

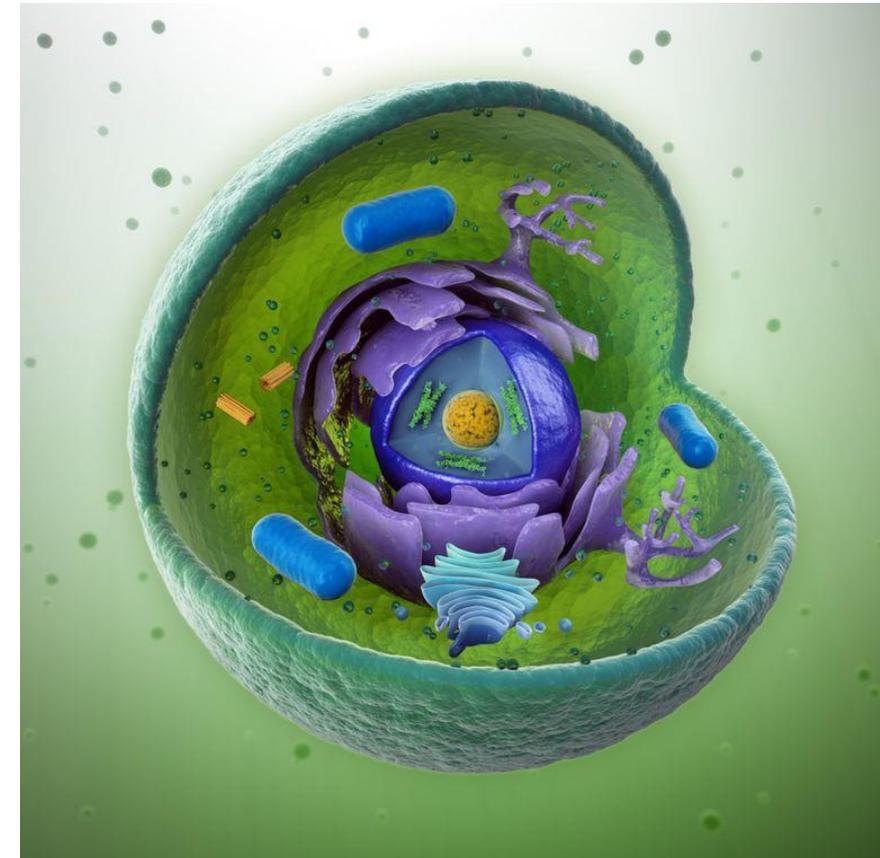
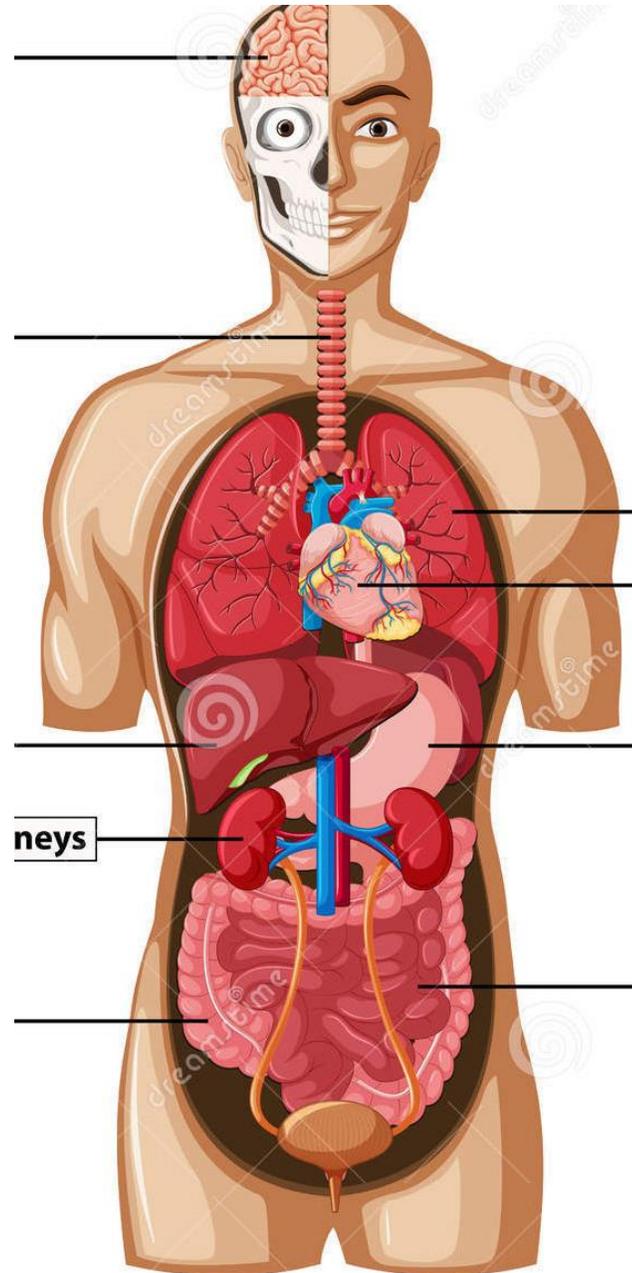
# Cell Theory

- In 1665, British scientist, Robert Hooke observed that living things contain empty room-like compartments that he called “**cells**”.
- In 1864, Louis Pasteur proved that new living things can come only from other living things of the **same** type.

# Cell Structure

# Cell Structure

- Cells are filled with smaller structures called **organelles** that work together so the cell functions.
- <https://www.youtube.com/watch?v=26y1PCkWilc>



# Cell Structure

- *Different types of cells have different types of organelles, but some organelles can be found in **all cells**.*
- ***Cell structure animation***
- <https://www.youtube.com/watch?v=URUJD5NEXC8>
- Amoeba sisters:  
<https://www.youtube.com/watch?v=8IlzKri08kk>

# Newo Colony Activity

- *An **analogy** is a way to understand new ideas by making a comparison.*
- *A **factory** can be used as an analogy for the cell.*

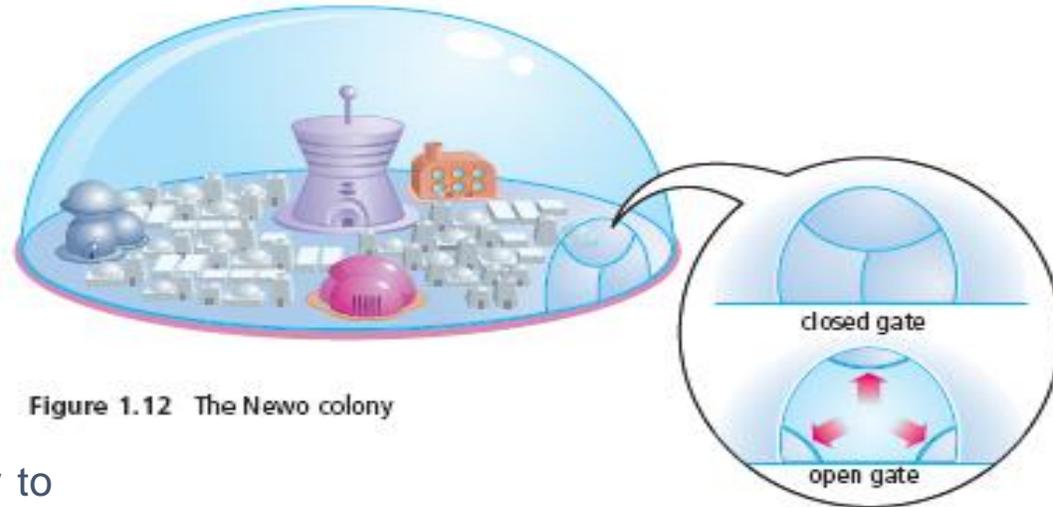


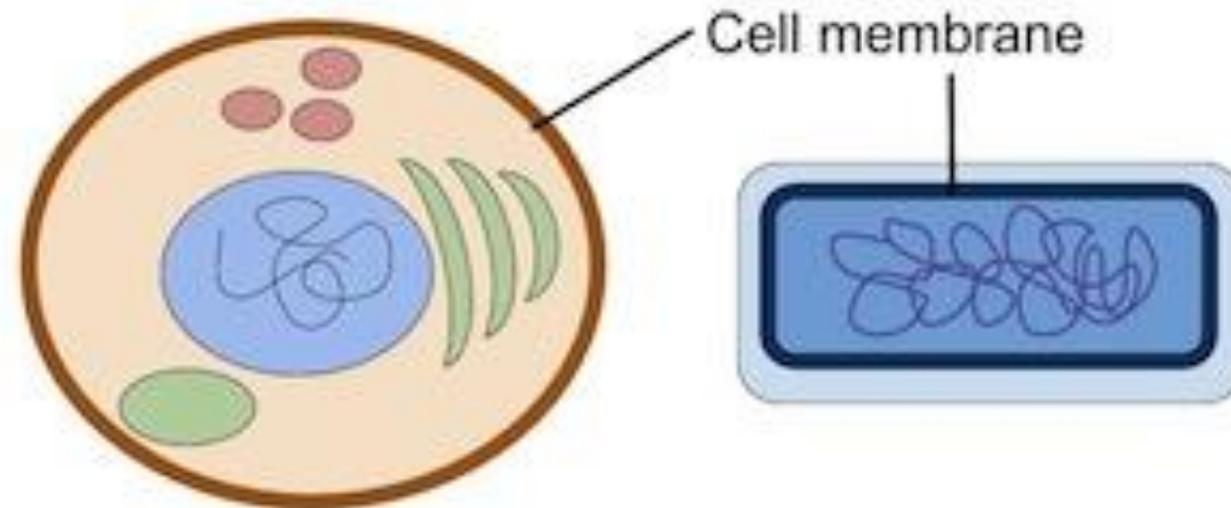
Figure 1.12 The Newo colony

How is the Newo colony similar to a factory?

See pages 22 - 24

# Cell Membrane = Gate Keeper

- The cell membrane protects the cell and regulates movement of particles in and out of the cell.
- Cell Membrane is Selectively Permeable.



# Cell Membrane = Gate Keeper

*In the Newo colony the cell membrane would be like the **protection dome**, controlling movement of materials in and out of the colony through the entry and exit gate.*

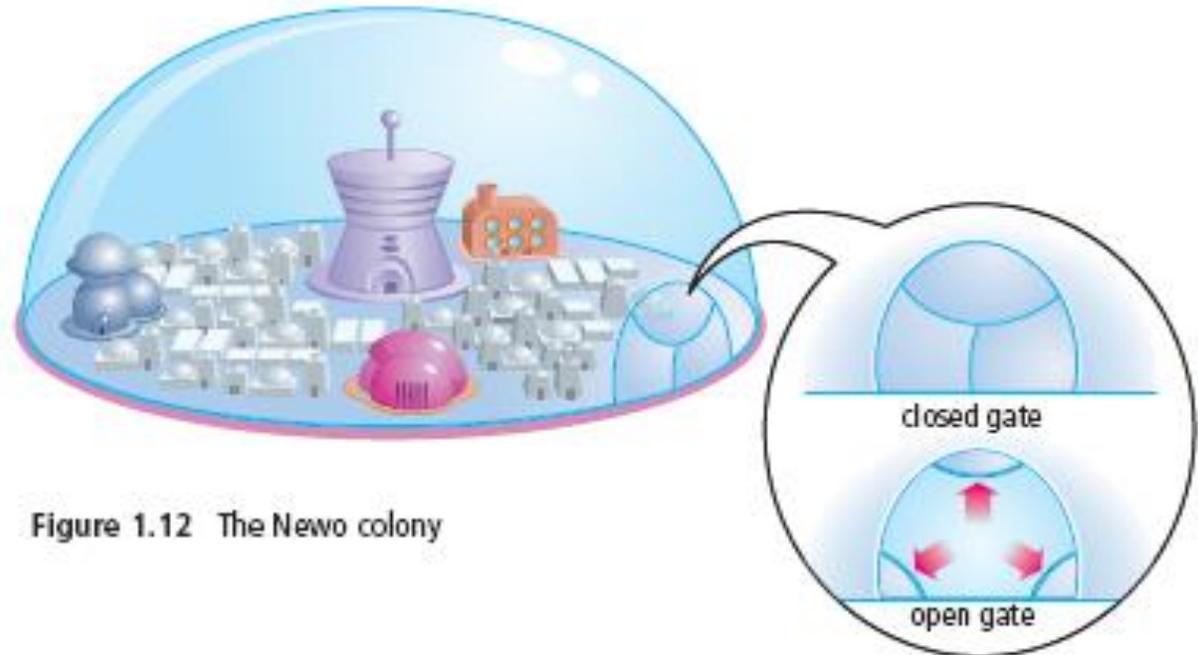


Figure 1.12 The Newo colony

Rough endoplasmic reticulum (ER)

Smooth ER

Golgi apparatus

Nuclear pore

Nucleus

Vesicles

Nuclear envelope

Centrioles

Microtubules

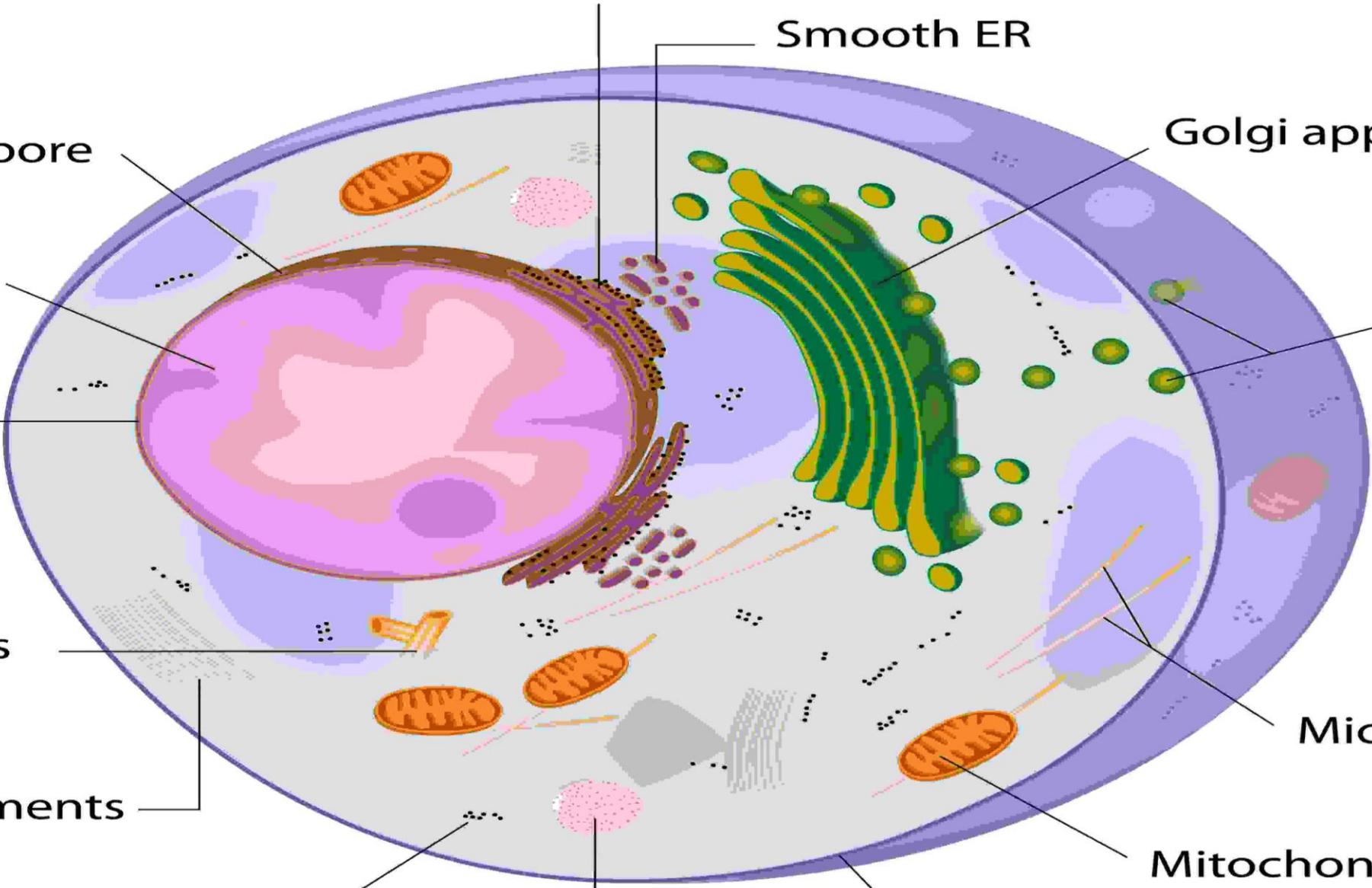
Microfilaments

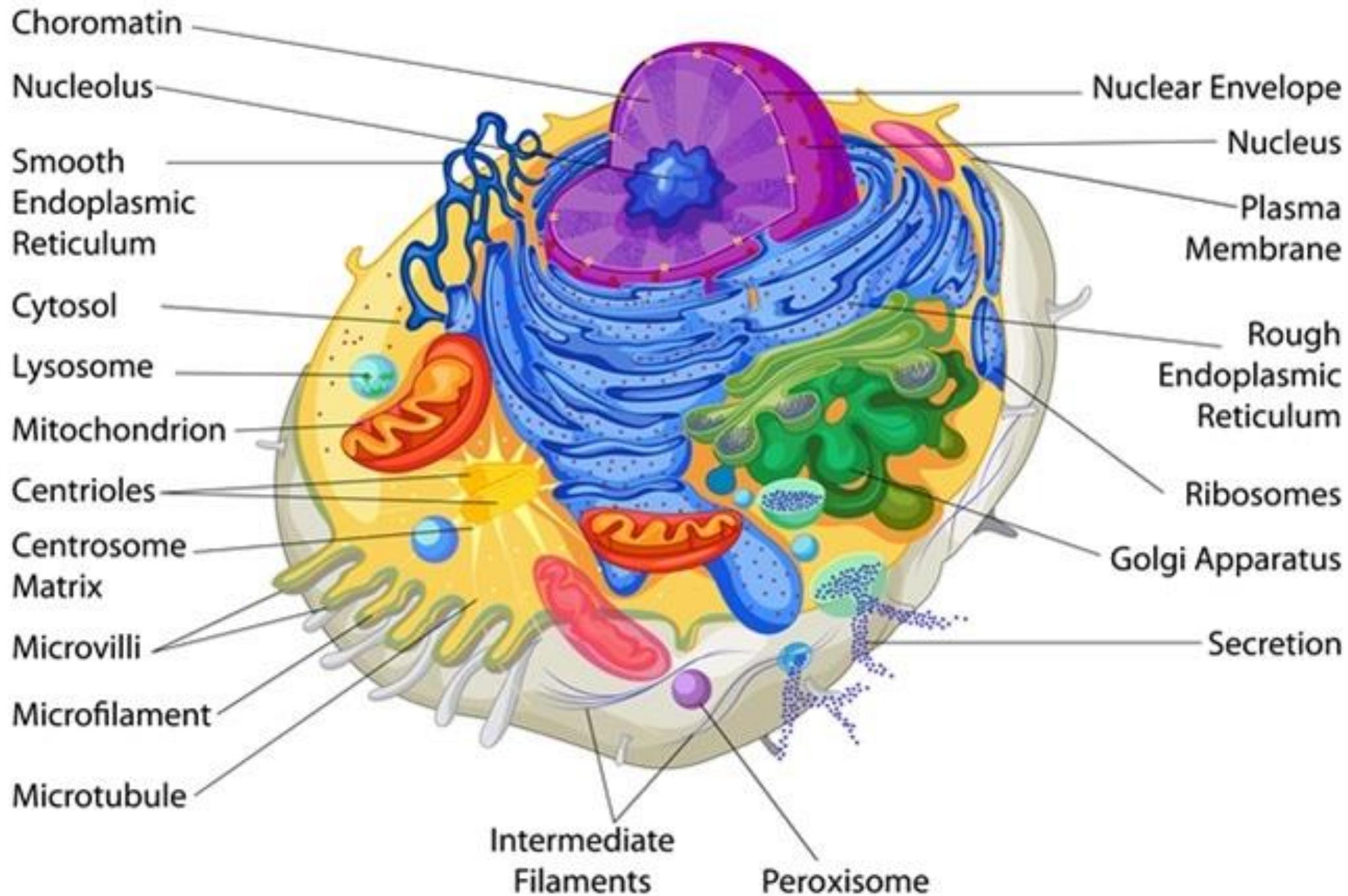
Mitochondrion

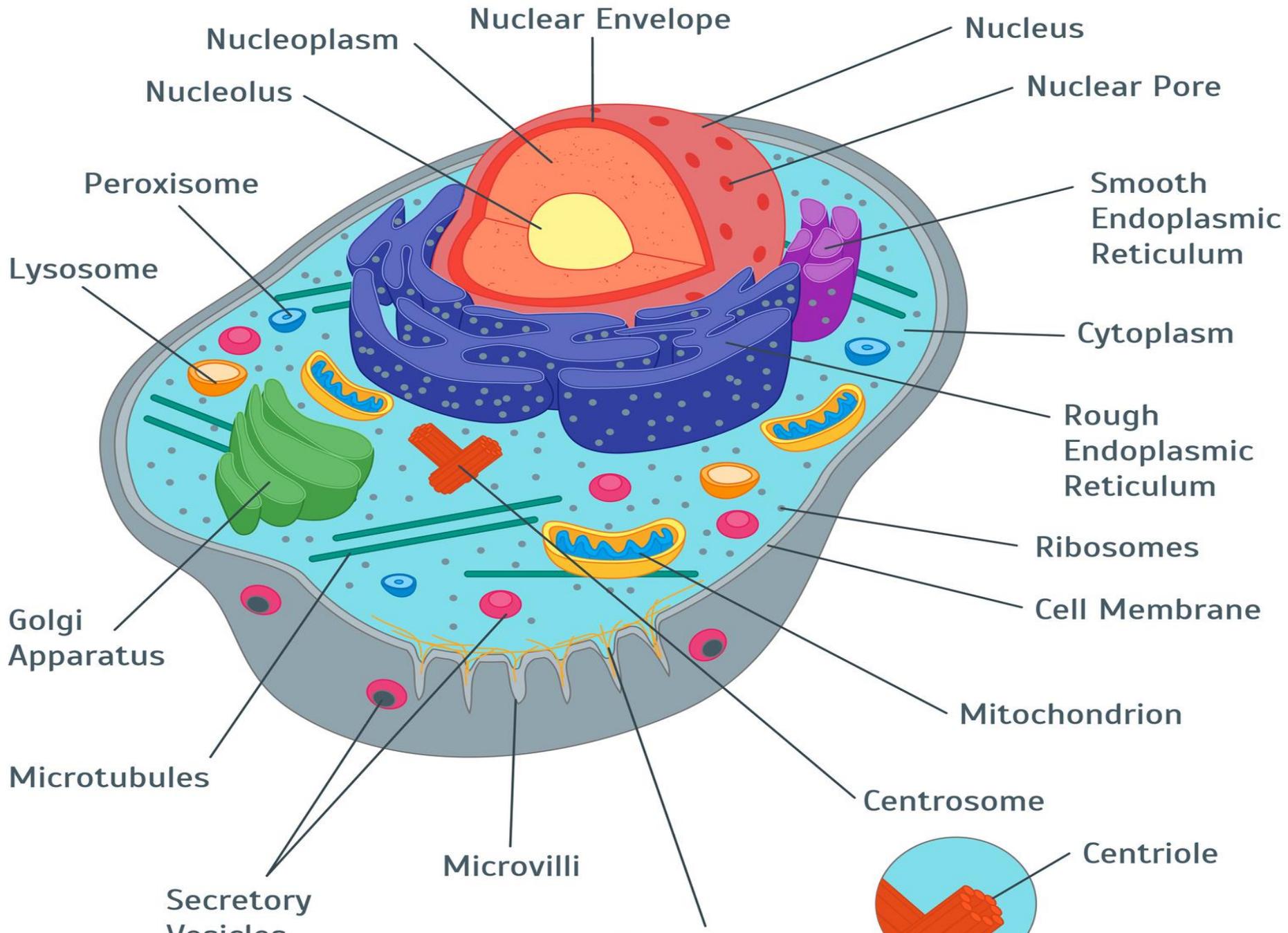
Ribosomes

Lysosome

Plasma membrane

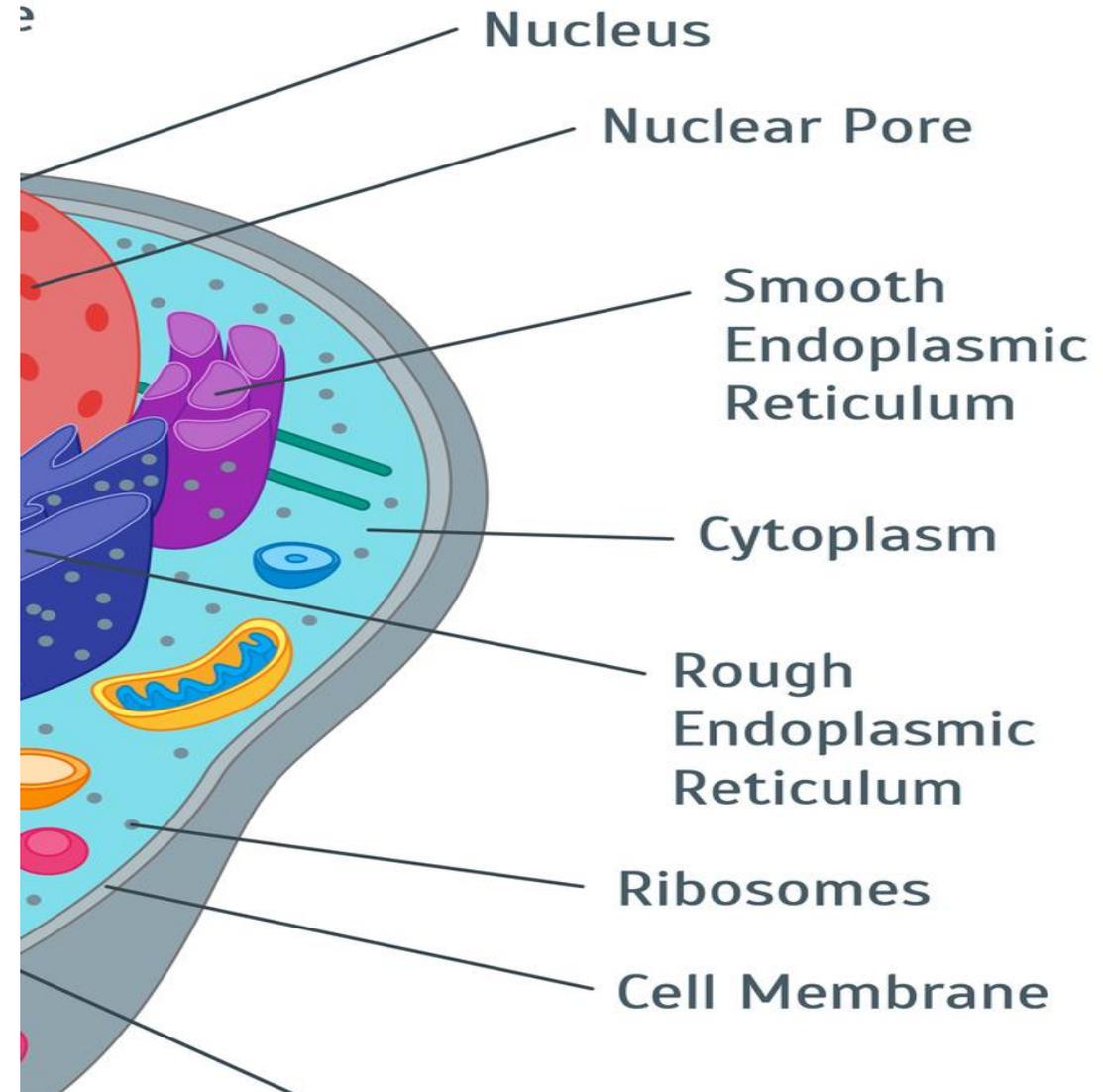




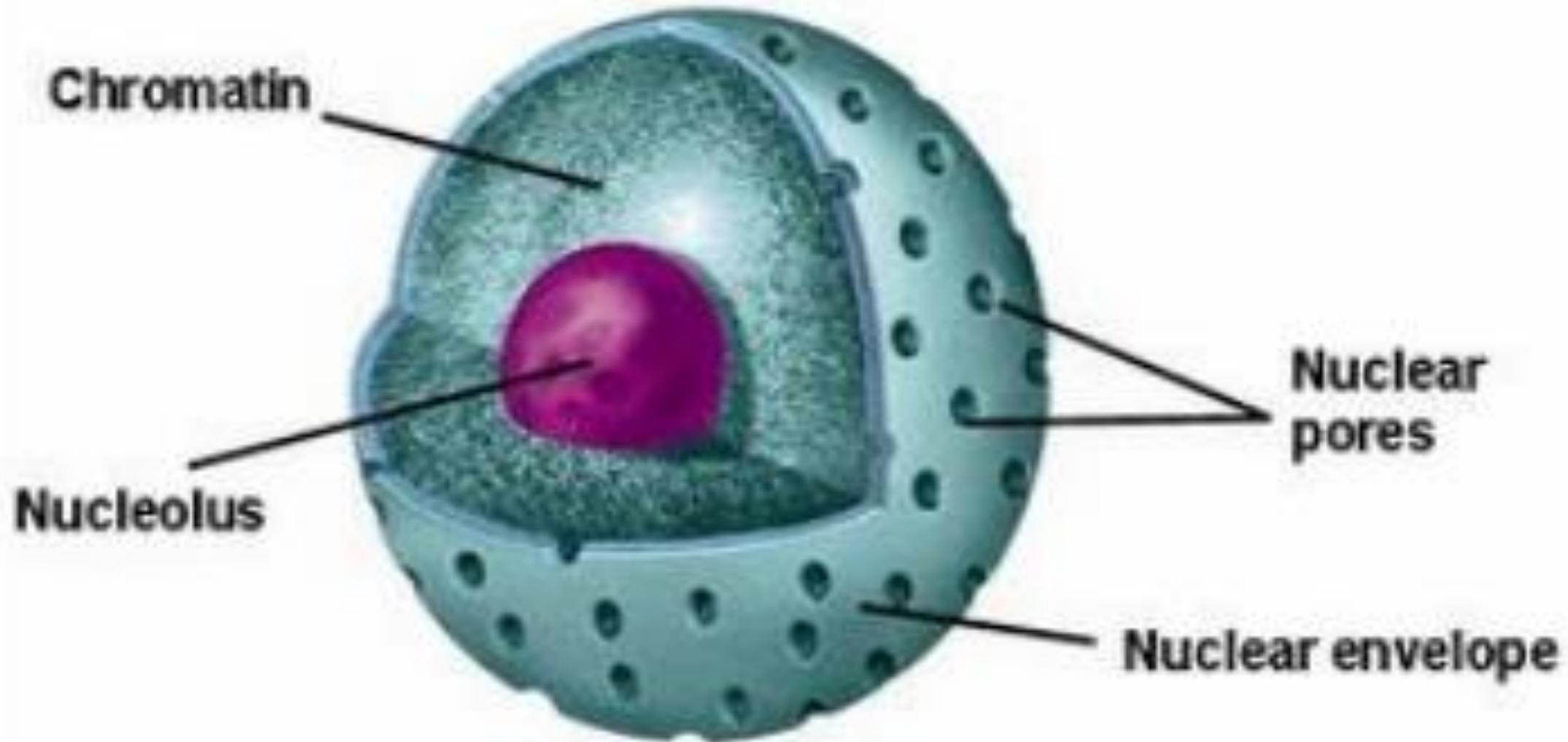


# Cytoplasm = Environment

- Cytoplasm, the jelly-like substance within the cell, contains organelles, water, and other life supporting materials.
- *The liquid in which the NEWO colony lives.*

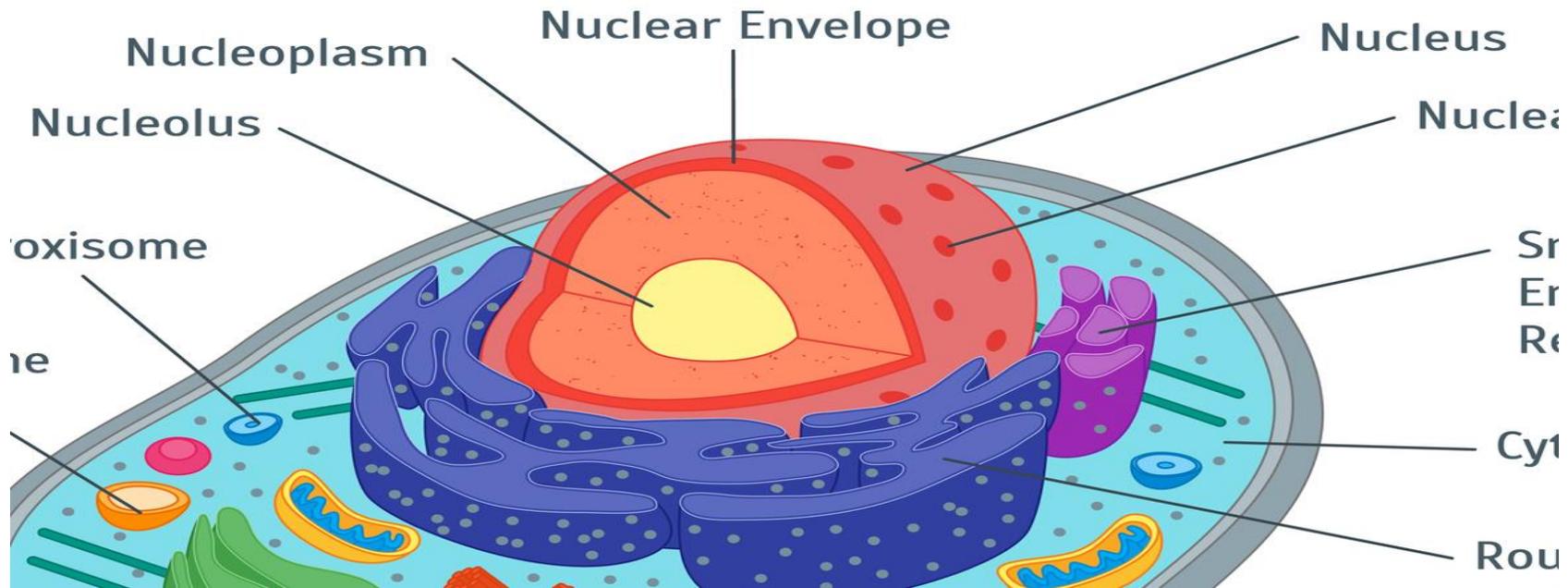
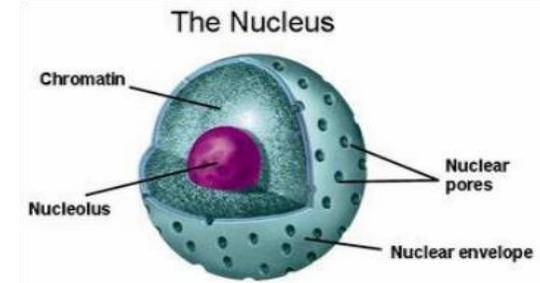


# The Nucleus



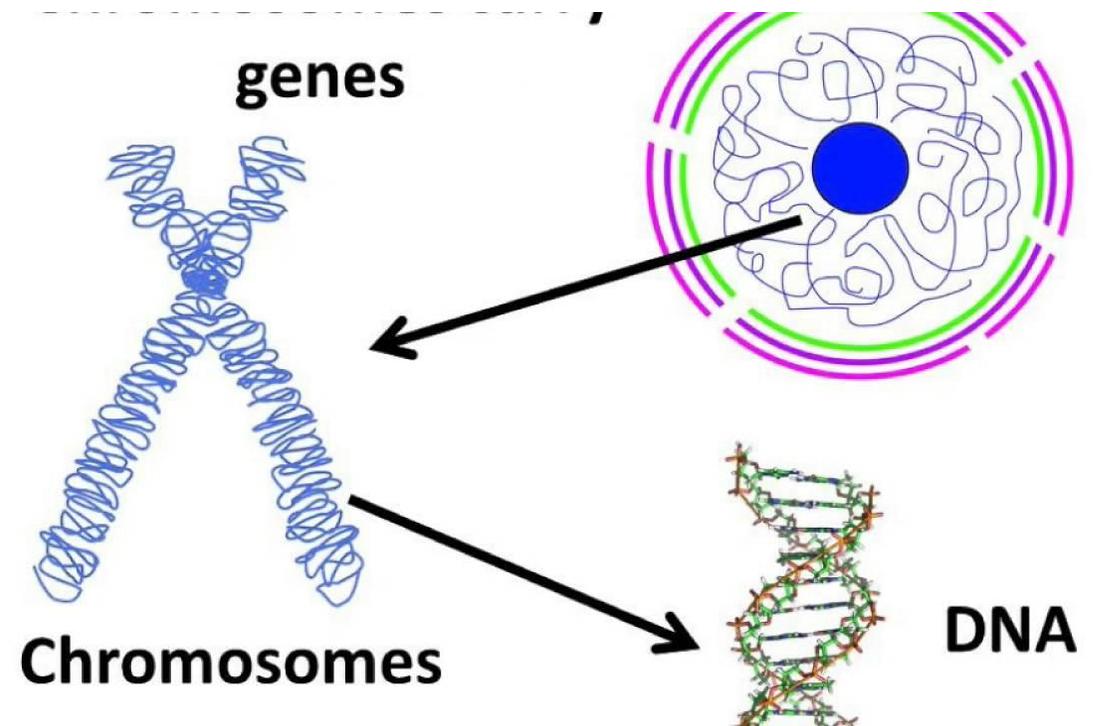
# Nucleus = Control Center

- Controls all activities within the cell.
- *Surrounded by nuclear envelope*
- *Nuclear envelope has small holes called nuclear pores*



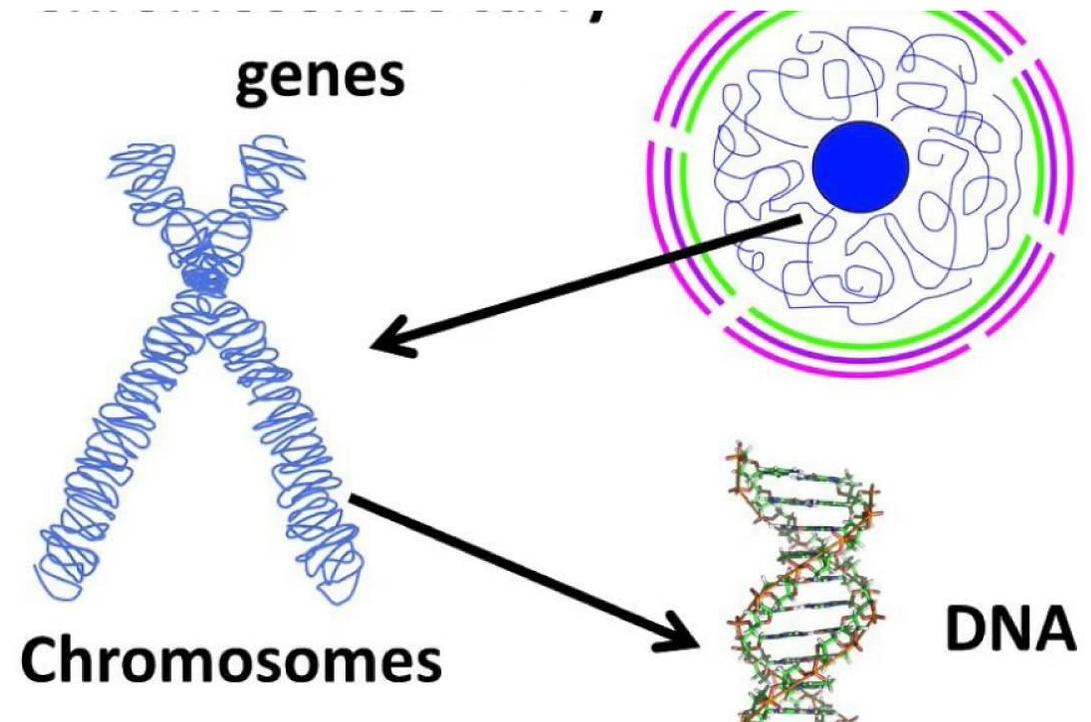
# Inside the Nucleus: DNA

- Contains our **genetic material** (DNA).
- DNA contains the **instructions** for the development and function of living things



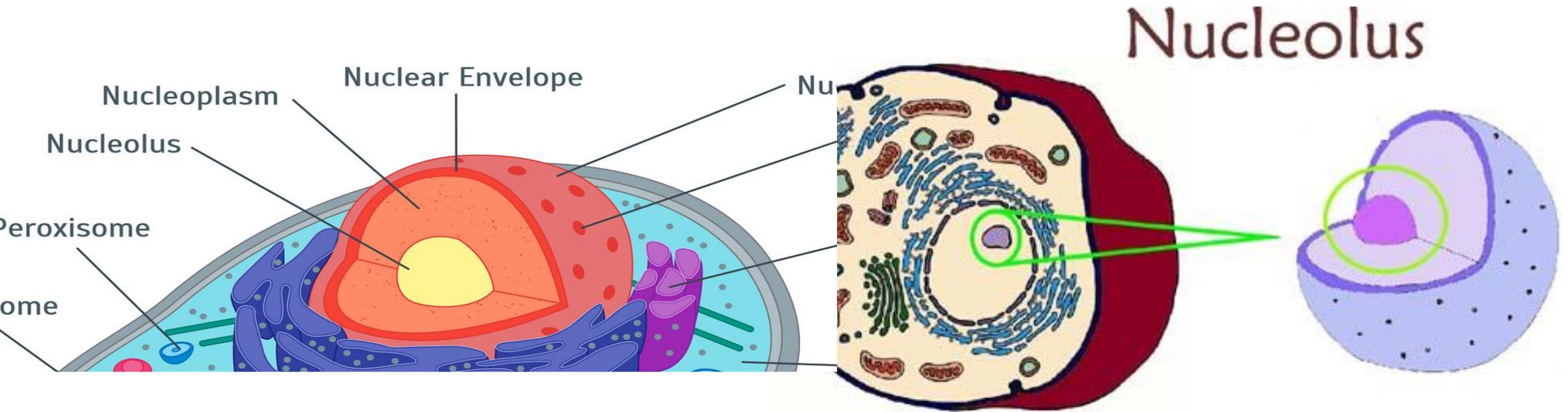
# Inside the Nucleus: DNA

- *DNA exists in the form of **chromatin**, which condenses into **chromosomes** just before a cell is ready to divide.*



# Inside the Nucleus: Nucleolus

- Some nuclei also contains a **nucleolus**
- Nucleolus forms incomplete **ribosomes**.
- *Ribosomes produce proteins for the cell.*



# Mitochondria = Power House

- Produce energy for the cell.

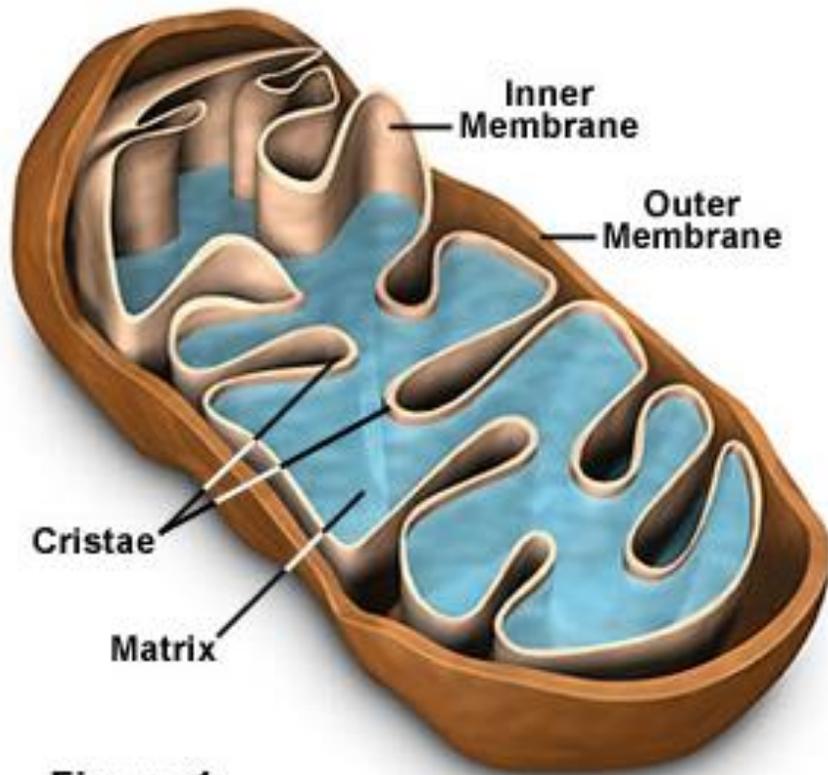
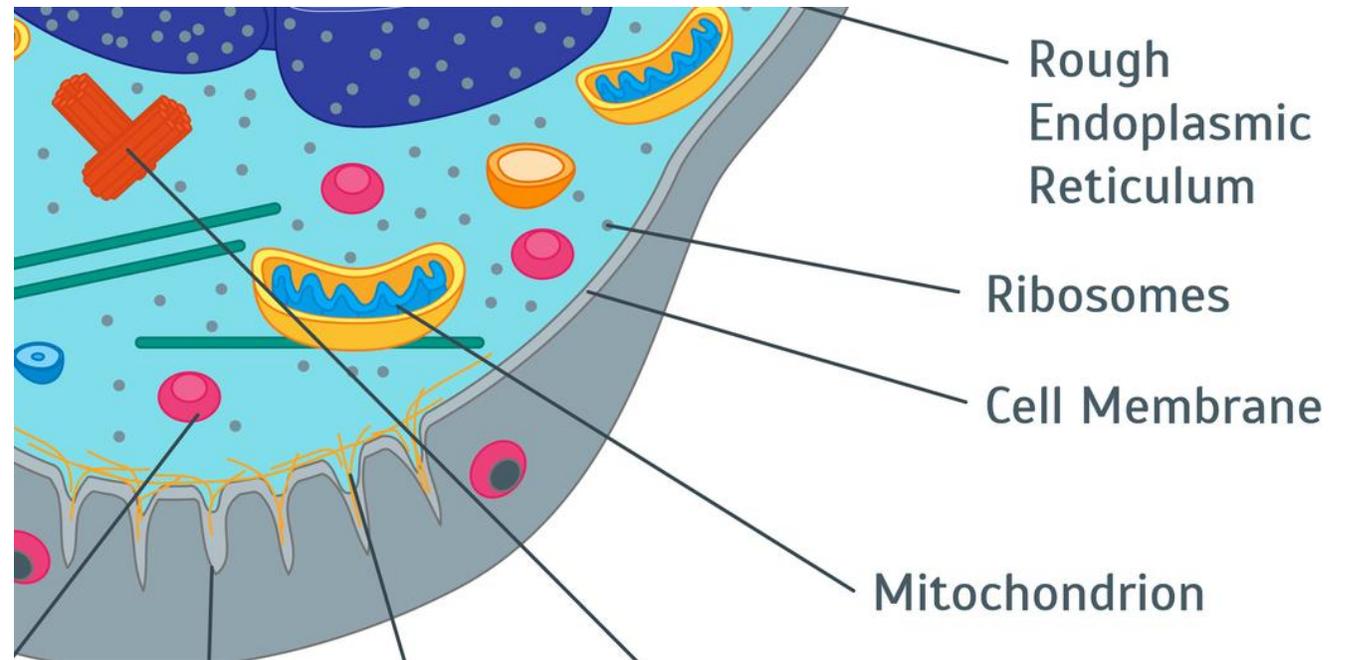
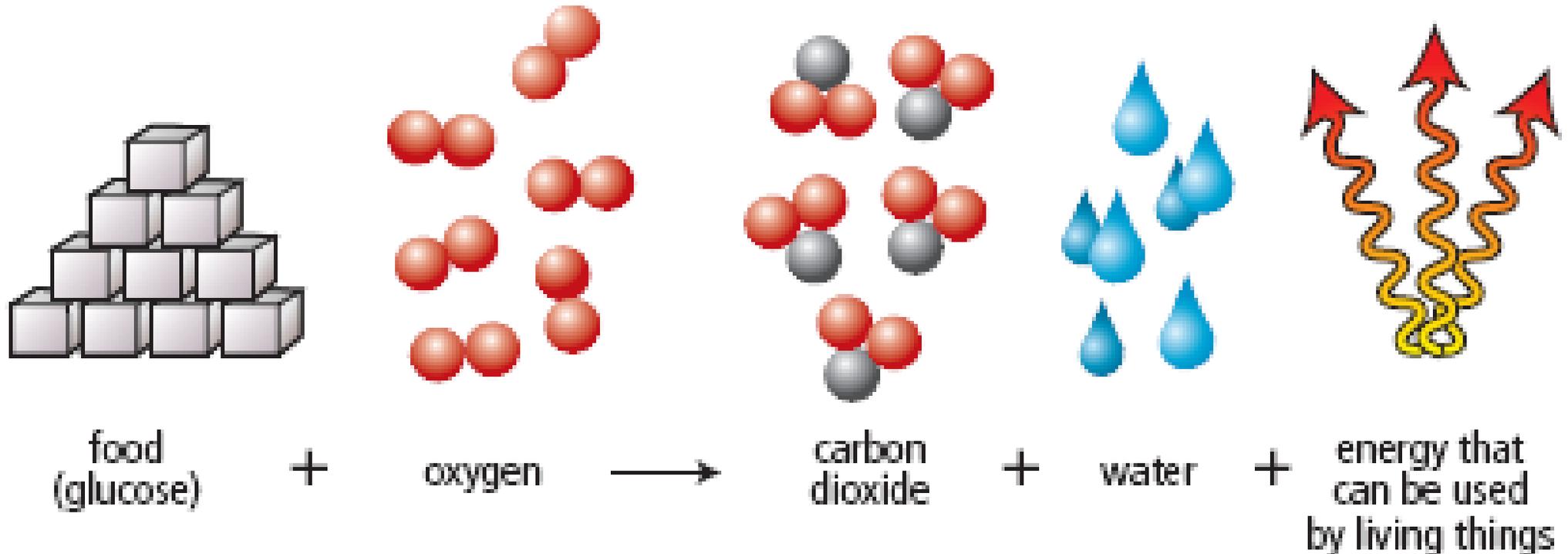


Figure 1

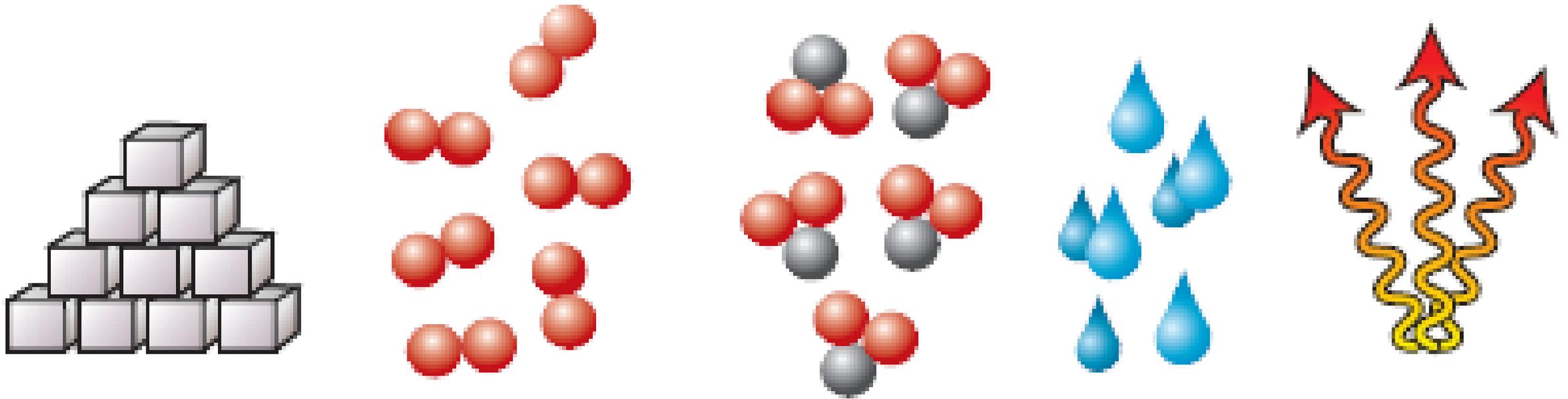


# Cellular Respiration

- **Cellular respiration** is the process of taking in nutrients, breaking them down, and creating energy rich molecules (**ATP**) for the cell.



# Cellular Respiration: Label your diagram



Food +  
(glucose)

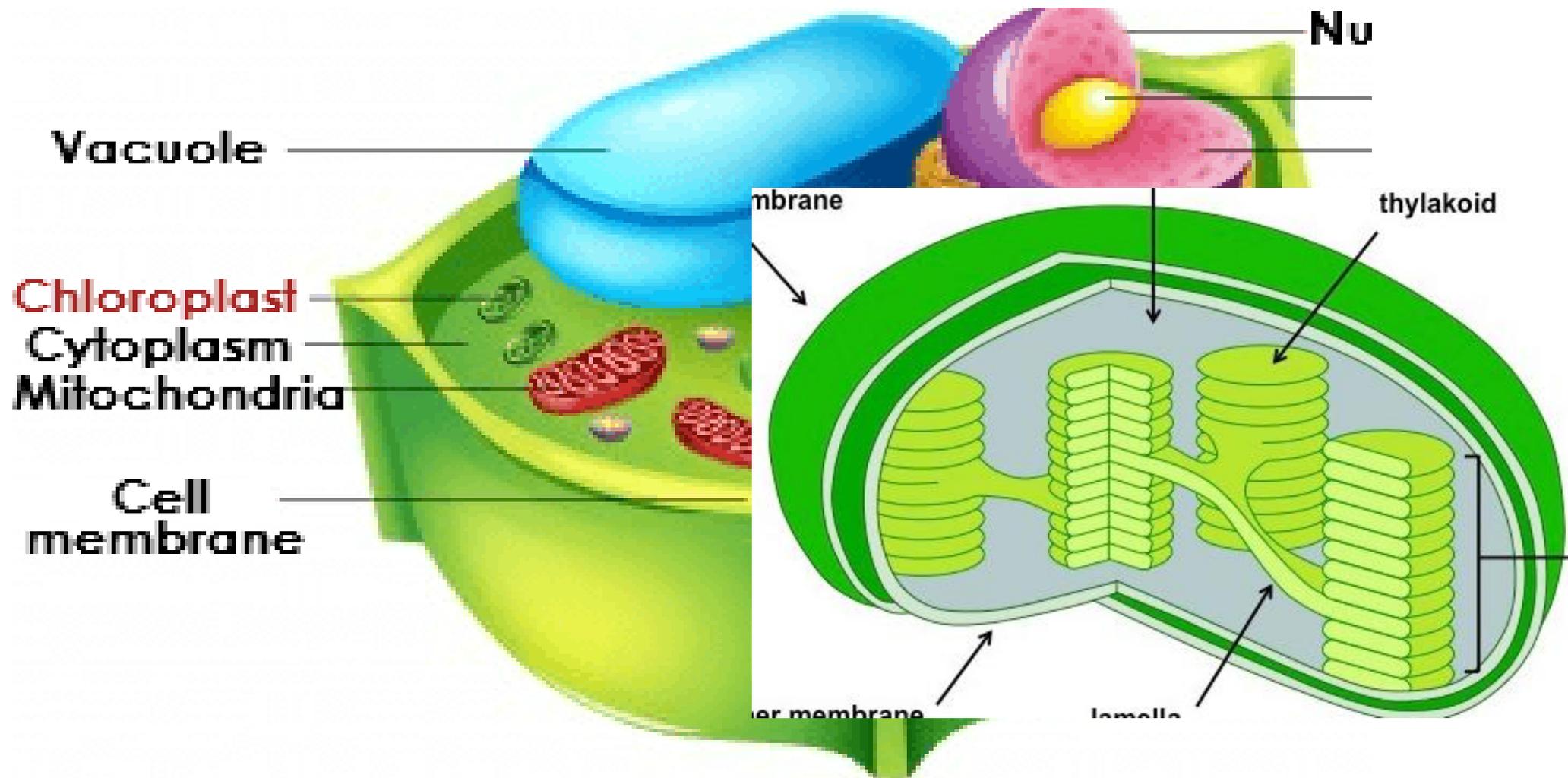
Oxygen  $\xrightarrow{\text{---}}$  Carbon  
Dioxide

+ Water + Energy

# Ameoba Sisters Video on Cellular Respiration

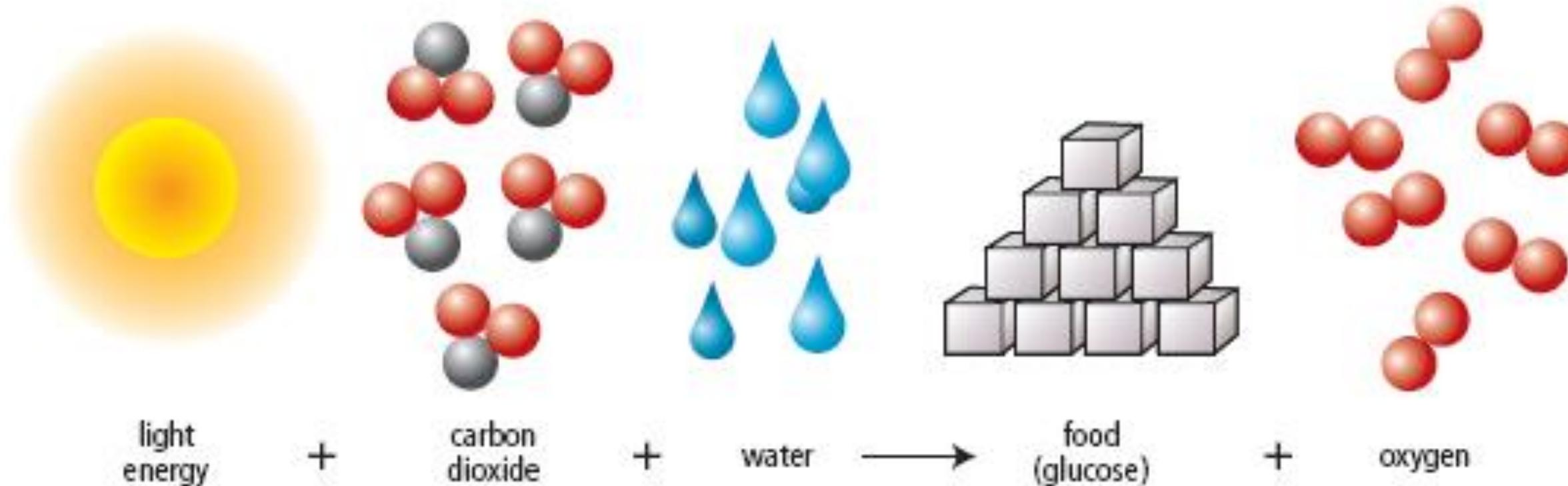
- <https://www.youtube.com/watch?v=4Eo7JtRA7lg>

# Chloroplast = food Maker



# Chloroplast = Food Maker

- change the Sun's energy into chemical energy in a process called **photosynthesis**.

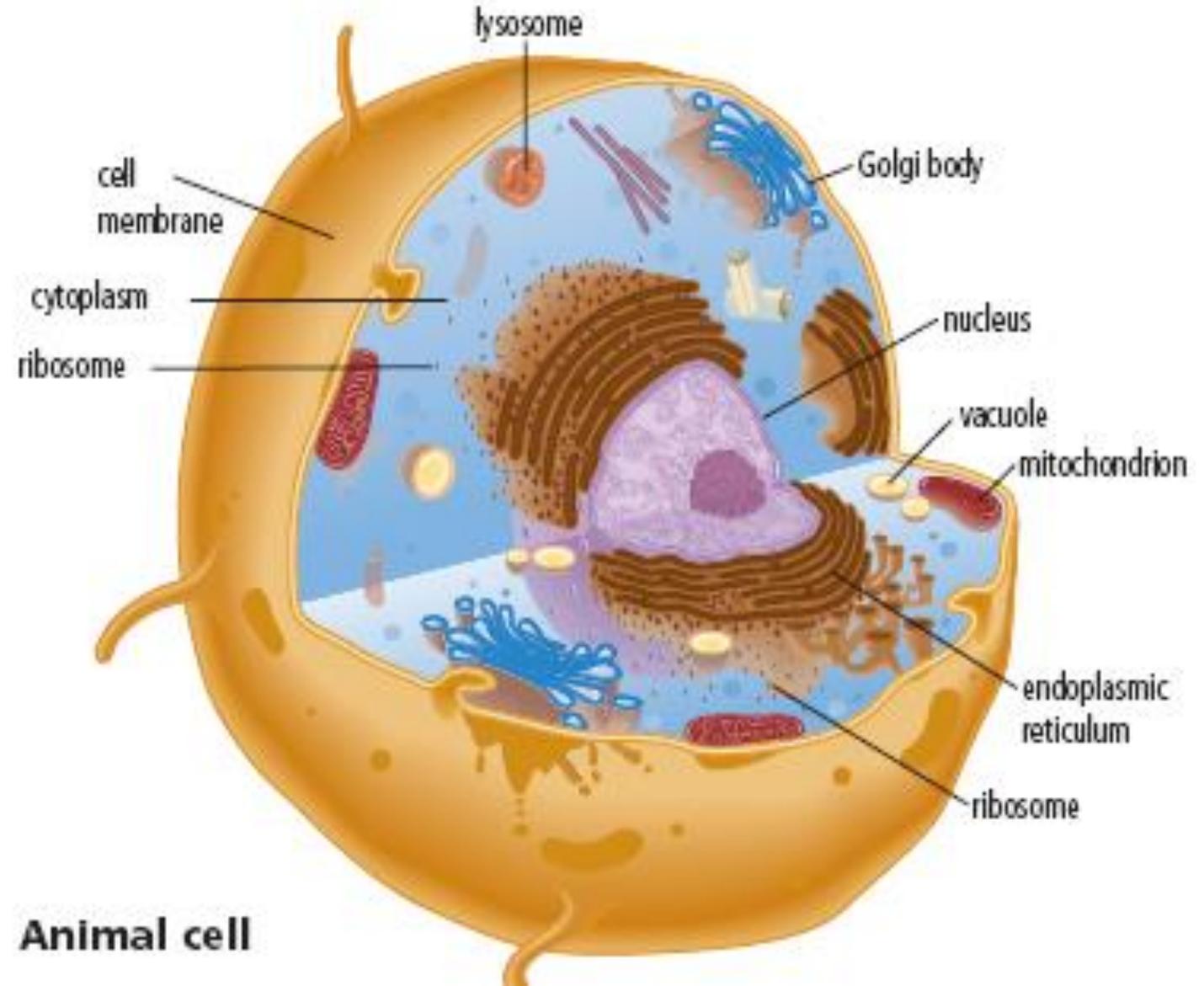


# Cyanobacteria

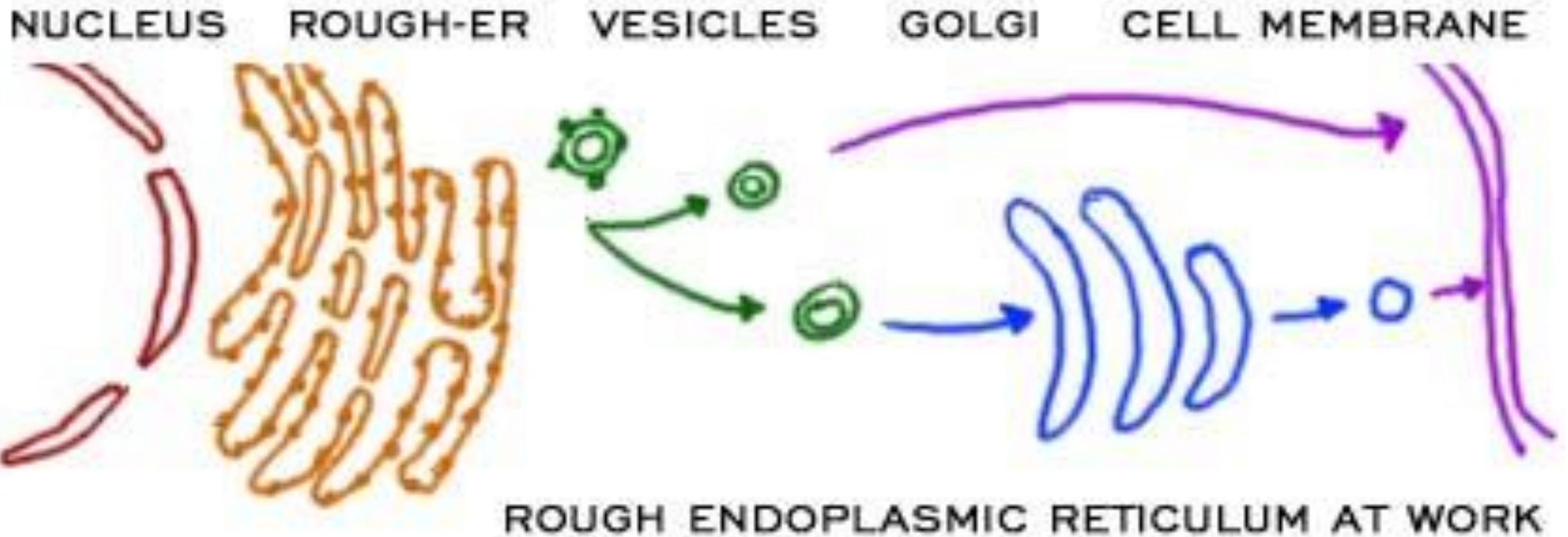
- See Ted Ed video
- How chloroplasts came to be

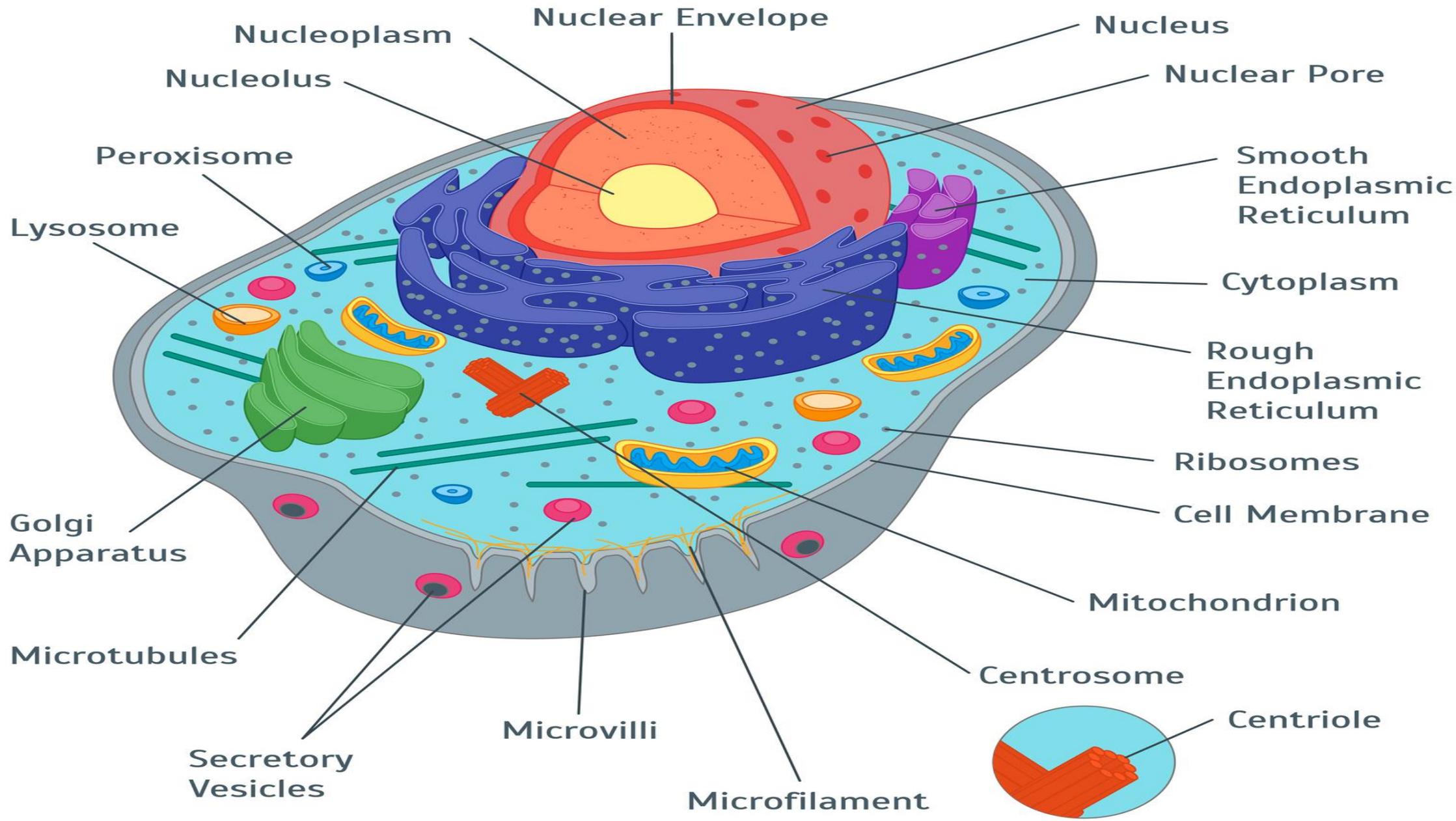
# Organelles for Assembly, Transport, and Storage

- *Ribosomes*
- *Endoplasmic Reticulum*
- *Golgi Apparatus*
- *Lysosomes*
- *Vacuoles*



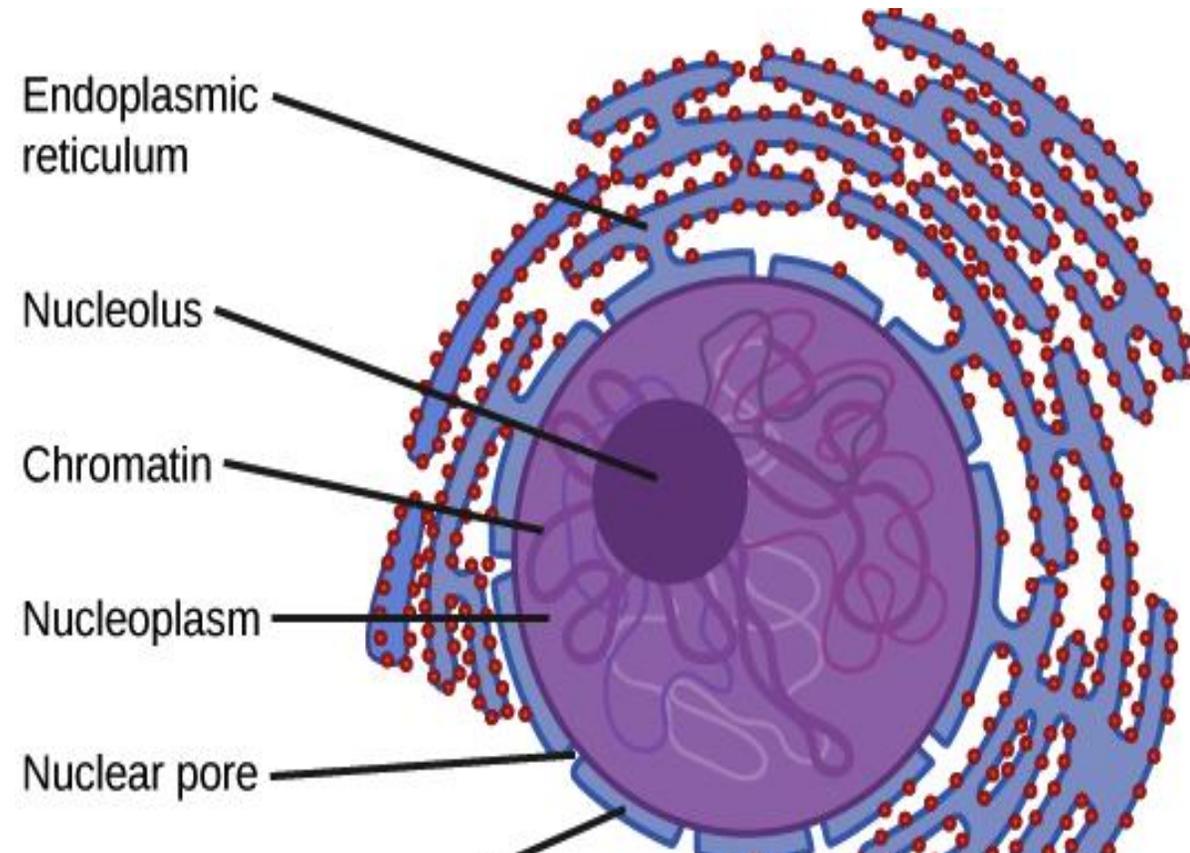
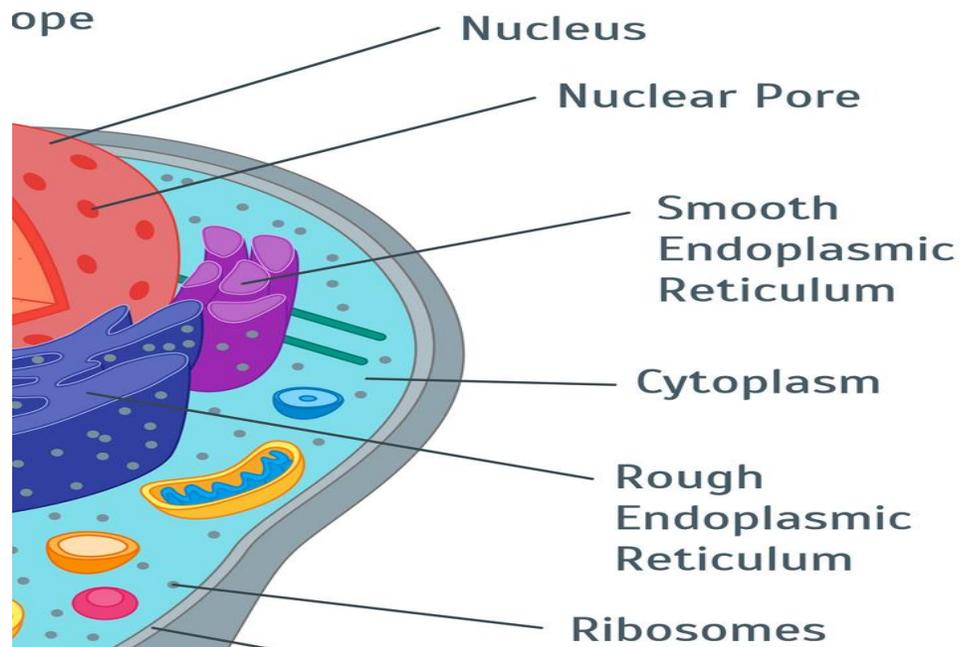
# Organelles work together





# Ribosomes = Production of Building Blocks

- Assemble **proteins** that are essential for all life.
- Found **free** in the cytoplasm or **attached** to endoplasmic reticulum



Rough endoplasmic reticulum (ER)

Smooth ER

Golgi apparatus

Nuclear pore

Nucleus

Vesicles

Nuclear envelope

Centrioles

Microtubules

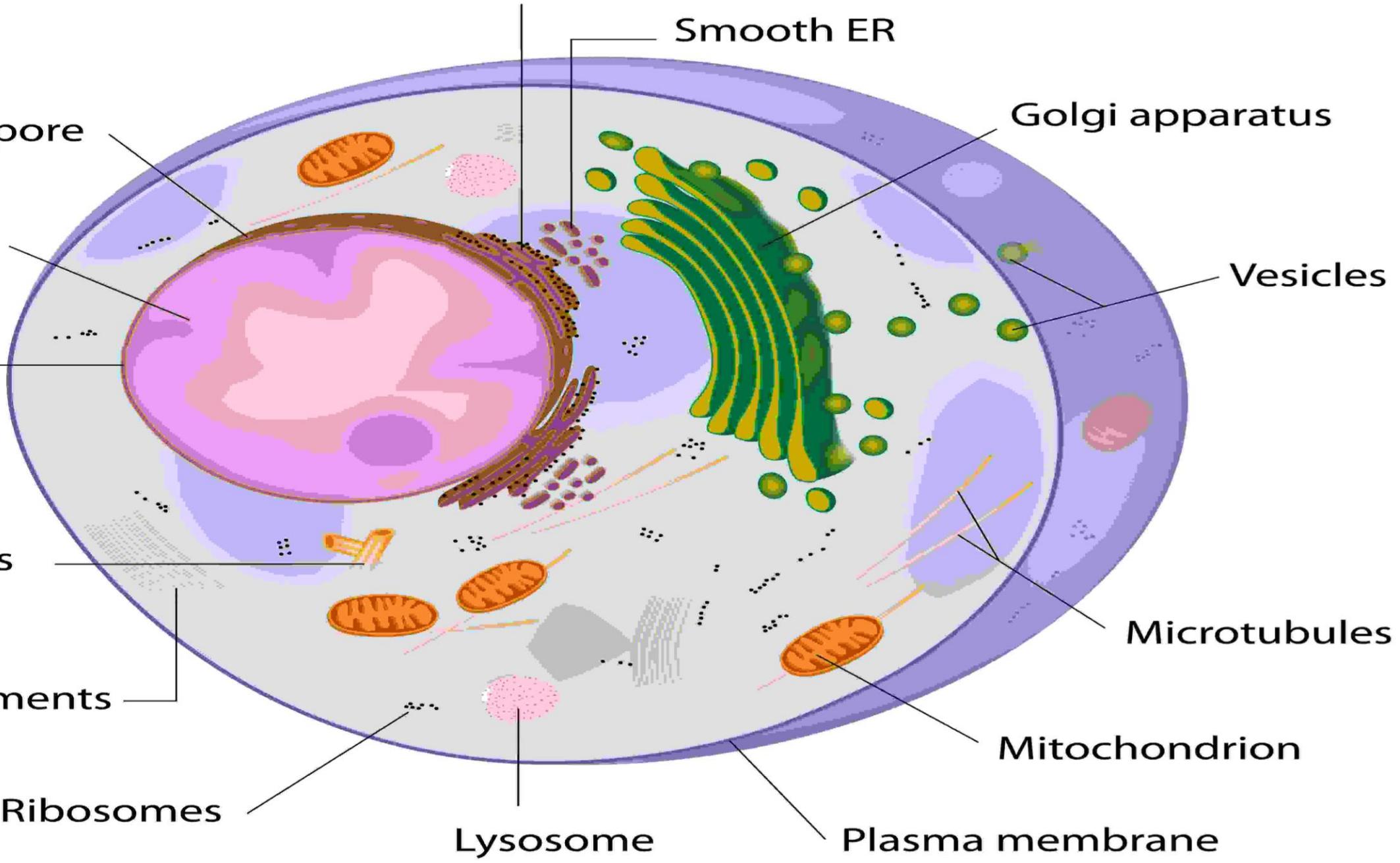
Microfilaments

Mitochondrion

Ribosomes

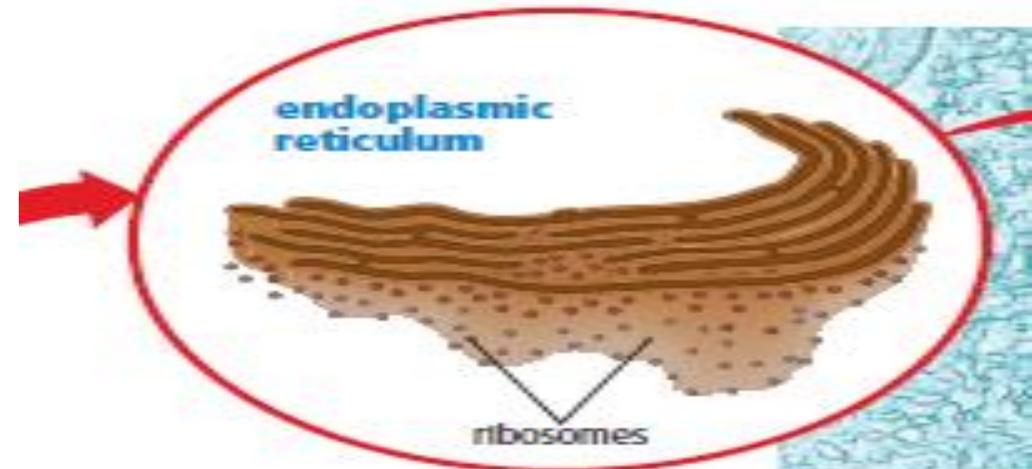
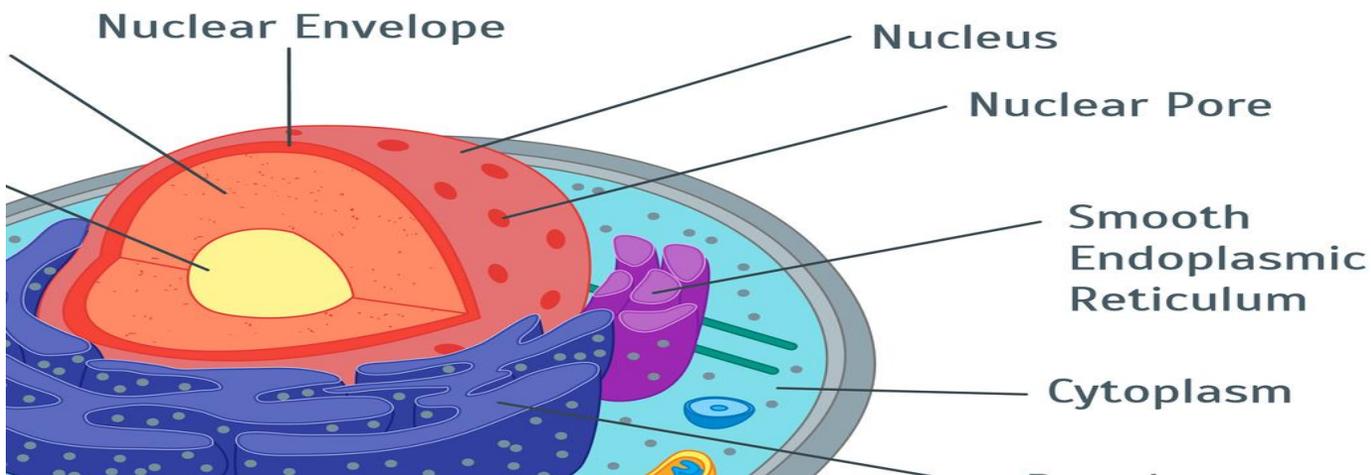
Lysosome

Plasma membrane

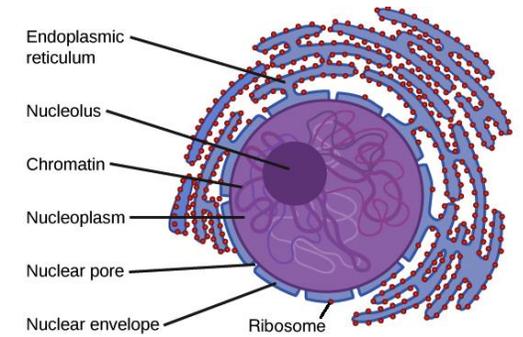


# Endoplasmic Reticulum (ER) = transport

- Network of membrane-covered channels that transport materials throughout the cell.
- *Proteins made by ribosomes pass into ER.*
- *Two kinds of ER: Smooth ER, Rough ER*



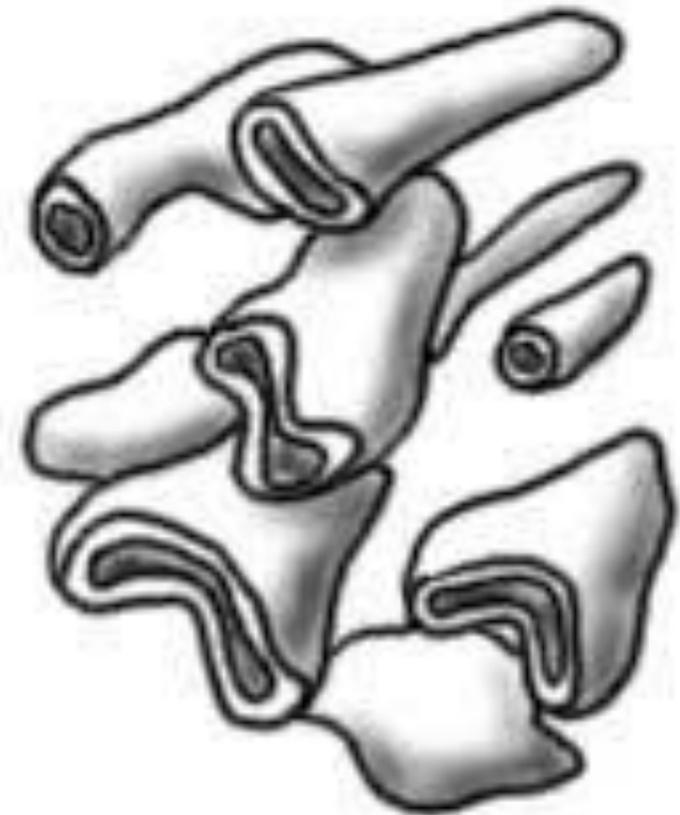
# Rough ER (Rough ER)



- Involved in some protein production, protein folding, **modifying** (*attaches sugars*) and **packaging** of proteins to be used within the cell or secreted outside of cell.
- *Package proteins in vesicles which go to the Golgi Apparatus*
- It is called '**rough**' because it is studded with *ribosomes*
- *Rough ER is found throughout the cell but mostly near the nucleus and the Golgi apparatus.*

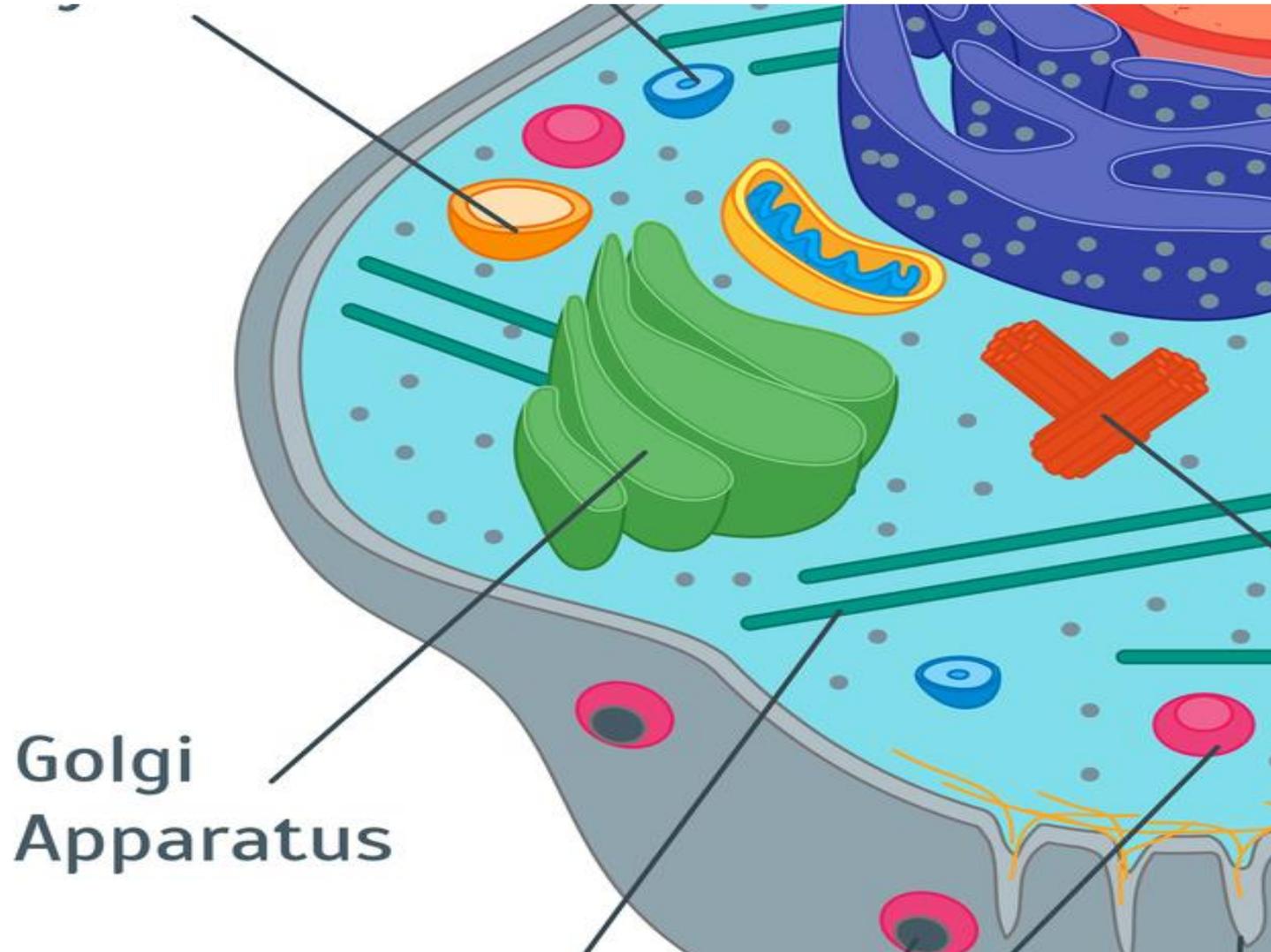
## Smooth ER (SER)

- Produces and exports **lipids** (fats), steroid hormones, and detoxification of harmful byproducts.
- *More tubular in appearance*
- **No ribosomes** – appears smooth
- *Cells in your body that release oils also have more SER than most cells.*



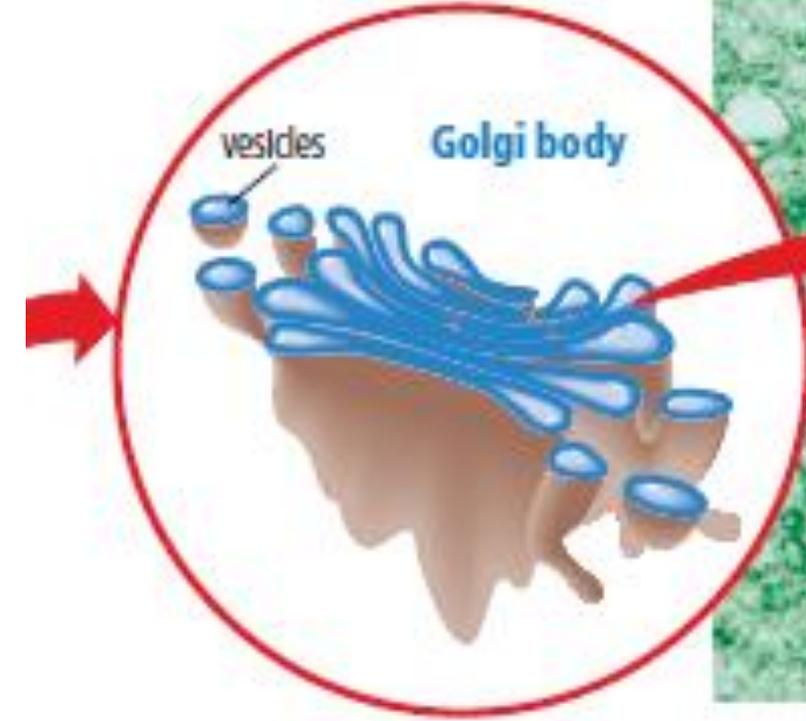
SMOOTH ER

# Golgi Apparatus (Post Office)



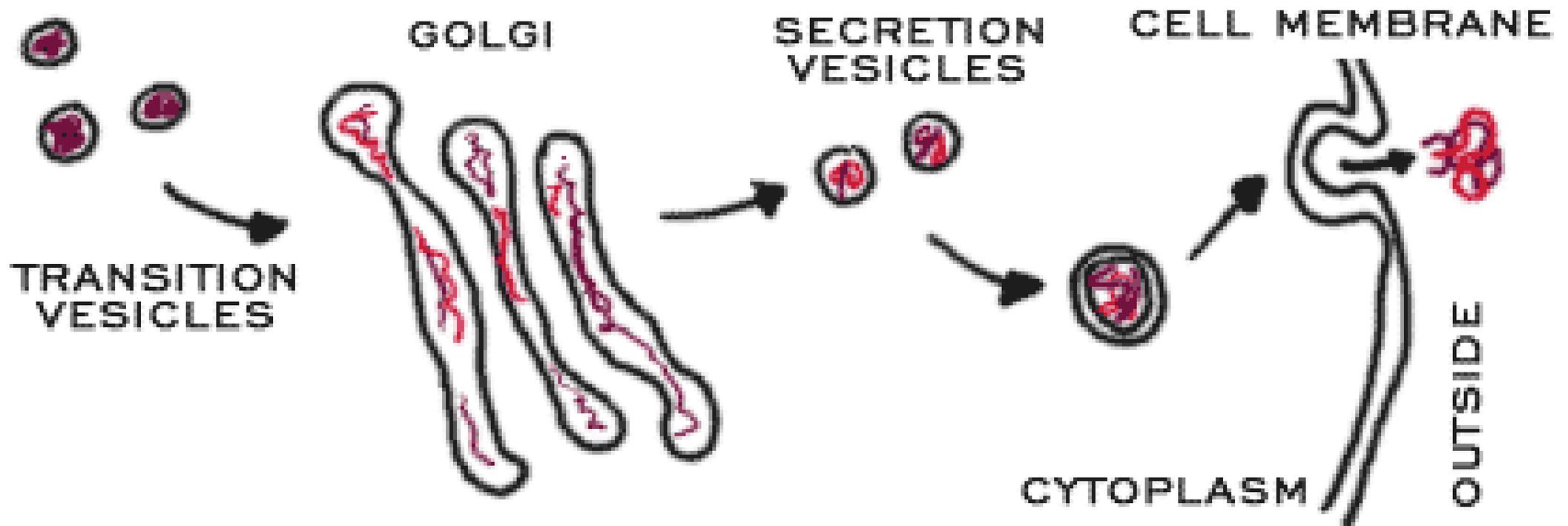
# Golgi Body = Post Office

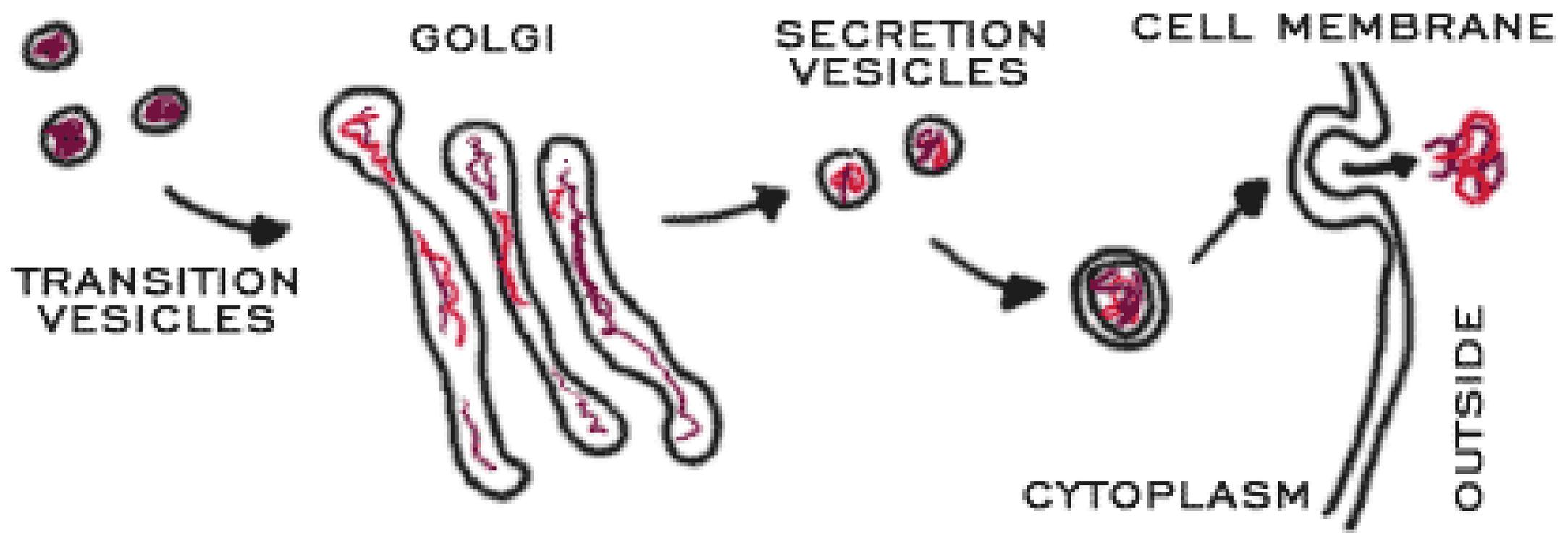
- *Piles of flattened sacs, layered one above the other and connected to each other.*
- *Proteins from ER are transformed into more complex proteins, sorted and **repackaged** into ***vesicles*** to be moved within the cell or to the outside.*
- **Sorting and Repackaging proteins**



# Vesicles = transport units

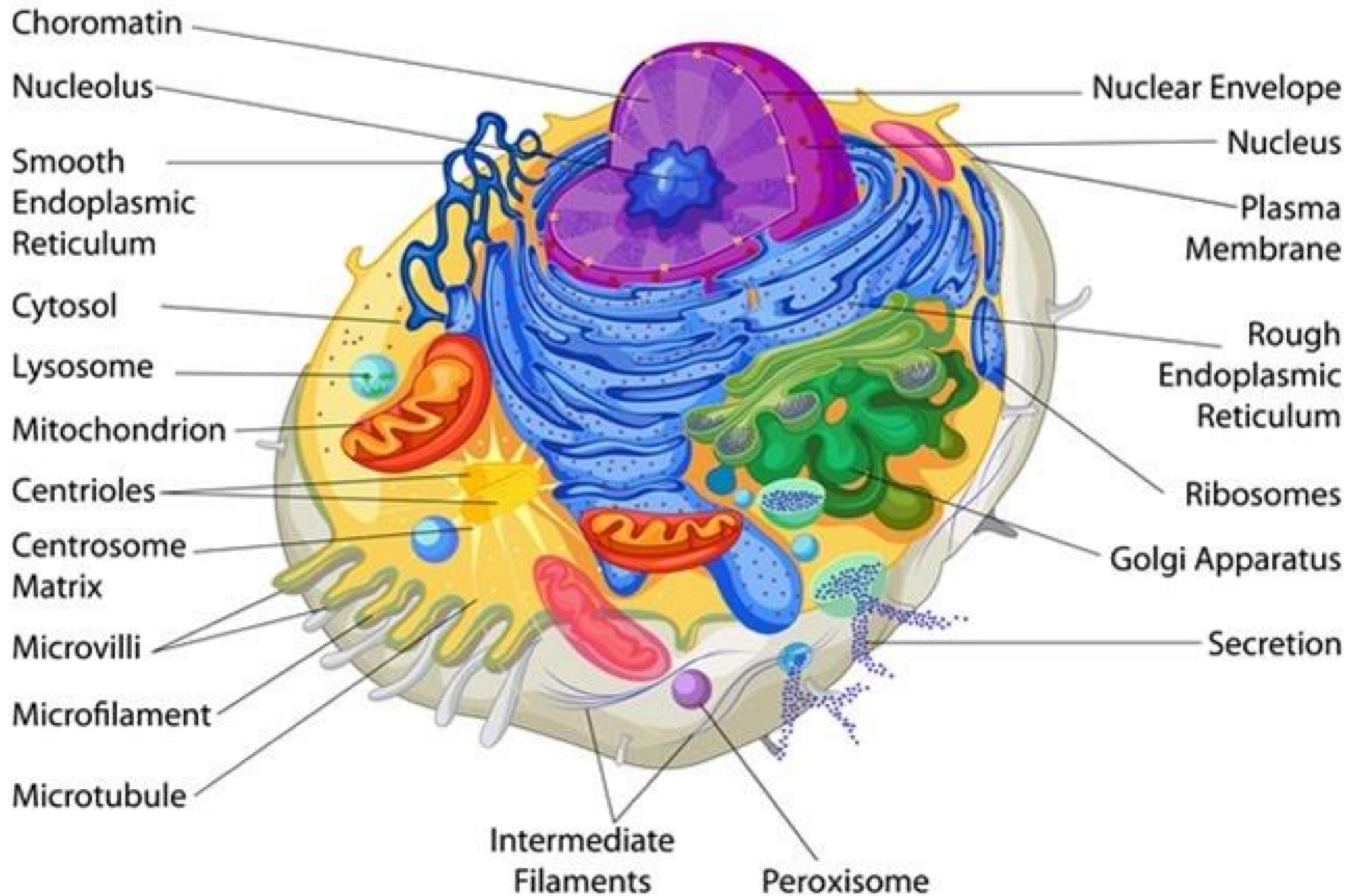
- Small membrane-wrapped packages that carry **proteins, nutrients and water** around the cell.





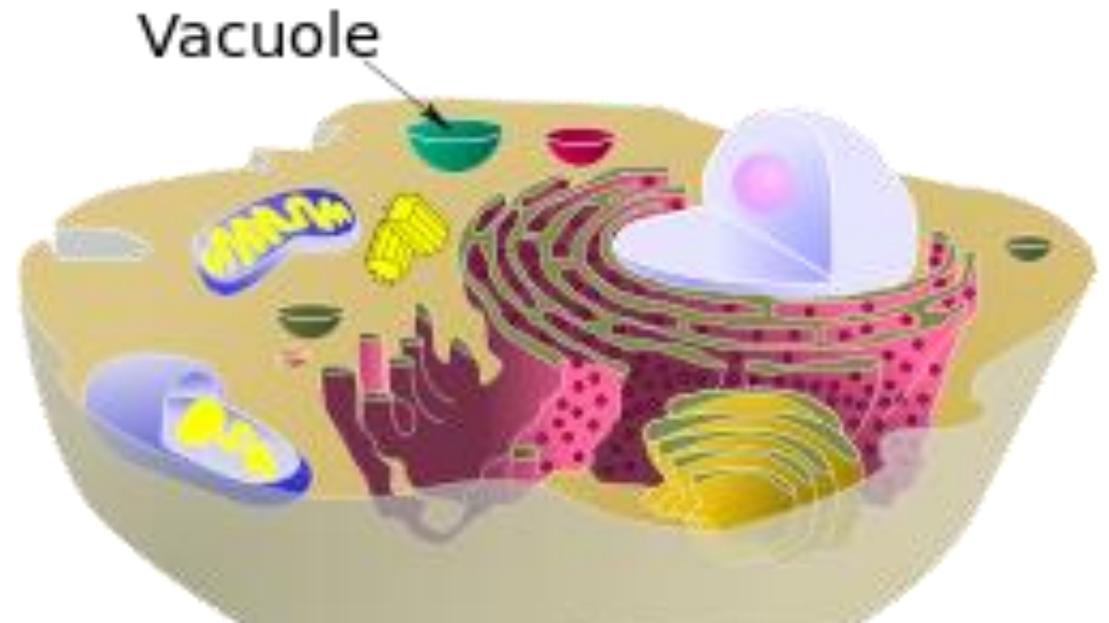
What would happen to cells without the endoplasmic reticulum?

- *Without the RER the cell is not able to synthesis new plasma membrane proteins, lysosomal enzymes, proteins for the Golgi apparatus and proteins for extracellular secretion.*



# Vacuoles = Storage

- temporary storage compartments that store nutrients or waste.
- size and shape depends on the cell's
- Plant have a large vacuole



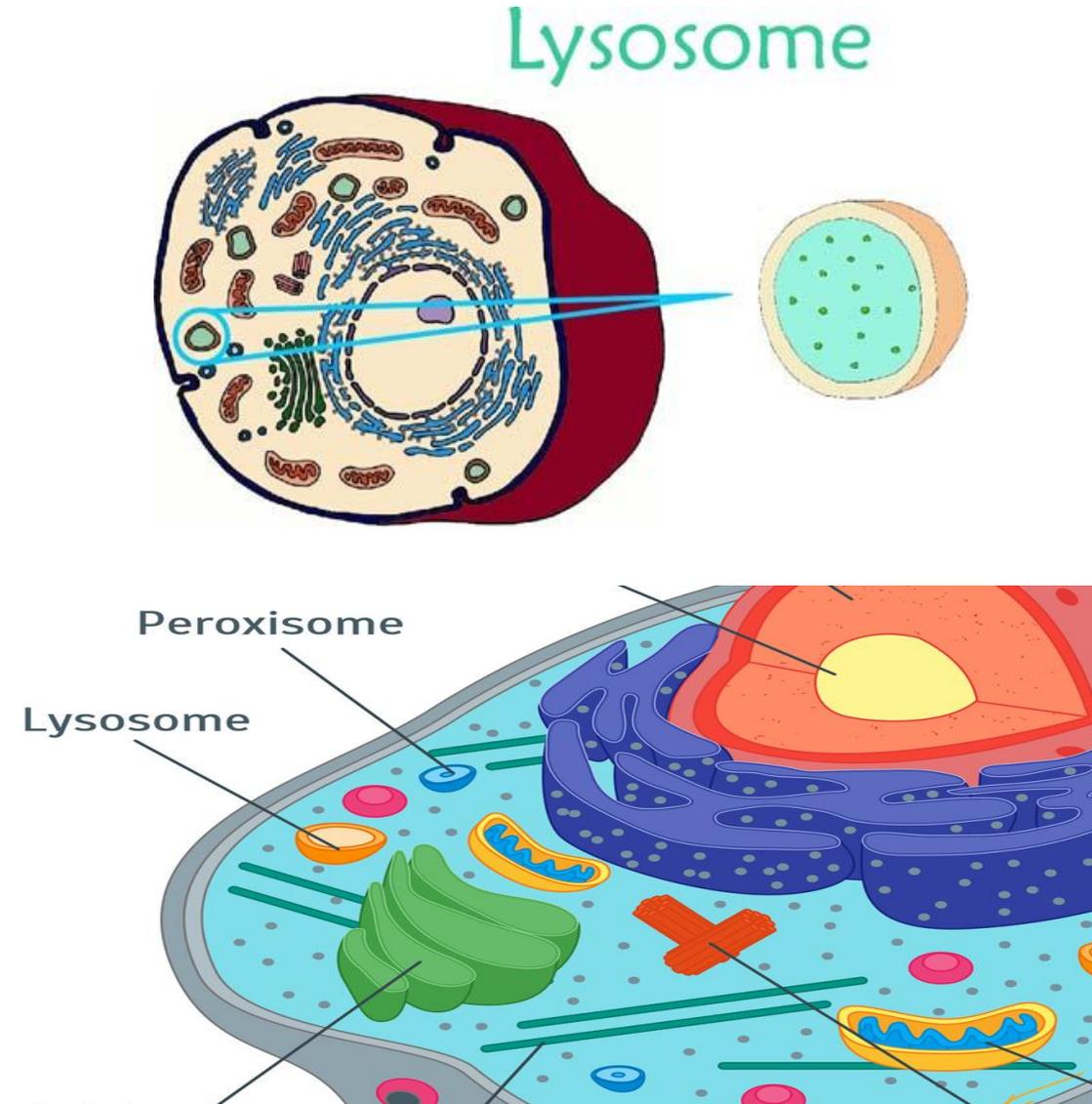
# Vacuoles

- Plant cells have a large central vacuole for storing water.



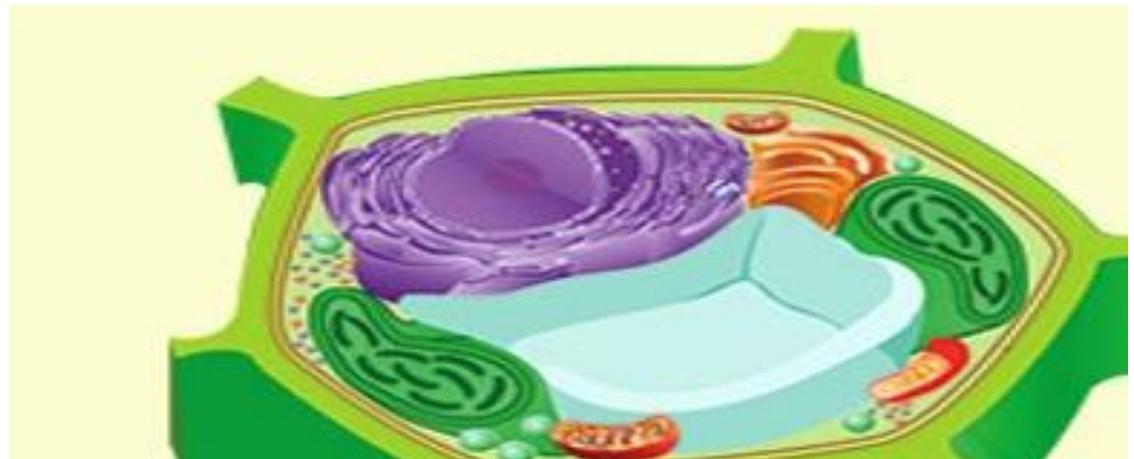
# Lysosomes = Garbage Disposal

- Specialized vesicles that contain enzymes that digest (**break down**) food particles, cellular waste, and worn-out organelles.



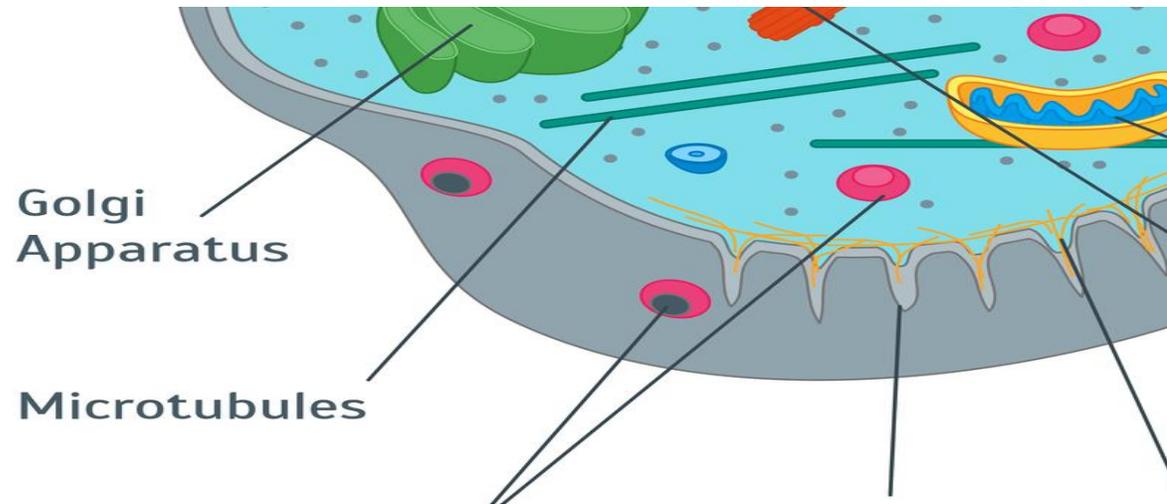
# Cell Wall = Structure and Support

- A tough, rigid structure surrounding the cell membrane
- Protects and supports the cell and give the cell shape
- Found in cells of plants, fungi, bacteria, algae.



# Microtubules = **cytoskeleton**

- Tiny tube-like structures in the cytoplasm that allow **movement** of the organelles within the cell and provide **support** for the cell.



# Centrioles

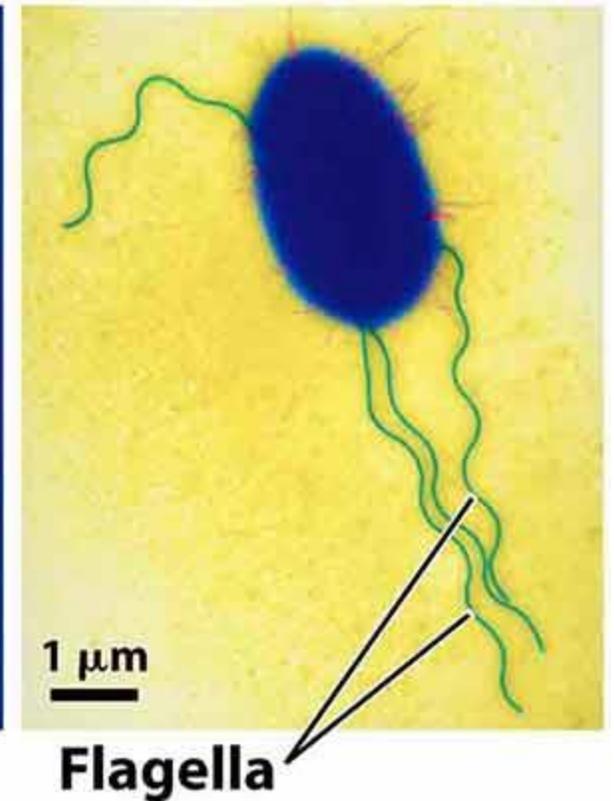
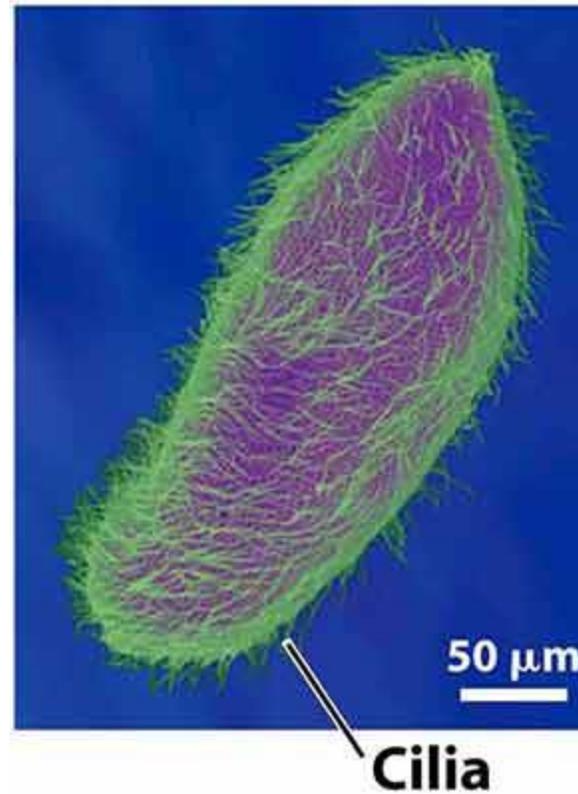
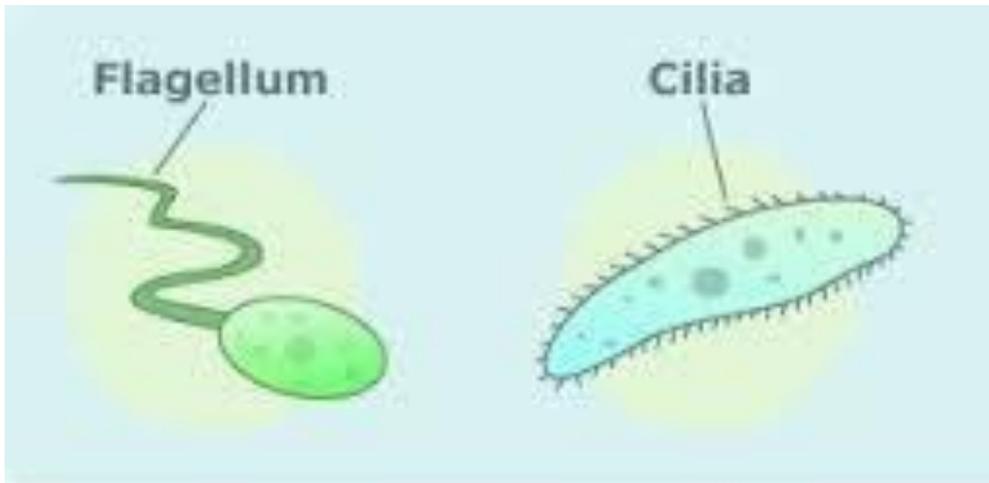
- Cylindrical organelles occurring in **pairs** (centrosome)
- involved in **cell division**.
- Only found in animal cells.

The Centrioles



# Less Common Structures

- Cilia and Flagella:
- Hair like structures used for movement



# Compare Plants and Animals

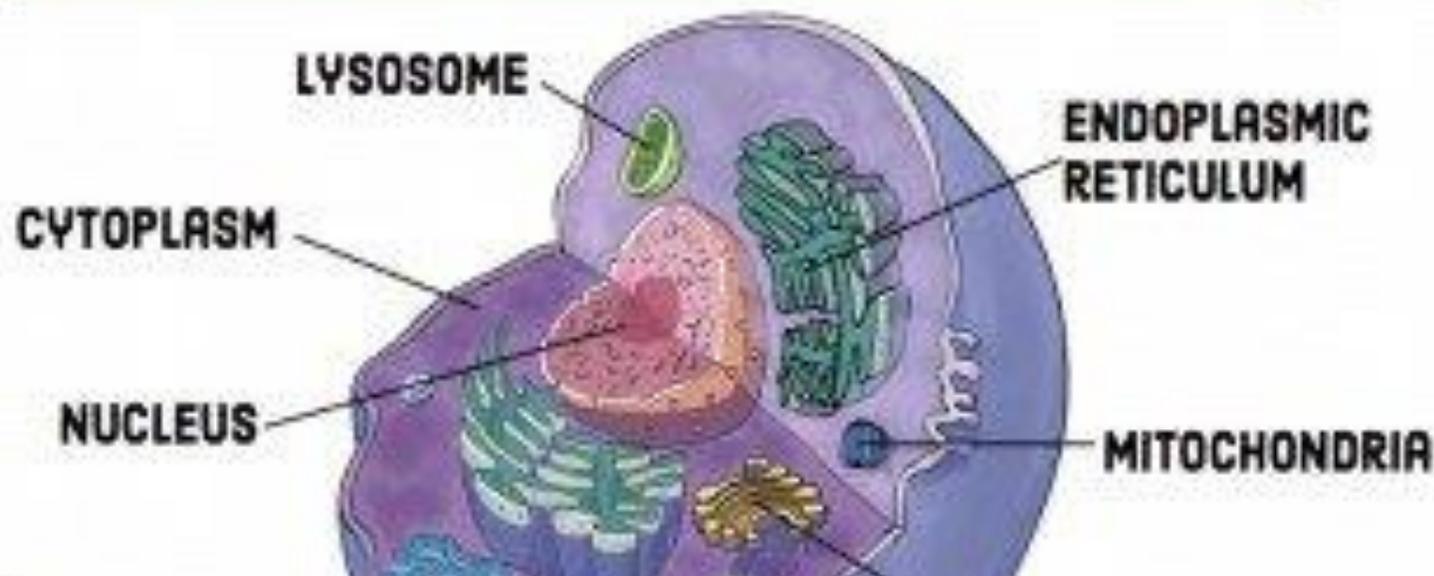
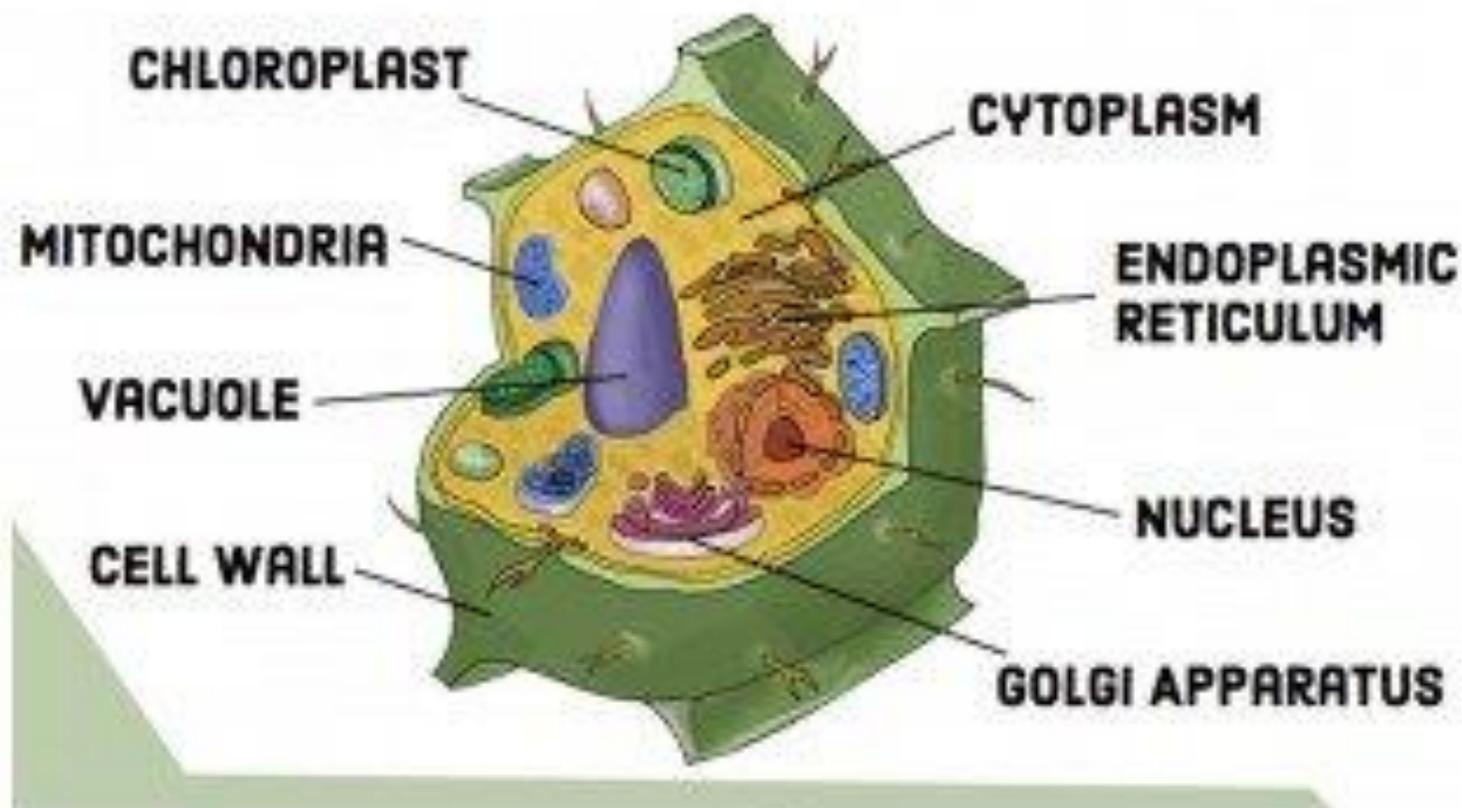
- Do you think plant cells have all the same organelles as animals?

# Plant Cell

VS.

# Animal Cell

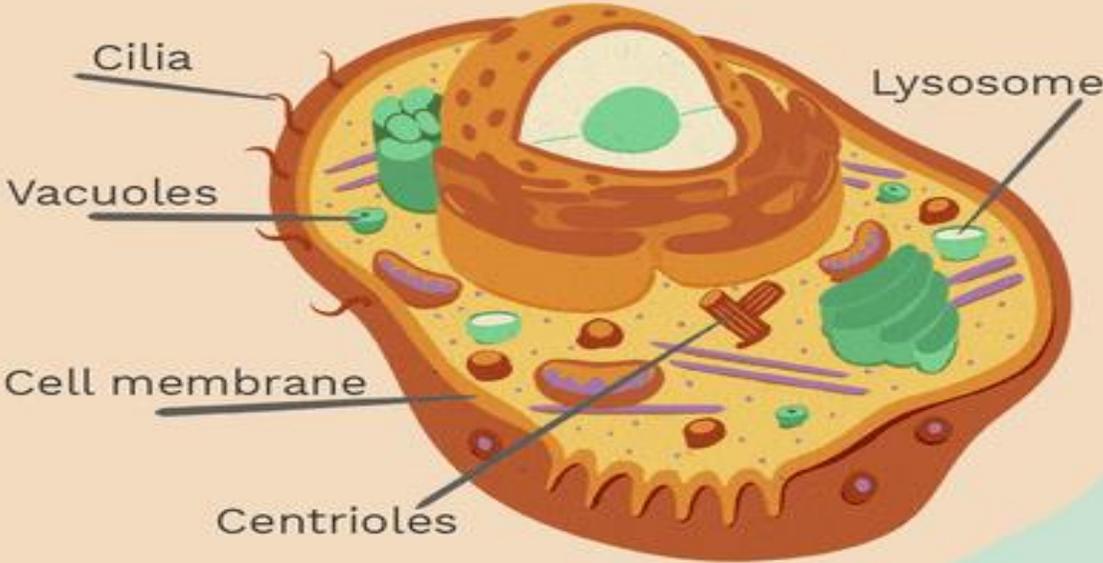
Compare and Contrast



# Plants and Animals

- Do you think plant cells have all the same organelles as animals?
- What could be different?

# Difference between Animal and Plant Cells

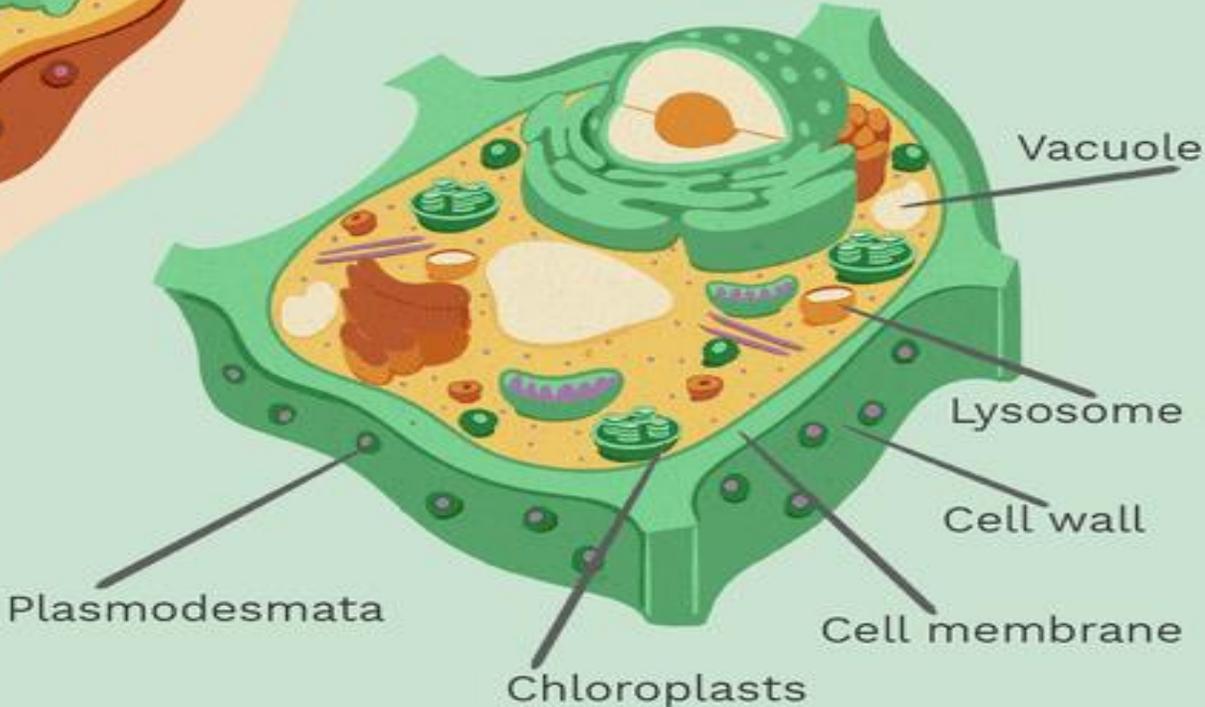


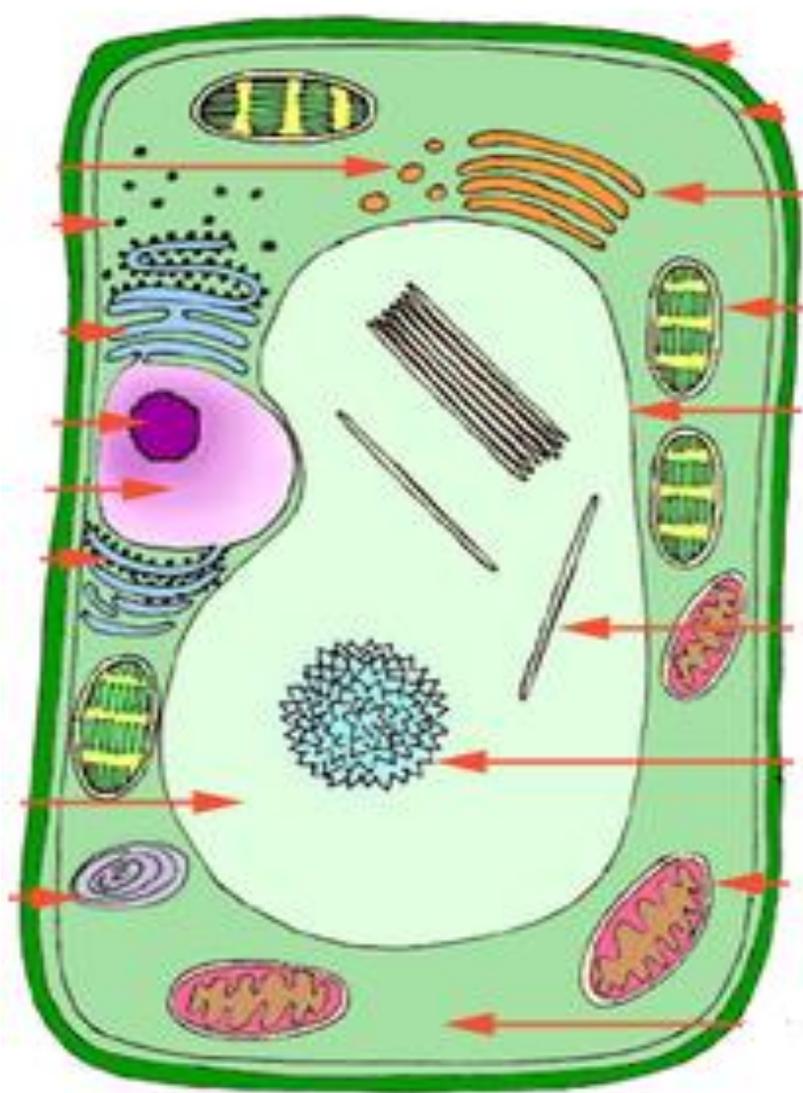
## Animal Cell

- 10-30 micrometers in length
- Typically round or irregular in shape

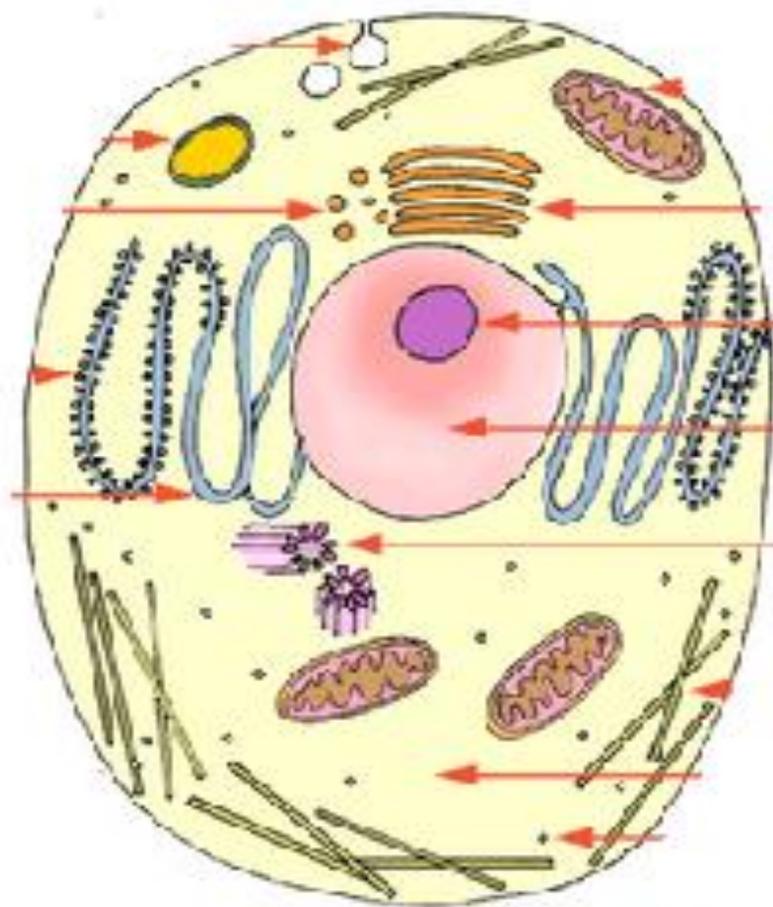
## Plant Cell

- 10-100 micrometers in length
- Typically rectangular or cubic in shape





**Plant cell**

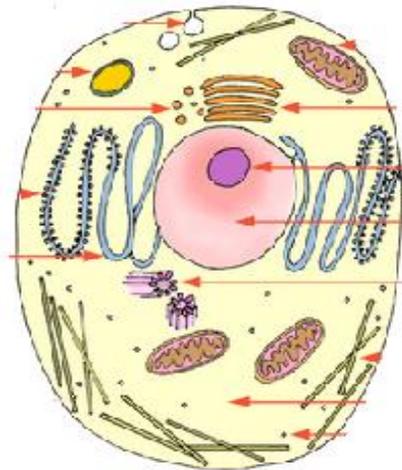


**Animal cell**

Size: Plant cells can sometimes be bigger.

## Animal Cells

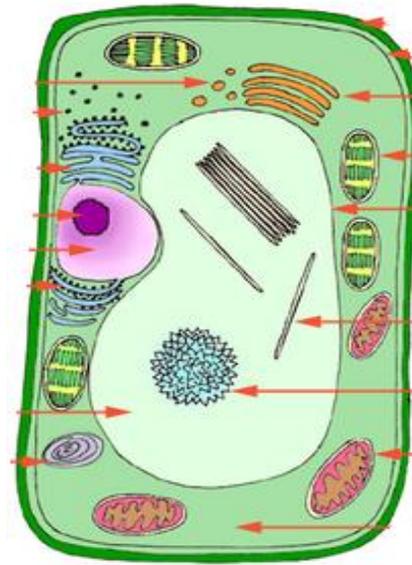
- 10-30  $\mu\text{m}$  in length



Animal cell

## Plant Cells

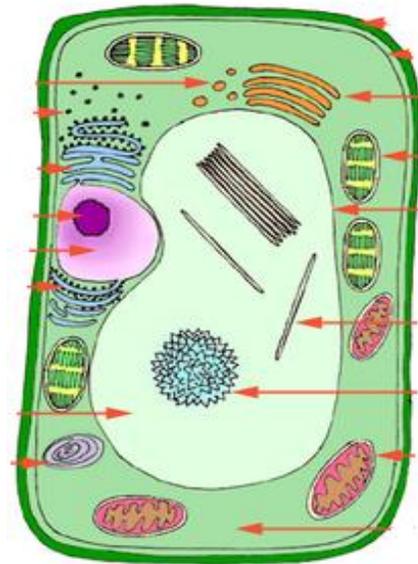
- 10-100 $\mu\text{m}$  in length



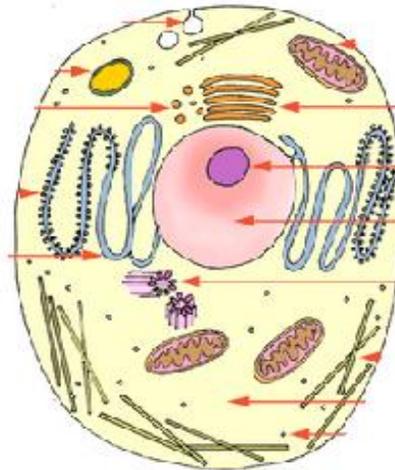
Plant cell

# Shape:

- Plant cells are often **square or rectangular**
- Animal cells are more **rounded**



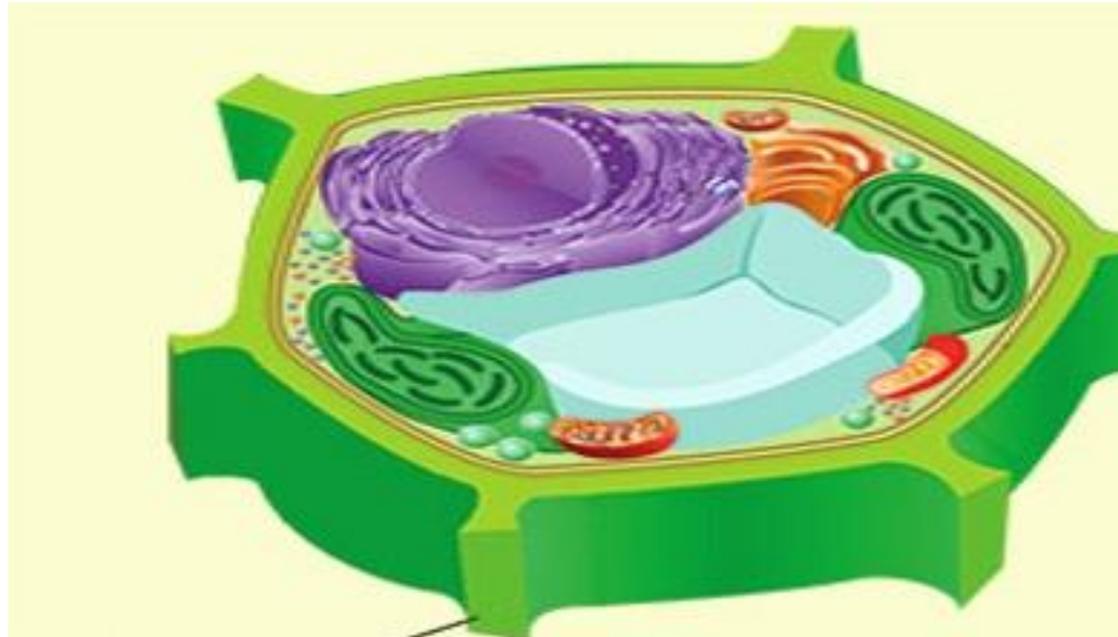
**Plant cell**



**Animal cell**

# Plant Cells have a Cell Wall

- Cell Wall is a tough, rigid structure that surrounds the cell membrane
- **Protects and supports** the cell and give the cell **shape**

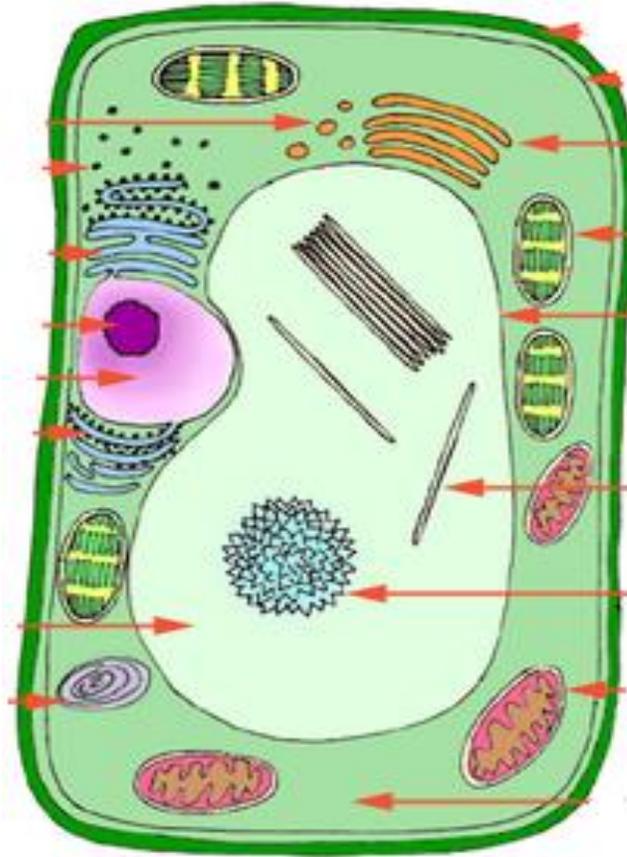


# Centrioles

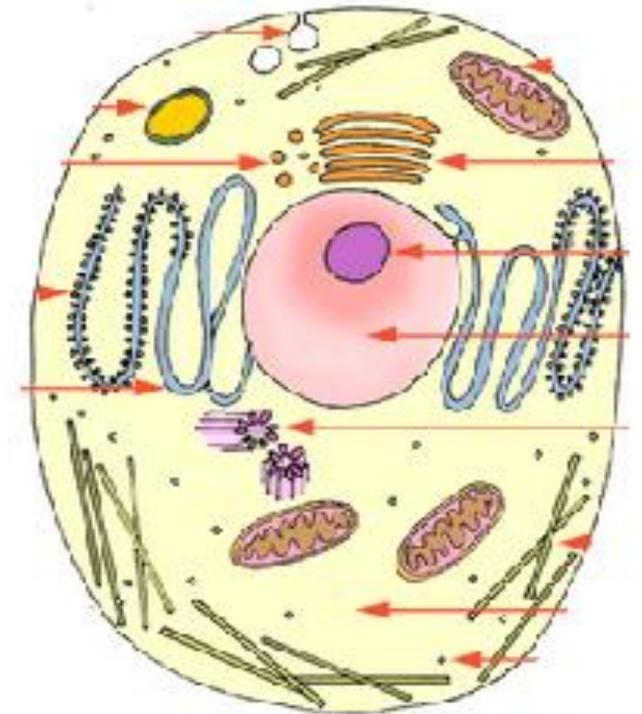
- Plant cells have no centrioles

# Plant cells have large central vacuole

- For storing water

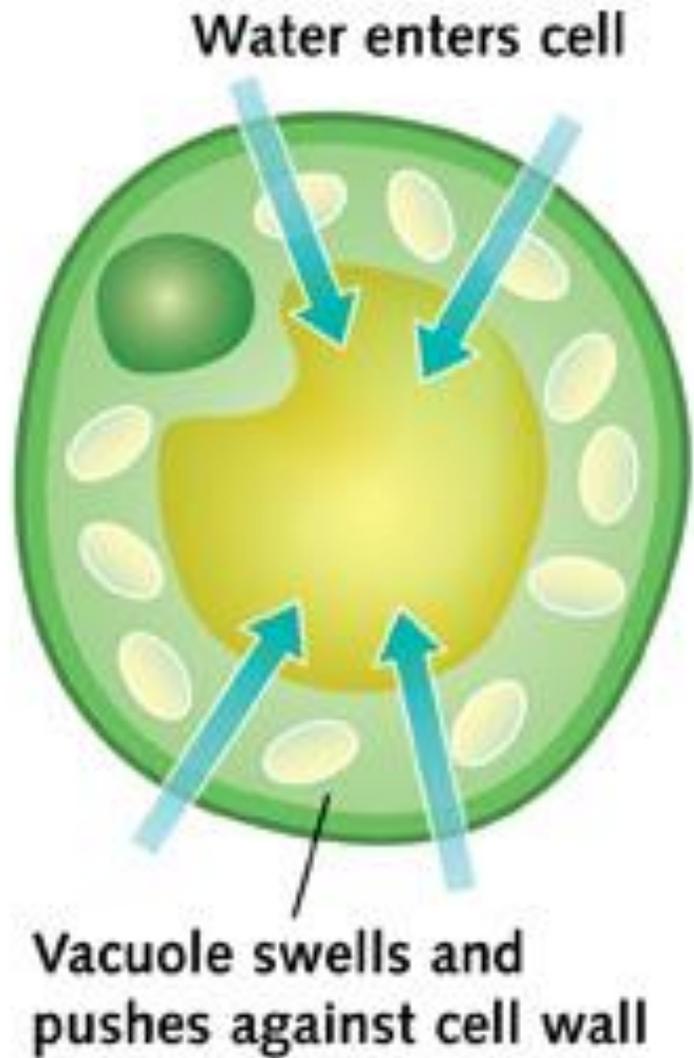


**Plant cell**

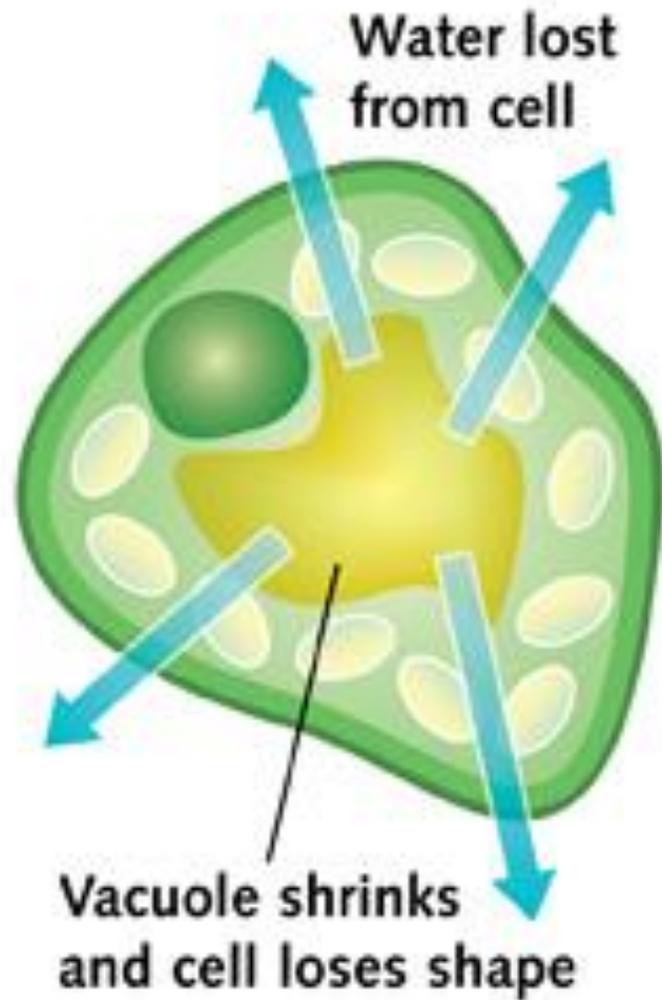


**Animal cell**

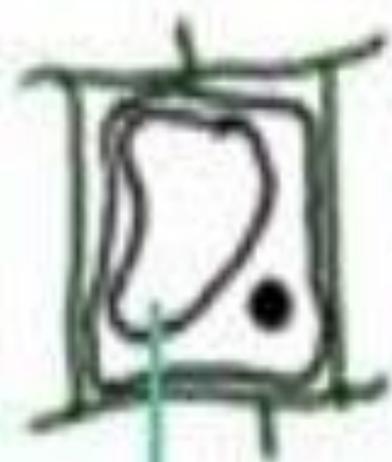
## Turgid Cell



## Flaccid Cell



**FULL**



VACUOLE



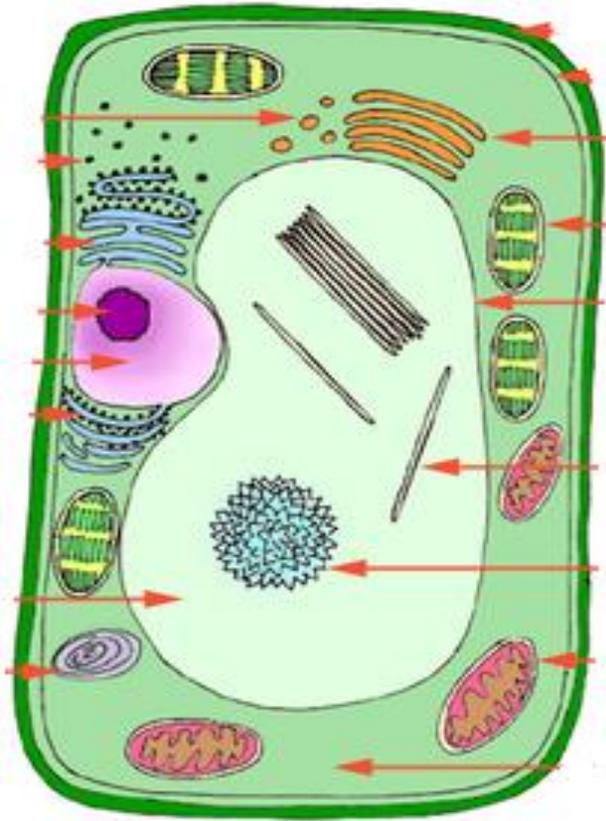
**EMPTY**



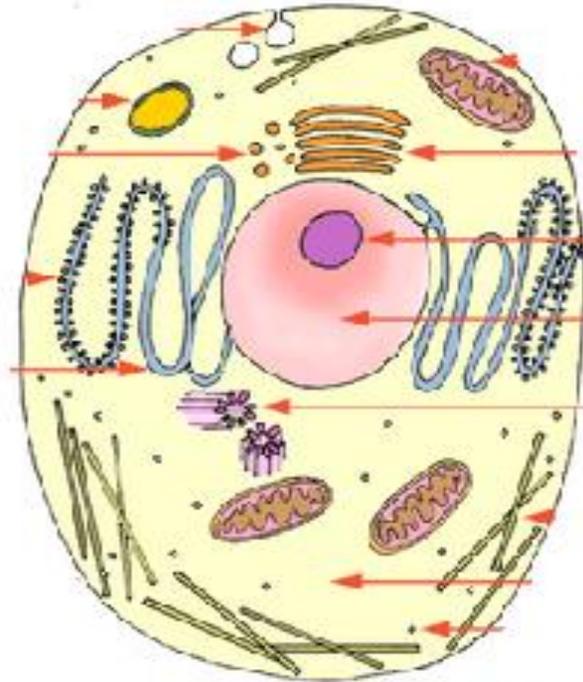
VACUOLE



Plant cells have **chloroplasts**



**Plant cell**



**Animal cell**

# Amoeba Sisters video on Photosynthesis

- <https://www.youtube.com/watch?v=uixA8ZXx0KU>

# Organelles summary

- Cell organelles animation
- <https://www.youtube.com/watch?v=URUJD5NEXC8>
- Organelles Amoeba sisters
- <https://www.youtube.com/watch?v=8IlzKri08kk>

# Check your understanding

1. A cell that produces a lot of proteins might have more of which organelle(s)?
2. A cell whose job is about secretion might have more of which organelle(s)?
3. Cells that require a lot of energy might have more of which organelle?
4. Compare photosynthesis and cellular respiration
5. Compare plant and animal cells.

# Assignment: 3D model of a cell

Using recycled materials from around the home, create a 3 dimensional model of a plant or animal cell. Must include:

1. Title (plant or animal), your names, block
2. Include all parts listed
3. All parts must be labeled or use a legend
4. Brief description of **function** of each organelle
5. Each type of organelle must look different from the others

