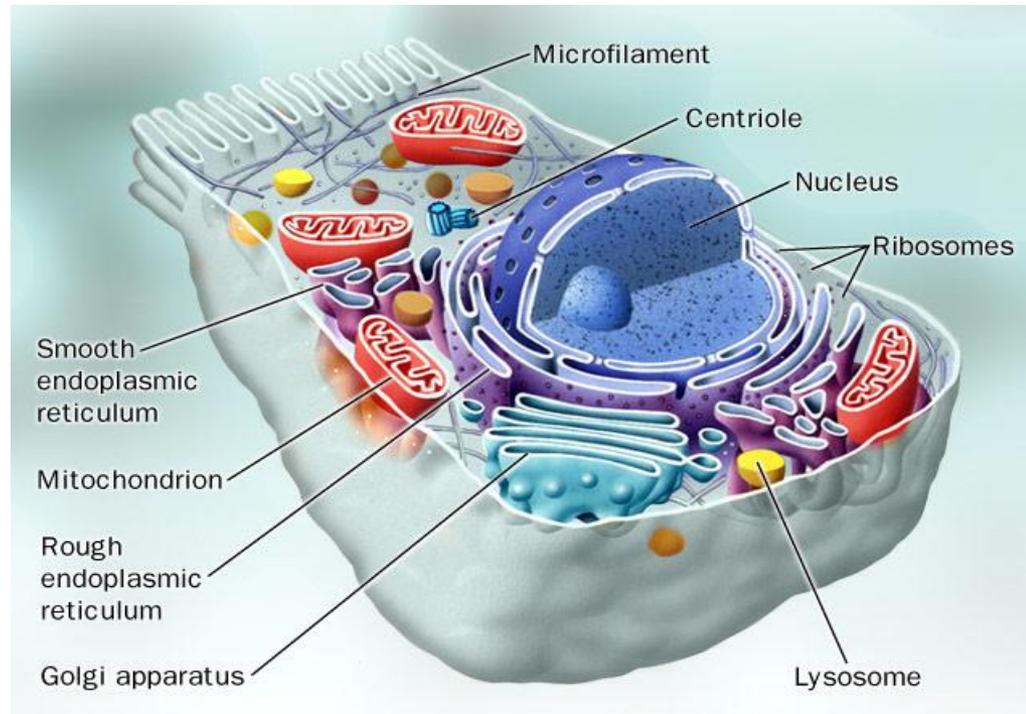


# CELL ORGANELLES II



*By*

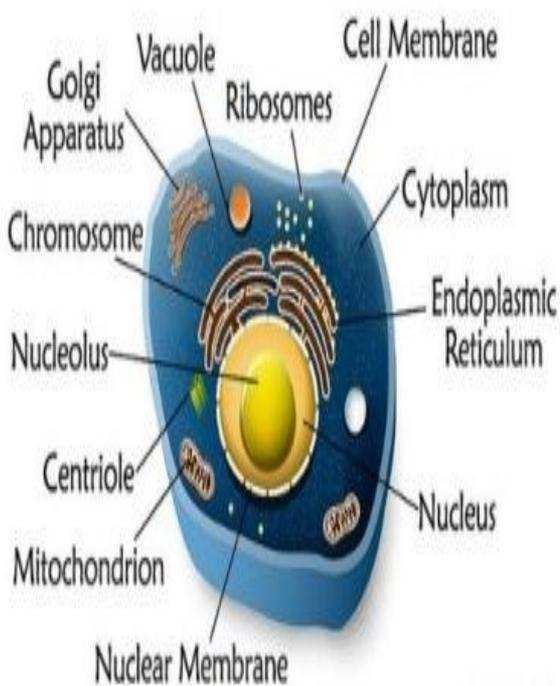
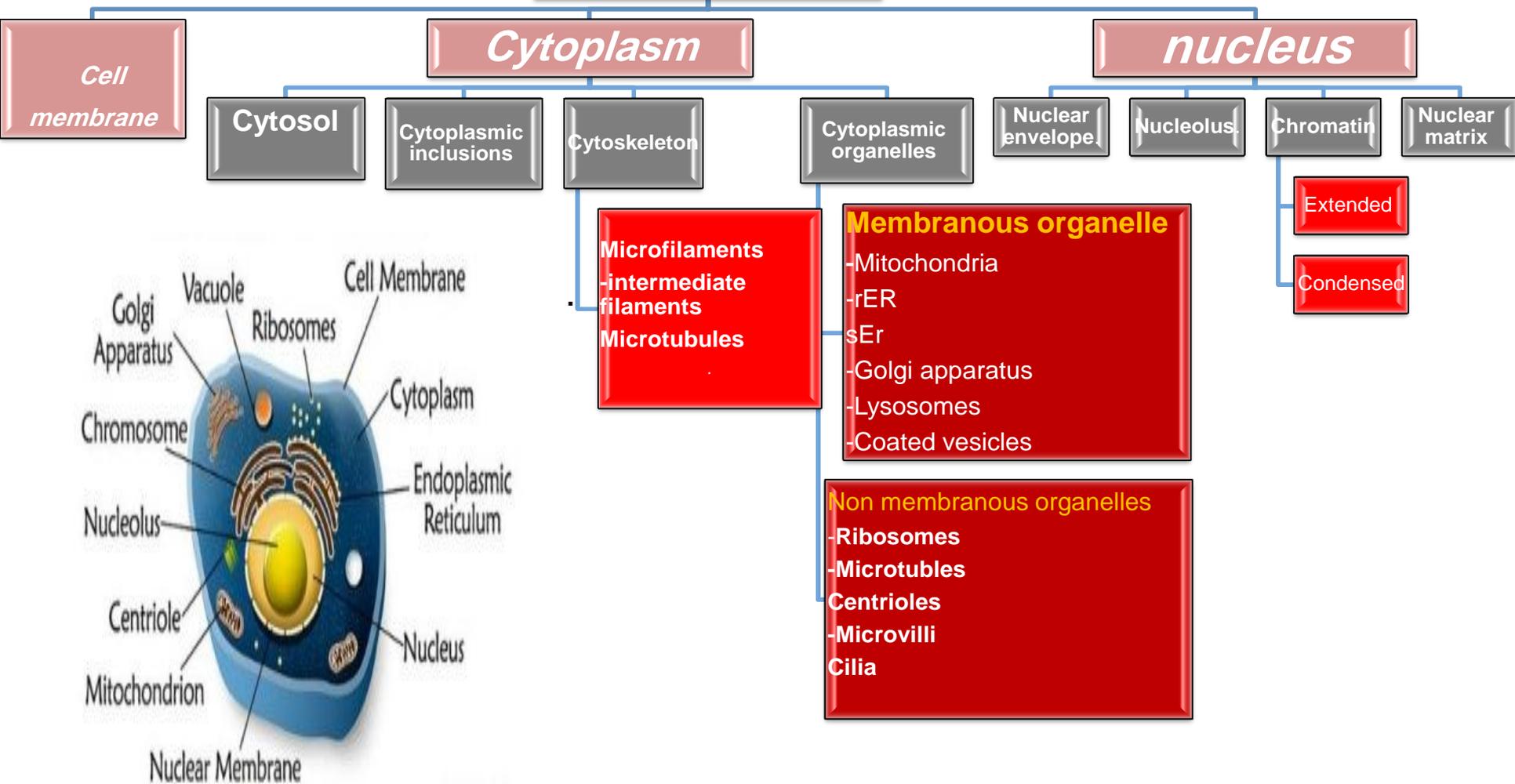
**Dr. Heba Sharaf Eldin**

Assistant Professor of Histology & Cell Biology

# *OBJECTIVES OF THE LECTURE*

1. Classify the cell organelles.
2. Define and describe the structure and functions of the cytoplasmic organelles.
3. correlate the structures of the organelles with their functions.
4. Predict structures present in a cell from their functions.
5. Recognize different cellular components in electron photomicrographs.

# The cell



# CELL ORGANELLES I

They are classified according to the presence or absence of surrounding membranes into-

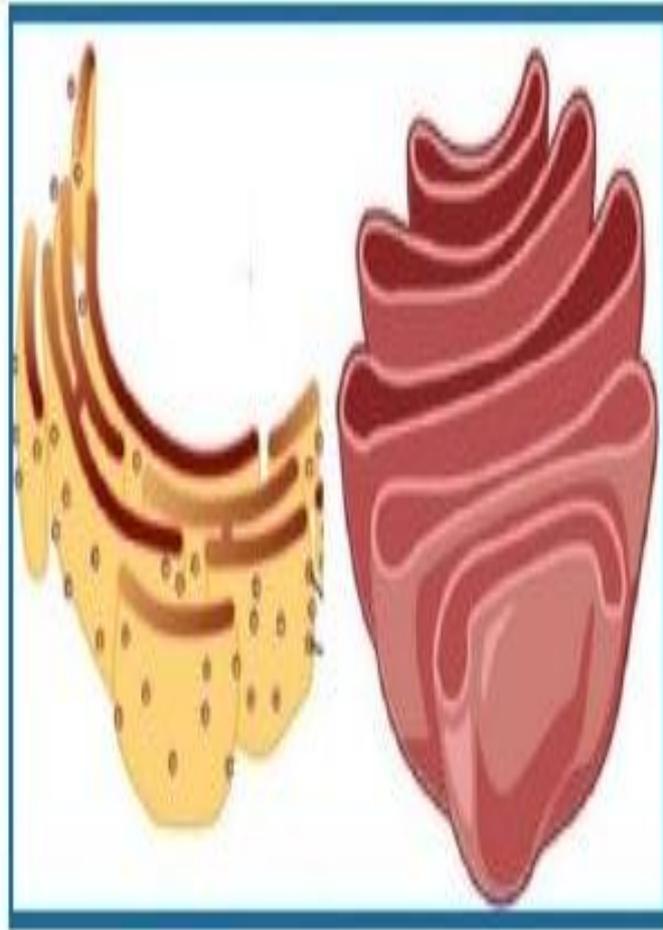
## A-Membranous cell organelles:

- 1- Mitochondria
- 2- Endoplasmic reticulum (rough & smooth)
- 3- Golgi apparatus
- 4- Membrane bounded vesicles.
  - Lysosomes
  - Peroxisomes
  - Endosomes

## B-Non membranous cell organelles

- 1- Ribosomes
- 2- Proteasomes
- 3- Cytoskeleton

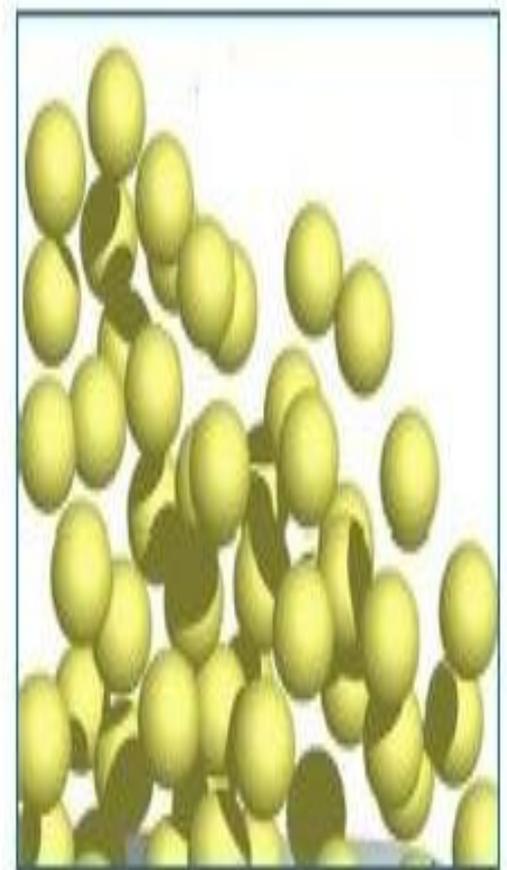
*A. Cisternae*



*B. Tubules*



*C. Vesicles*

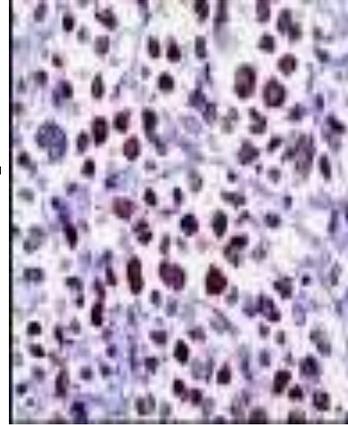


# LYSOSOMES

- **Definition:** membranous cell organelles consist of vesicles filled with **hydrolytic enzymes**. Considered the **digestive system** of the cell.
- **Origin of lysosomal enzymes:**
  - synthesized in rER and transported in vesicles to Golgi complex.
  - Sorting of lysosomal enzymes occurs also in Golgi.
- **Contents:** hydrolytic digestive enzymes called **hydrolases** e.g acid phosphatase, proteases, nucleases and lipases.
- **Site:**
  - All cells except mature erythrocytes
  - *Numerous* in **phagocytic cells** e.g. macrophages, neutrophils.



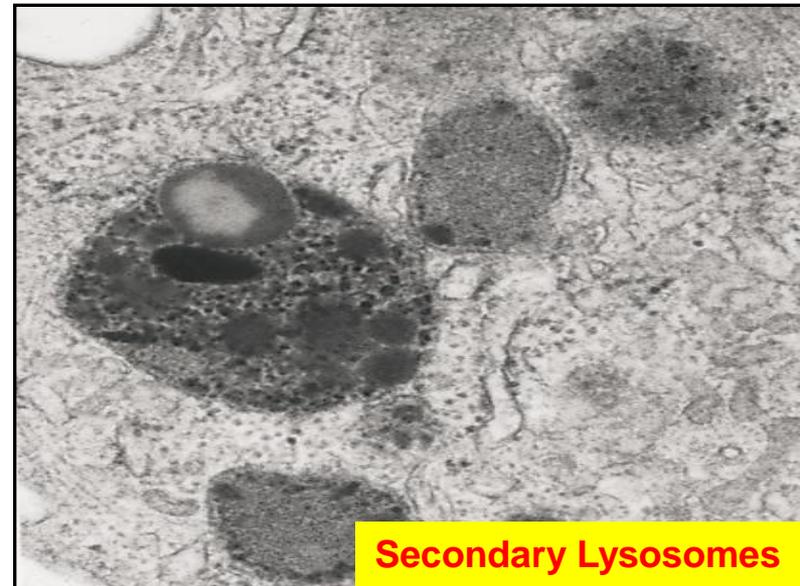
- **Structure**
- **LM:** could be demonstrated by histochemical stains for their enzymes.
- **EM:** spherical small membranous vesicles .
- **Types of lysosomes**
- **1- Primary Lysosomes:**
  - **Newly** formed lysosomes that have pinched off from trans-face (mature face) of Golgi
  - **Do not enter** into digestive events.
  - **By EM:** appear **Homogenous**



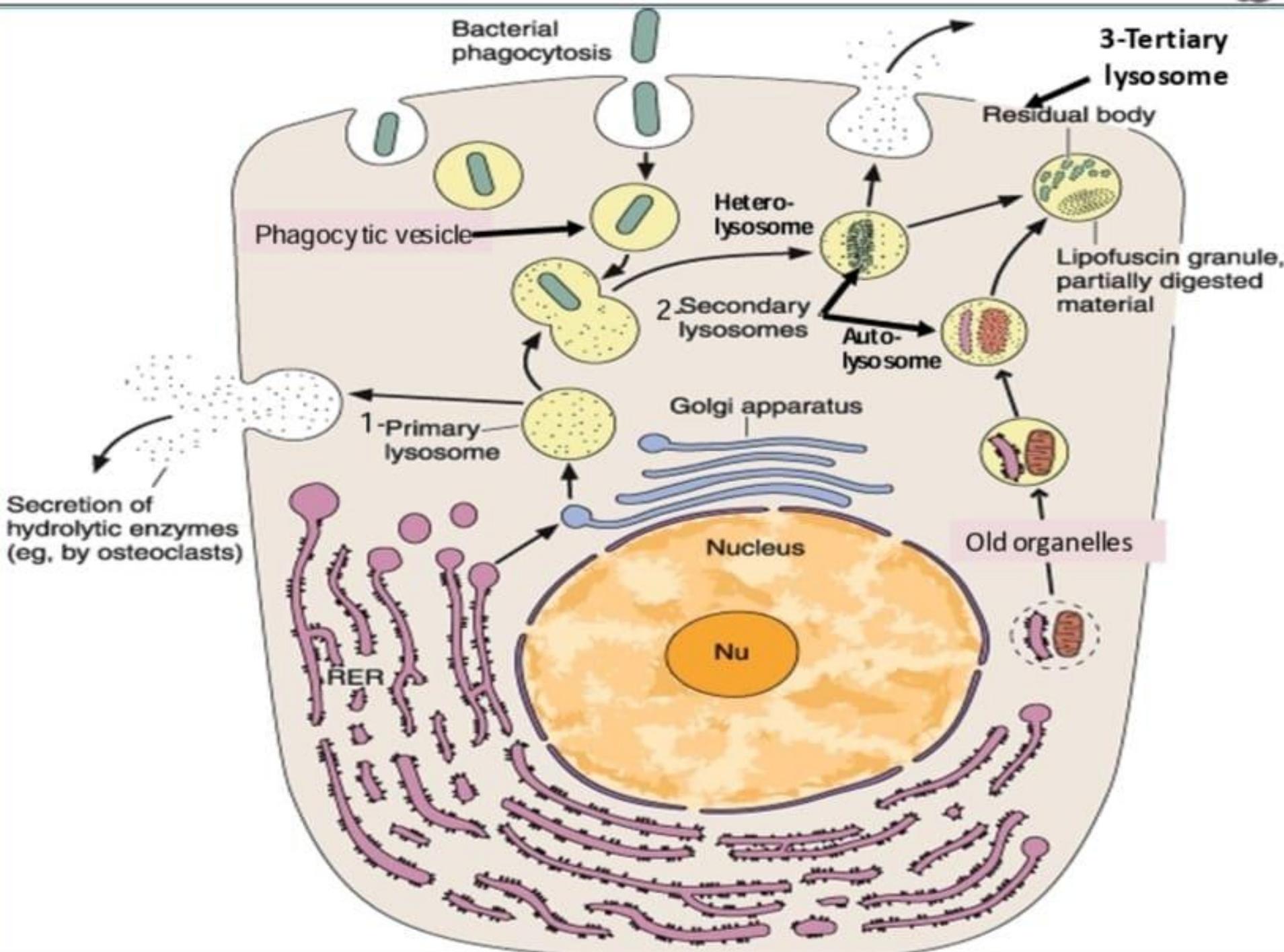
**Primary Lysosomes**

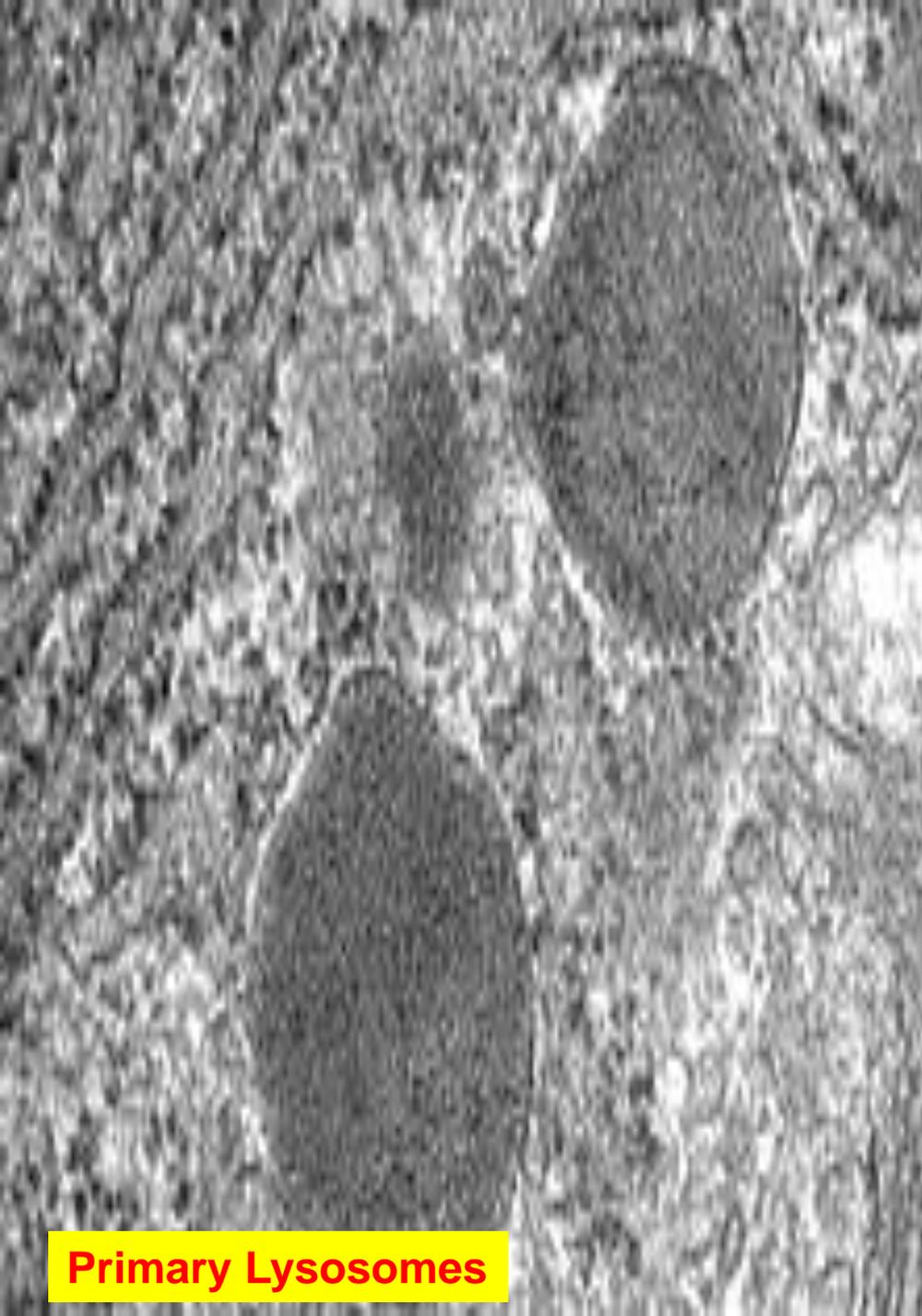
## 2- Secondary Lysosomes:

- The contents of secondary lysosomes are **heterogeneous**.
  - They are formed after fusion of primary lysosomes with some other substances from within or outside the cells.
- 1) Substances of extracellular origin enter the cells by endocytosis as
- Fluid materials ( with pinocytosis) will give pinocytotic vacuole.
  - Solid materials (with phagocytes) will give phagocytic vacuole.
- 2) Substances of intracellular origin (e.g. mitochondria) are enclosed in a membrane → autophagic vacuole.

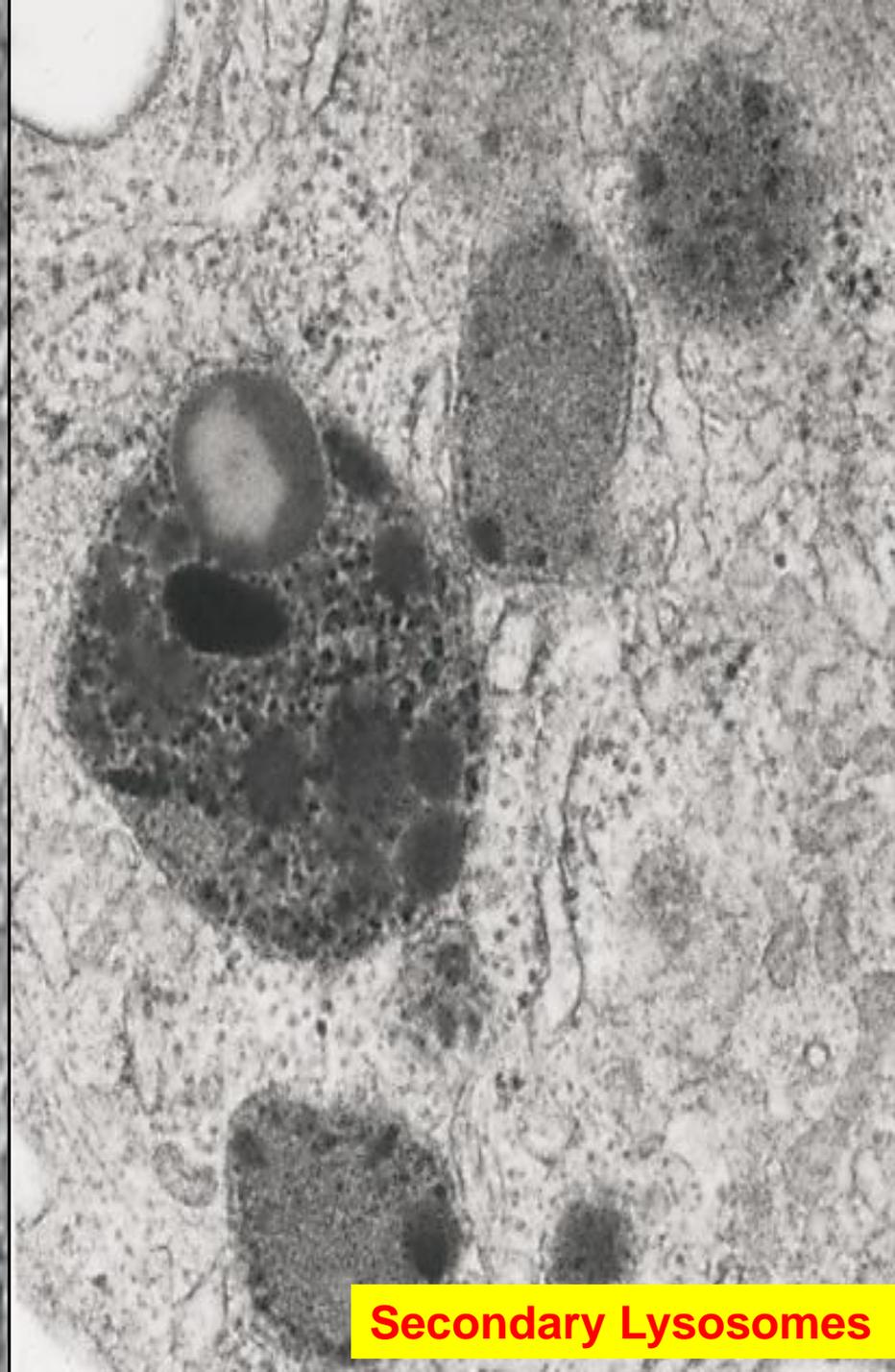


- When primary lysosome interacts with **pinocytotic vacuole** it gives **multivesicular body**.
- When primary lysosome interacts with **phagocytic vacuole** it gives **phagosome**.
- When primary lysosome interacts with **autophagic vacuole** it gives **autophagosome**.
- Multivesicular body, phagosome and autophagosome all are varieties of **secondary lysosomes**.
- In secondary lysosomes enzymatic digestion breaks down the contents into small molecules that pass back across the lysosomal membranes, into the cytosol.
- The **undigested materials** remain inside the secondary lysosomes which are then called **residual bodies that released by exocytosis**.
- When residual bodies remain inside the cells especially the long lived cells as nerve cells or cardiac muscle cells called (**Tertiary lysosomes**).





**Primary Lysosomes**



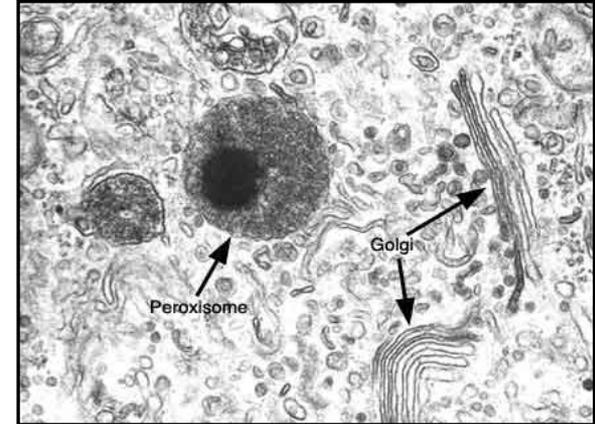
**Secondary Lysosomes**

## **Functions of lysosomes:**

- 1- Digestion of materials originated from outside and inside the cell.
- 2- Defensive function, destruction of any bacteria or virus.
- 3- Removal of any degenerated old organelles.
- 4- Lysis of the cells and all bodies after death.

# PEROXISOMES (Microbodies)

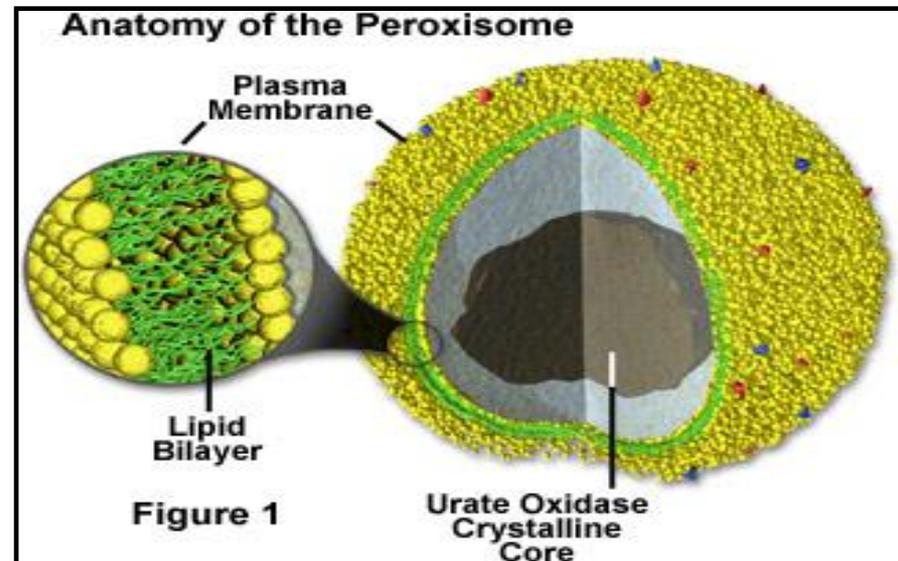
- **Definition:** small spherical membranous cell organelles.
- **Number:** increase in metabolically active cells such as liver and proximal tubules of kidney.
- **Contents:** oxidative enzymes
- **Origin of peroxisomal enzymes:** synthesized on free polyribosomes.



- **Structure by EM:**

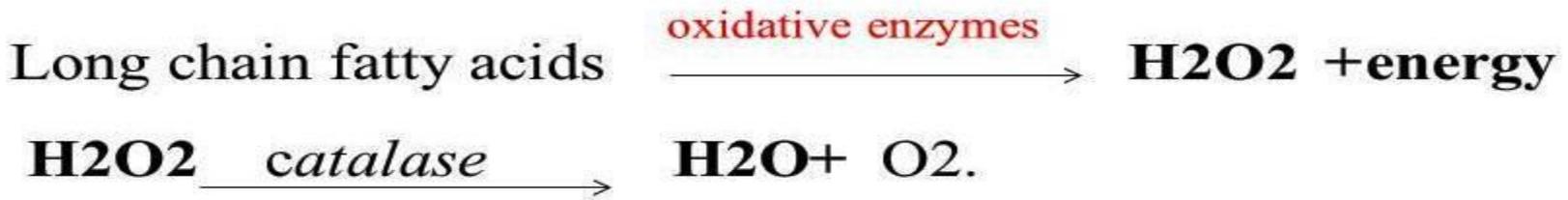
Finely granular homogeneous contents surrounded by unit membrane.

-In some animal species, peroxisomes have a denser central region called nucleoid, which contains a crystal of urate oxidase.



# • Functions:

- They contain more than 40 oxidative enzymes such as enzymes for B-oxidation of long chain fatty acids and urate oxidase.
  - These enzymes **oxidize their substrates** giving rise to **hydrogen peroxide and water**.
  - Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) detoxifies various noxious agents e.g. ethanol and kills micro-organisms
- but **excess H<sub>2</sub>O<sub>2</sub>** can damage many important cellular components.
- So, it is broken down by the action of **another peroxisomal enzyme** called catalase into water and O<sub>2</sub>.
- The **energy** produced in peroxisomes is dissipated as **heat** to maintain body temperature.

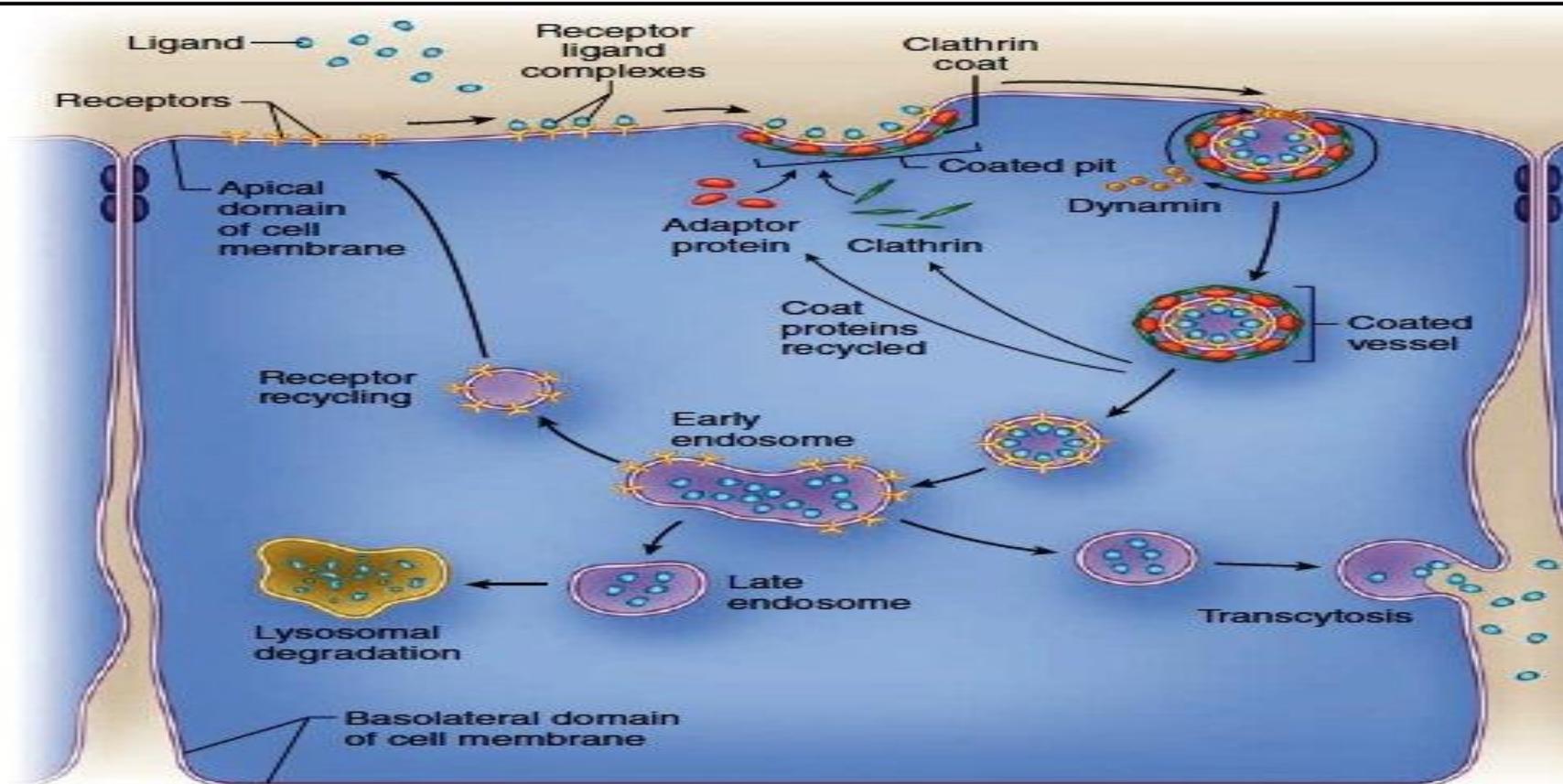


# ENDOSOMES

- **Definition:** membranous organelles that stored materials before reaching the lysosomes.
- **Types:**
  - 1- Early endosome.
  - 2- Late endosome.Both have [H<sup>+</sup> pumps to acidify their interior.](#)
- **Structure EM:**
  - ❑ They consist of a **system of vesicles and tubules.**
  - ❑ *Early endosome* is present near the cell membrane
  - ❑ *Late endosome* is present near Golgi apparatus (deeper in the cytoplasm).

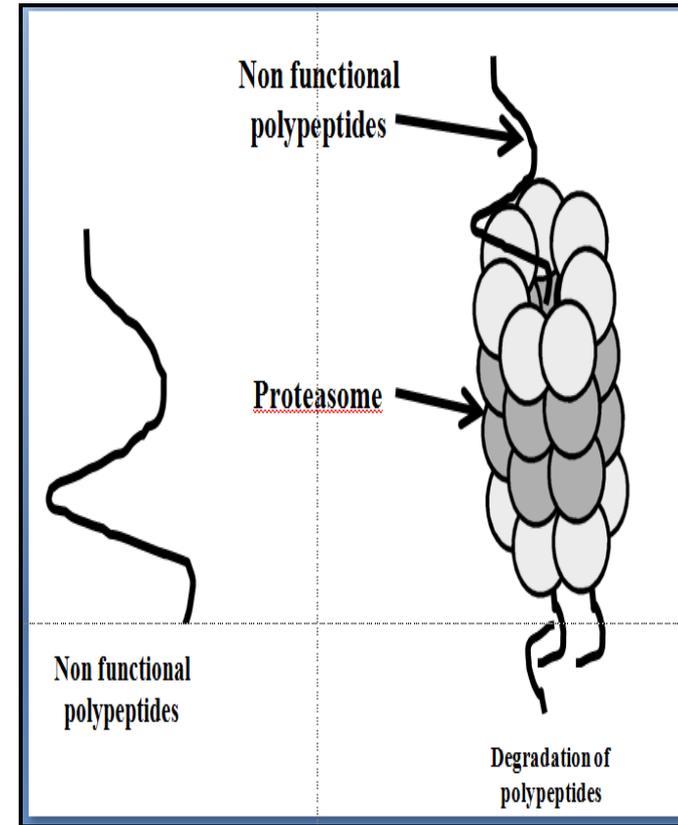
- **Functions:**

- Early endosome fuses with coated vesicles after losing their clathrin coat. Its acidic interior dissociates the ligand from its receptor molecule.
- Recycling of the receptor to plasma-membrane to be reused again.
- Ligands may be packaged and return to plasma membrane where they are released into extracellular space (e.g. transferrin), or transferred to late endosome which transport them to lysosomes for degradation.



# Proteasomes

- **Definition:** non-membranous organelles
- **structure:**
  - **Size:** very small in size (as small subunit of a ribosome).
  - **Shape:** barrel-shaped protein complex
  - **Function:** degrade non-functional polypeptides and unneeded proteins.



# Examine your self

- The arrow (→) refers to

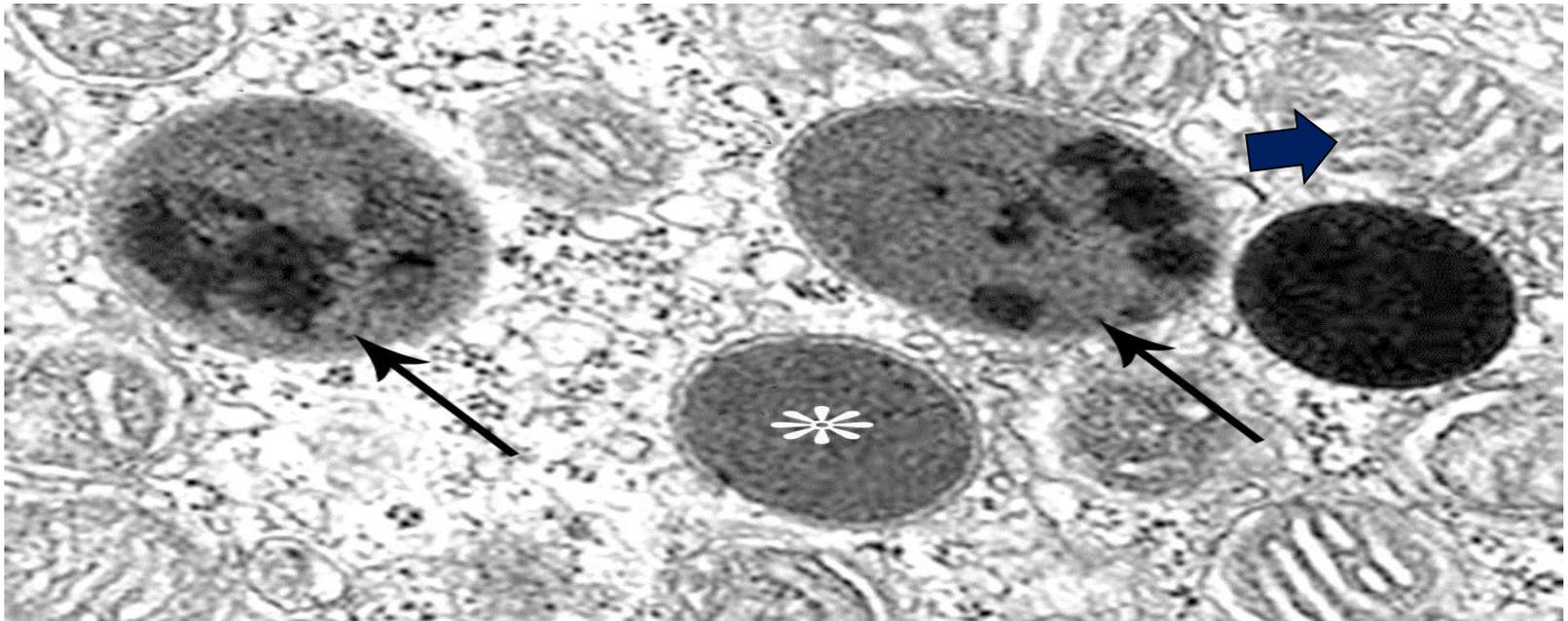
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- The star (\*) refers to

.....

- The thick arrow refers to

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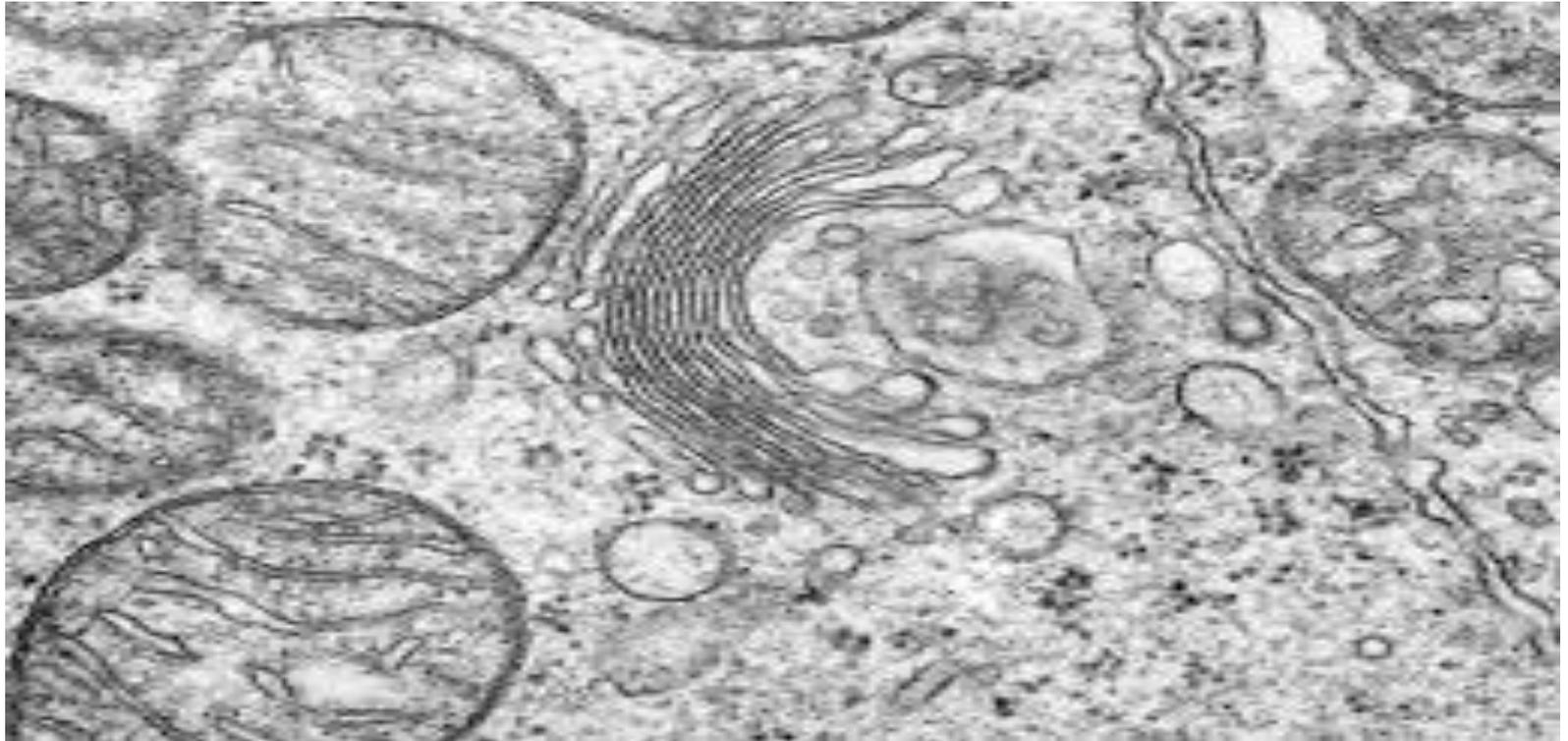
# Mention 2 organelles in this photo



1-.....

2-.....

# Mention 2 organelles in this photo



1-.....

2-.....

# Write the difference points between:

	RER	SER
L.M	..... ..... .....	..... ..... .....
E.M	..... ..... .....	..... ..... .....
Examples of cells rich in...	..... ..... .....	..... ..... .....



THANK  
YOU