

The structure of cells I.

Organelles of eukaryotic cells

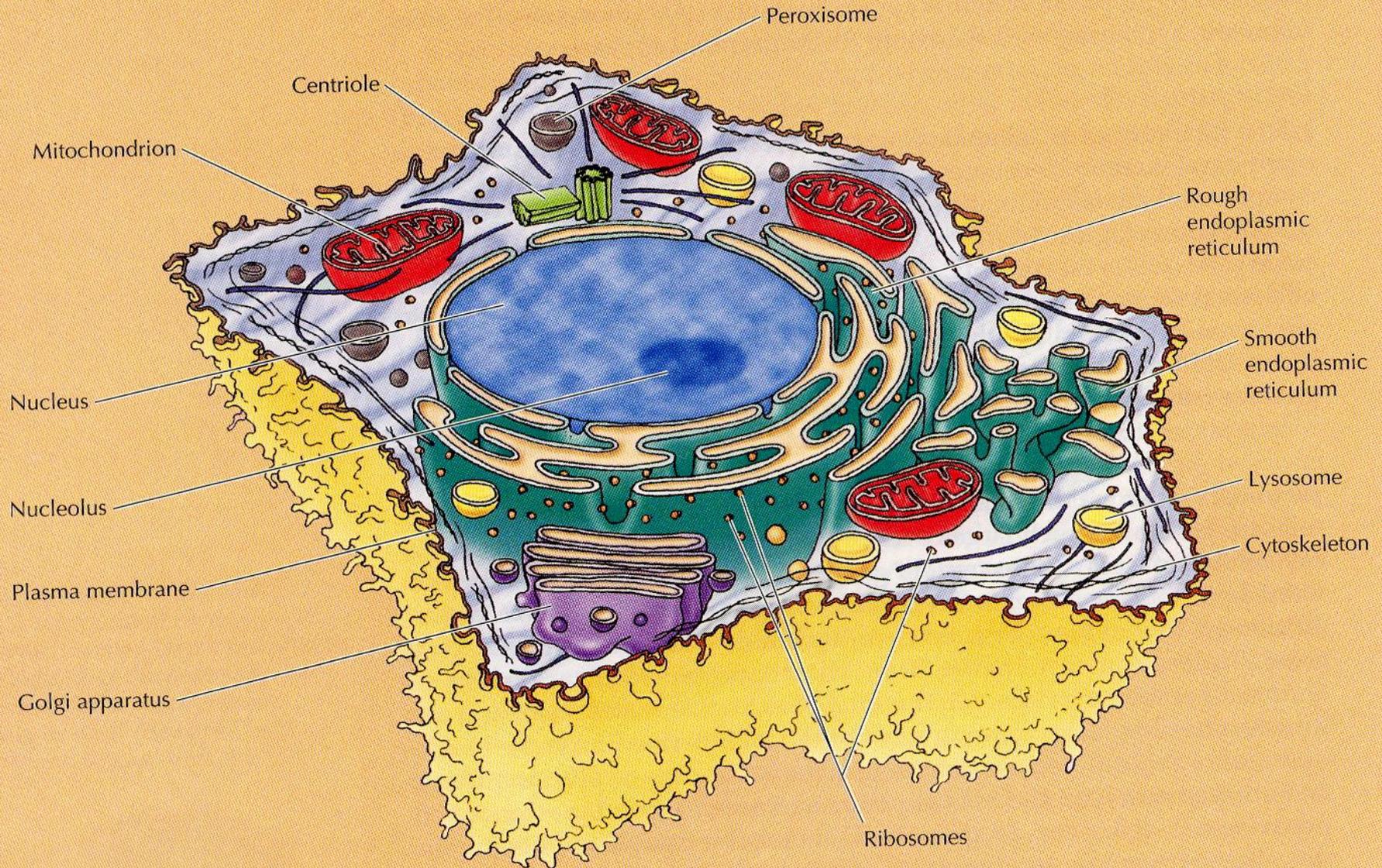
Pro- and eukaryotic cells

- Prokaryotic cells: no real nucleus, no membrane-bound organelles
 - Bacteria and cyanobacteria
- Eukaryotic cells: they have a real nucleus, and membrane-bound organelles
 - Plants, fungi, animals

The animal cell

- The structure of an animal cell (from Cooper: The Cell)

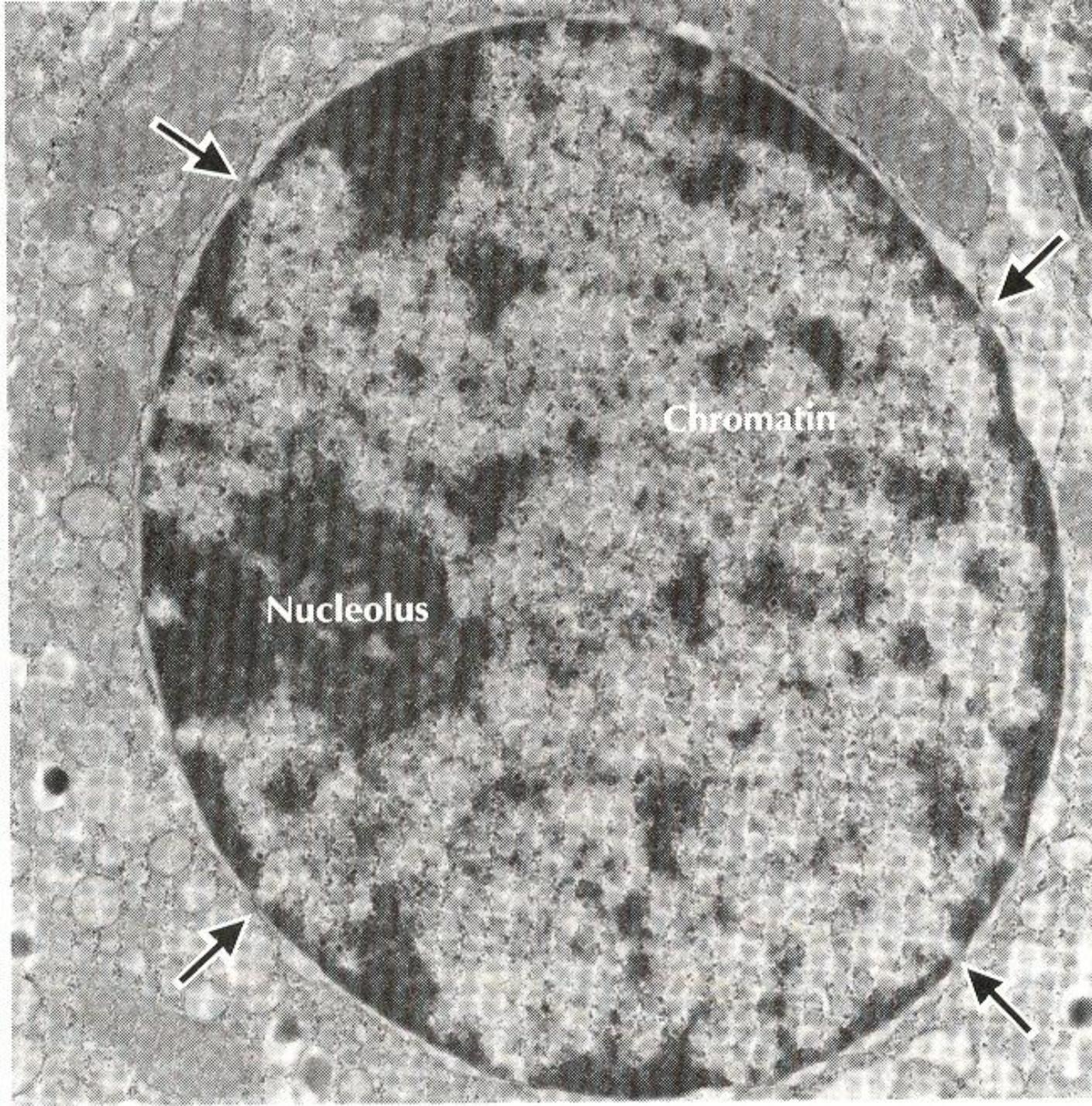
Animal cell



Organelles of an animal cell

Nucleus:

- *Nuclear membrane*: outer and inner membrane
- Nuclear pores: RNA export, protein import
- *Nucleolus*: place of rRNA synthesis and maturation
- *Chromatin*:
 - euchromatin: place of mRNA and tRNA synthesis and maturation
 - heterochromatin: condensed, no transcription
- *Nucleoplasm*: the material within the nuclear membrane *or* the fluid content of the nucleus



**The nucleus, electron
microscopic picture.
(from Cooper: The
Cell) Arrows indicate
nuclear pores.**

Organelles of an animal cell

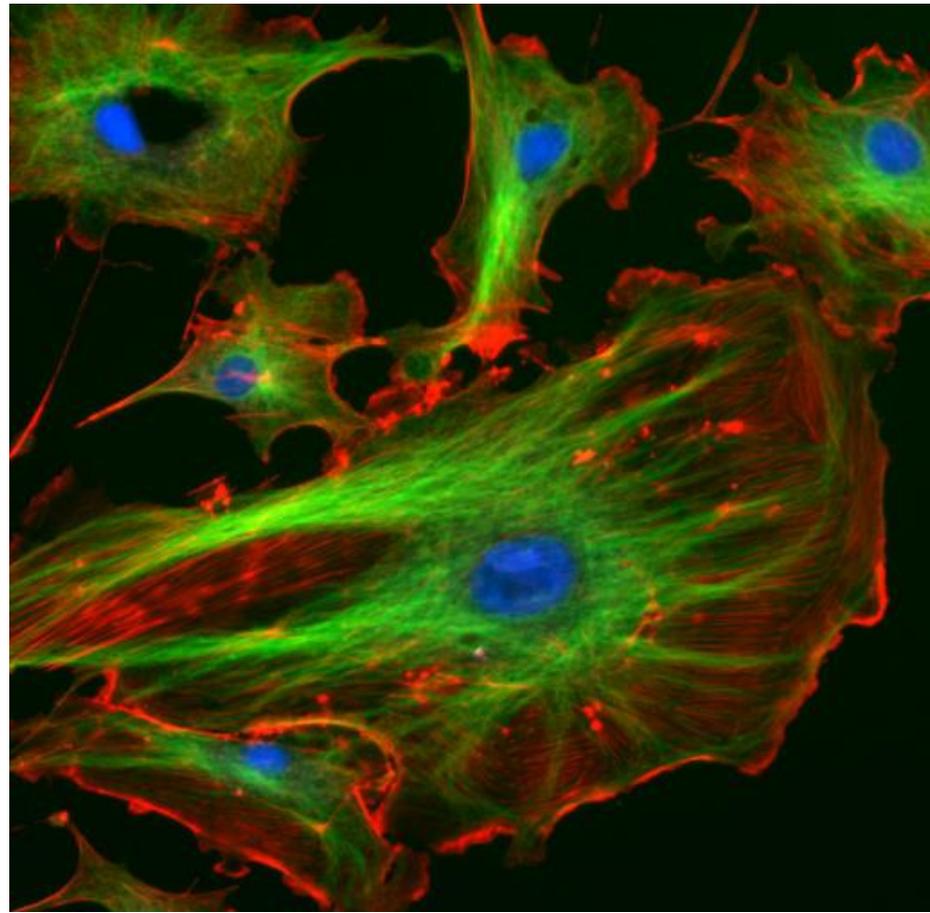
Cytoplasm: the material between the cell membrane and nuclear envelope *or* the fluid material between the cell membrane and nuclear membrane

Organelles of an animal cell

Cytoskeleton:

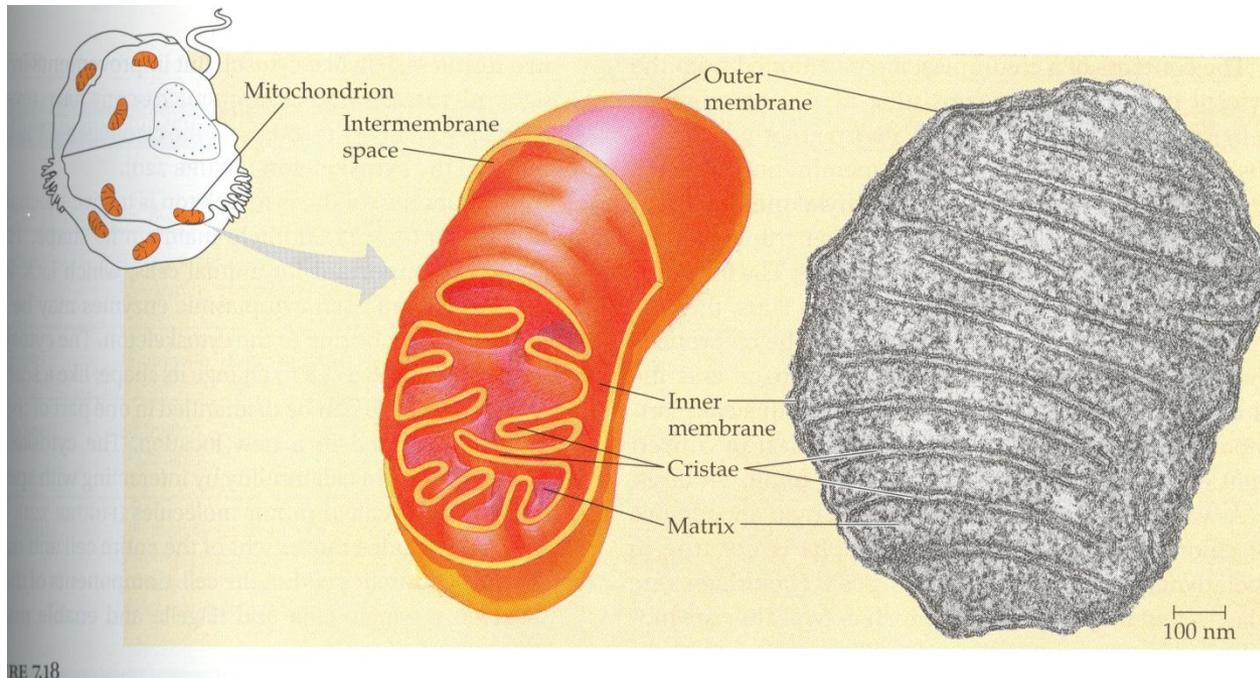
- Function: Cell shape and movements, cell division, transport of organelles
- Microtubules
- Intermediate filaments
- Microfilaments (actin filaments)

<http://rsb.info.nih.gov/ij/images>



Organelles of an animal cell

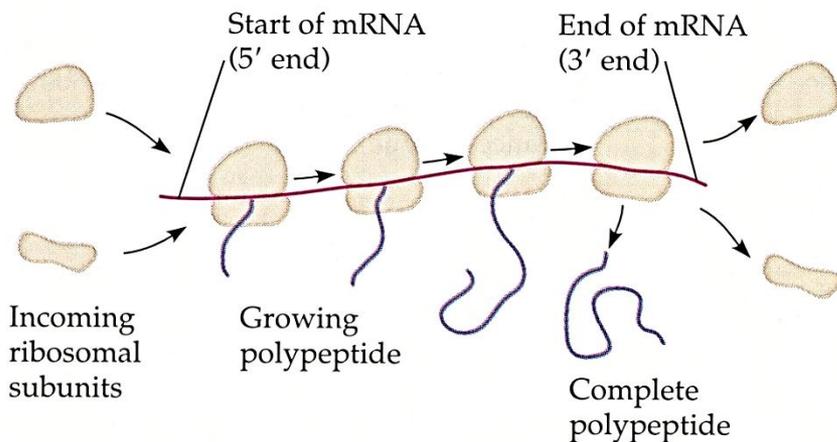
Mitochondria: ATP synthesis



Cooper: The Cell

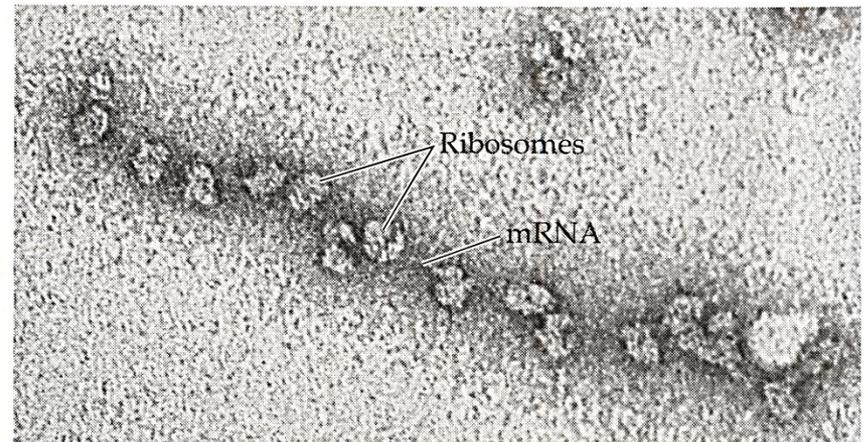
Organelles of an animal cell

- **Ribosomes:** place of protein synthesis
 - free ribosomes (proteins of nucleus, cytoplasm, mitochondria)
 - membrane-bound ribosomes (proteins of membranes, lysosomes and secretory proteins)



(a)

FIGURE 16.16



(b)

0.1 μm

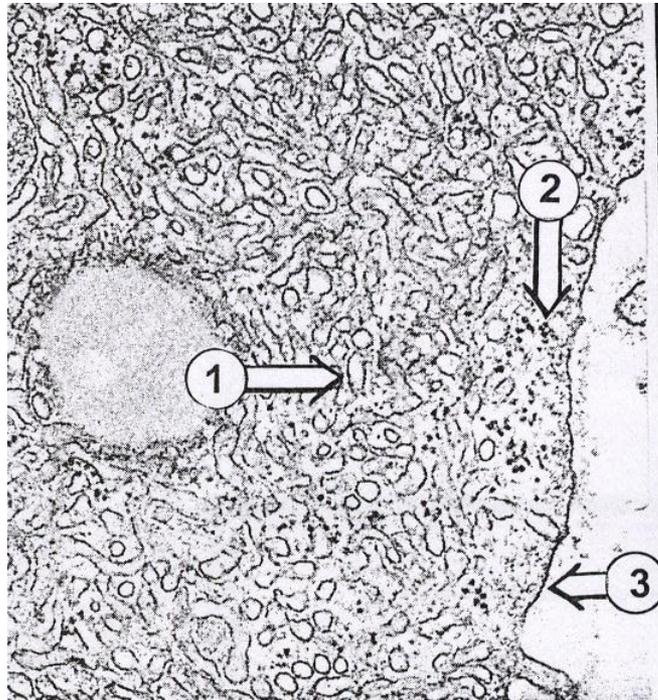
Organelles of an animal cell

Endoplasmic reticulum:

- Rough endoplasmic reticulum: contains ribosomes
 - place of protein synthesis (lysosomal proteins, membrane proteins, secretory proteins)
- Smooth endoplasmic reticulum: no ribosomes
 - Place of lipid synthesis, biotransformation, Ca²⁺ storage



Rough ER



Smooth ER

Organelles of an animal cell

Golgi apparatus:

- Place of maturation and sorting of proteins:
- Lysosomal proteins, membrane proteins, secretory proteins

Organelles of an animal cell

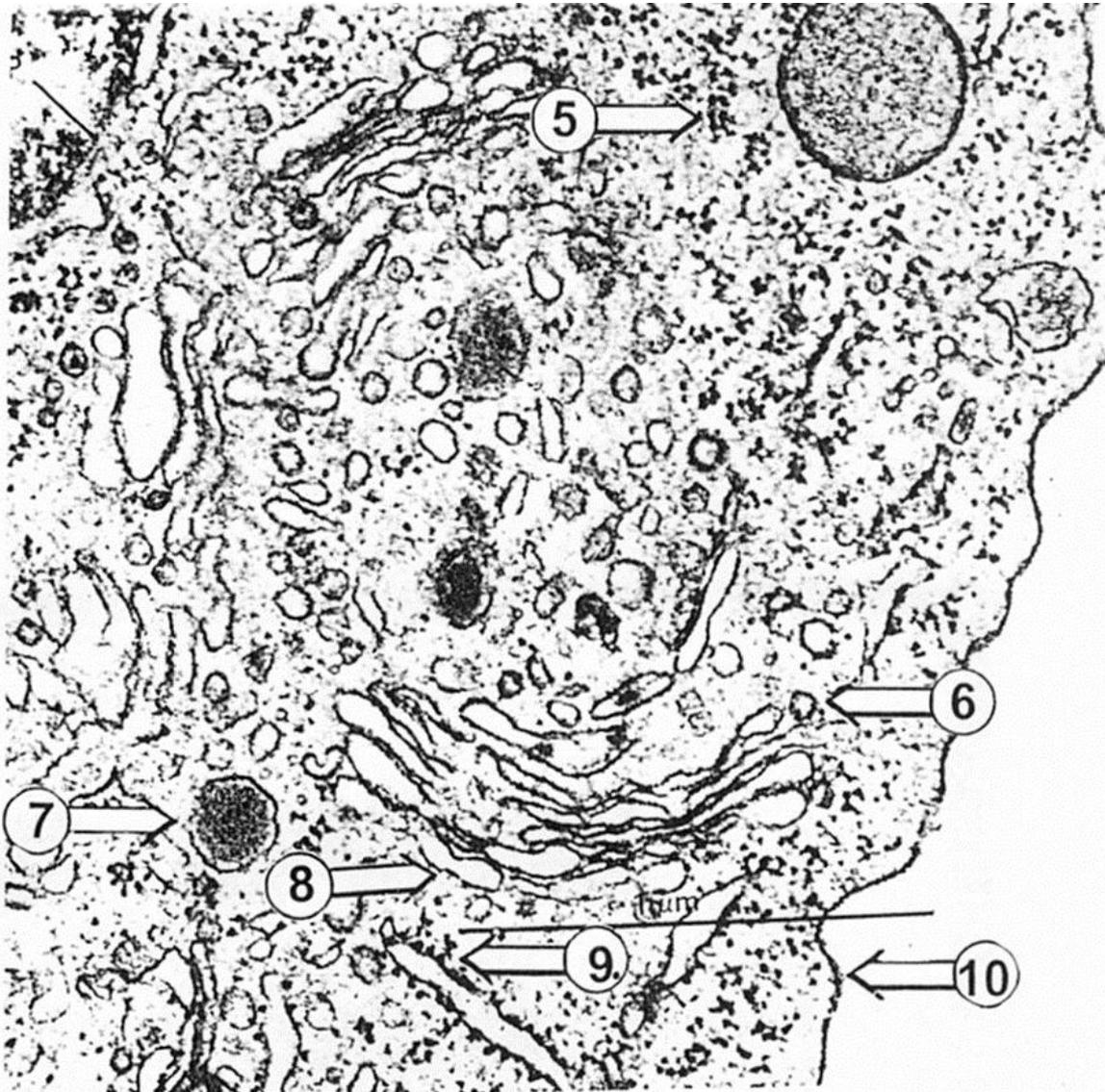
Vesicles: compartments, separated from the cytosol by lipid bilayer.

- **Transport vesicle:** are able to move molecules between locations inside the cell, e.g., proteins from the rough endoplasmic reticulum to the Golgi apparatus.

Organelles of an animal cell

Lysosome: degradation of materials from the cell (autolysis) or from environment (heterolysis)

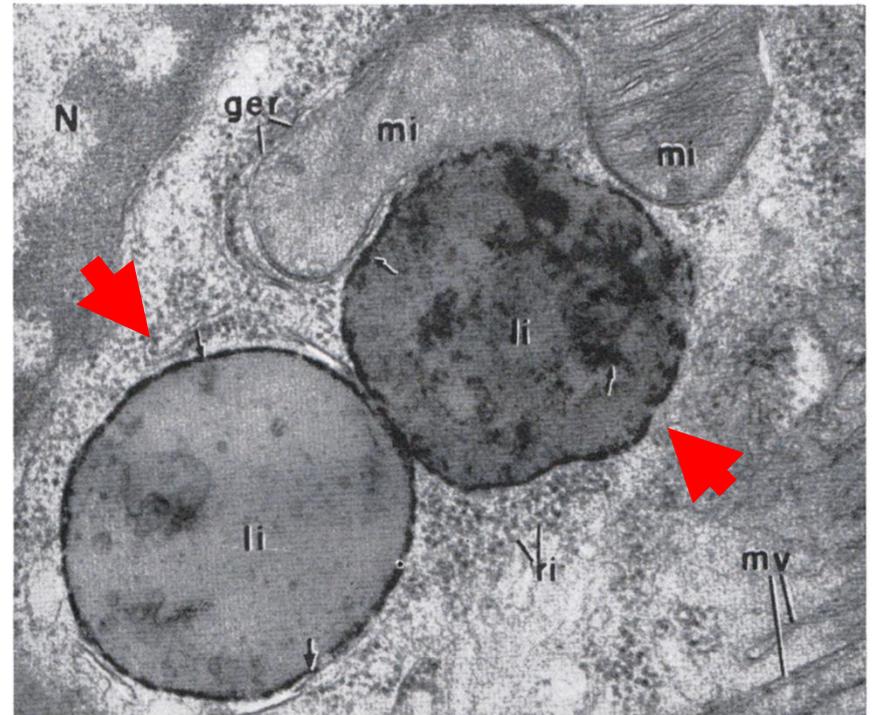
- Primary lysosomes: contain digestive enzymes
- Secondary lysosomes: contain digestive enzymes + the digested material



8 : Golgi
7: Primary lysosome
6: Transport vesicle

(9: Rough ER,
10: cell membrane
5: free ribosomes)

Secondary lysosomes



Organelles of an animal cell

Cell membrane:

- barrier between the living cell and its environment
- *Structure:*
 - Lipids: - phospholipid bilayer:
 - glycolipids: in outer layer of cell membrane
 - cholesterol: in the apolar part of membrane
 - Proteins: transmembrane proteins, integral proteins, peripheral proteins
 - Rotation and lateral movement is possible
 - Flip-flop movement requires energy and enzyme

