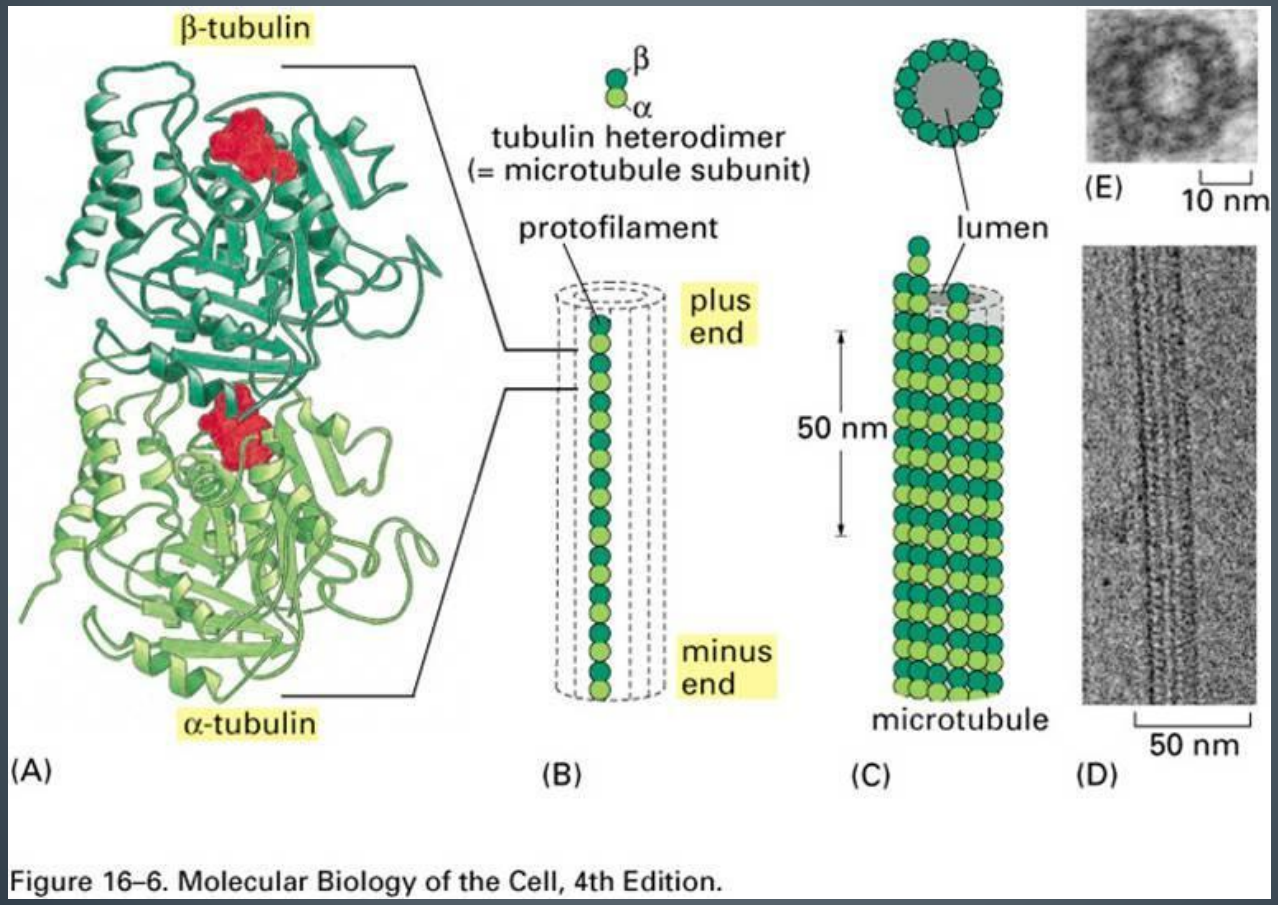
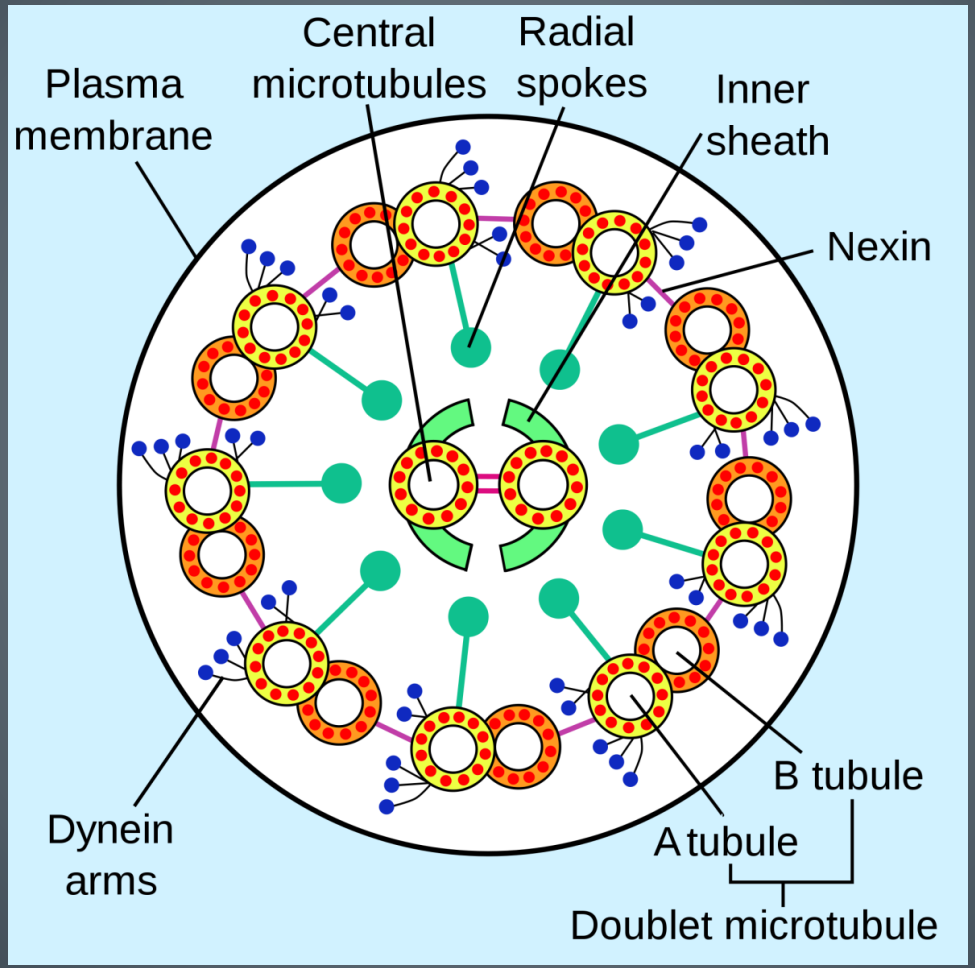
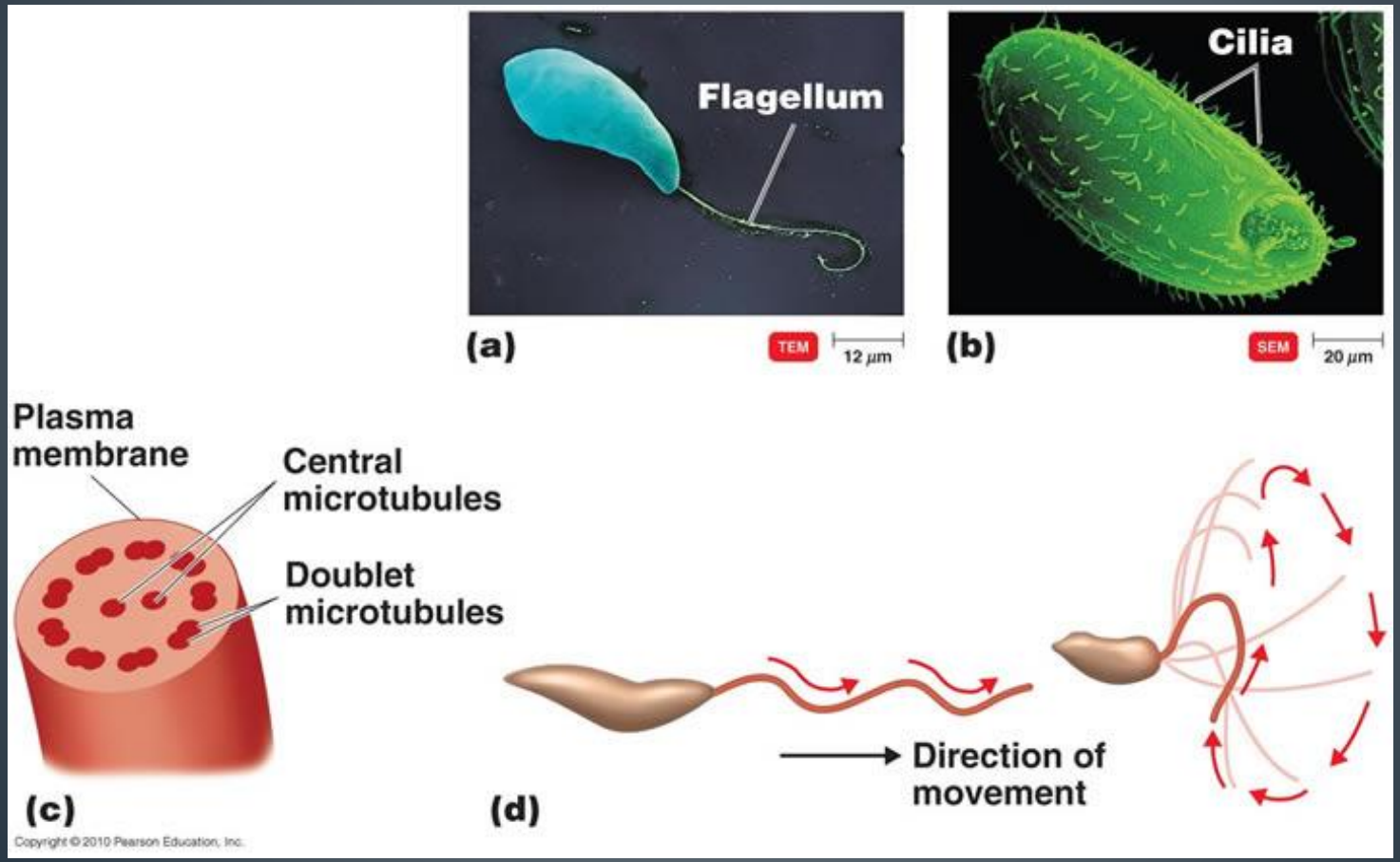


Figure 16–6. Molecular Biology of the Cell, 4th Edition.

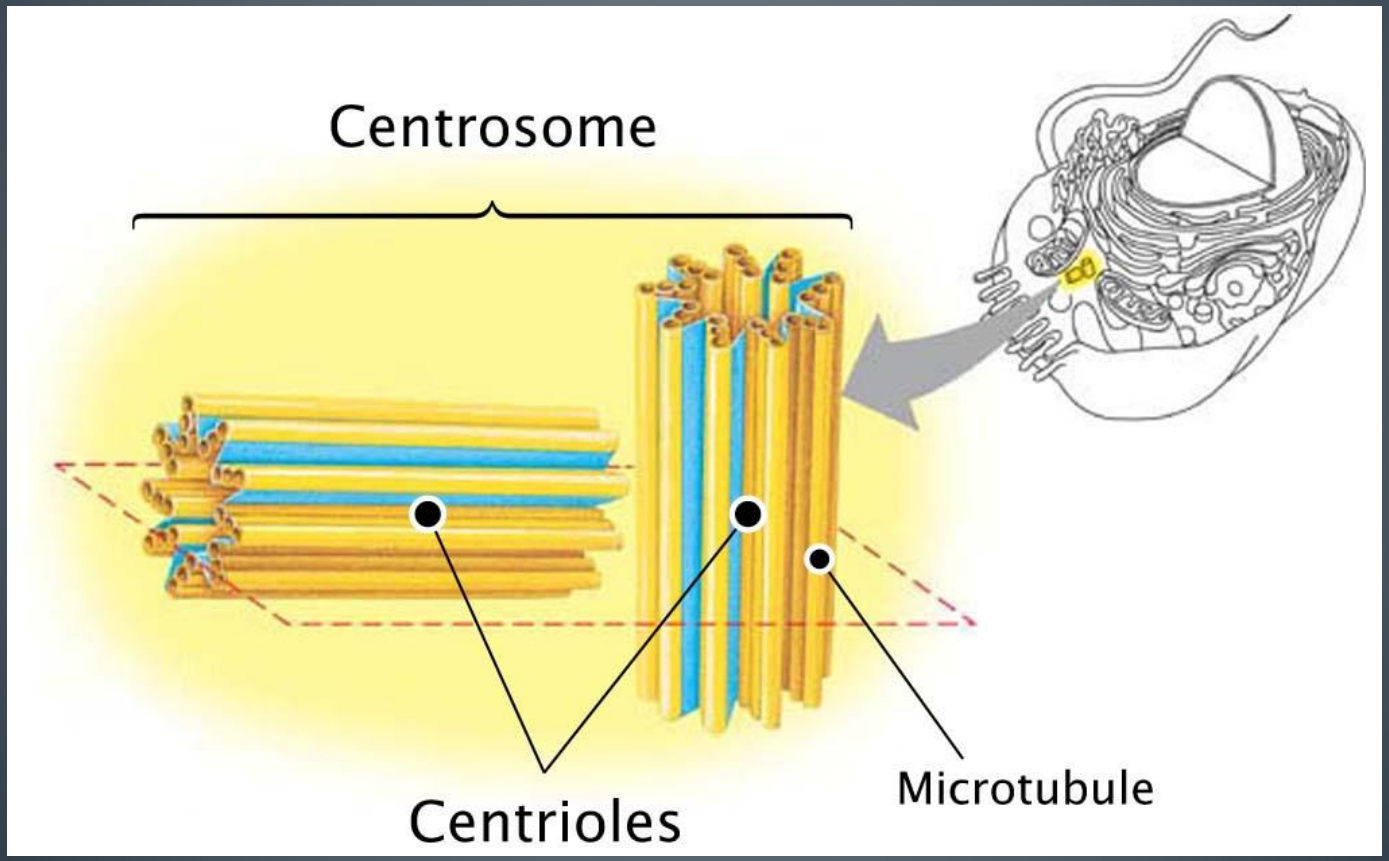
Axoneme


Central microtubules
Radial spokes
Plasma membrane
Inner sheath
Nexin
Dynein arms
B tubule
A tubule
Doublet microtubule

Cilia and Flagella

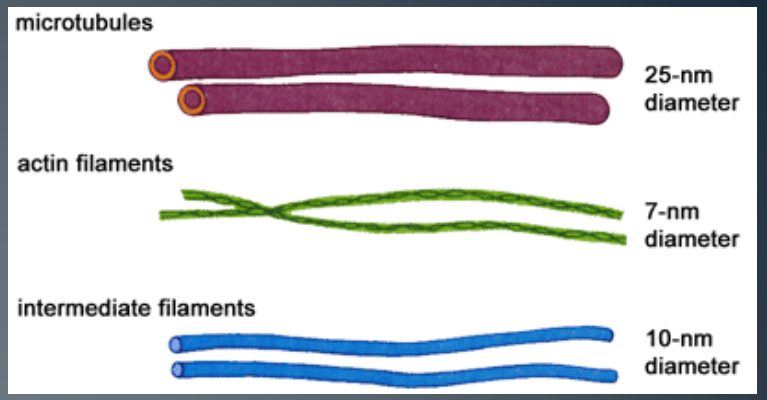


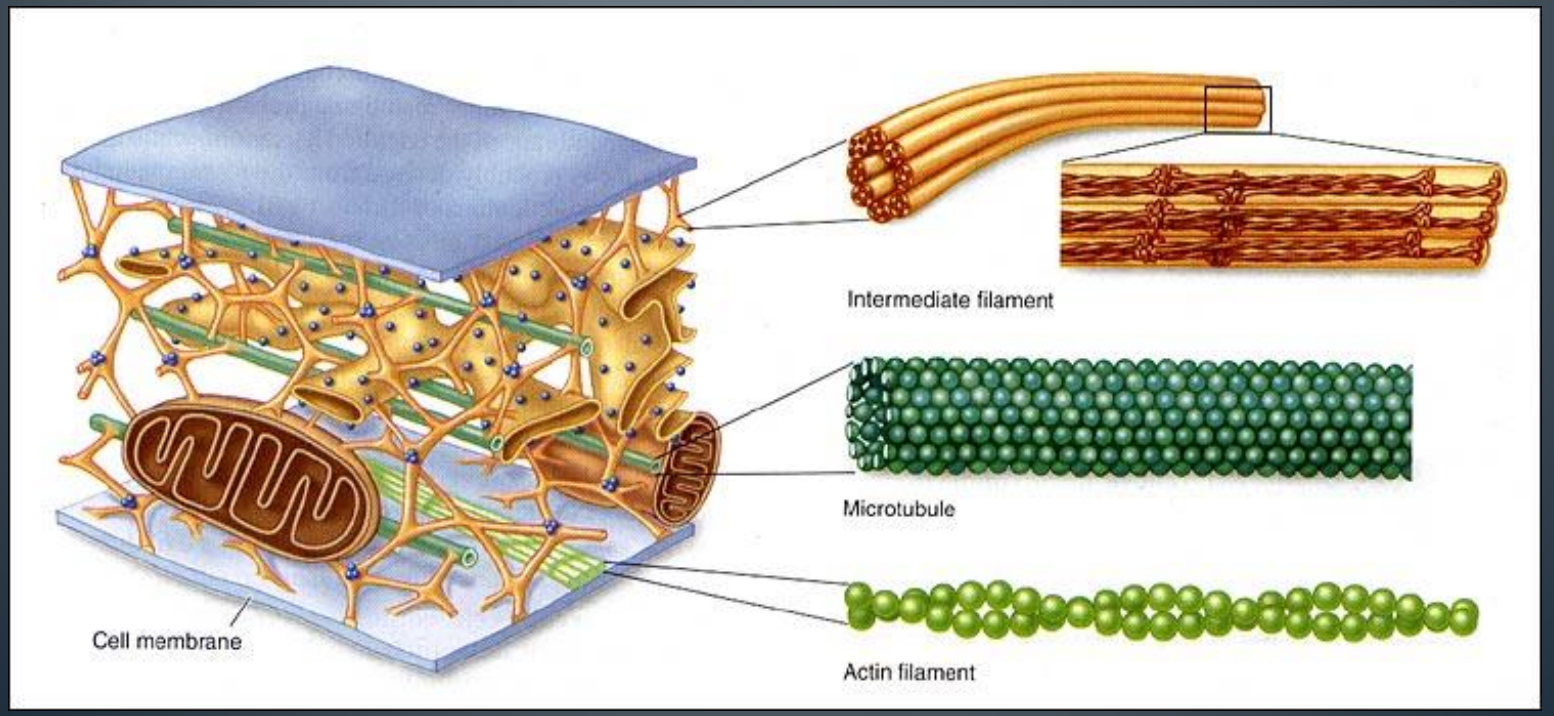
Centrosome



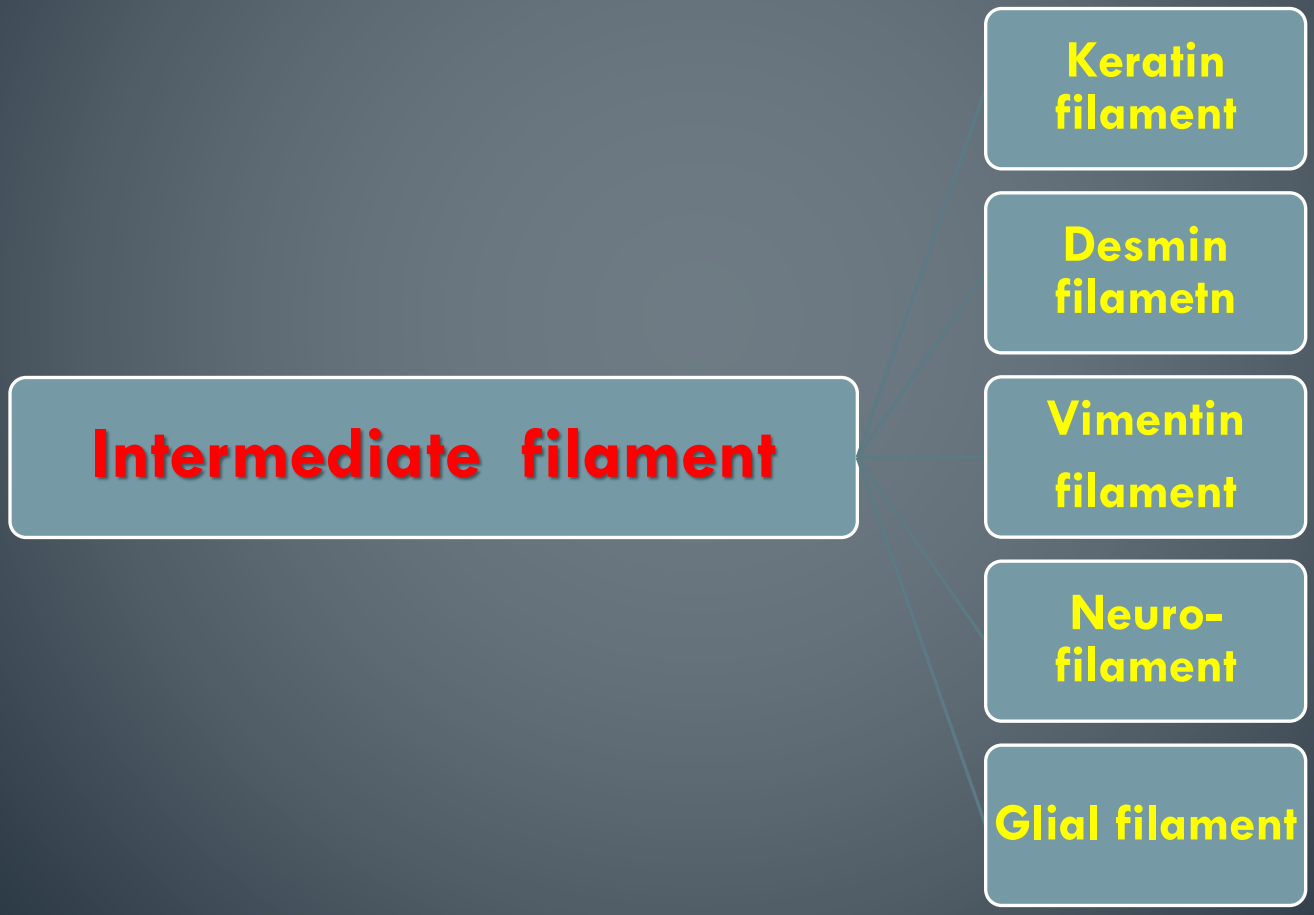
Cytoskeleton

- Acts as **skeleton** and **muscle**
- Provides shape and structure
- Helps move organelles around the cell
- Made of three types of filaments





Intermediate filament



Actin and Myosin

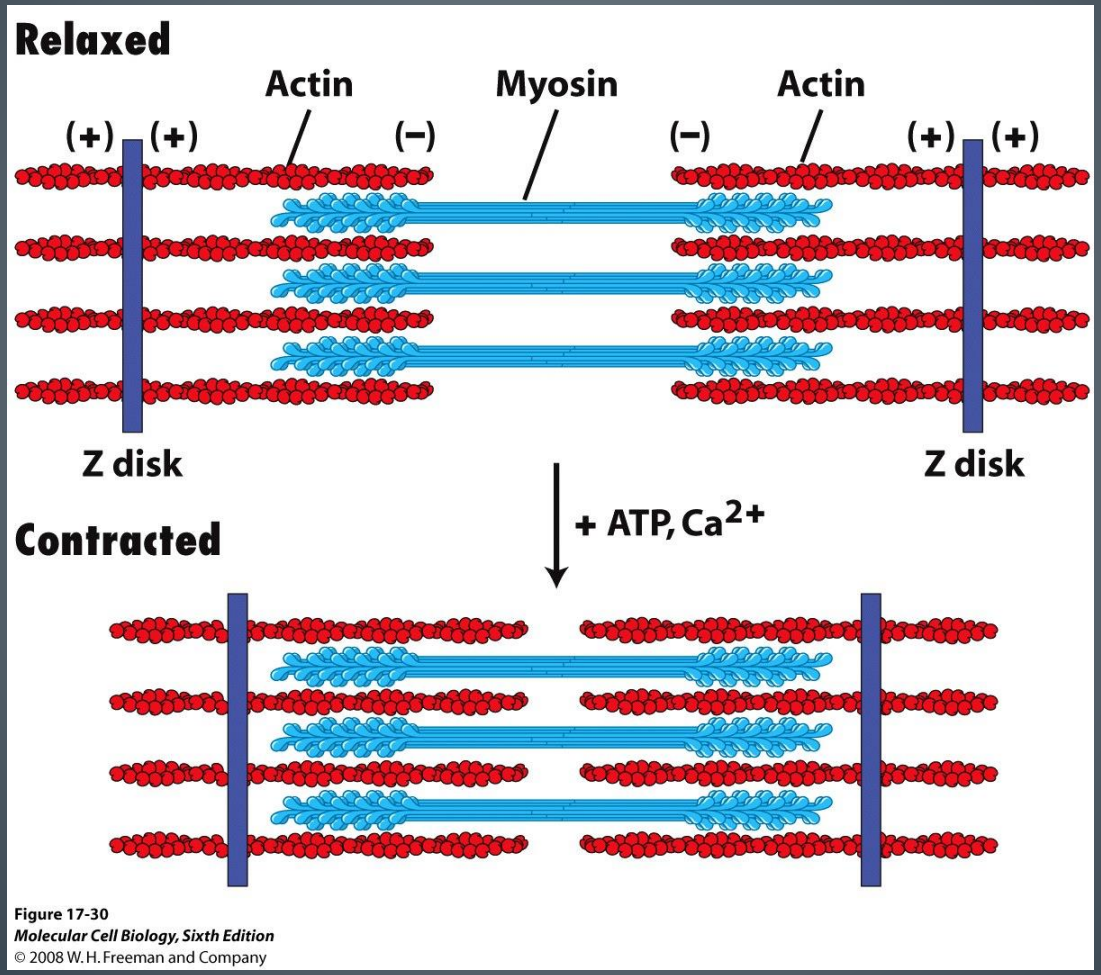


Figure 17-30
Molecular Cell Biology, Sixth Edition
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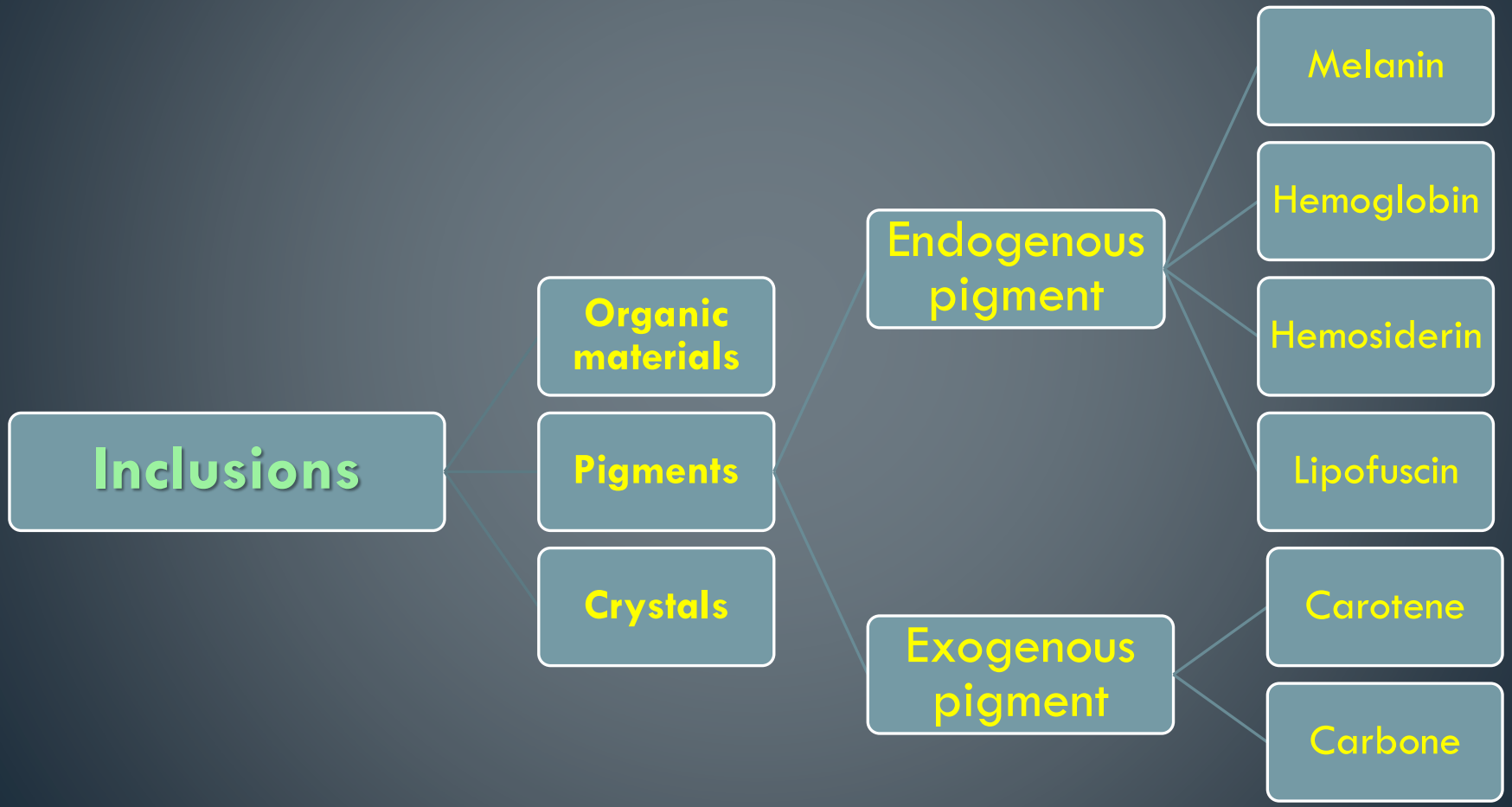
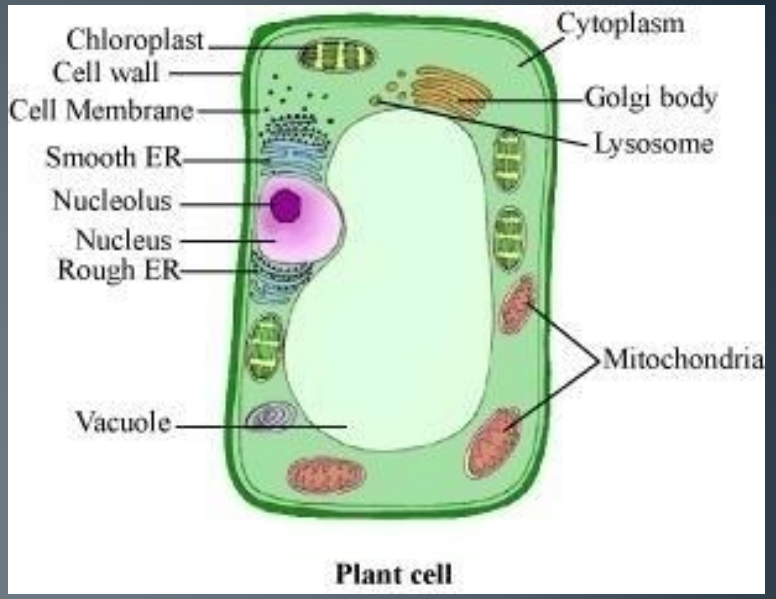
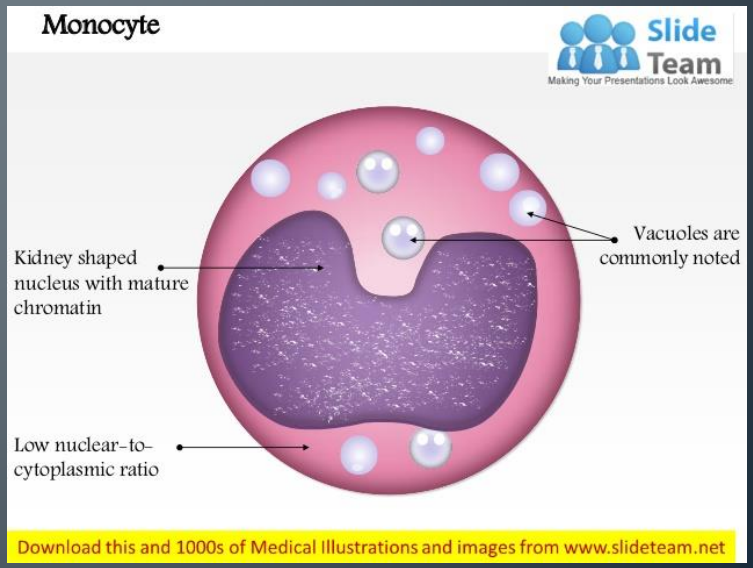
Inclusions (Vacuole + Enclave)



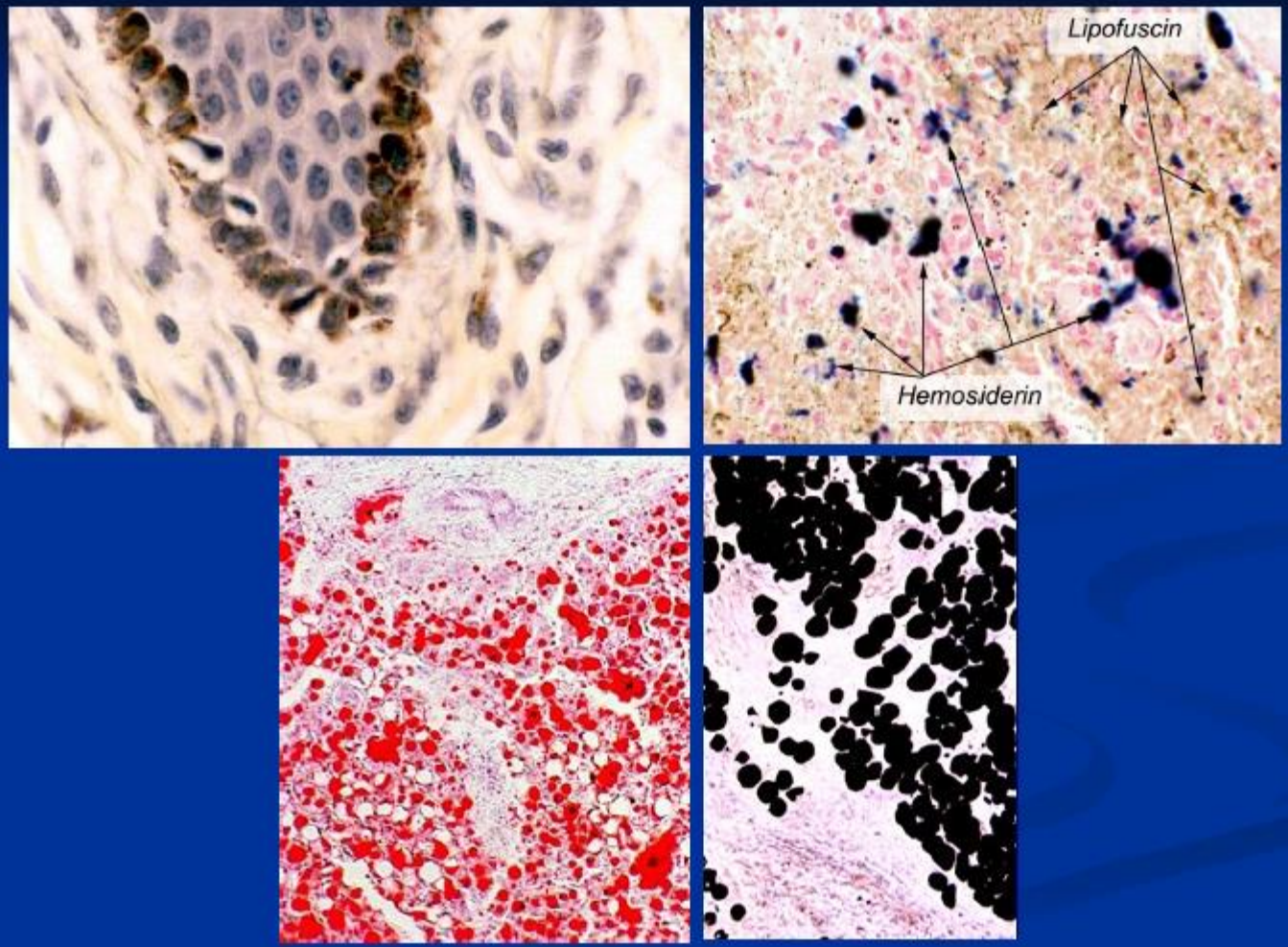
Vacuoles

- Large central vacuole usually in plant cells
- Many smaller vacuoles in animal cells
- Storage container for water, food, enzymes, wastes, pigments, etc.

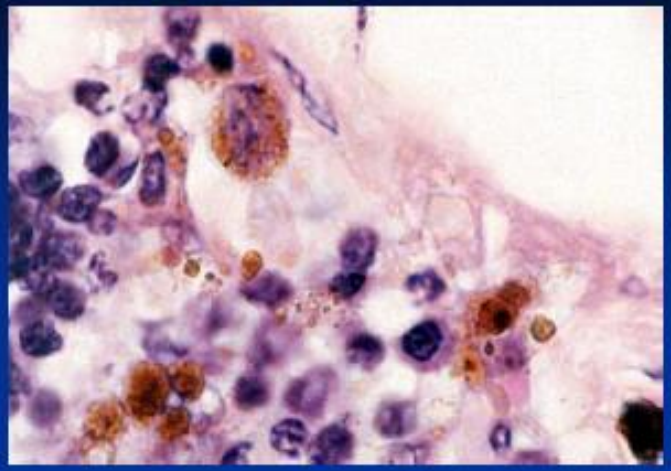


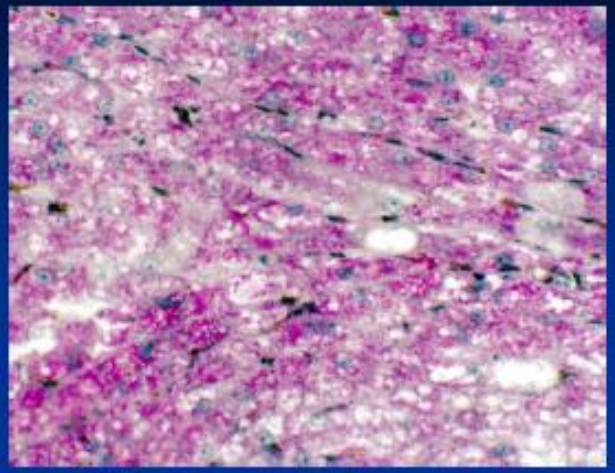


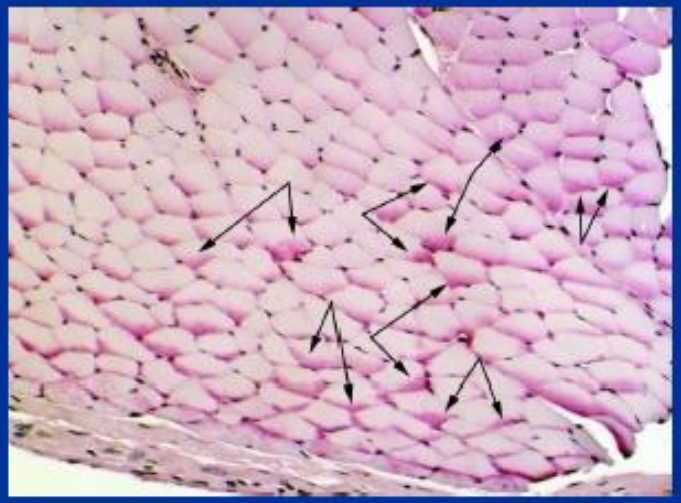
1-Melanin (dark brown), 2- Hemosiderin, 3,4- lipid (Oil Red O, Sudan Black)



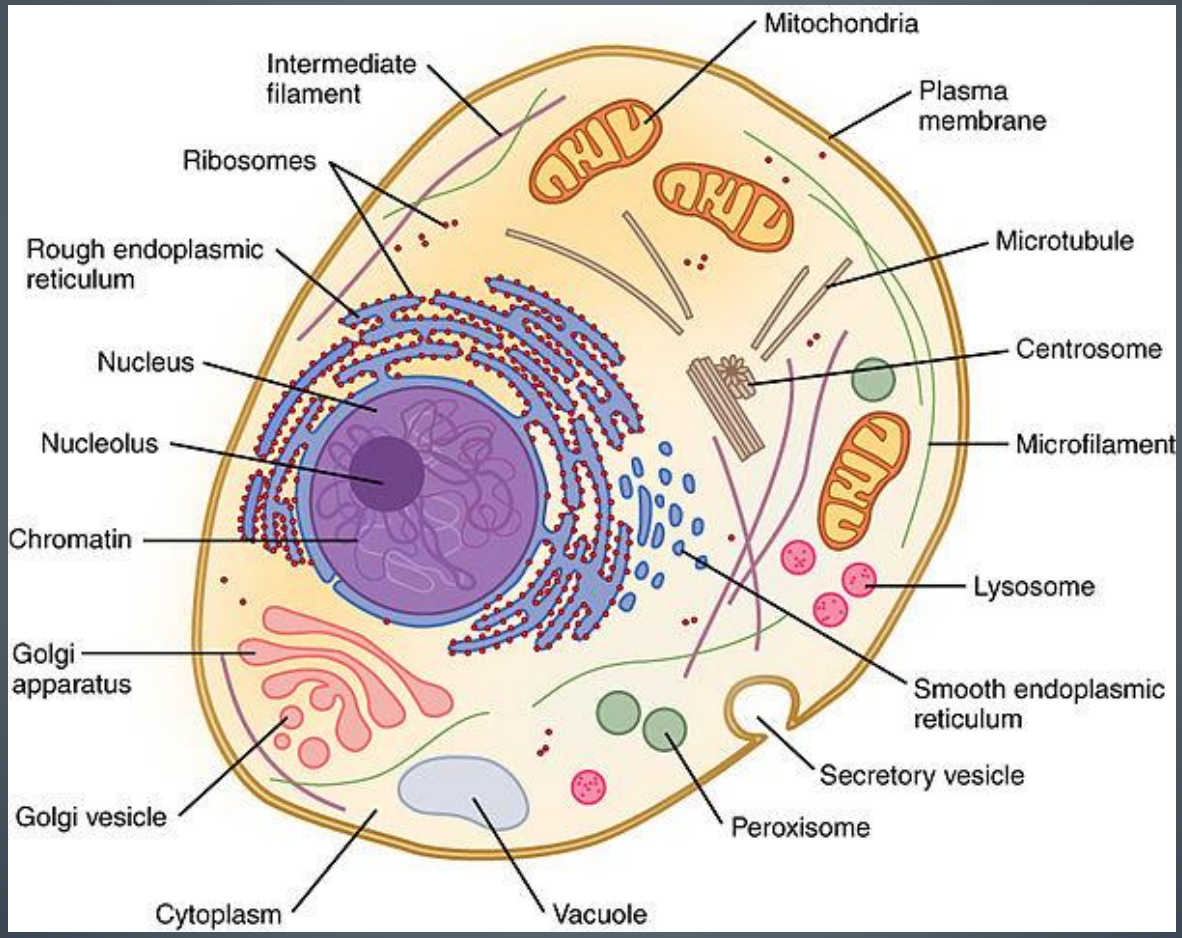
1: Lipofuscin 2,3: Glycogen (liver & skeletal muscle)





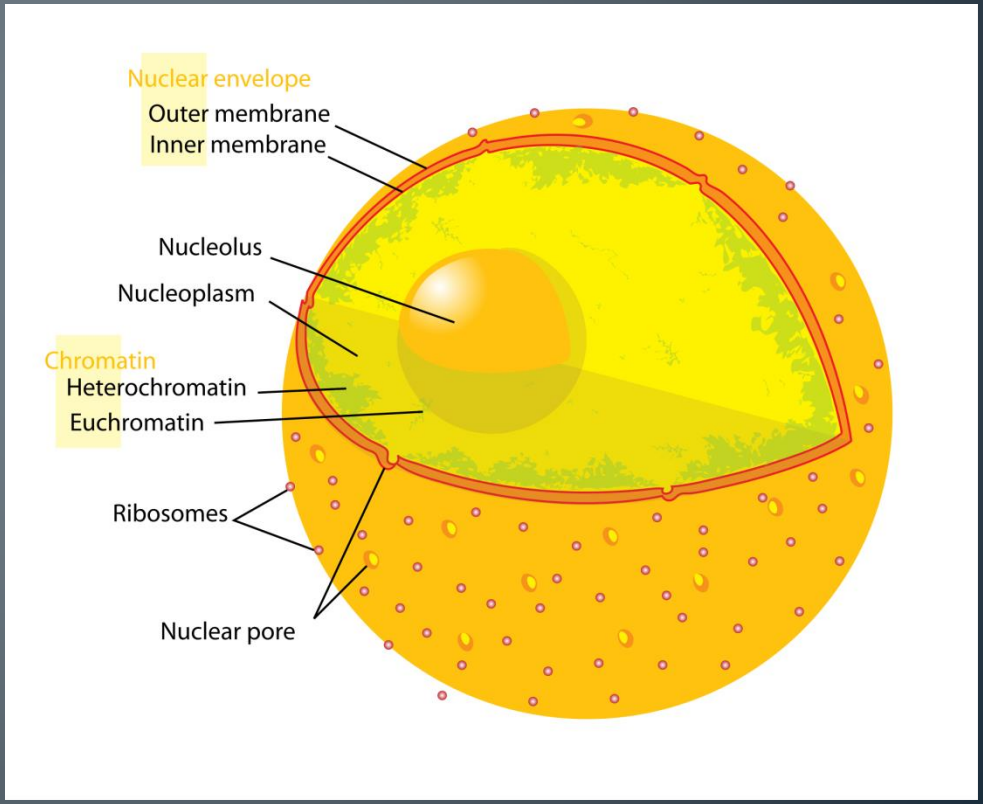


Cytosol


Mitochondria
Intermediate filament
Plasma membrane
Ribosomes
Microtubule
Rough endoplasmic reticulum
Centrosome
Nucleus
Microfilament
Nucleolus
Chromatin
Lysosome
Golgi apparatus
Smooth endoplasmic reticulum
Secretory vesicle
Golgi vesicle
Peroxisome
Cytoplasm
Vacuole

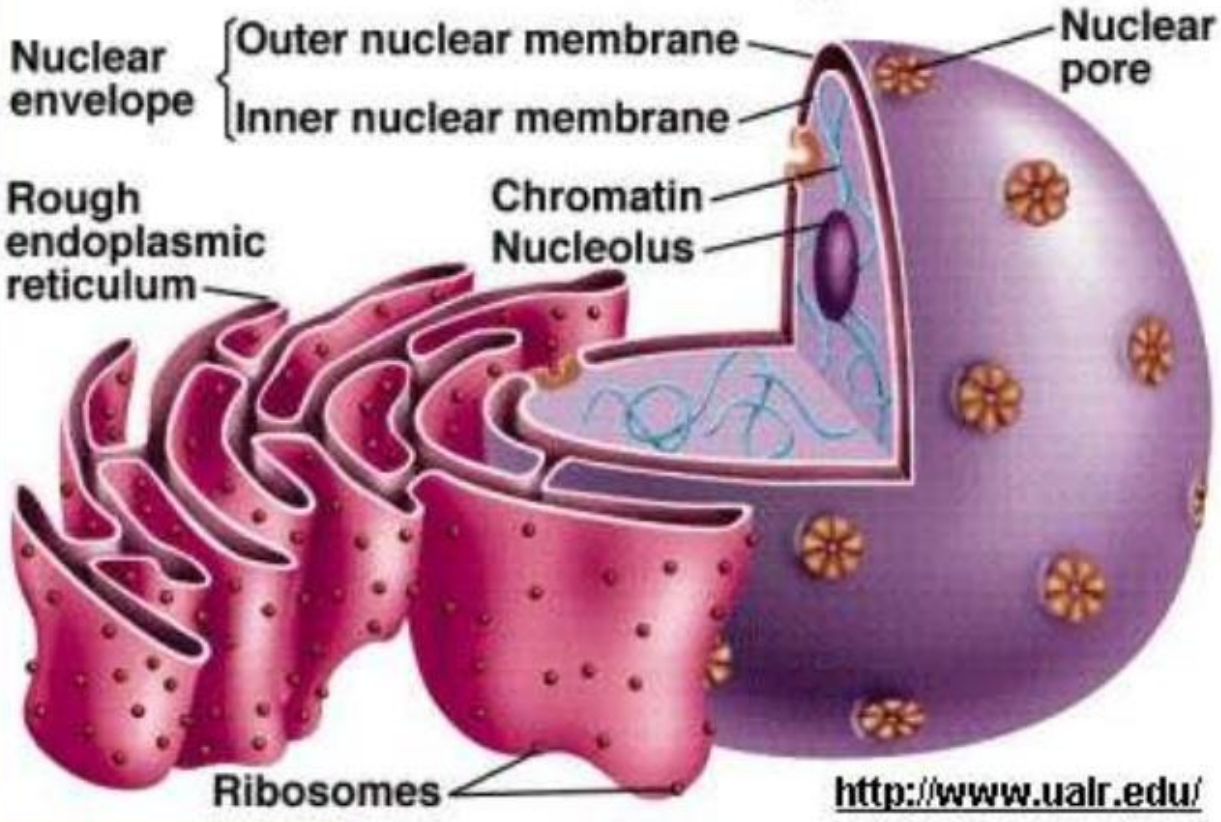
Nucleus

- Control center of the cell
- Contains **DNA**
- Surrounded by a double membrane
- Usually the easiest organelle to see under a microscope
- Usually one per cell

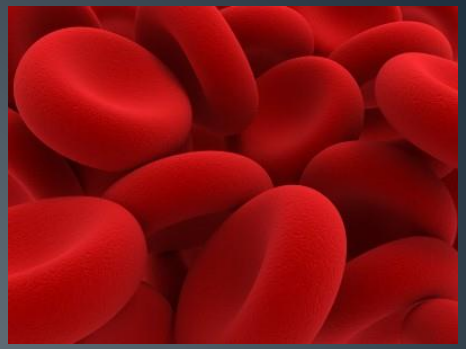


Randy Moore, Dennis Clark, Darrel Vodopich, Botany Visual Resource Library © 1998 The McGraw-Hill Companies,Inc. All rights reserved.

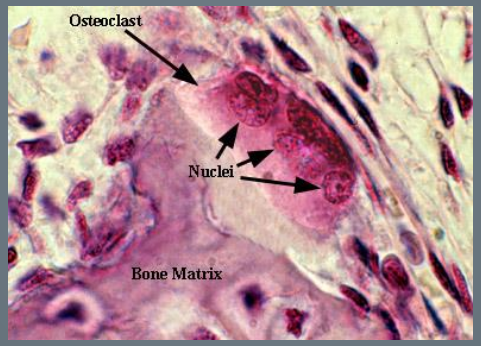
Nuclear Envelope

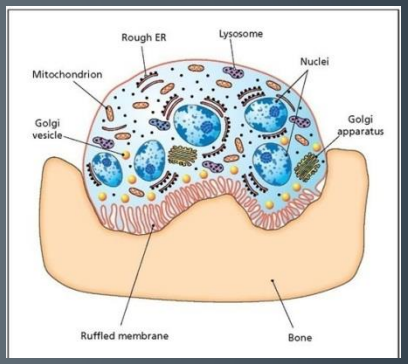


Non- nuclear : RBC , Platelets , Lens cells

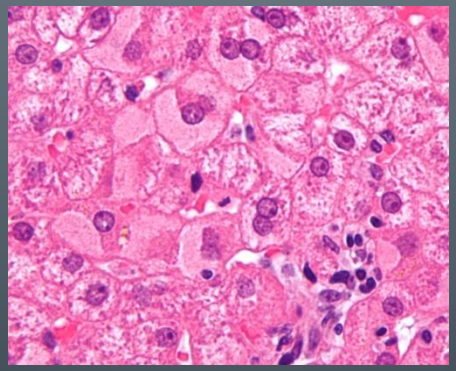


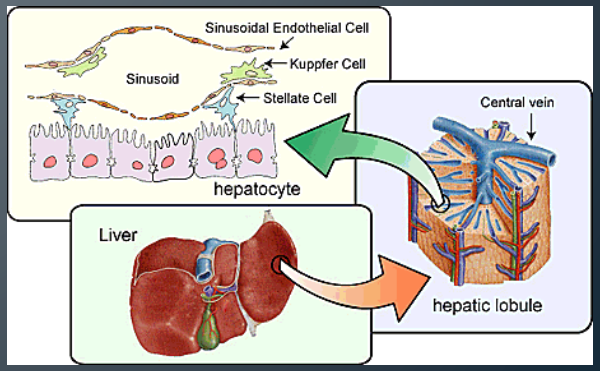
Poly nuclear : Osteoclast , Skeletal muscle



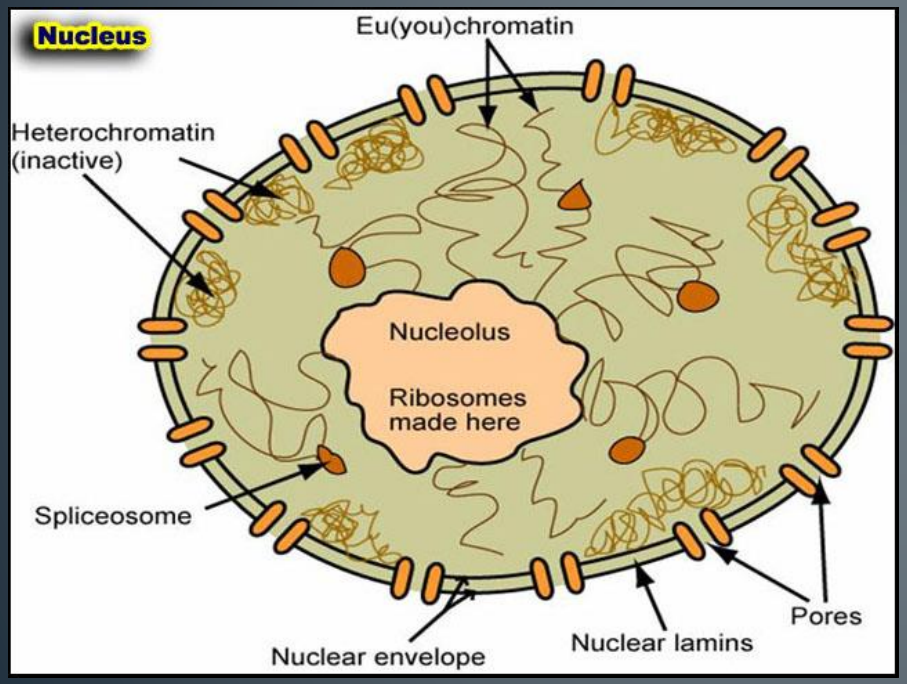


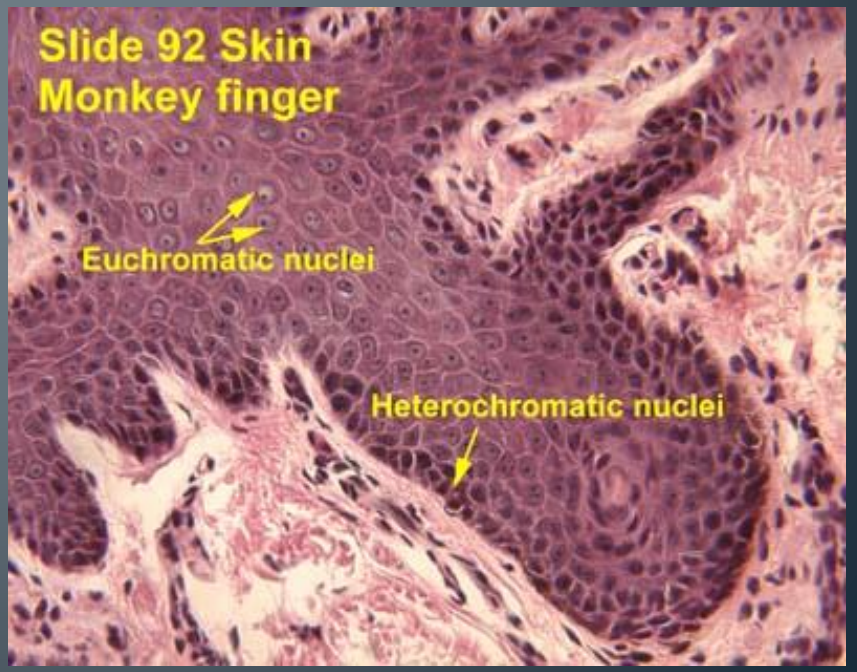
Bi nuclear : Cardiac cell , Hepatocyte



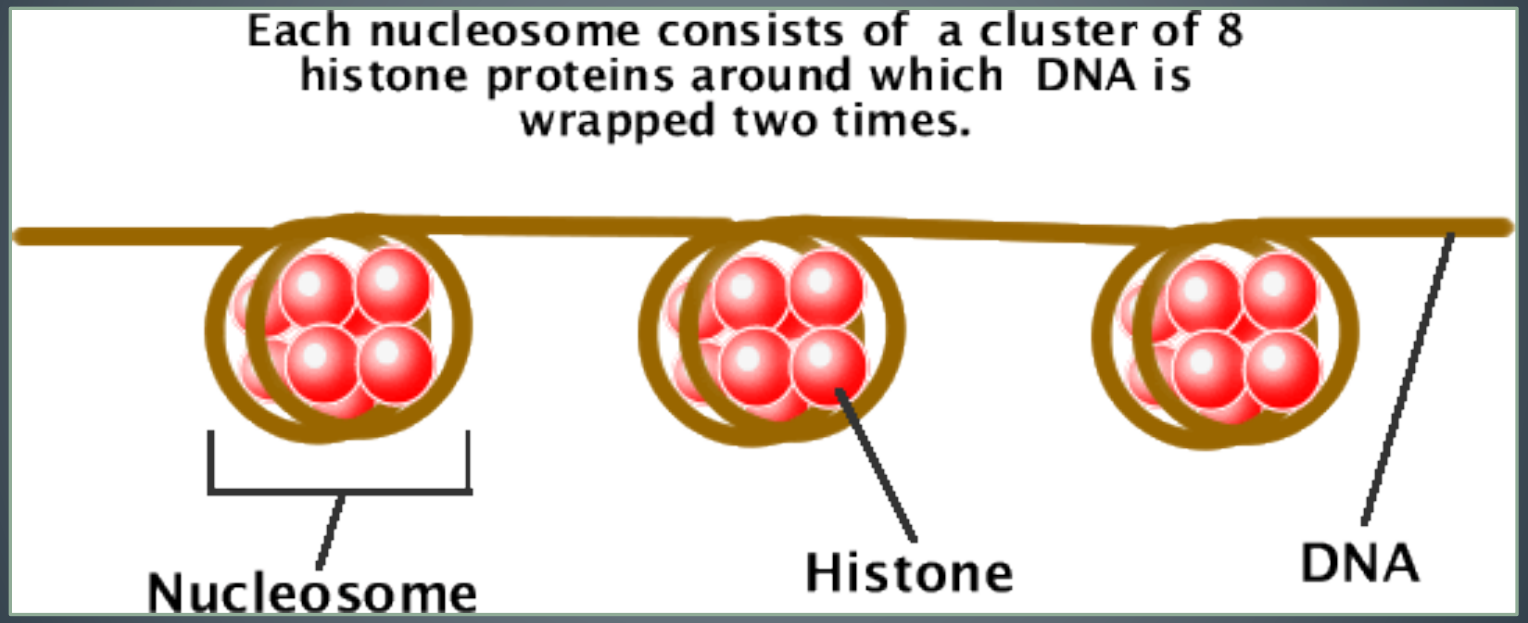


Euchromatin & Heterochromatin





Chromatin


Each nucleosome consists of a cluster of 8 histone proteins around which DNA is wrapped two times.
Nucleosome
Histone
DNA

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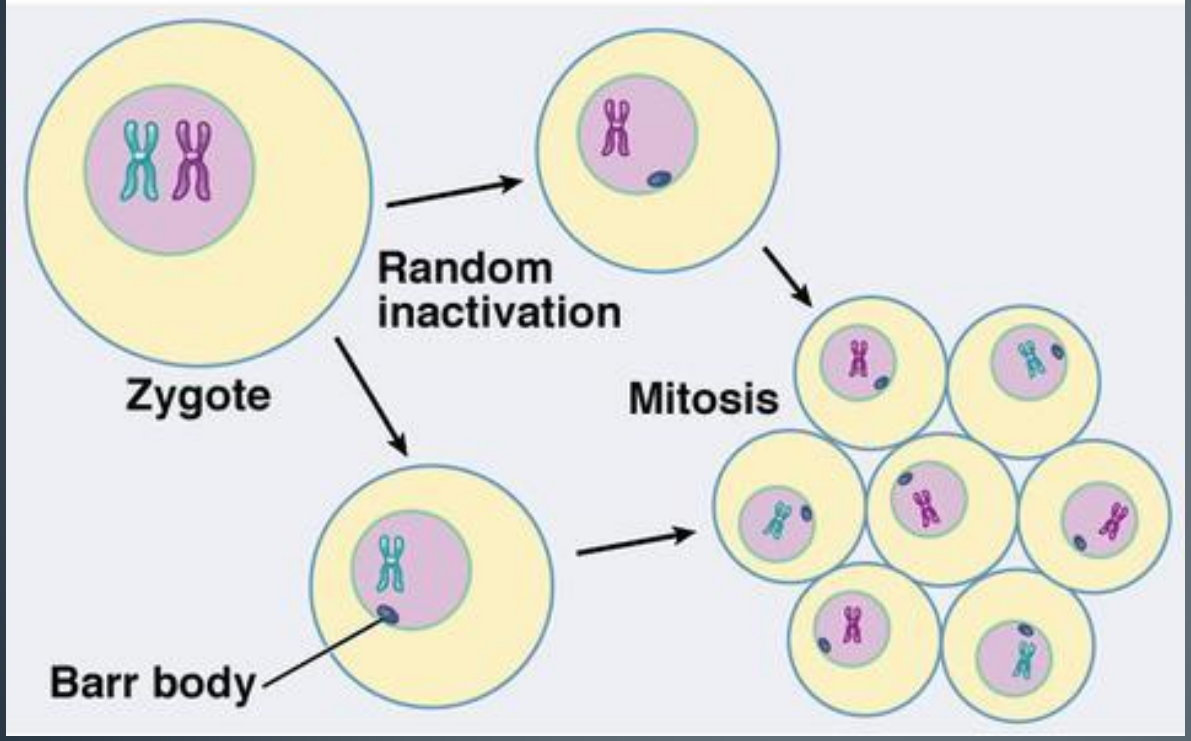
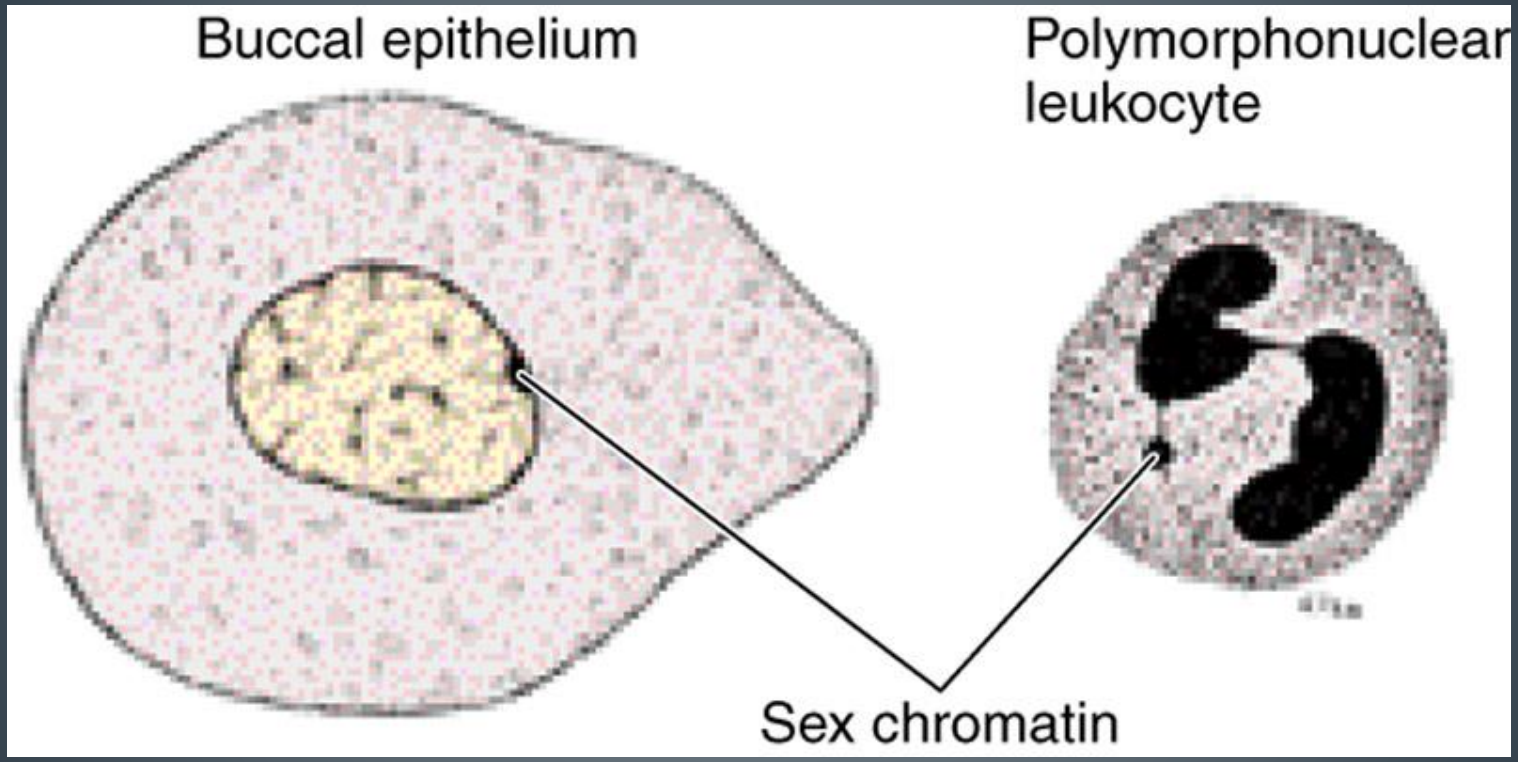
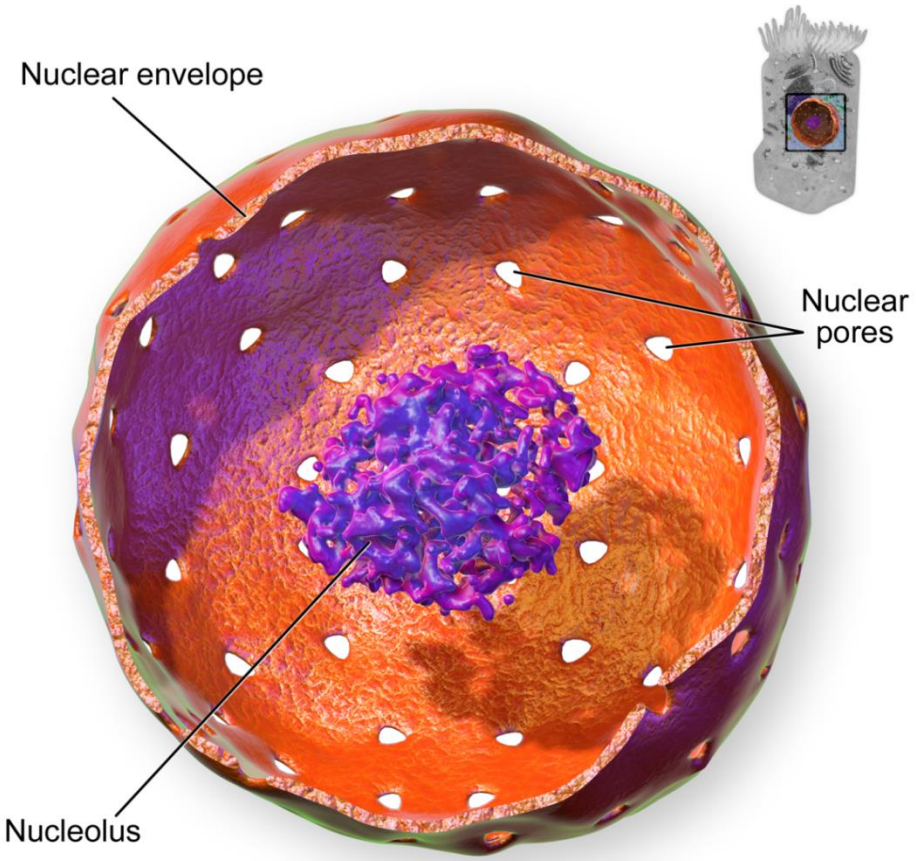
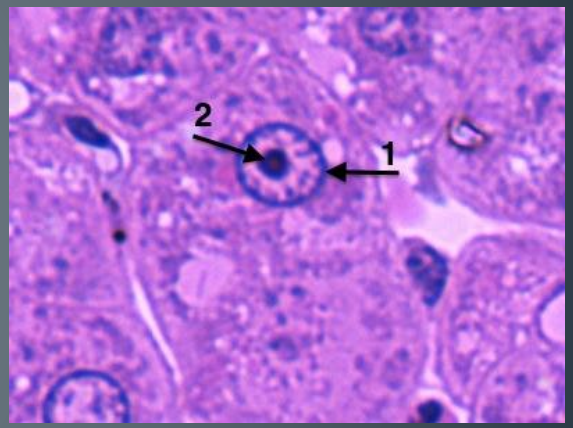
Barr Bodies



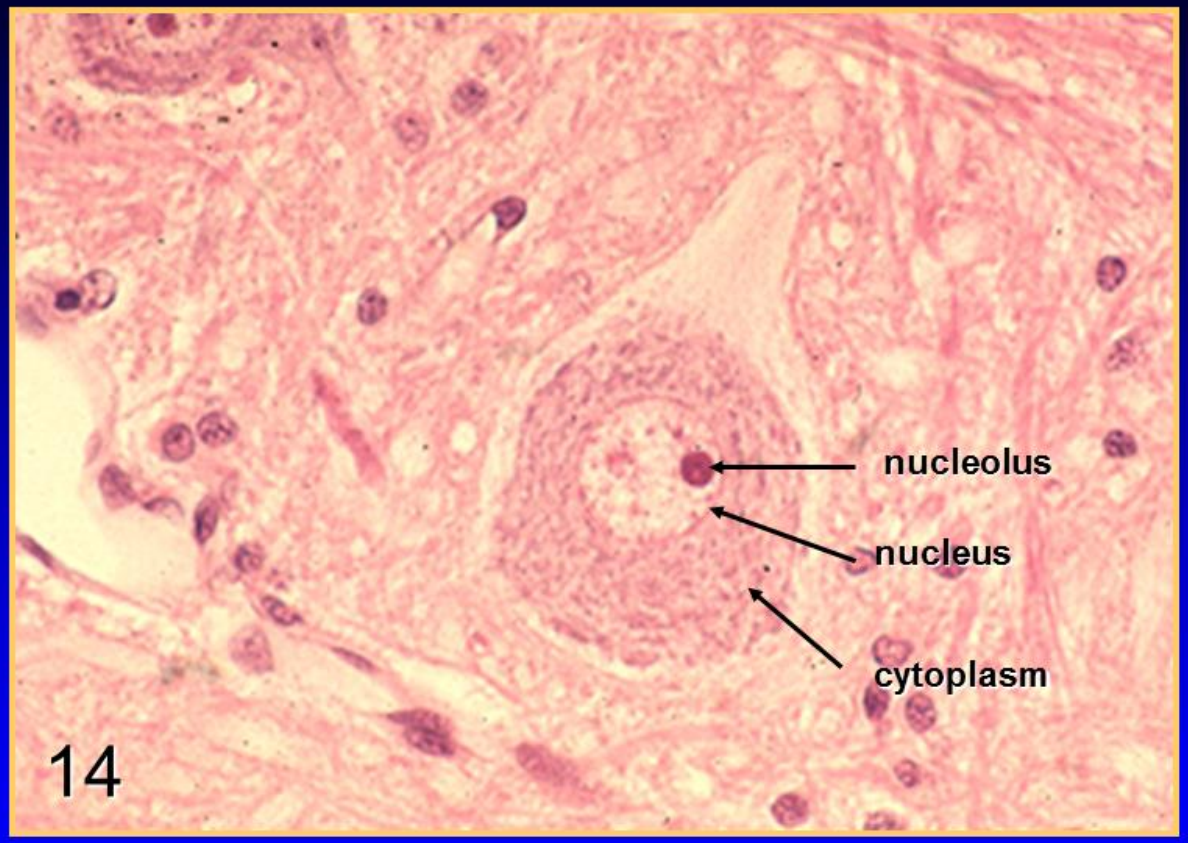

Buccal epithelium
Polymorphonuclear leukocyte
Sex chromatin



Nucleus

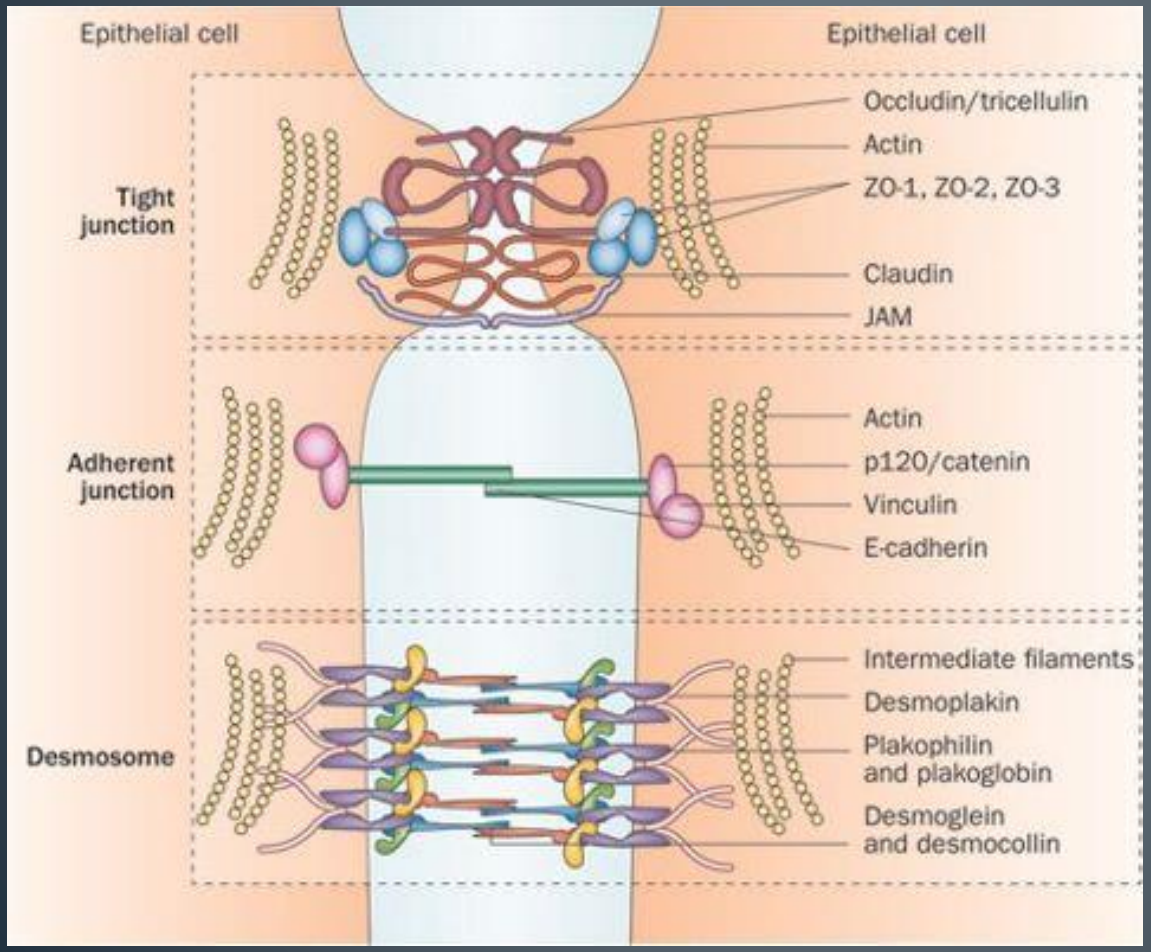


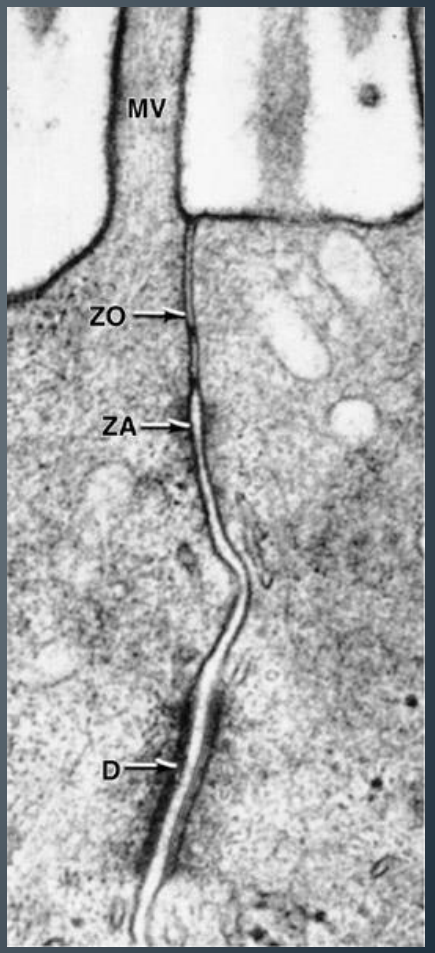
Structure of the Cell

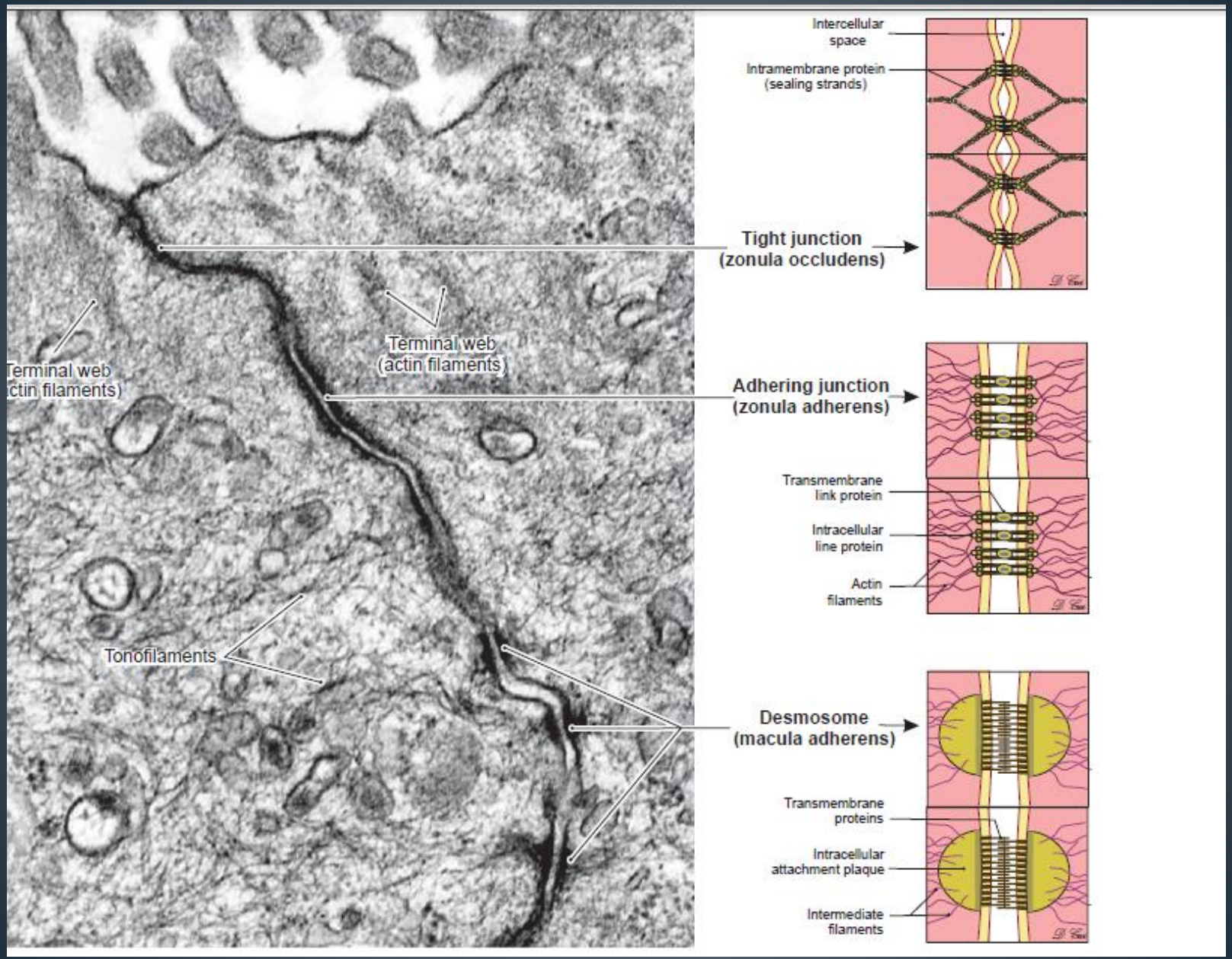


gure 14. High magnification of a neuron. 160X. Note that neurons have a large chromatic nucleus with prominent nucleolus and a basophilic granular toplasm. What cell organelle is responsible for the basophilia of the cytoplasm?

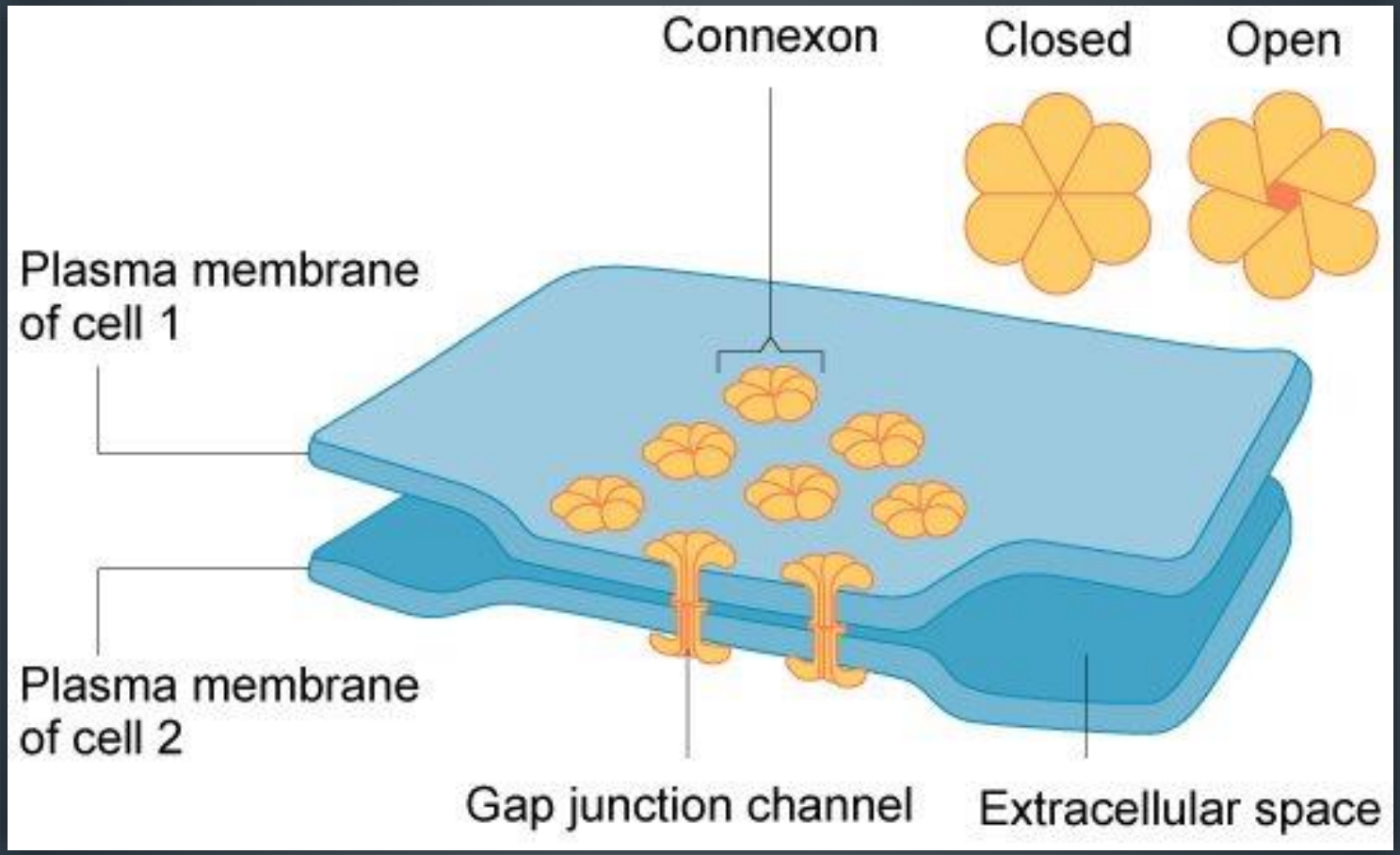
Cellular junctions

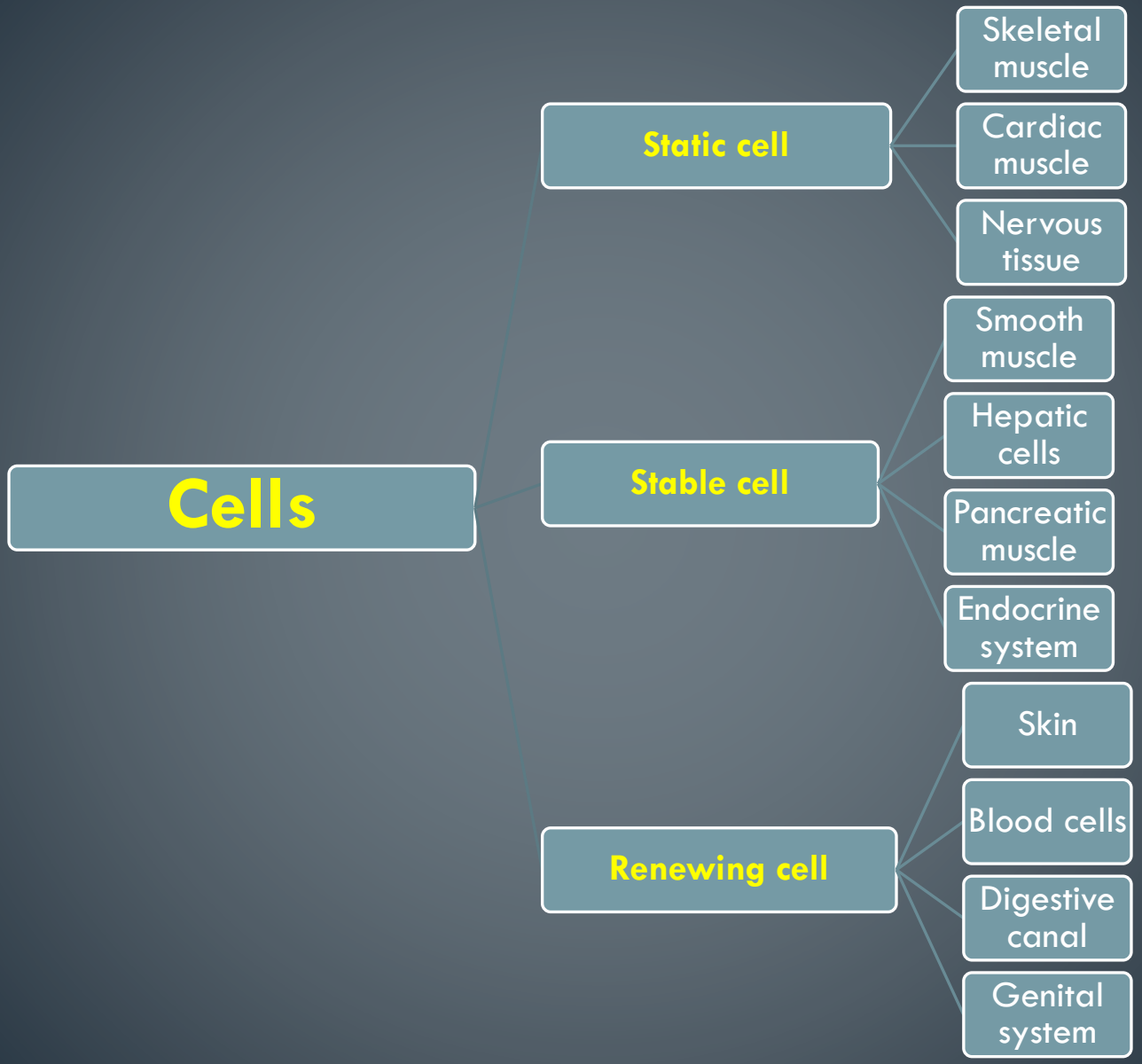


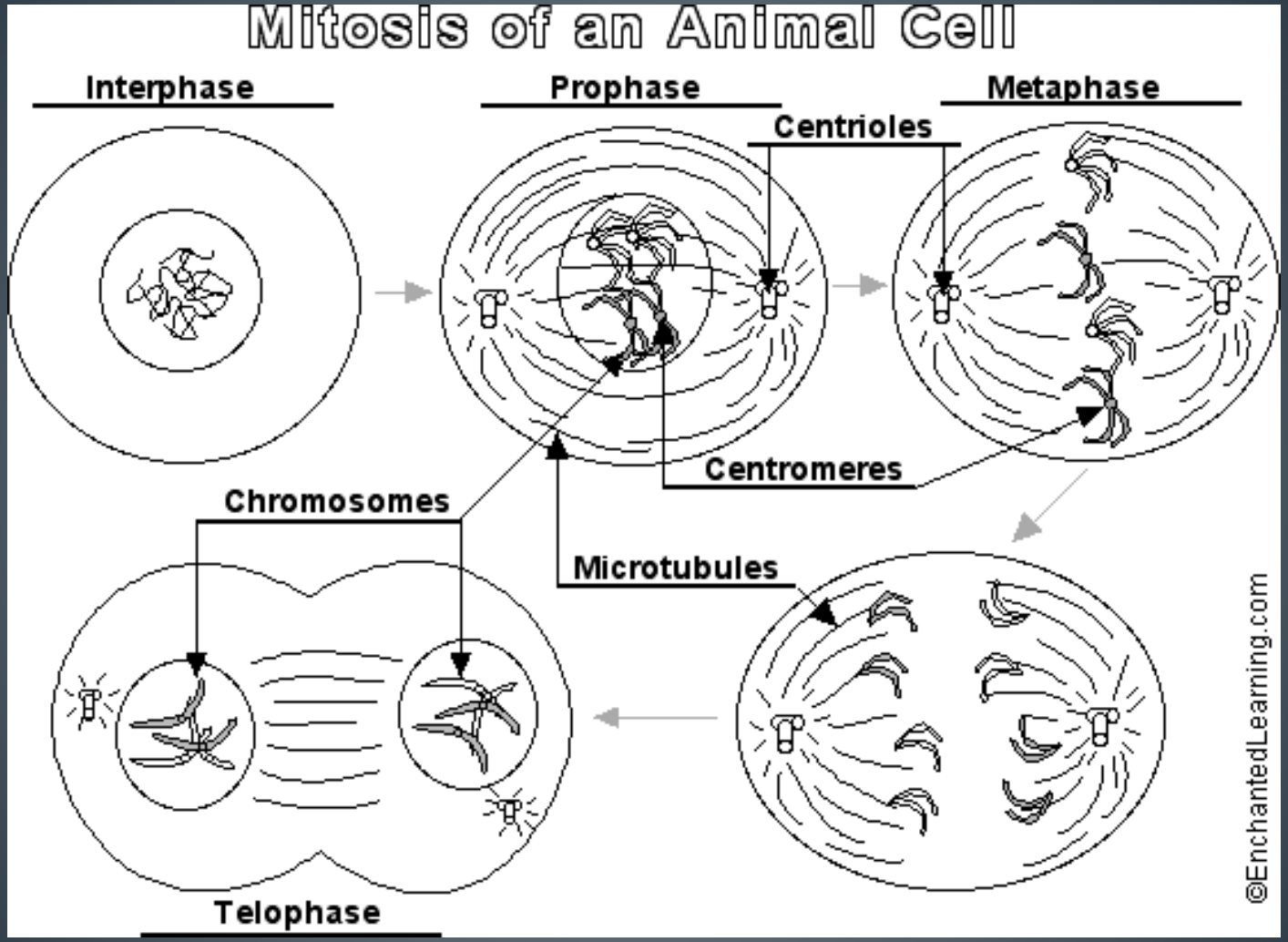



Terminal web
(actin filaments)
Terminal web
(actin filaments)
Tonofilaments
Intercellular space
Intramembrane protein
(sealing strands)
Tight junction
(zonula occludens)
Adhering junction
(zonula adherens)
Transmembrane
link protein
Intracellular
line protein
Actin
filaments
Desmosome
(macula adherens)
Transmembrane
proteins
Intracellular
attachment plaque
Intermediate
filaments

Gap junction




Cells
Static cell
Skeletal muscle
Cardiac muscle
Nervous tissue
Stable cell
Smooth muscle
Hepatic cells
Pancreatic muscle
Endocrine system
Renewing cell
Skin
Blood cells
Digestive canal
Genital system


Mitosis of an Animal Cell
Interphase
Prophase
Metaphase
Centrioles
Centromeres
Chromosomes
Microtubules
Telophase
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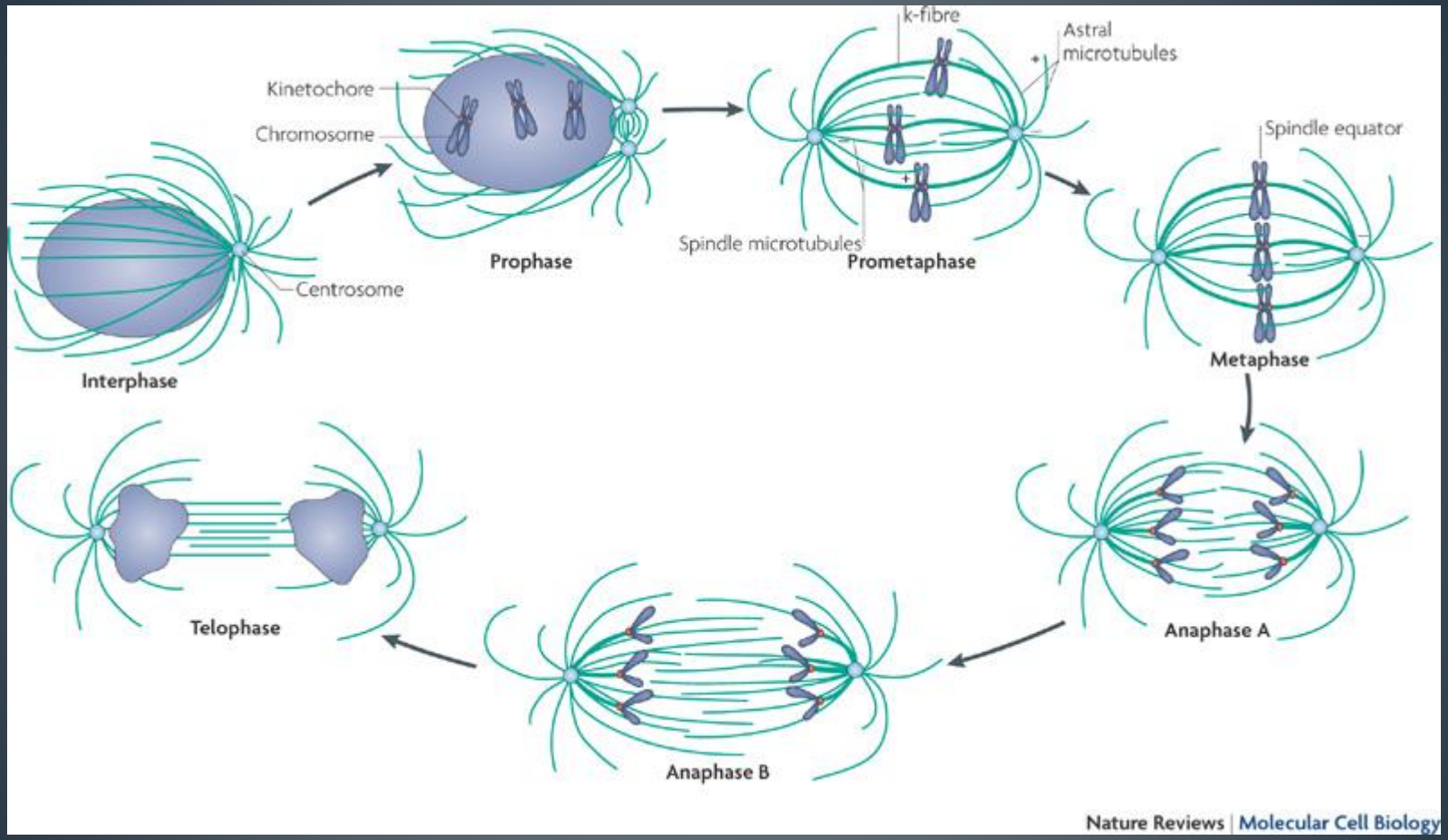
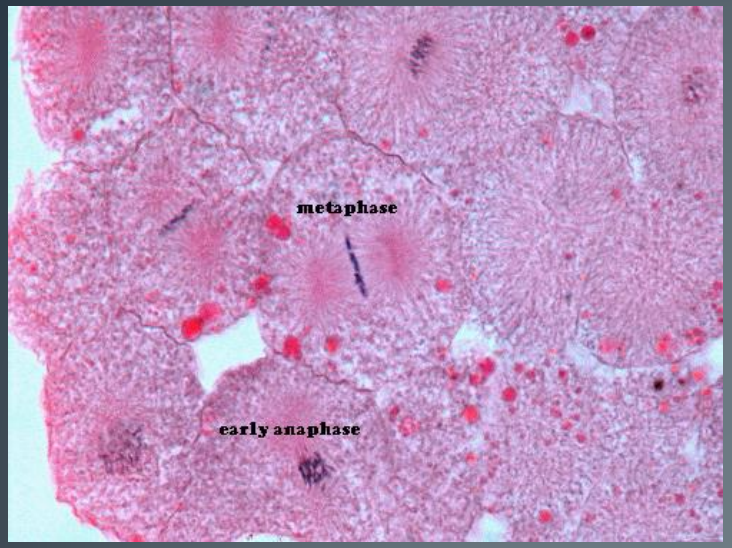
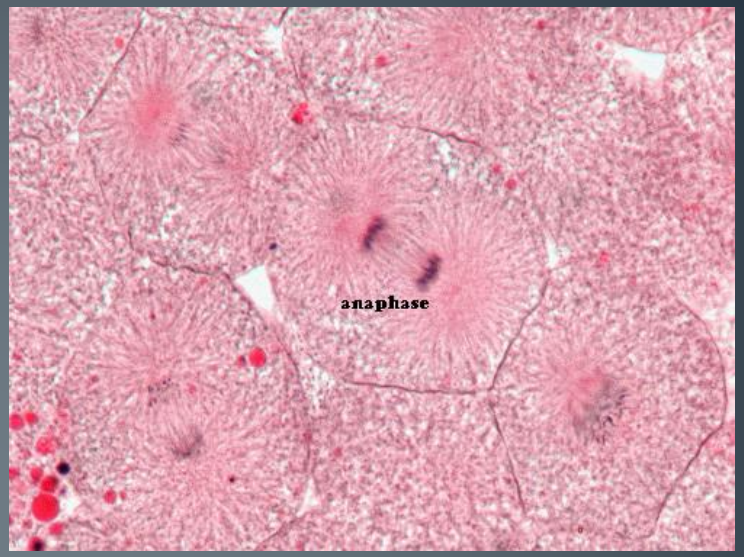
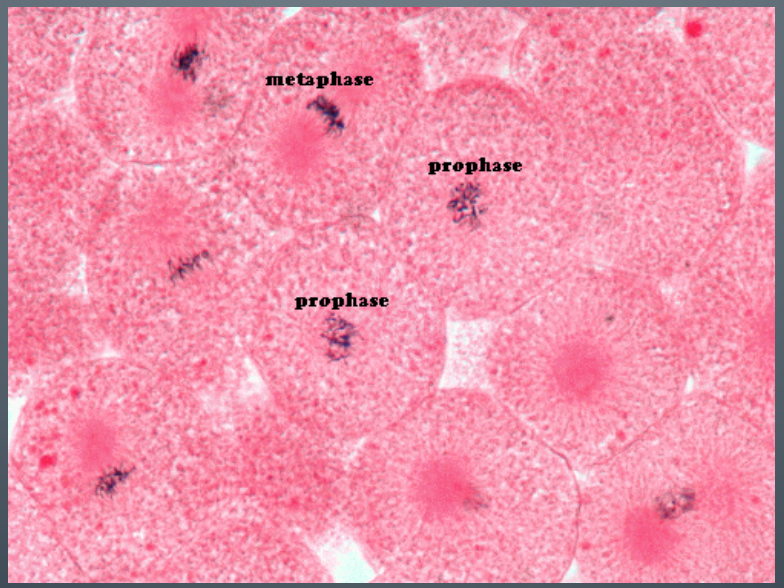

Kinetochore
Chromosome
Centrosome
Interphase
Prophase
k-fibre
Astral microtubules
Spindle microtubules
Prometaphase
Spindle equator
Metaphase
Anaphase A
Anaphase B
Telophase
Nature Reviews | Molecular Cell Biology


metaphase
early anaphase


anaphase


metaphase
prophase
prophase

General Principles (4- Artifacts: precipitate , crackling :thymus , separation/ space : Dog skin, knife marks, folds: Horse esophagus)