

Chapter 2 Cell




Zhou Li Prof.

Dept. of Histology and Embryology

The inner life of the cell

I . Plasma membrane (Plasmalemma)

1.1 The structure

- Unit membrane:
3-layered structure
- 
- inner layer
 - outer layer
 - mediat layer
-

Fluid mosaic model

Components: Membrane phospholipid

Membrane proteins (Intrinsic proteins &

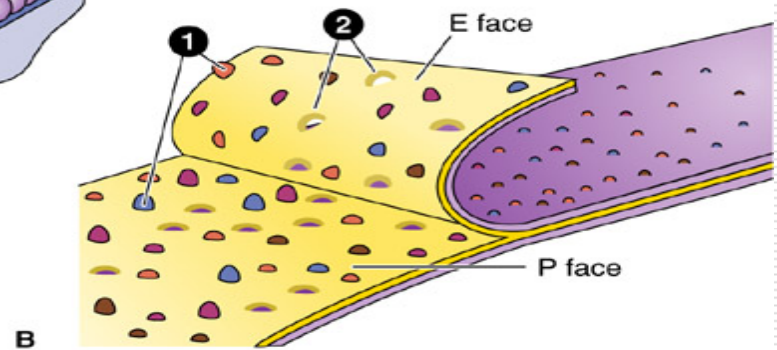
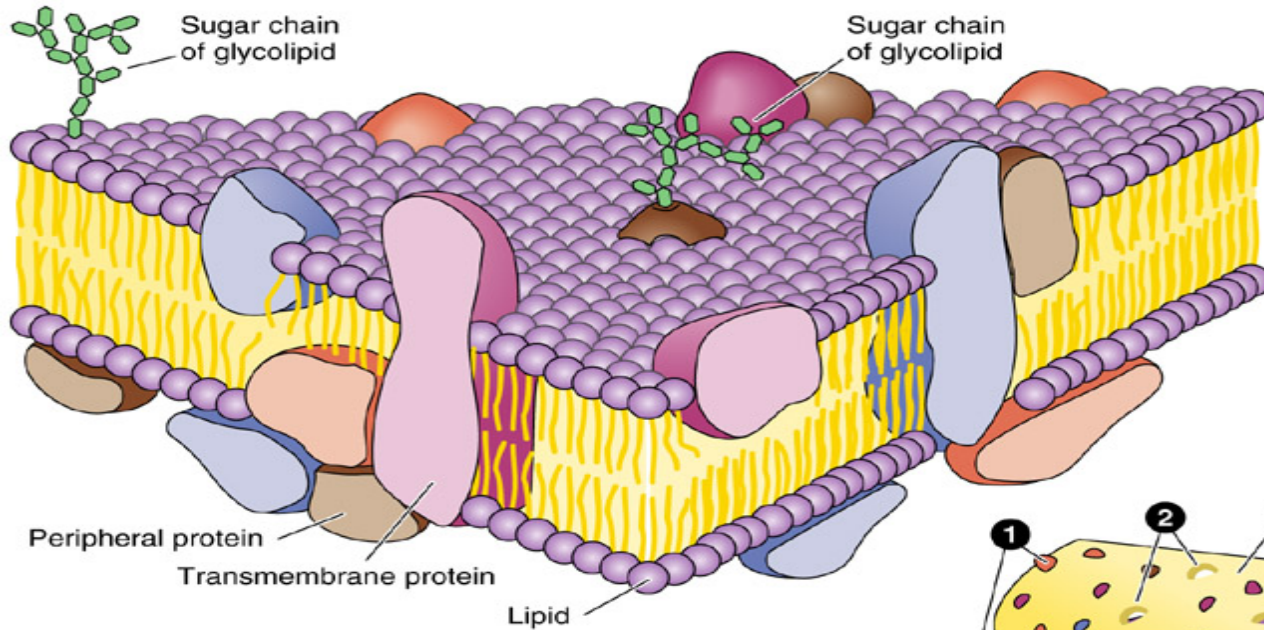
Peripheral proteins)

receptor, carriers, enzyme, antigen, et al

Glycocalyx (cell coat)—suger chain

Fluid mosaic model

A Carbohydrate chains bound to lipids and proteins



The functions of cell membrane

1. Transmembrane transport

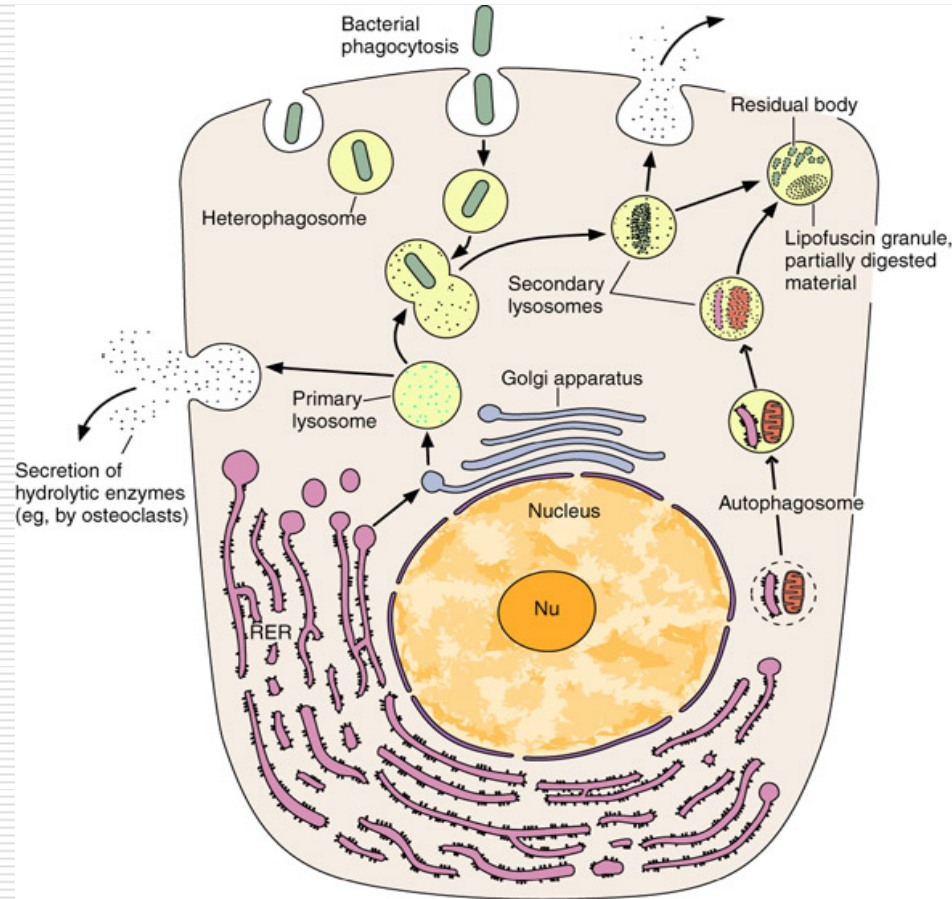
- Passive transport
- Active transport
- Transport of macromolecules and particles

Endocytosis: Pinocytosis, phagocytosis

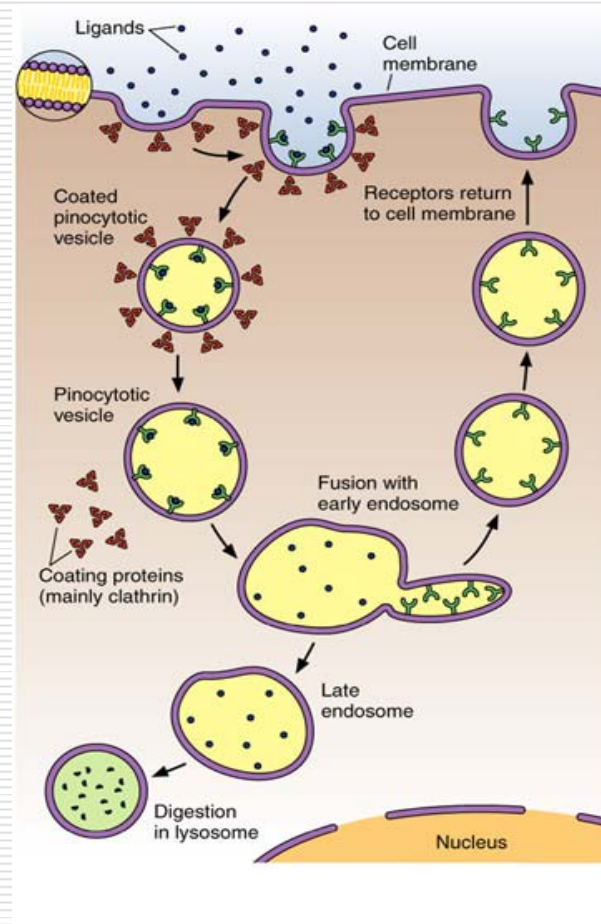
Receptor mediated endocytosis

Exocytosis

Endocytosis and exocytosis



Receptor mediated endocytosis



II .Cytoplasm

Organelles, inclusion and matrix

1. Matrix (Cytosol)

(1) Components

(2) Functions

① Coordinates the intracellular movements of organelles

② Provides a framework for the organization of enzyme and substrates

2. Organelle

The organelles related to protein synthesis

2.1 Ribosomes

(1) Structure

Small electron-dense particles

Free ribosome & attached ribosome

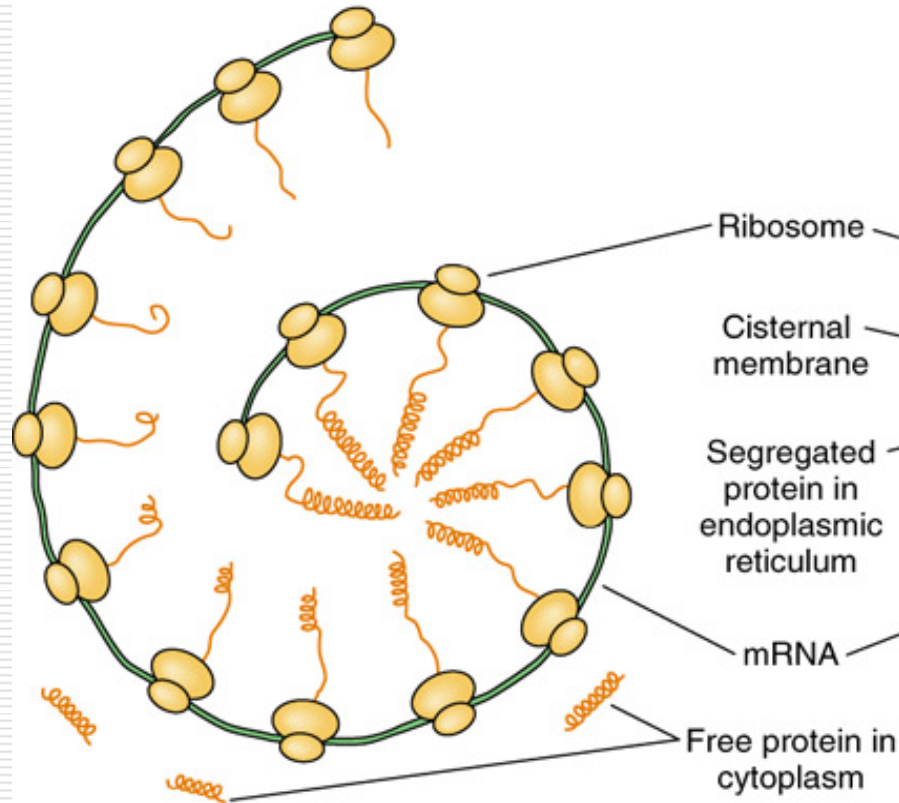
Polyribosome

(2) Function

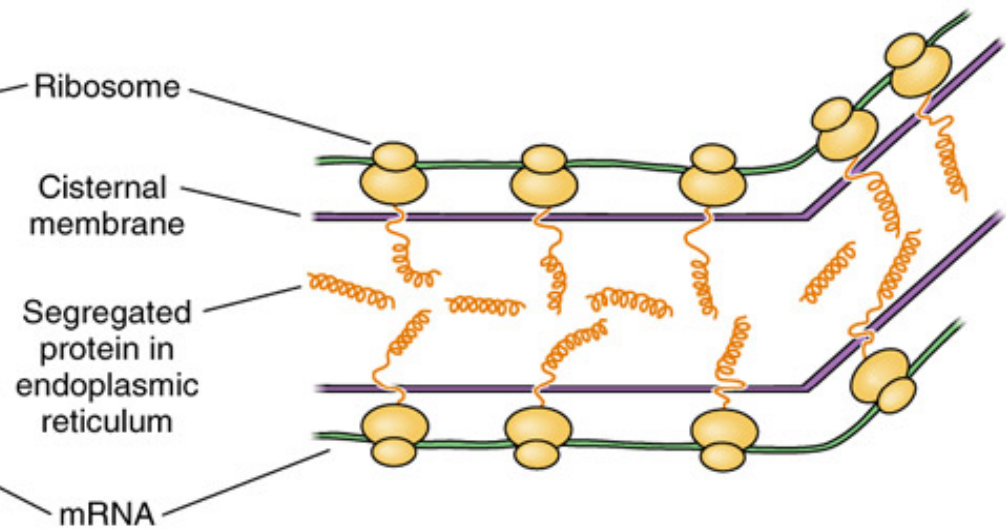
Take part in protein synthesis

Polyribosomes

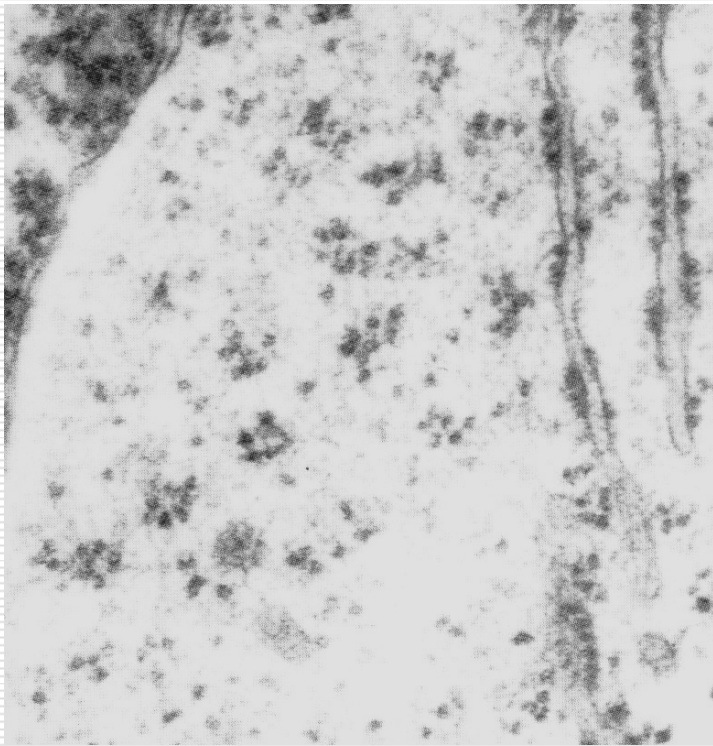
A Free polyribosomes, whose proteins remain in the cytoplasm



B Bound polyribosomes, showing protein synthesis and segregation into the rough endoplasmic reticulum



Free and attached ribosomes



2.2 Endoplasmic Reticulum

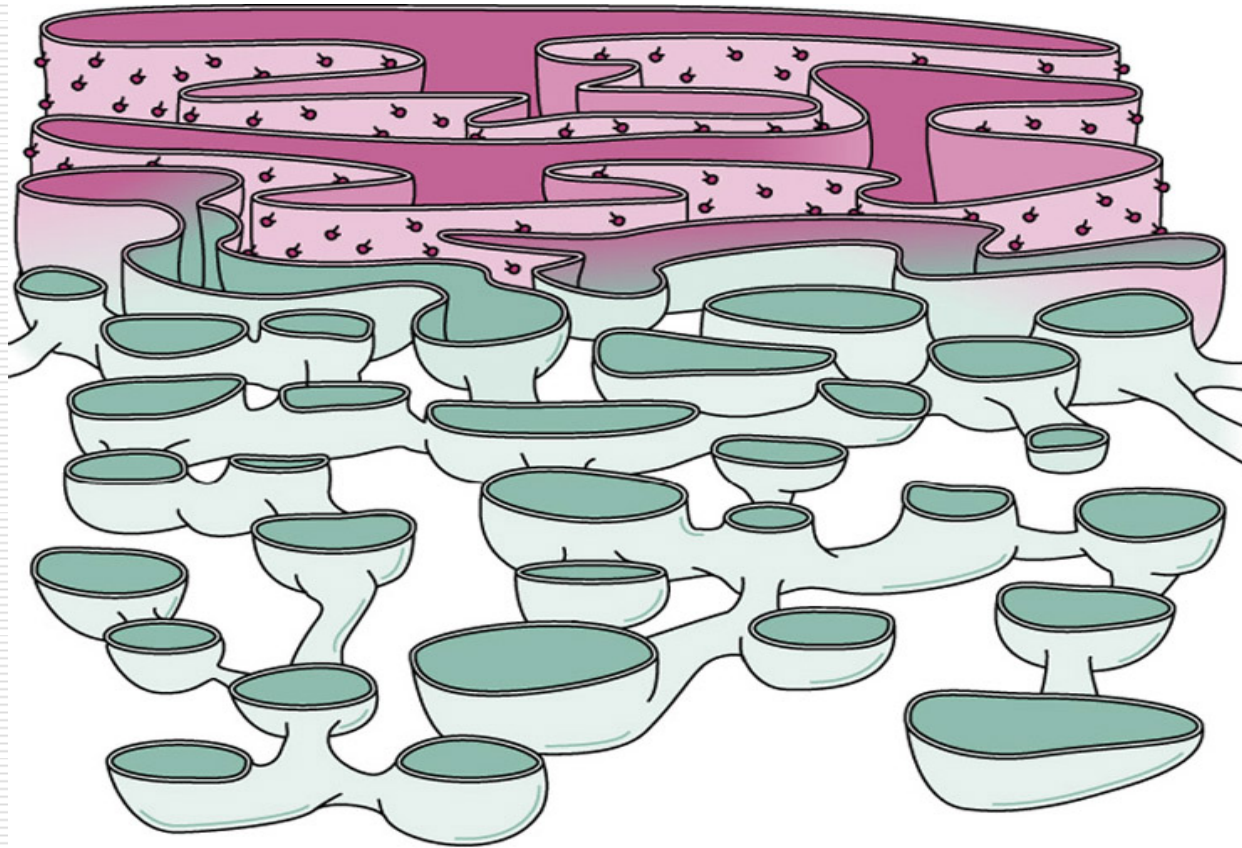
(1) Rough Endoplasmic Reticulum (RER)

Structure: Saclike and parallel stacks of flattened cisternae, Polyribosomes on the cytosolic surface

Functions

Synthesis of Secretory proteins

Endoplasmic reticulum (model)



RER



(2) Smooth Endoplasmic Reticulum (SER)

Structure: smooth tubular or vesicle and lacks polyribosomes

Function: varying function of cell from enzymes

- ① synthesis of steroid hormones
- ② neutralizing noxious substances
- ③ Synthesizes phospholipids
- ④ the contraction process in muscle cells

SER



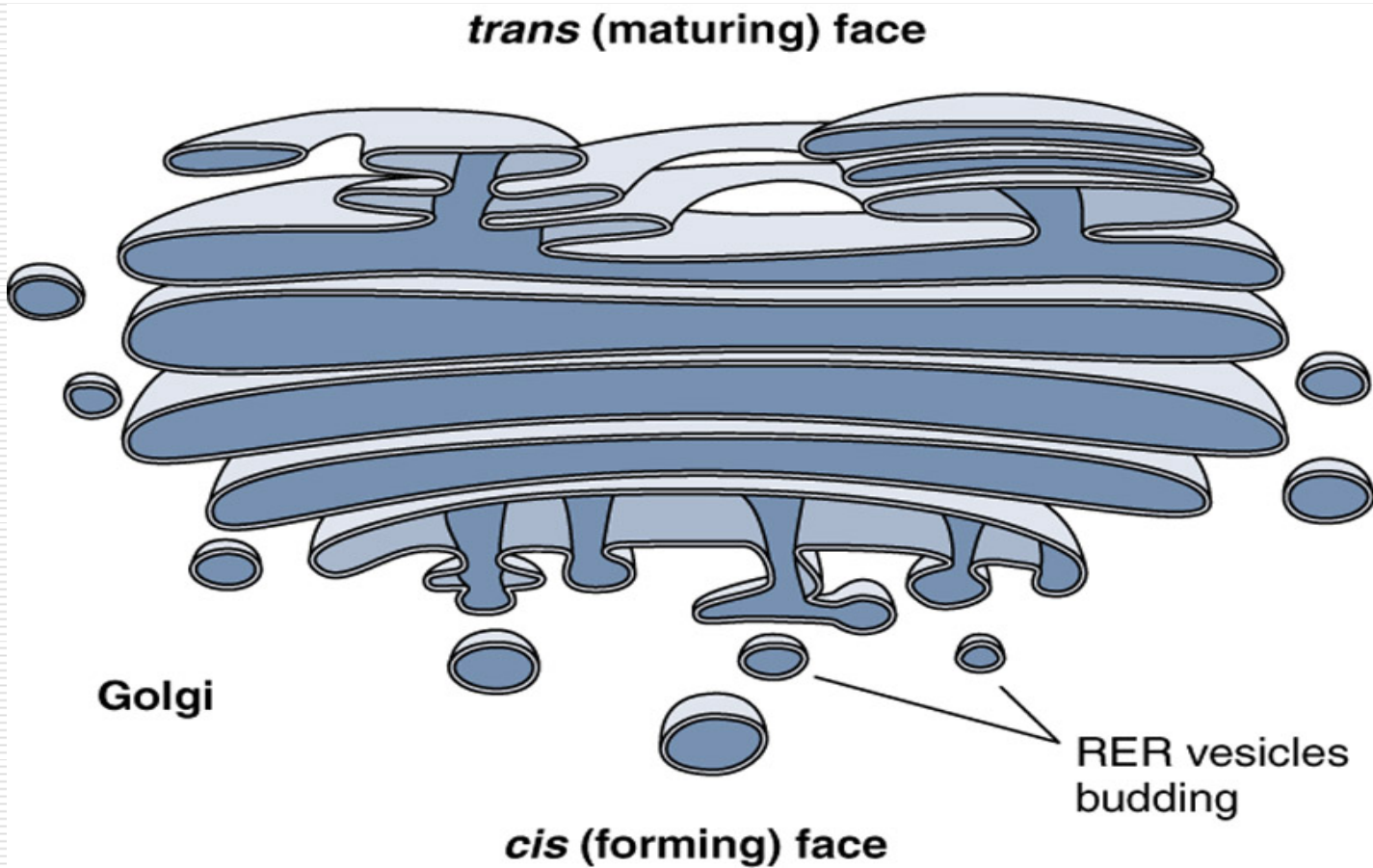
2.3 Golgi Complex (Golgi Apparatus)

Structure: vesicles (Transport vesicles)
saccule, vacuoles (Condensing vacuoles)

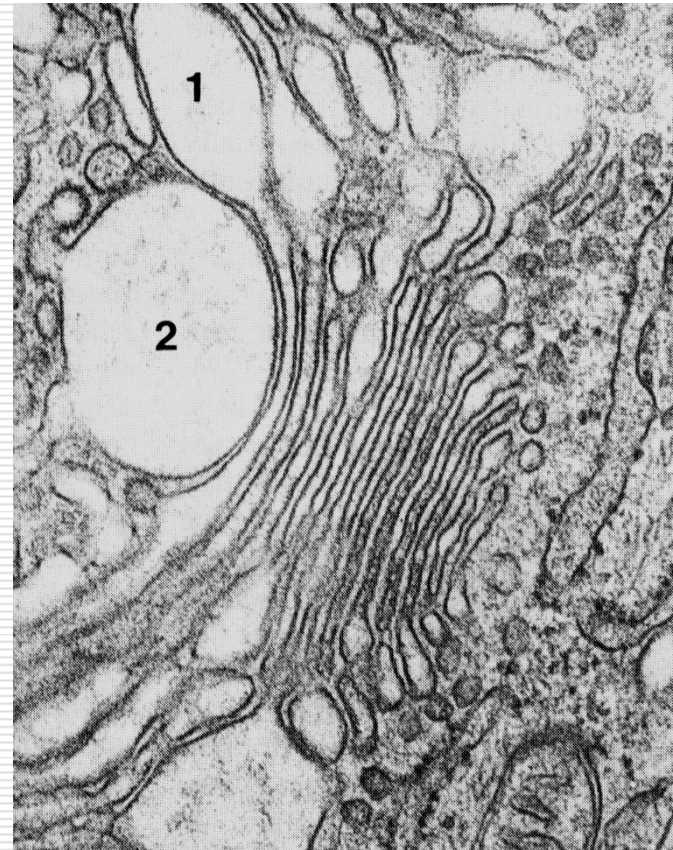
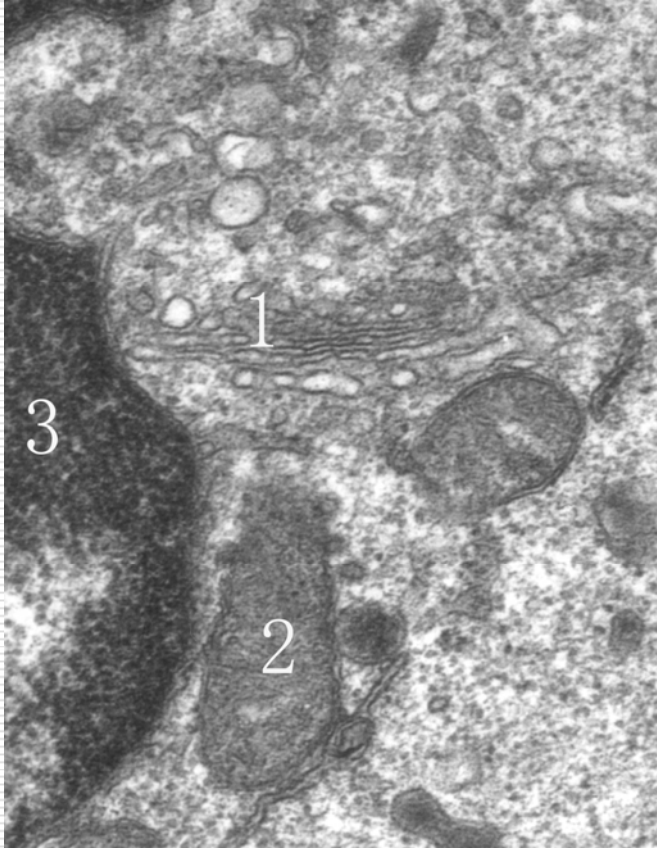
Forming face ,
maturing face

Functions: initiates packing, glycosylation and
concentration of secretory products
(including secretory granules and lysosome)

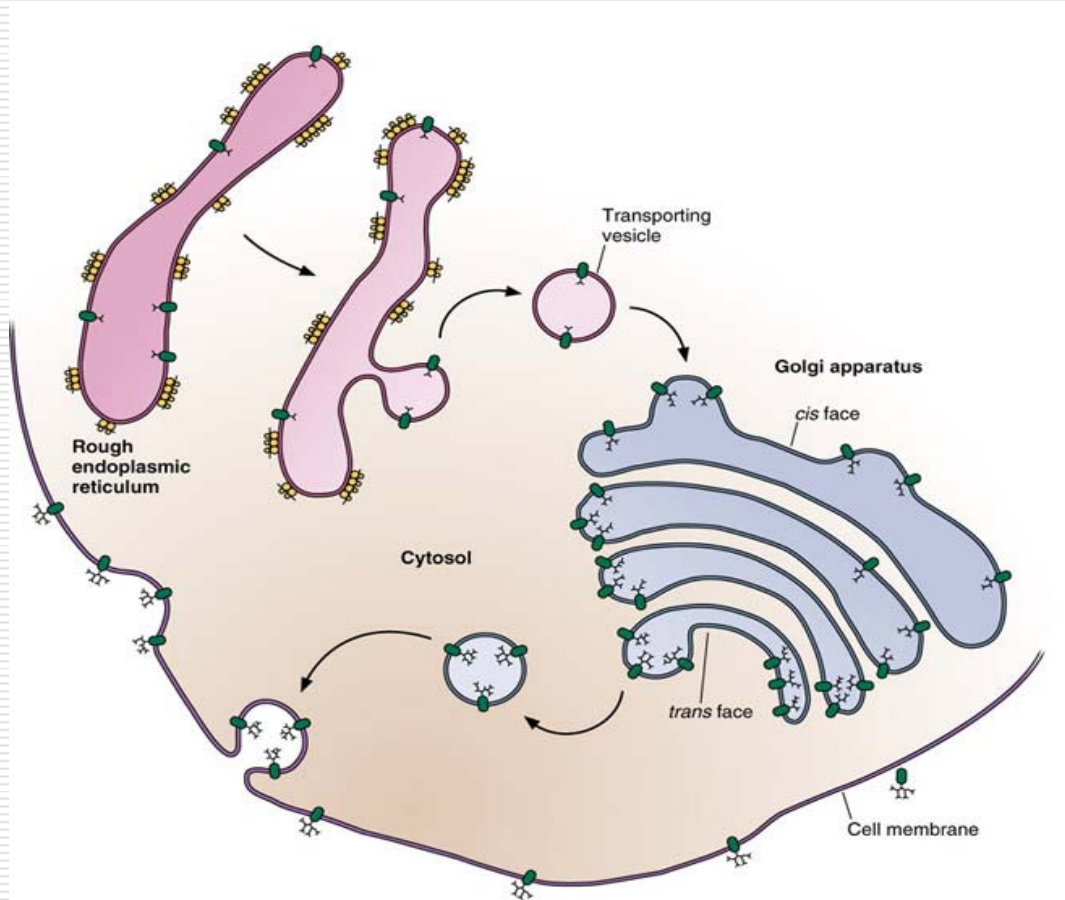
Golgi (modle)



Golgi complex



Process of synthesis and protein

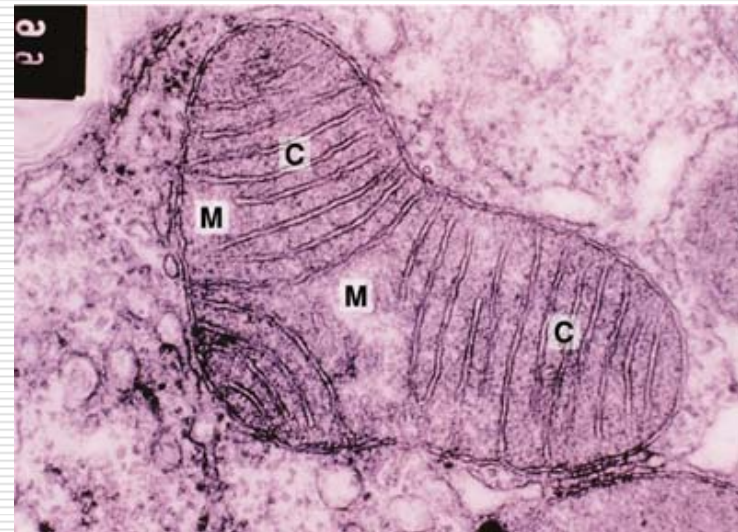
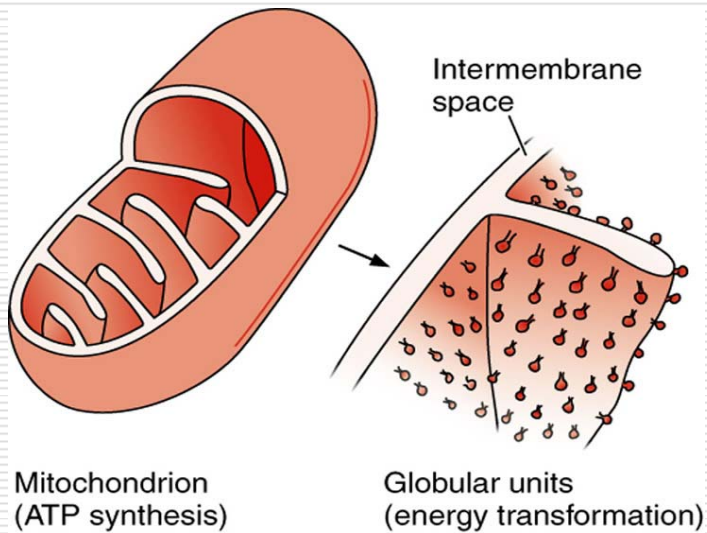


2.4 Mitochondria

Structure :Outer and Inner membrane,cristae,Intermembrane space, Intercristae space ,Matrix elementary particle

Function: Transform the chemical energy of the metabolites present in cytoplasm into energy that is easily accessible to the cell.

Structure modle of mitochonddia



Mitochondria



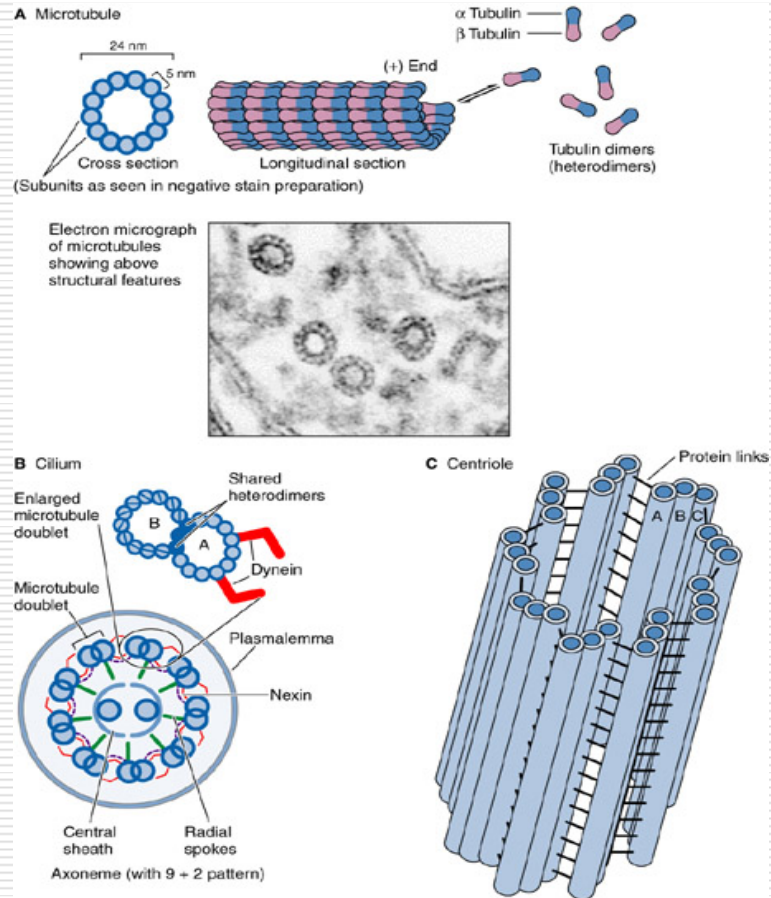
2.5 Centrosome

Structure: Centrosome is made of a pair of centrioles surrounded by a granular material.

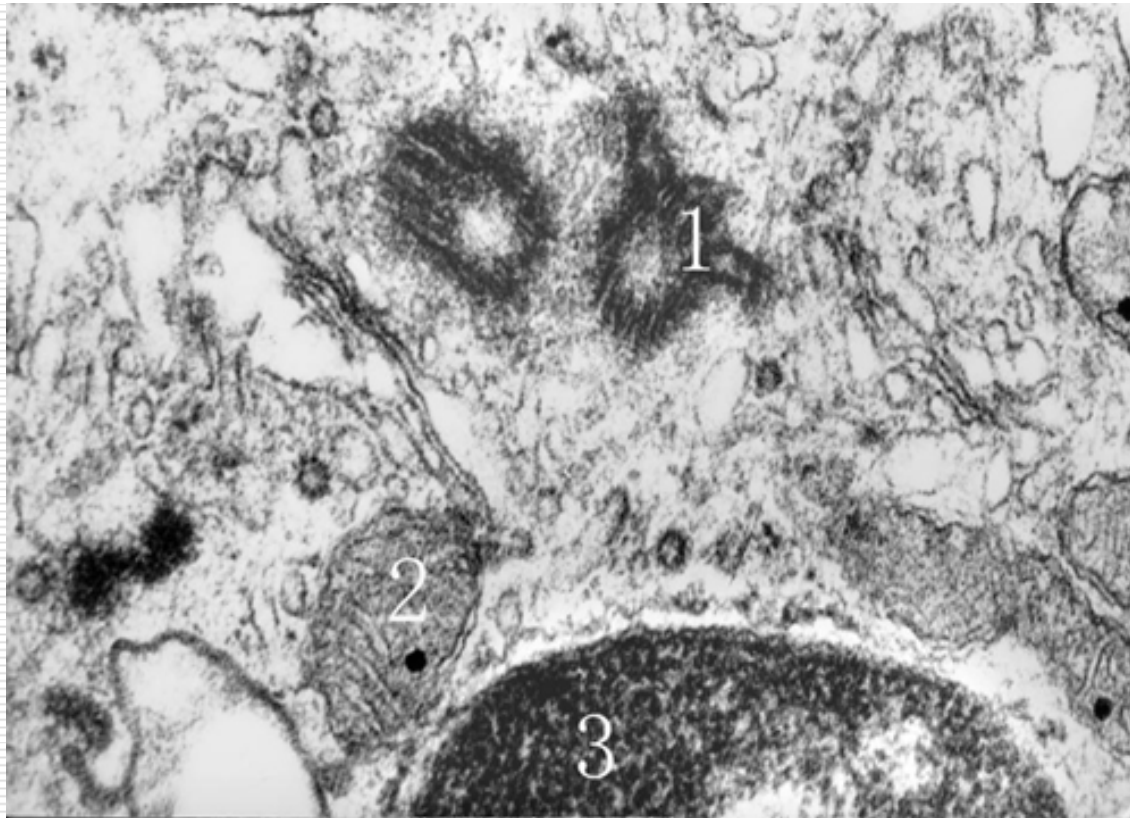
Centriole shows nine sets of microtubules arranged in triplets.

Function: Participate in the organization of the mitotic spindle.

Centriole (model)



Centriole (TEM)



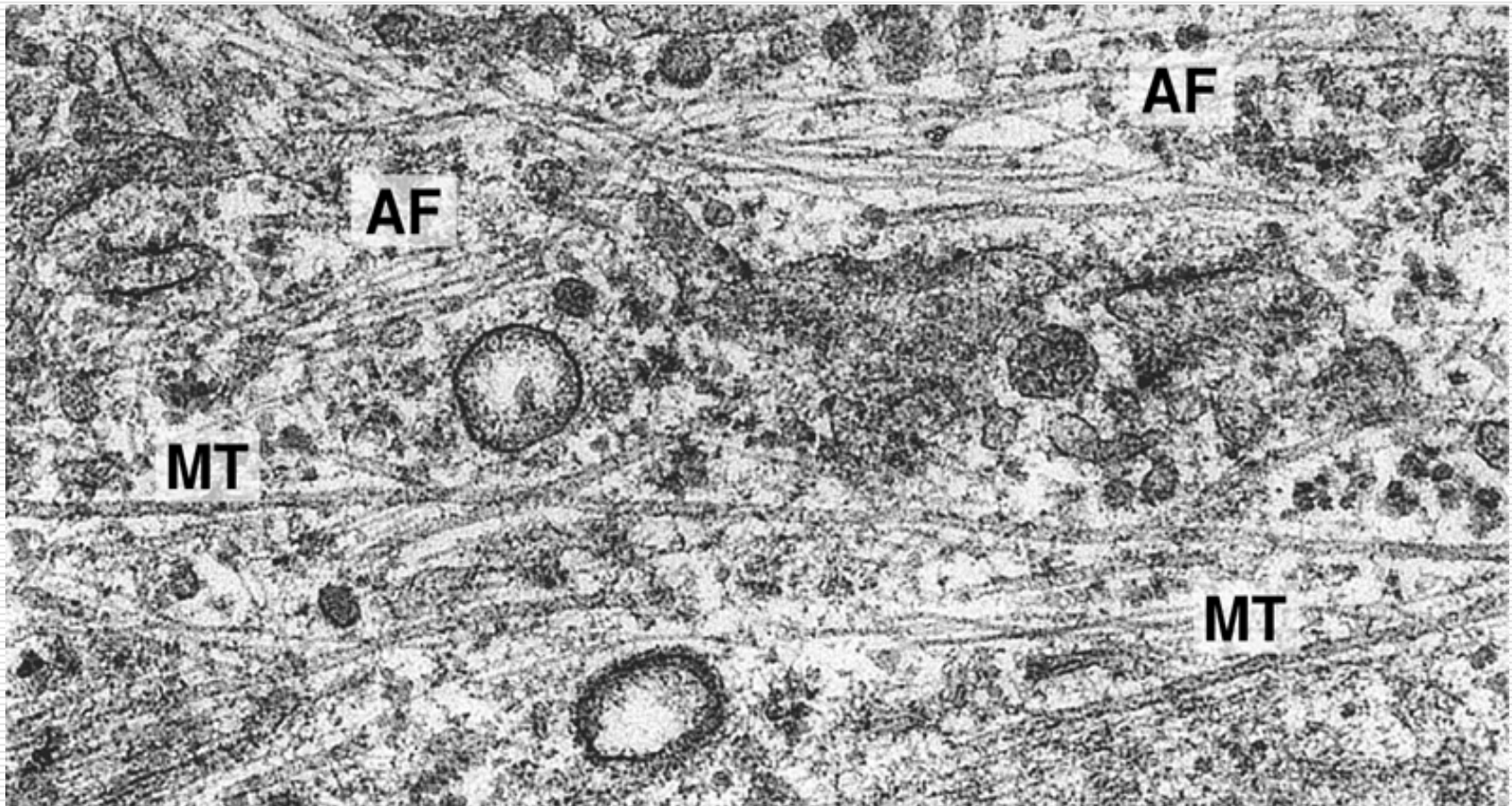
Cytoskeleton

Microtubules

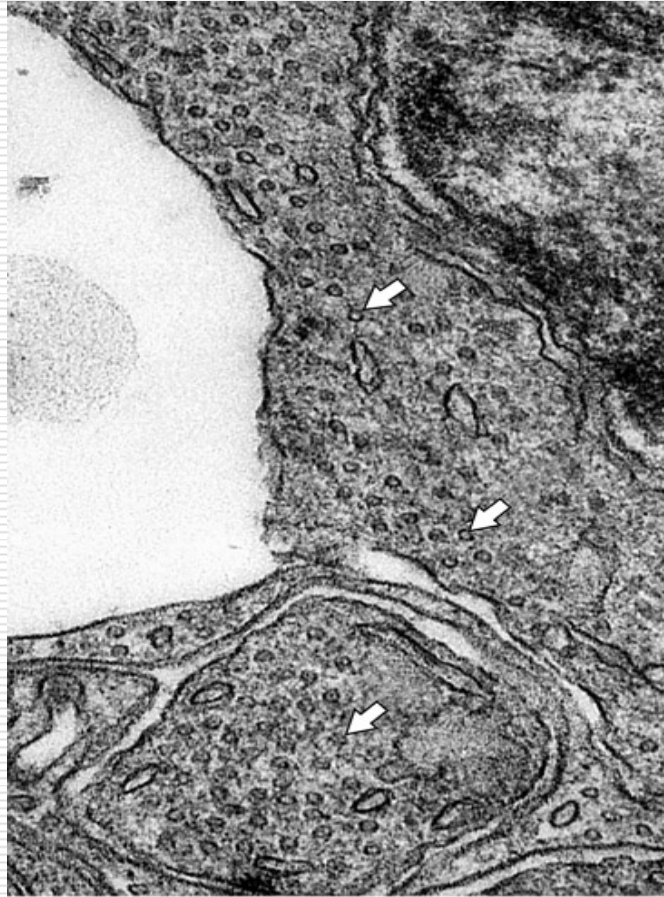
(1) Structure

- The subunit is a heterodimer composed of α and β tubulin molecules.
 - Microtubule-organizing centers (cilia, basal bodies, and centrosomes)
-

Microtubule and microfilament



Microtubules (transversal)



Microfilaments (Actin filaments)

Structure

- Thin filament (Actin filament, be composed of actin)
- Thick filament (Myosin filament, be composed of myosin)

Function

- Form a meshwork to maintain the shape of the cell
-

Intermediate filaments

Classification:

Keratin filament (Tonofilament)

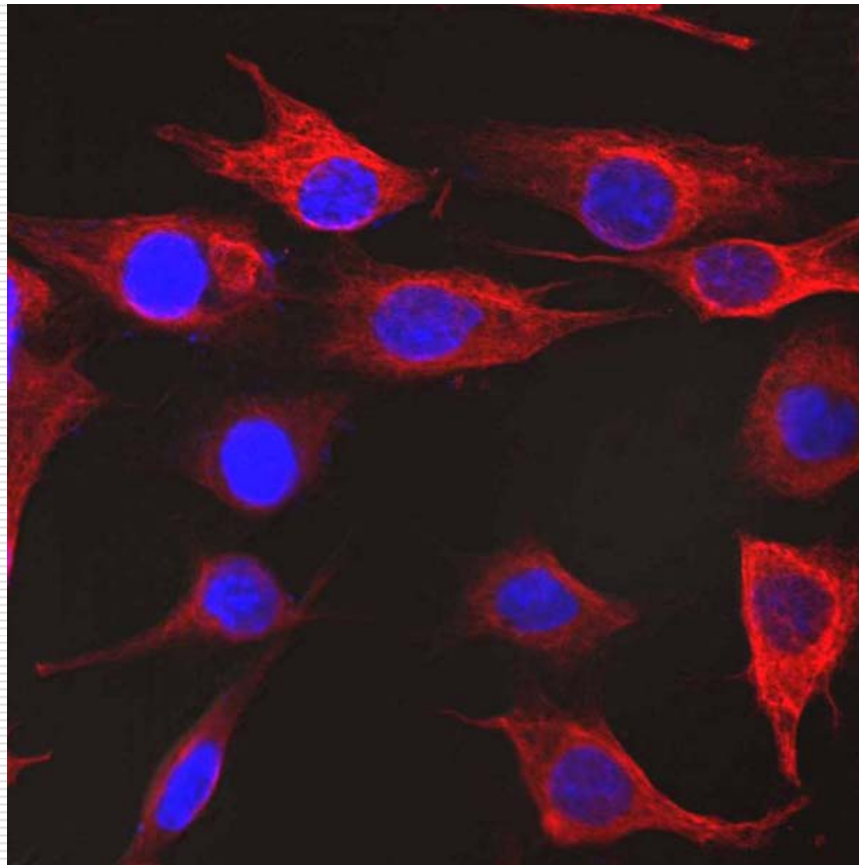
Desmin filament

Vimentin filament

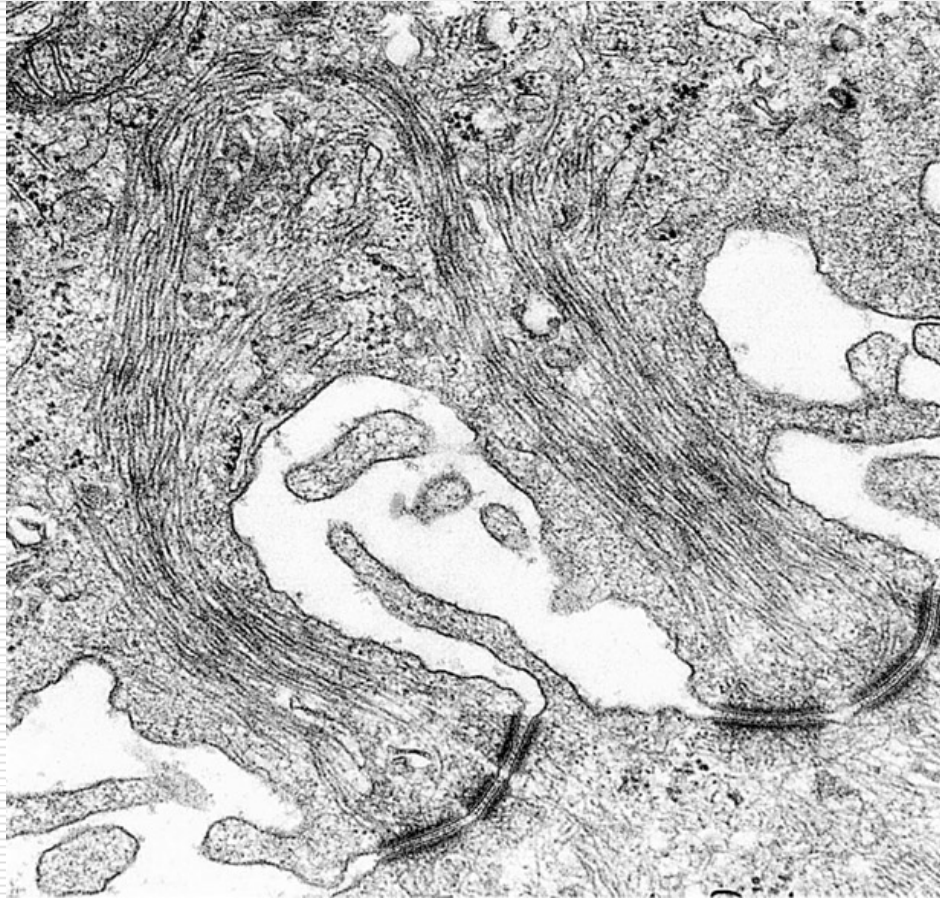
Neurofilament

Neuroglial filament

Vimentin filament



Intermediate filament



2.6 Lysosomes

Structure :Spherical, membrane-limited vesicles ,Containing hydrolytic enzymes

Primary lysosomes multivesicular body

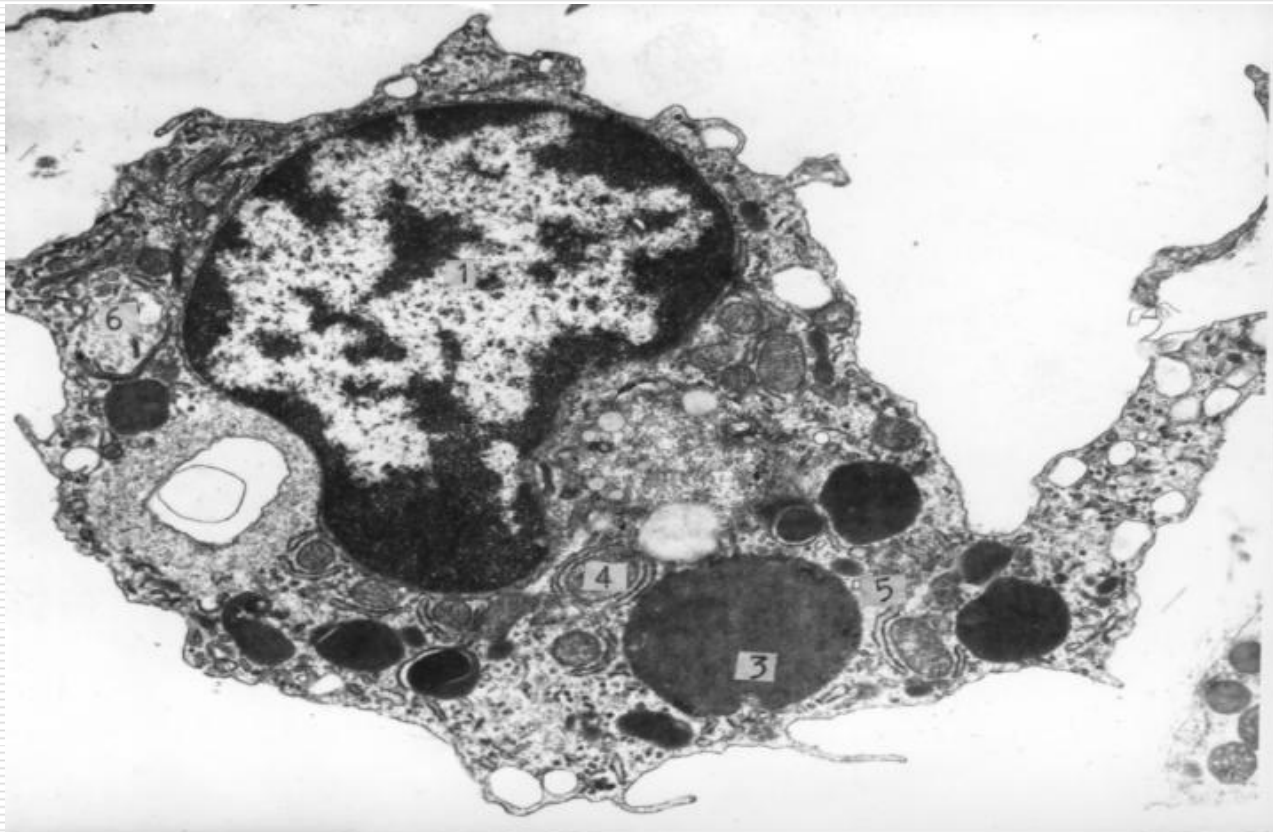
Secondary lysosomes

Residual bodies (lipofuscin, or age pigment)

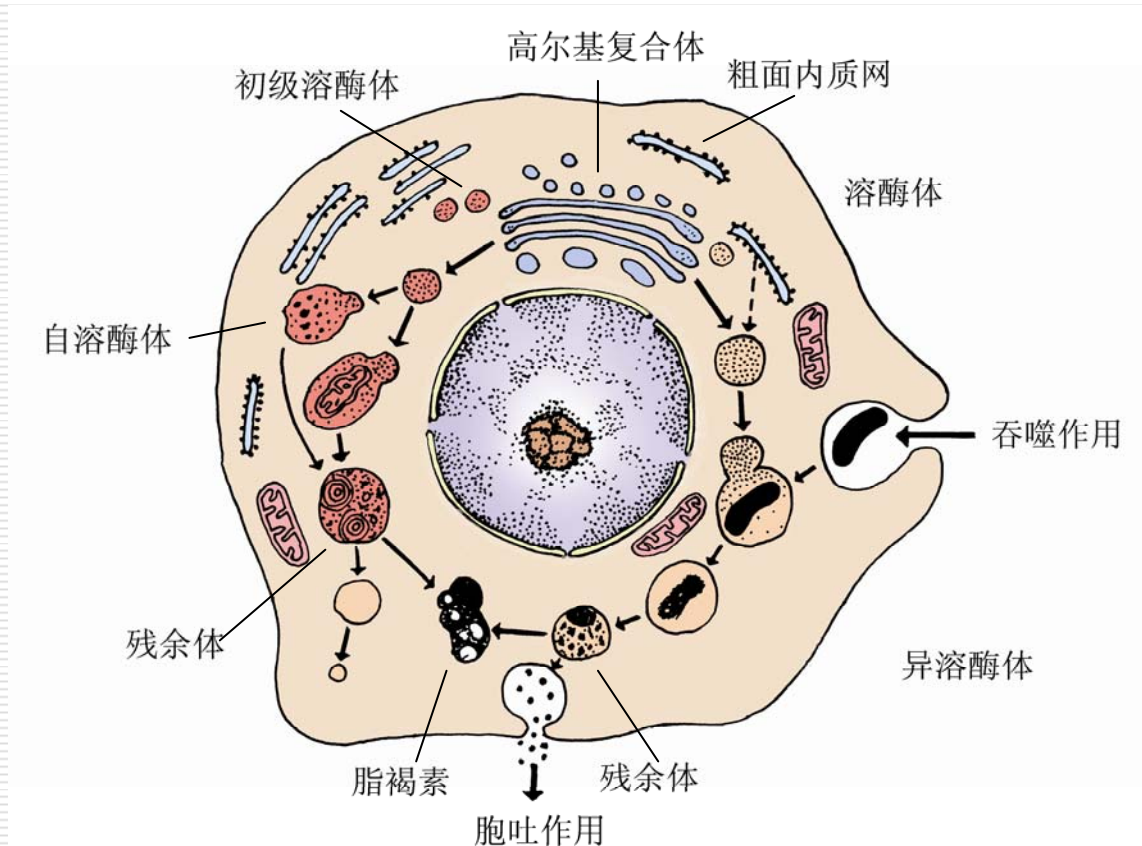
Functions

Digest intracellular material from its environment and turnover of cytoplasmic organelles

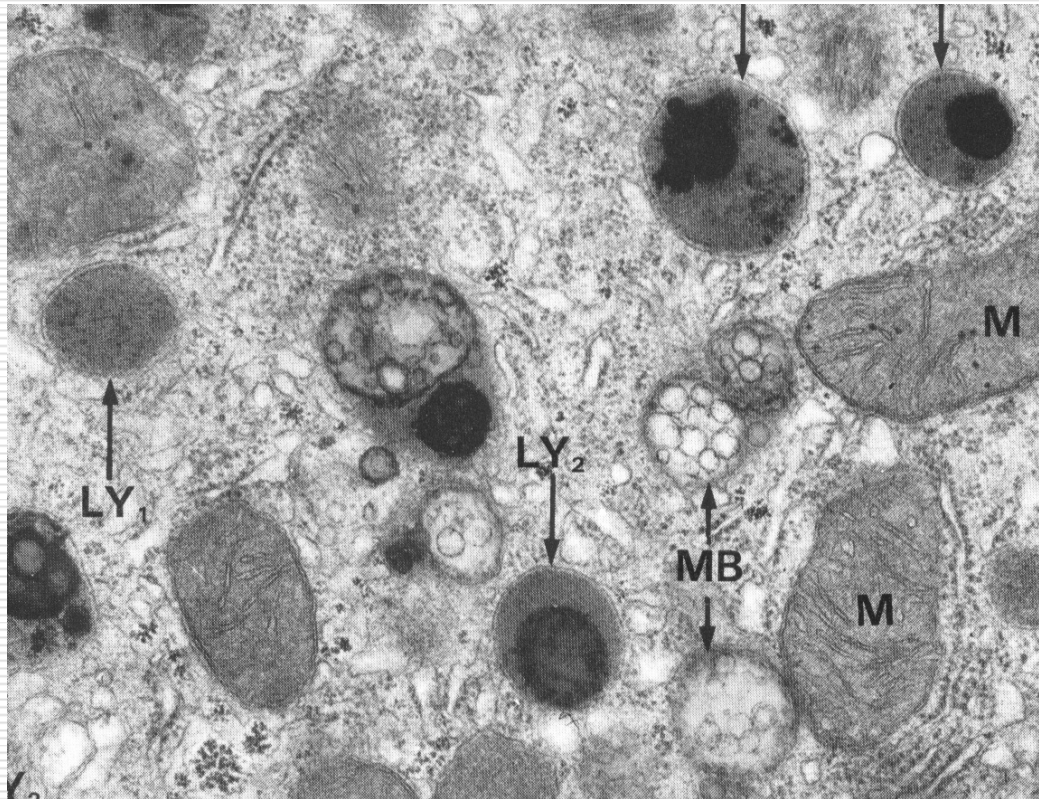
Lysosome



The function of lysosome



Multivesicular body



2.7 Peroxisomes or Microbodies

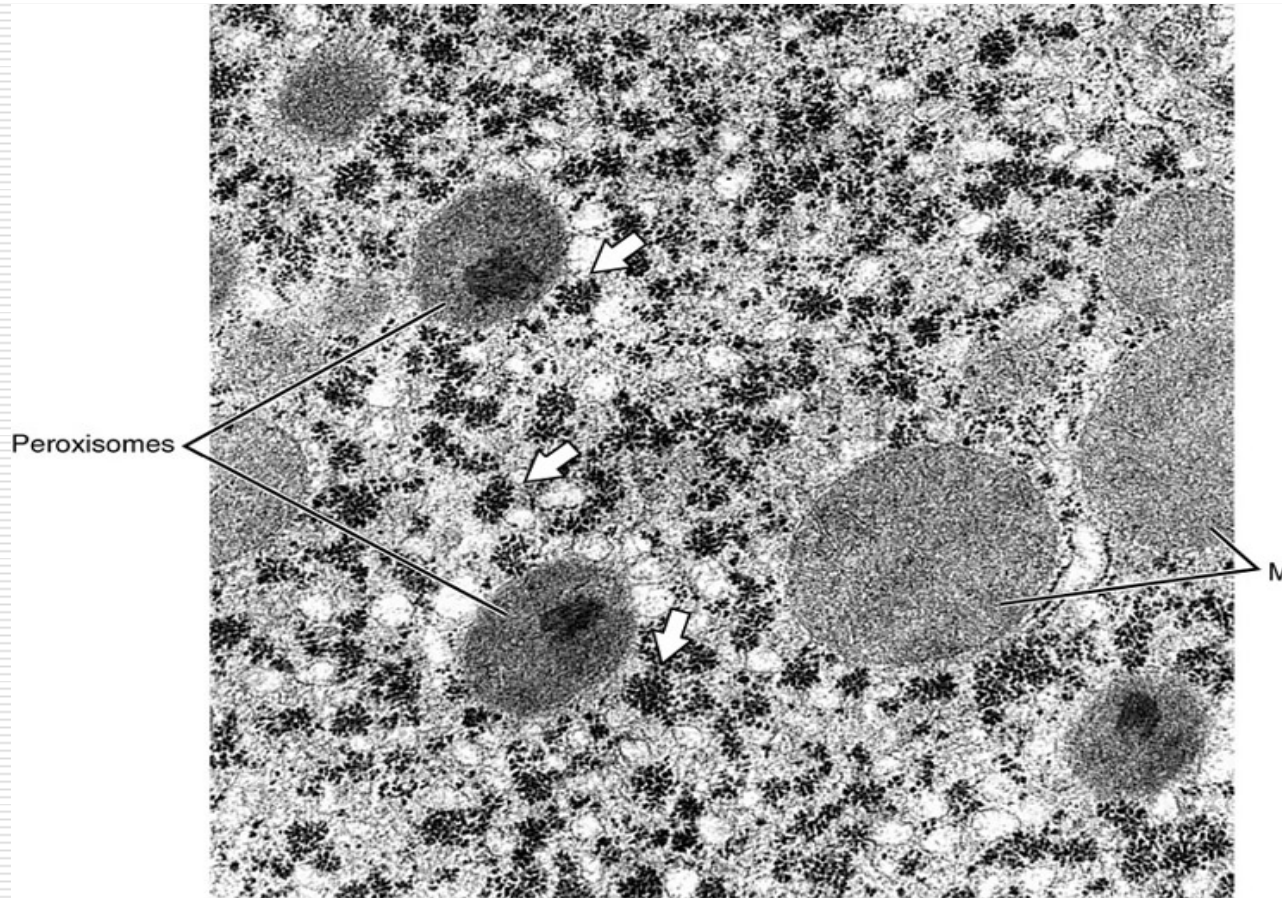
Structure:

Spherical membrane-limited organelles,
Contain catalase

Functions

- ① Eliminate hydrogen peroxide
 - ② Degrade toxic molecules in liver and kidney
 - ③ Participate in lipid metabolism
-

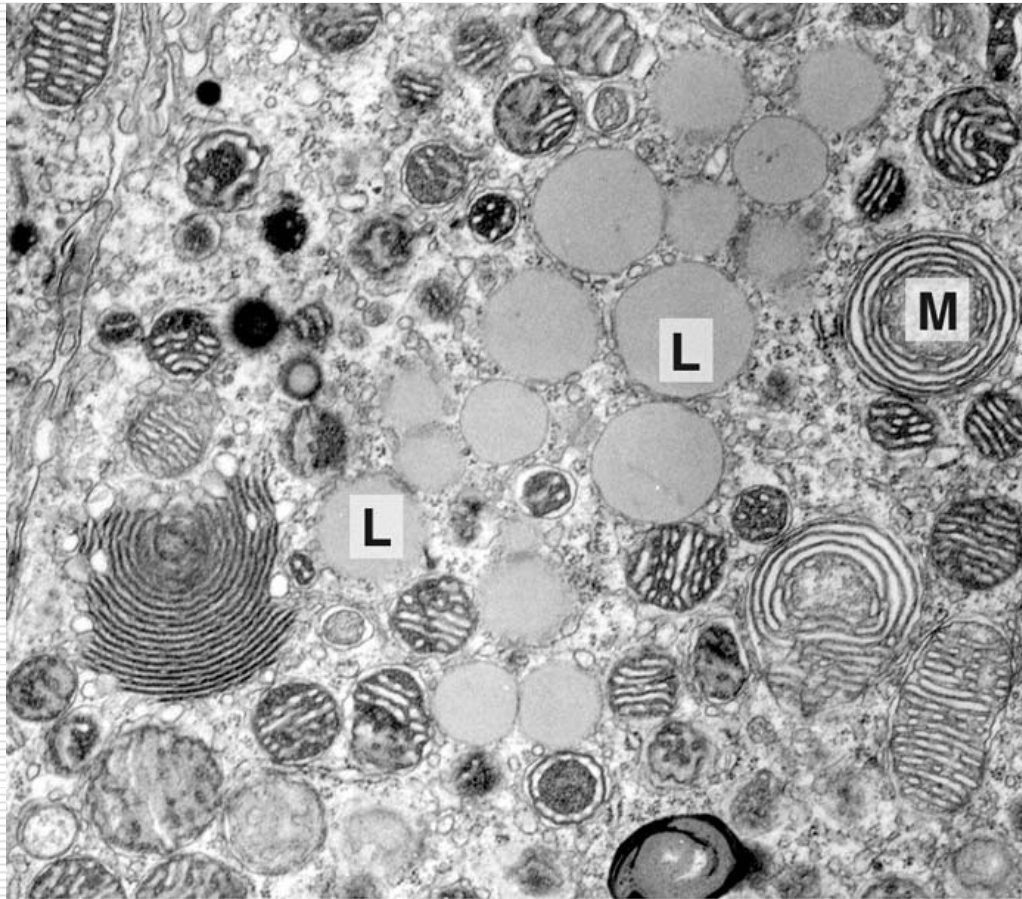
Glycogen granules and microbody (peroxisome)



Inclusion

1. Glycogen granule
 2. Lipid droplet
 3. Secretory granule or secretory vesicles
 4. Pigments (Lipofuscin)
-

Lipid droplets



III. Cell Nucleus

1. Nuclear envelope

Outer nuclear membrane

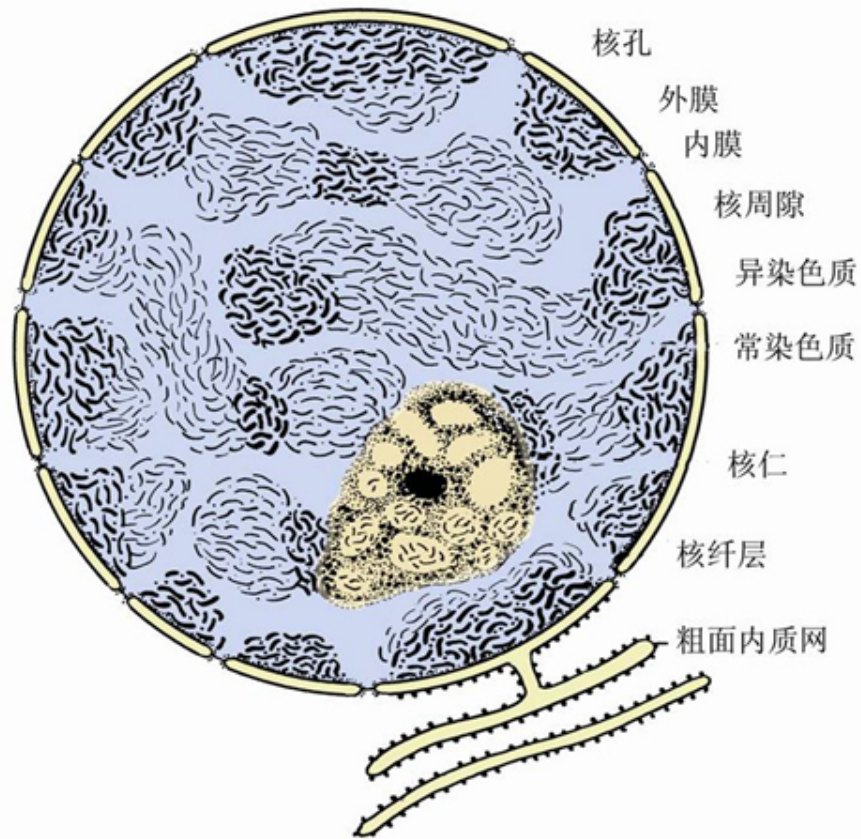
Inner nuclear membrane

Perinuclear cisterna

Fibrous lamina

Nuclear pores

Nucleus (model)



2. Chromatin

Components: DNA and Proteins

Classification

(1) Heterochromatin

LM: basophilic clumps

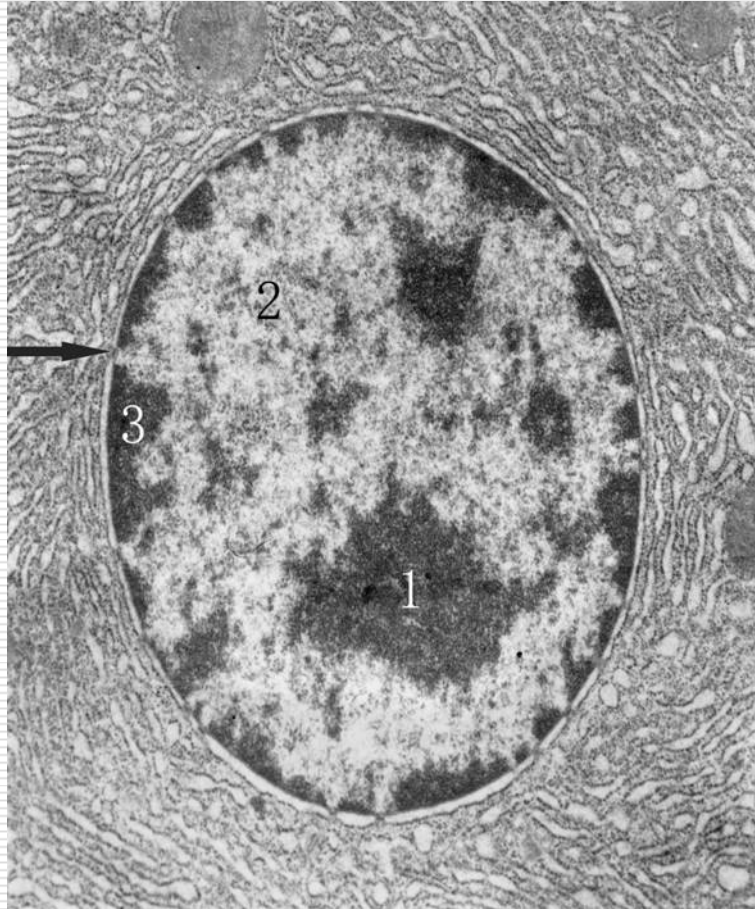
EM: coarse granules

(2) Euchromatin

LM: lightly stained basophilic areas

EM: finely dispersed granular material

Neuclues (TEM)



3. Nucleolus

Components: rRNA and Proteins

4. Nuclear matrix

The Highlight This Chapter

1. Structure and function of the organelles
 2. What are Euchromatin and Heterochromatin ?
-