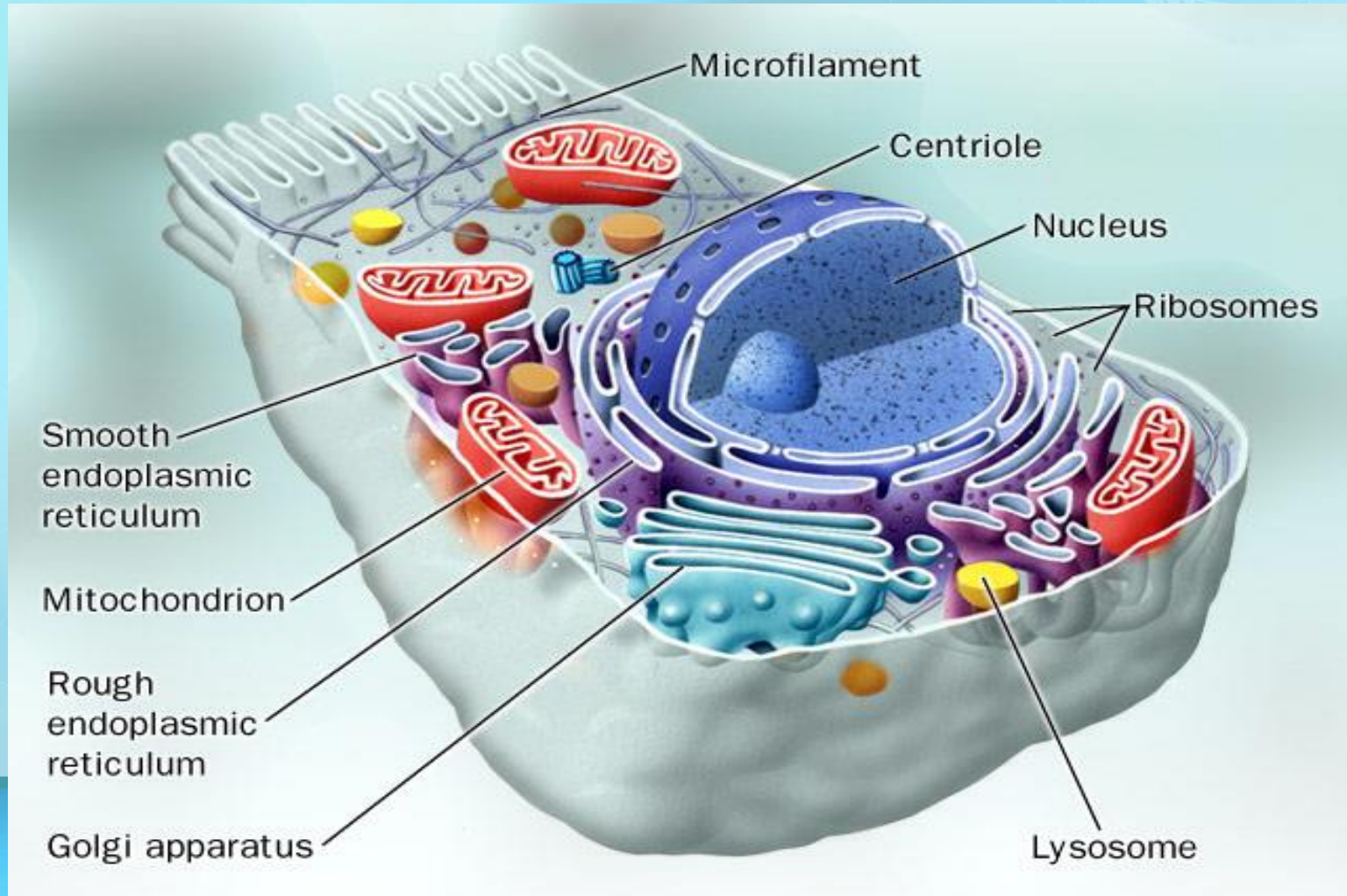


Go to the “**Slide Show**”
shade above

Click on “**Play from Beginning**”

Chapter 5: Cell Interior and Function





How do our bodies function so efficiently?

Compare the organelles in a cell to the organs in your body.

What functions are necessary to carry on life ... what organelles / organs perform these functions?





How do our bodies function so efficiently?

Compare the organelles in a cell to the organs in your body.

Brain → nucleus

Circulatory system → endoplasmic reticulum

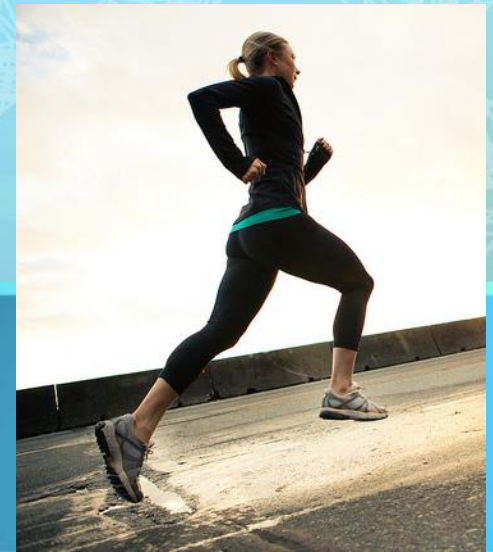
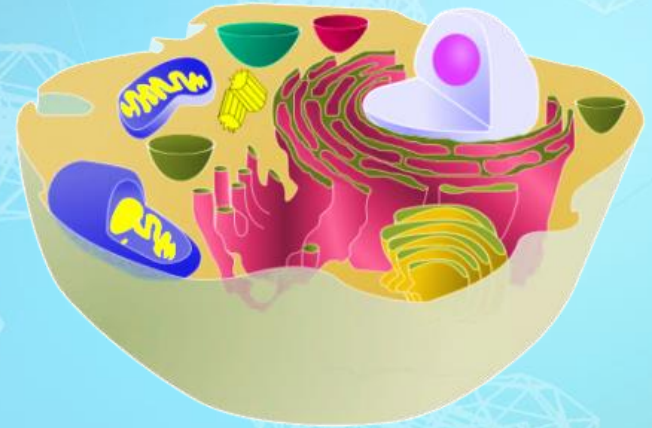
Digestion → lysosomes / vacuoles

Chemical respiration (energy) → mitochondrion

Skeleton / Support → cytoskeleton in cytoplasm

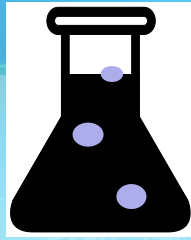
Skin → cell membrane

Reproduction → cell division





Lesson Objectives

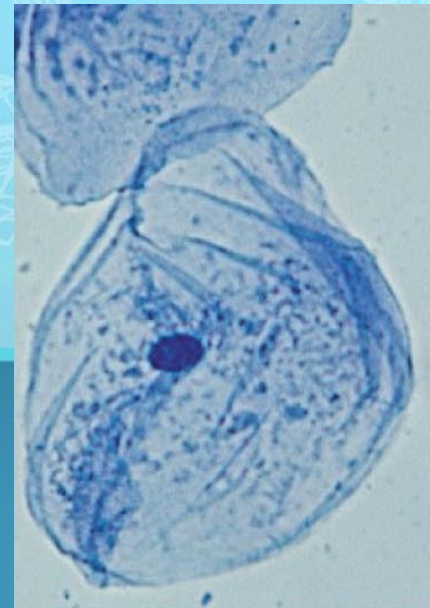


By the end of this lesson, you should be able to:

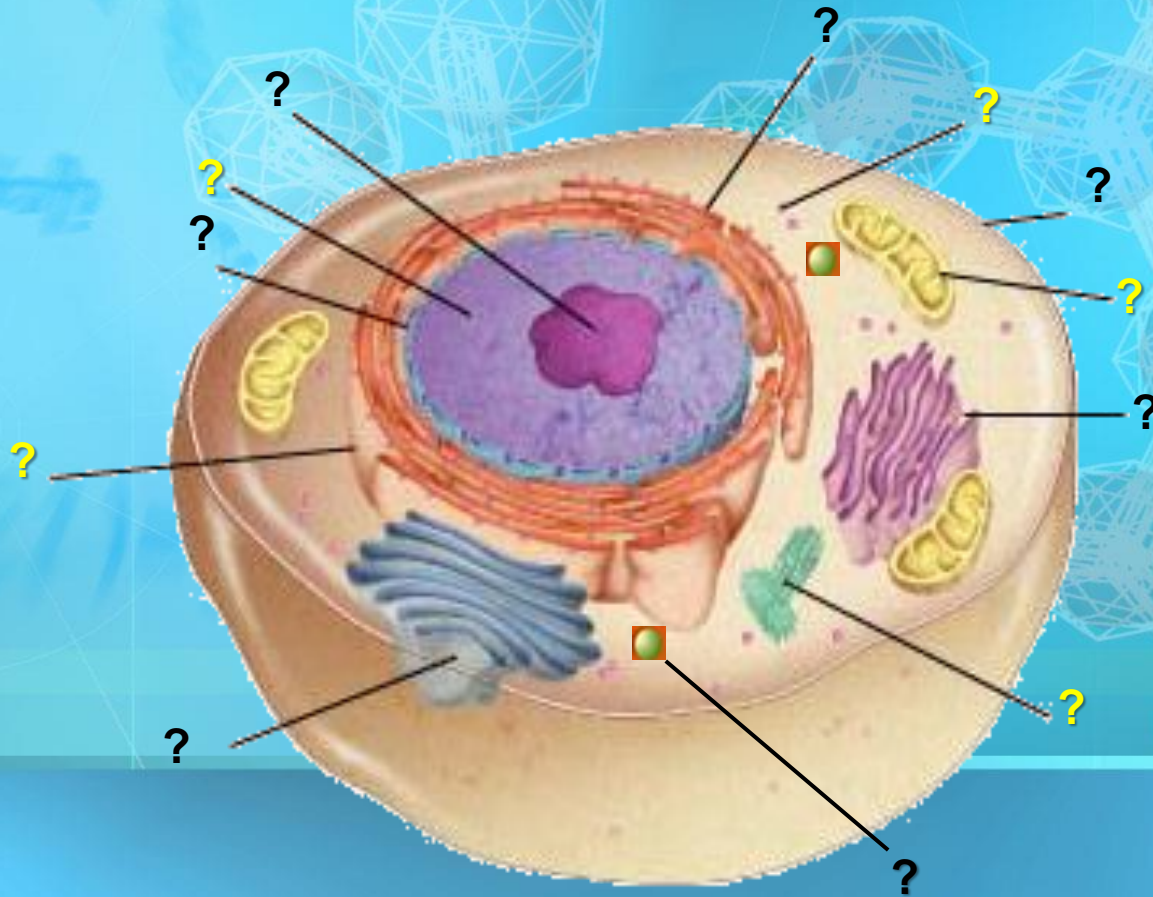
- Discuss the general and specific features and functions of a Cell and its Organelles.
- Contrast animal versus plant cells.
- **Science Practice:** Study of the Cell: Onion, Cheek

Organelles

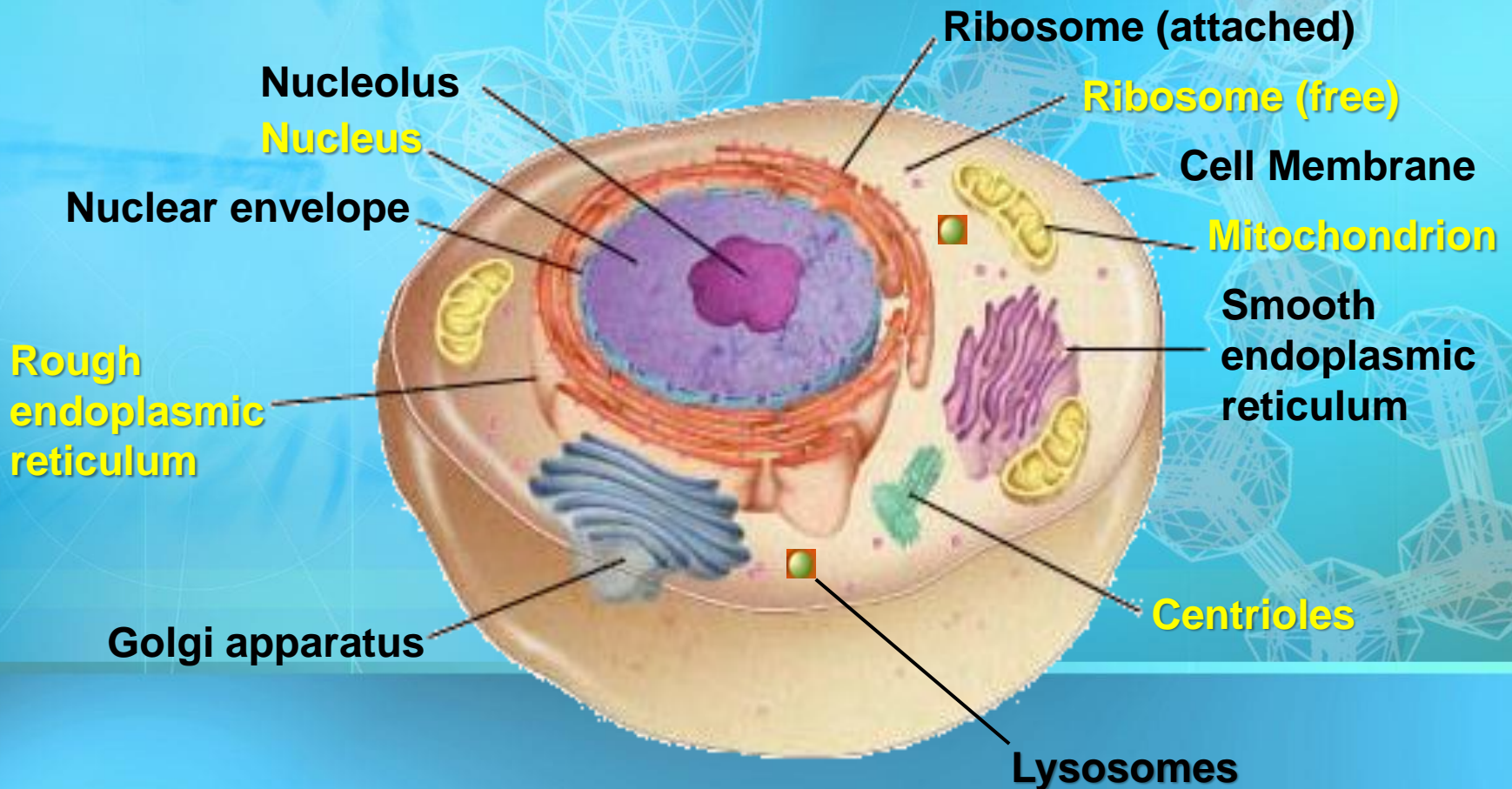
- Specialized structures found **within a cell** (in the **cytoplasm**).
- Each has a **specific job** or **function**.
- May or may not be **membrane-bound**.



Animal Cell Organelles



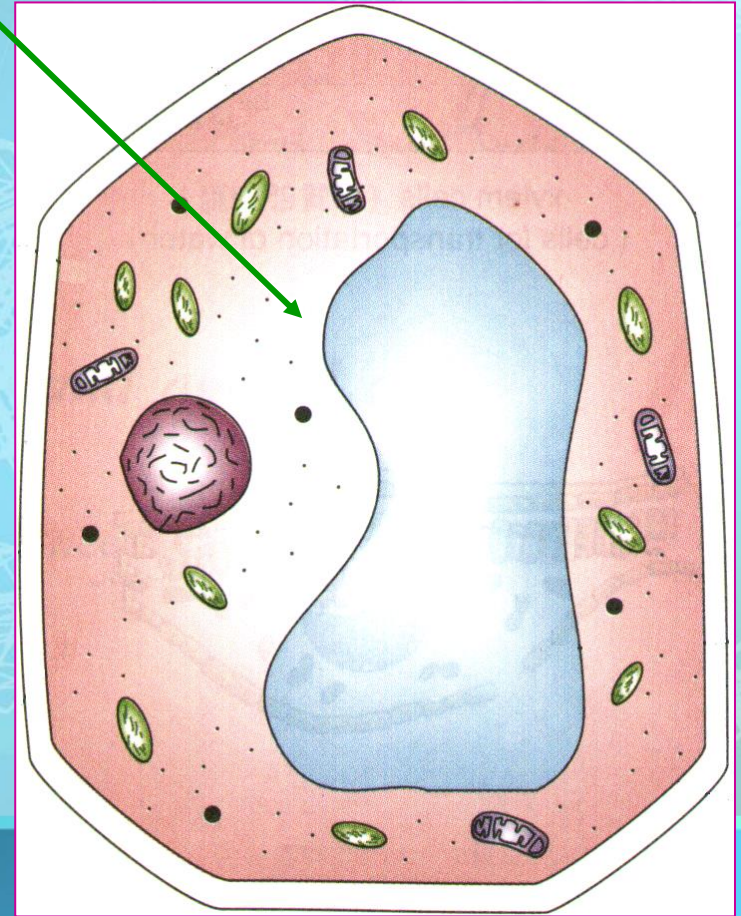
Animal Cell Organelles



Cytoplasm

- Gel-like substance enclosed by cell membrane.
- Provides a medium for chemical reactions to take place.
- Contains organelles to carry out specific jobs.
- Found in ALL cells.

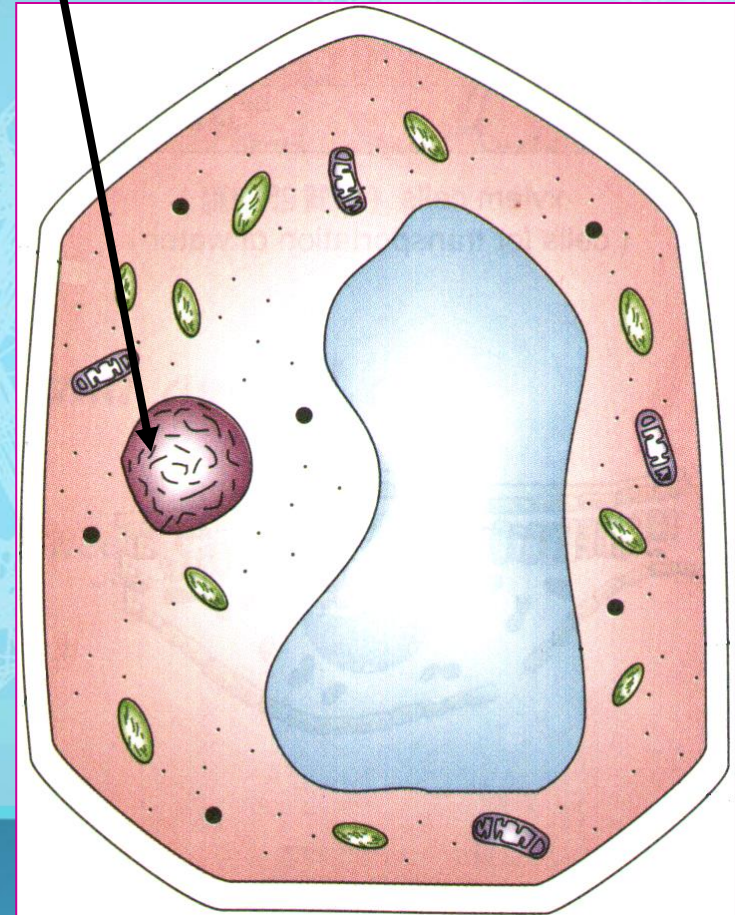
cytoplasm



Nucleus "Brain"

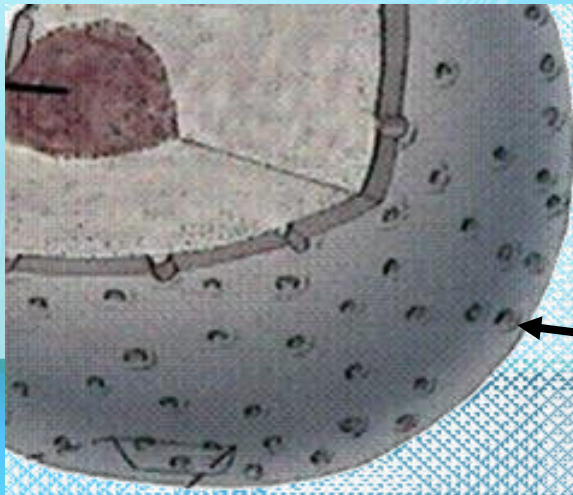
- **Control Center** of the cell.
- Contains nearly all the cell's **DNA**.
- **DNA** has the instructions for making **Proteins** and other important molecules.
- Surrounded by a **Nuclear Membrane**.

Nucleus

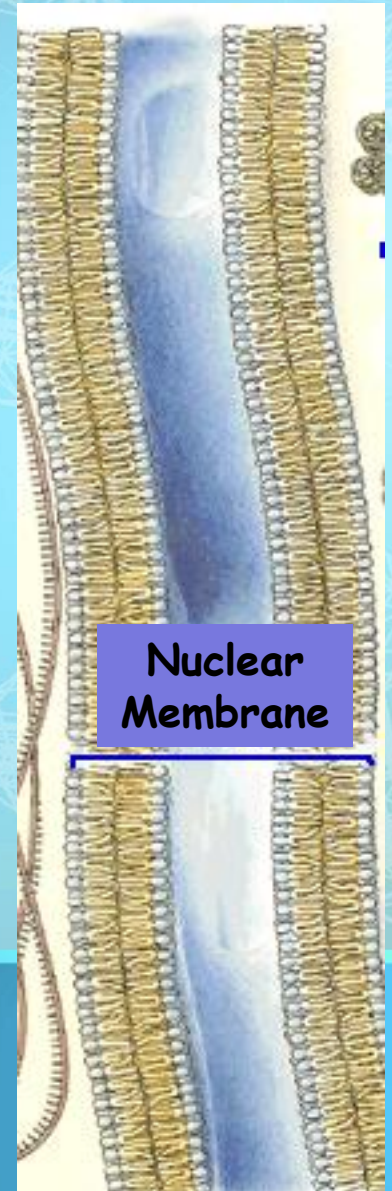


Nuclear Membrane

- **Double membrane** surrounding **Nucleus**.
- Contains **Nuclear Pores** that allow materials to move into and out of the nucleus.



Nuclear Pores

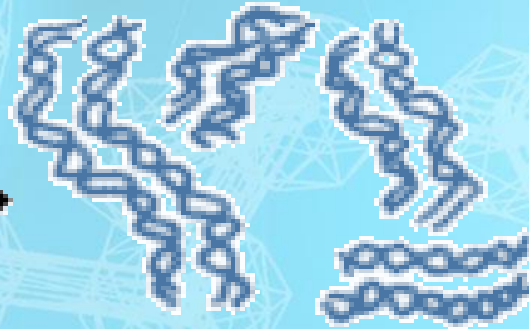


Nuclear Membrane

Nucleus

DNA is found **inside** the nucleus

CHROMATIN



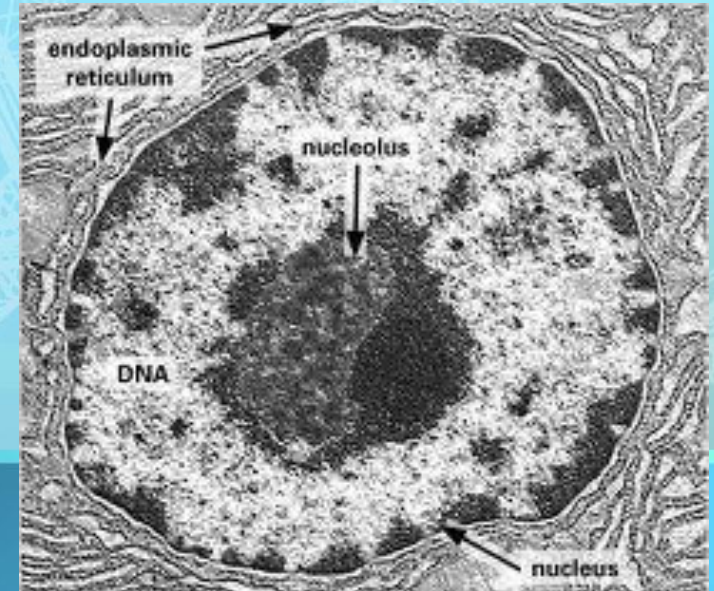
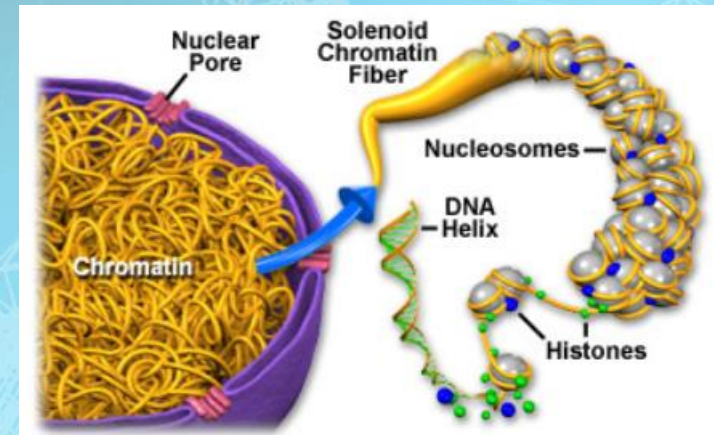
CHROMOSOMES

DNA is spread out
and appears as
CHROMATIN
in **non-dividing** cells.

DNA is condensed and
wrapped around proteins
forming
CHROMOSOMES
in **dividing** cells.

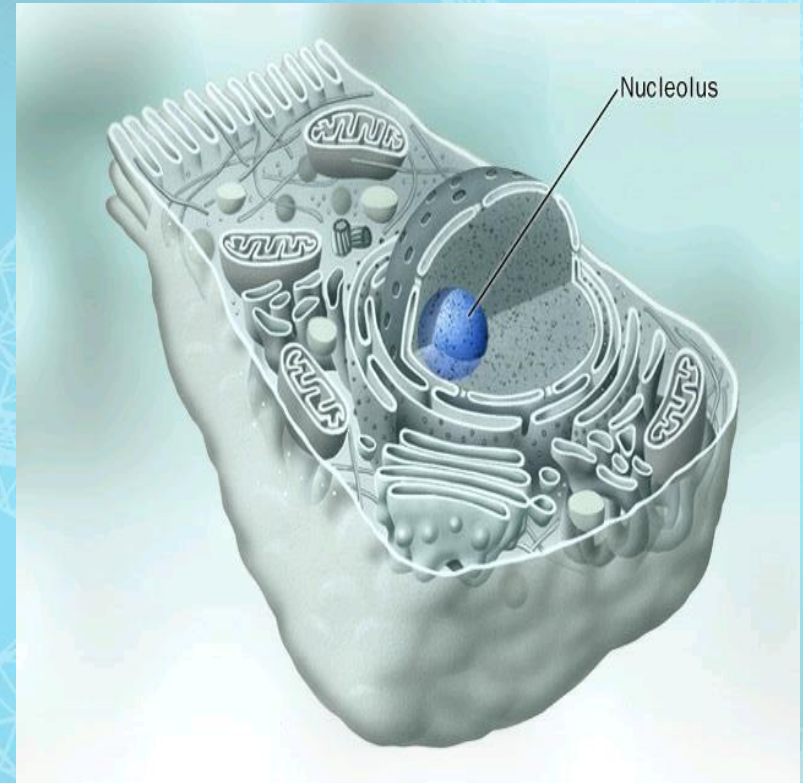
Chromosomes/Chromatin

- Made of **DNA**
- Two Functions:
 - Contain the **genetic information** that is **passed from one generation to the next (GENES)**.
 - **Controls** cell's activities and characteristics.



Nucleolus

- Inside nucleus.
- Cell may have 1 to 3 nucleoli.
- Disappears when cell divides.
- Manufactures the subunits that make up the Ribosomes (organelles that make proteins).



Ribosomes

- Most **numerous** cell organelle.
- Sites of **Protein Synthesis**.
 - Join **amino acids** to make **proteins**.
- Found at two locations:
 - **Free-floating in the cytoplasm.**
 - **Attached to the Rough Endoplasmic Reticulum (RER).**

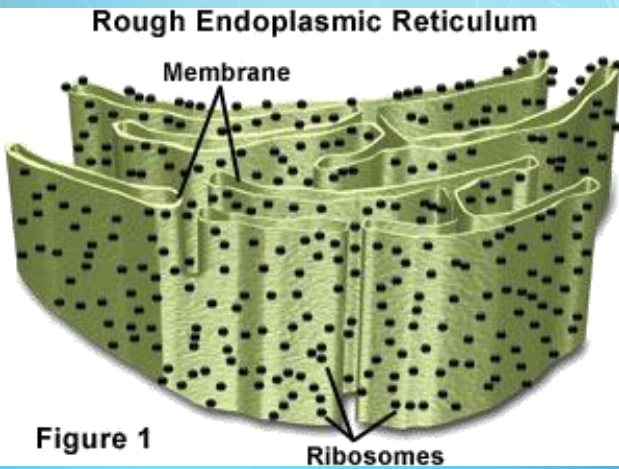
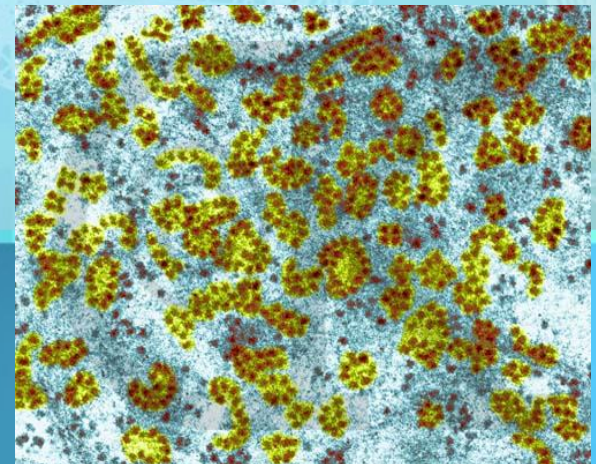


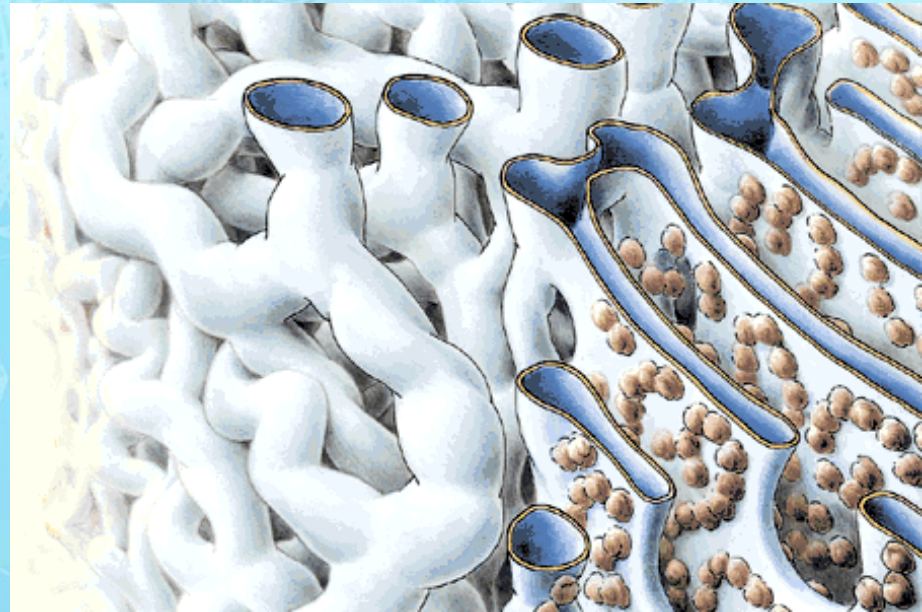
Figure 1



Endoplasmic Reticulum (ER)

“Circulatory System”

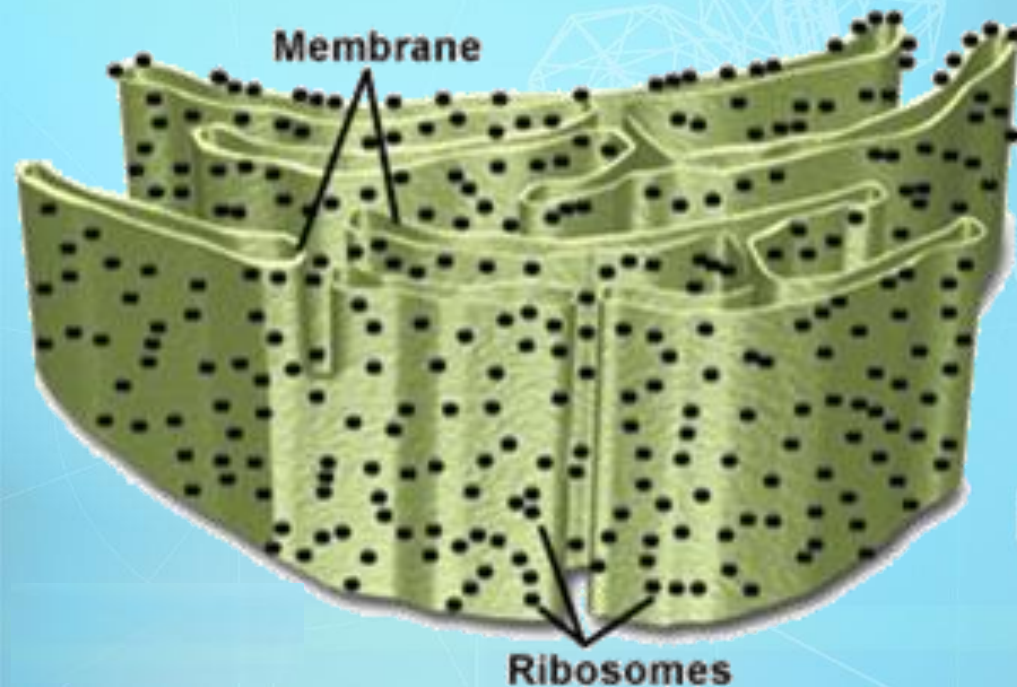
- Internal membrane system of a cell.
- Connects the nuclear membrane to the cell membrane.



Two kinds of ER: **ROUGH** and **SMOOTH**

"Rough" Endoplasmic Reticulum (ER)

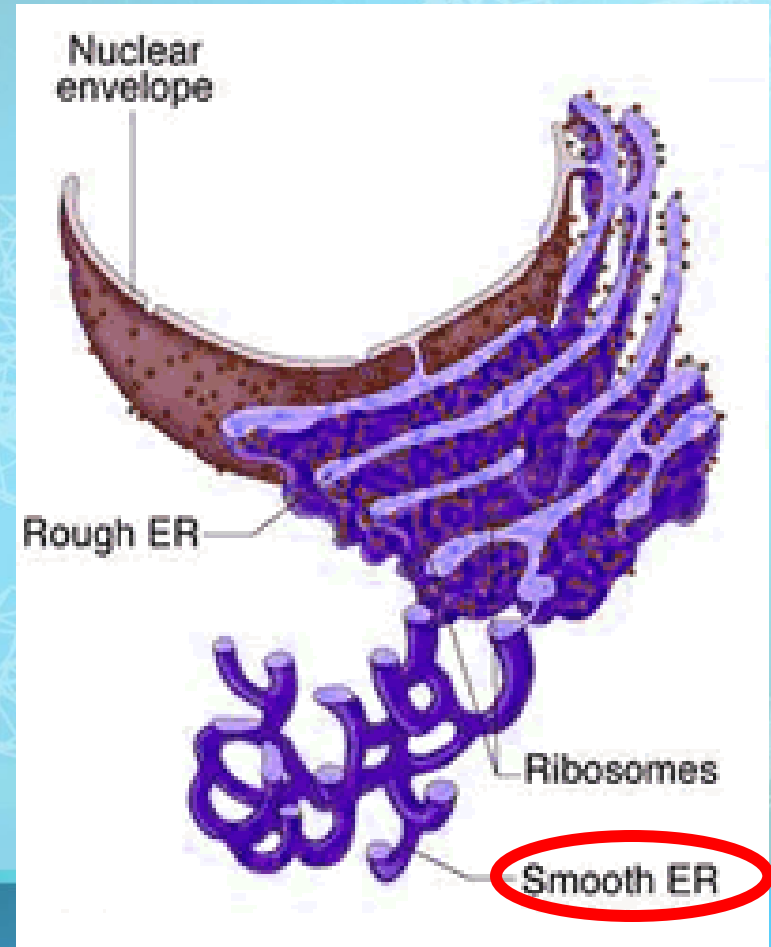
Studded with **Ribosomes**



- Thus, this type of ER is involved in the **making of proteins.**
- Newly made proteins leave the **ribosome** and are inserted into **spaces of the endoplasmic reticulum** where they are **modified and shaped** into a functioning **protein.**

“Smooth” Endoplasmic Reticulum (SER)

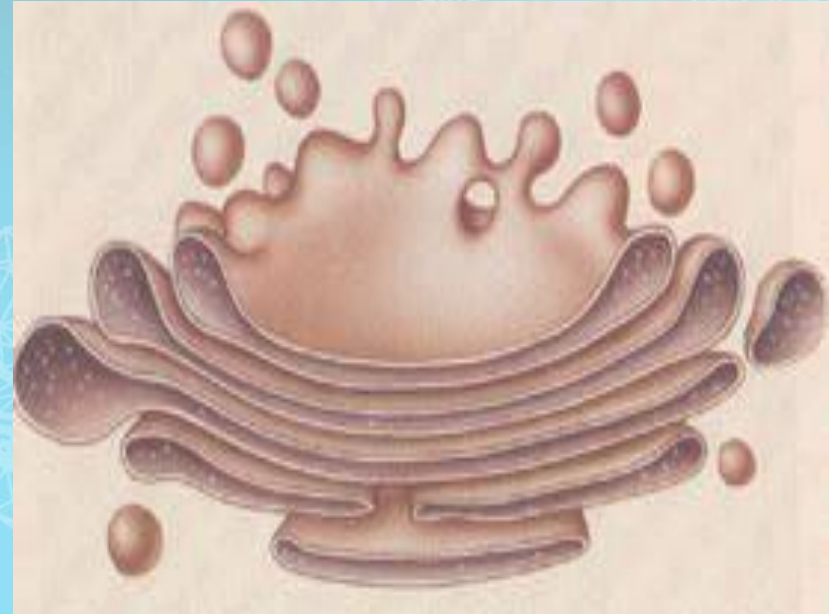
- Lacks ribosomes on its surface.
- Functions in:
 - Making Lipids that will be used in the cell membrane.
 - Detoxification of drugs and pesticides (esp. in human liver cells).



Golgi Apparatus

“Packaging Plant”

- Stacks of **flattened sacs**. (“stack of pancakes”)
- **Proteins** produced in the **RER** now move to the **Golgi apparatus**.
- **Modifies, sorts, and packages proteins** made by RER.
- These **proteins** will either be:
 - **Stored inside** the cell.
 - **Secreted to the outside** of the cell.

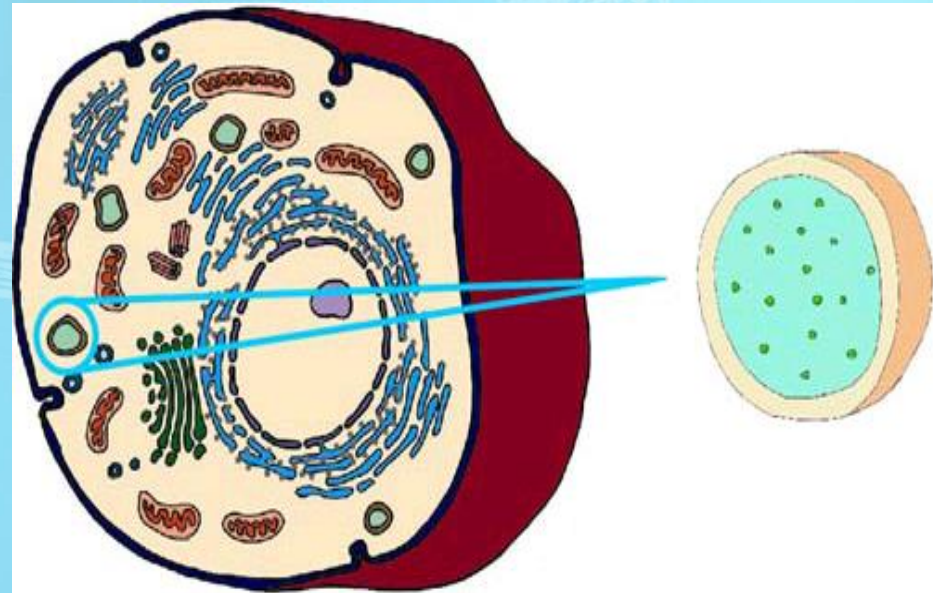


The “finishing touches” are put on **proteins** here before they are shipped off to their final destinations.

Lysosomes

“Digestive System”

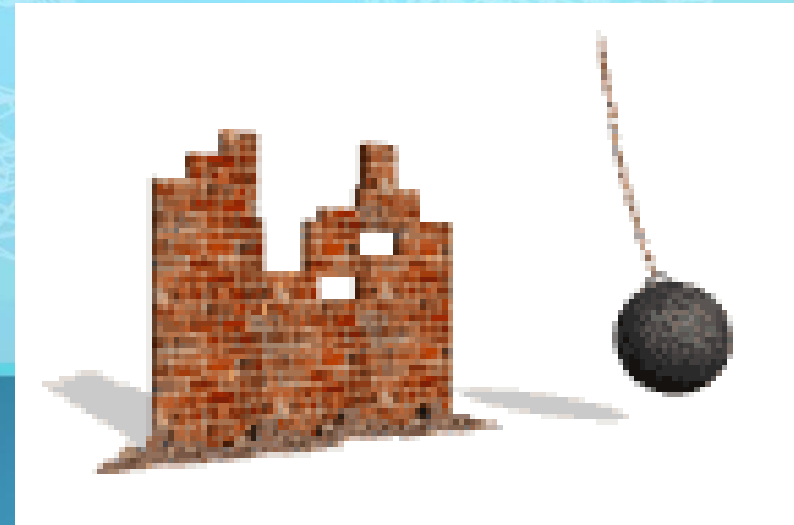
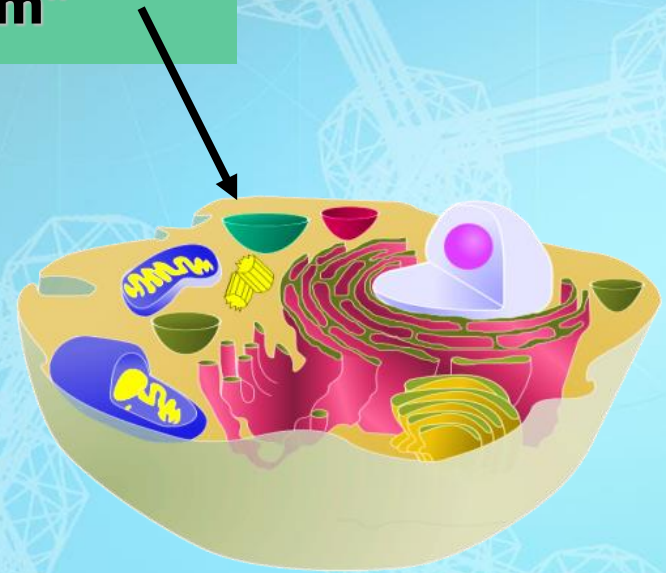
- Contain **digestive enzymes**.
- “Stomach of the cell”.
- **Digest** carbohydrates, proteins, and lipids into small molecules that can be used by the rest of the cell.



Lysosomes

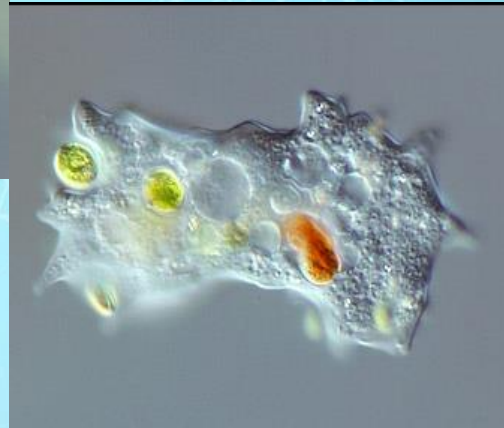
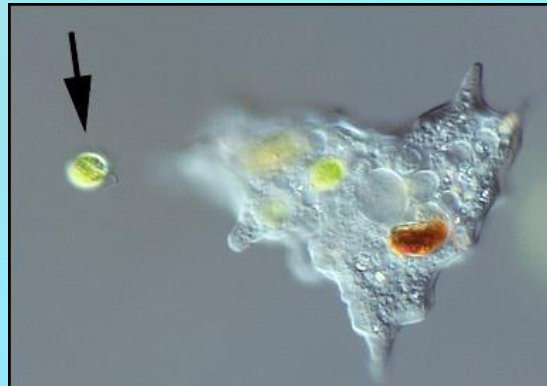
“Digestive System”

- **Recycle** cell's own organic materials, breaking them down into their building blocks, and returning them to the cytoplasm to be used again.
- **Destroy** old organelles that can no longer carry out their functions.
- Cell's **Demolition sites**.



Vacuoles

- Fluid filled sacks for storage.



- Storage of sugars, proteins, minerals, lipids, wastes, salts, water, and enzymes.

Mitochondria

“Powerhouse” of the cell

- Both plants and animal cells have mitochondria.
- Site of **CELLULAR RESPIRATION**
→ process of converting glucose into a usable form of energy for the cell (i.e. **ATP**).
- Generate **cellular energy (ATP)**.
- 100's or 1,000's may be found in a cell.



Mitochondria

“Powerhouse” of the cell

Mitochondria Inner Structure

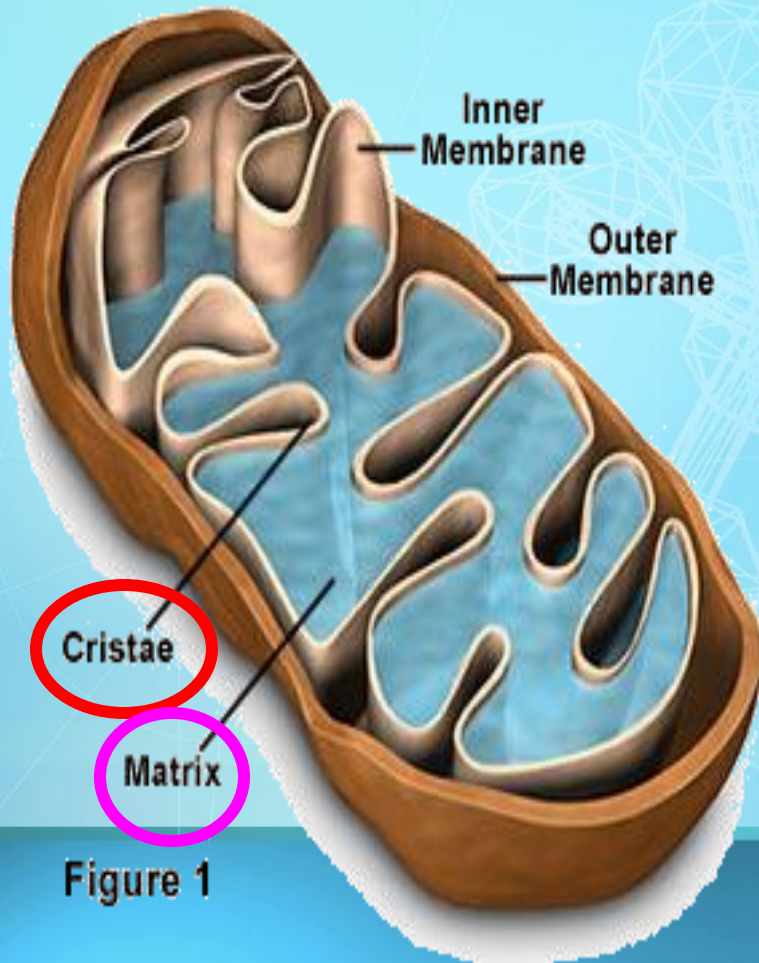
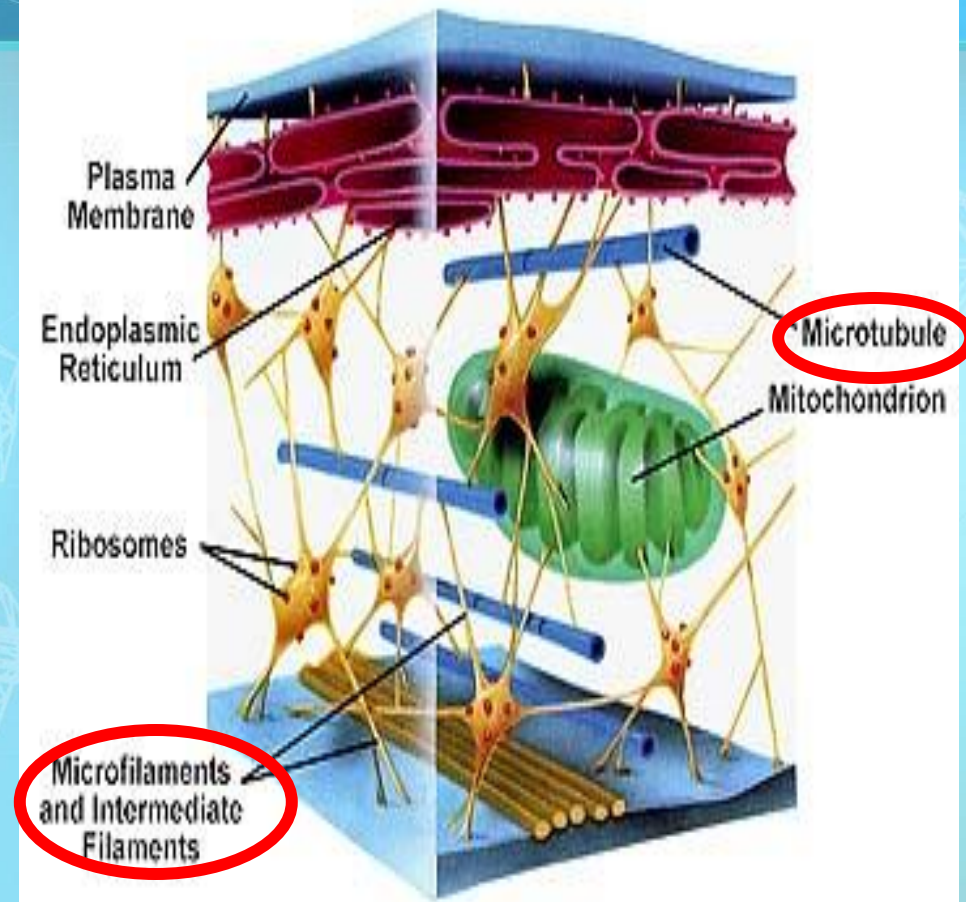


Figure 1

- Surrounded by a **DOUBLE membrane**.
- Smooth **Outer Membrane**.
- Folded **Inner Membrane** called **CRISTAE**.
 - Increases the surface area for **Cell Respiration**.
- Has its **own DNA**.
- Interior called **MATRIX**.

Cytoskeleton

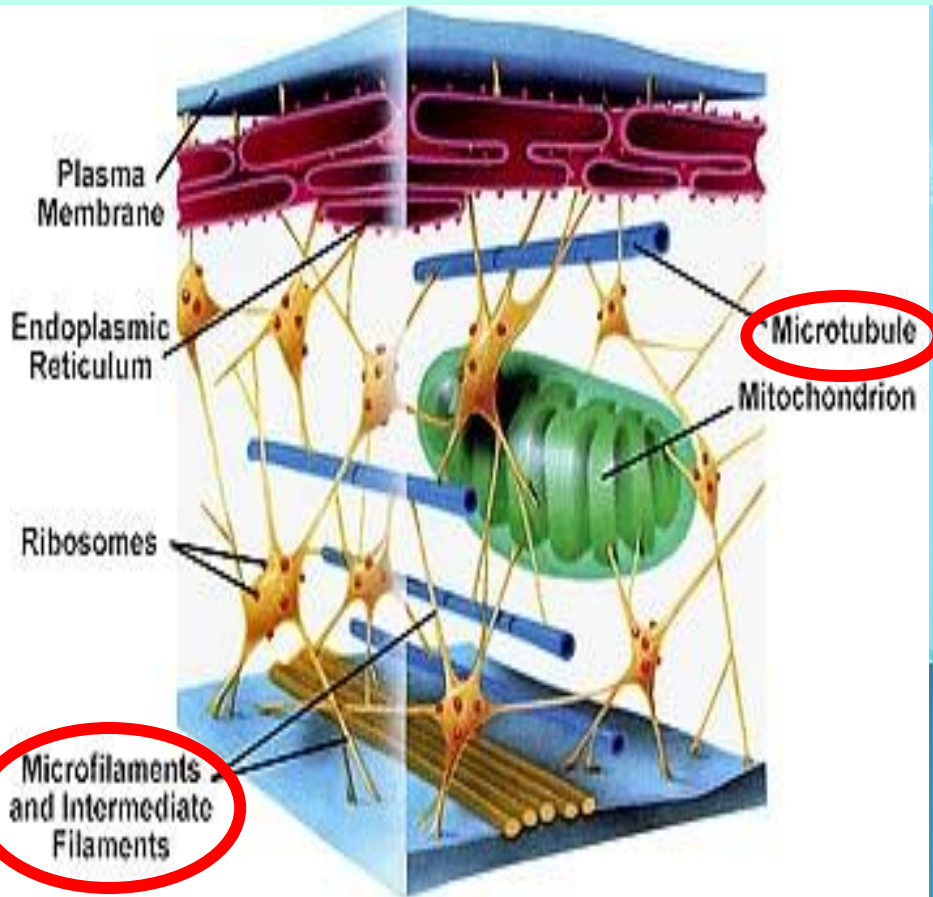
- The organelles of a cell do not flow freely in the cytoplasm.
- Cells must have an **internal framework** and **support system** to give **shape** and **organization** to it.
- Network of **protein tubes** and **fibers** that extend throughout the cytoplasm and help the cell to maintain its **shape**.
- Also involved in **movement**.



Two different types of elements:
Microfilaments (smallest)
Microtubules (largest)

Microfilaments

- Threadlike
- Made of **ACTIN** (protein)
- Structure, Support, Intracellular Transport
- Help bear Mechanical Stress



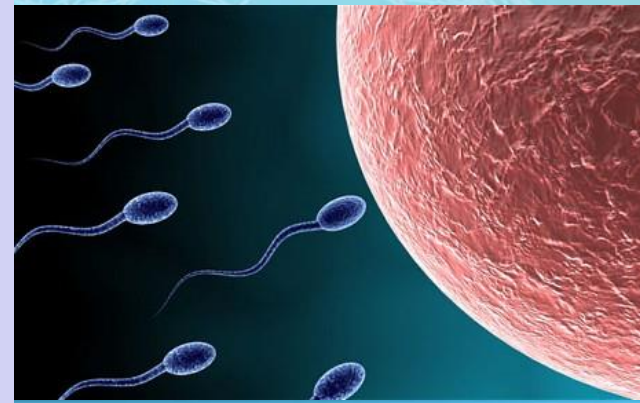
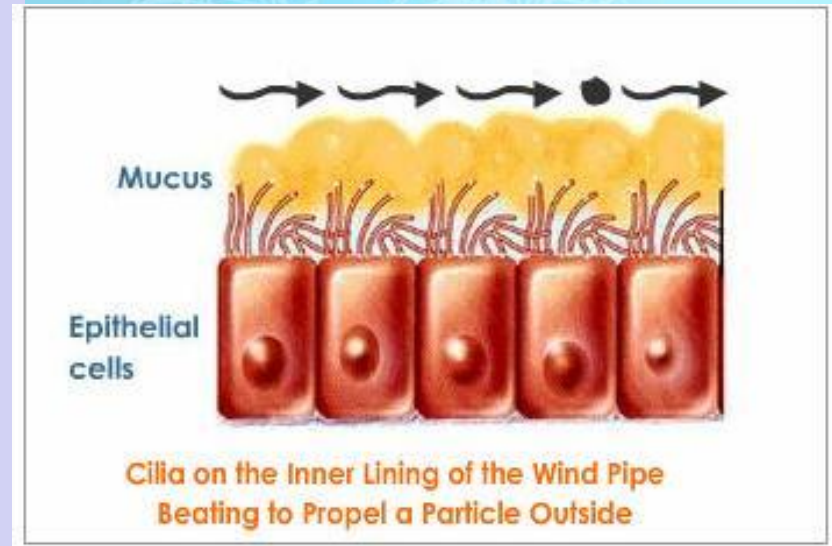
Cytoskeleton

Microtubules

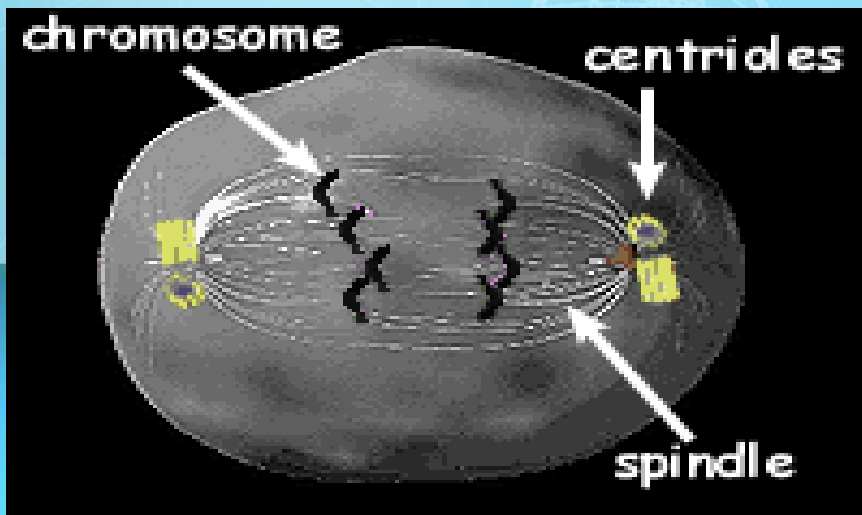
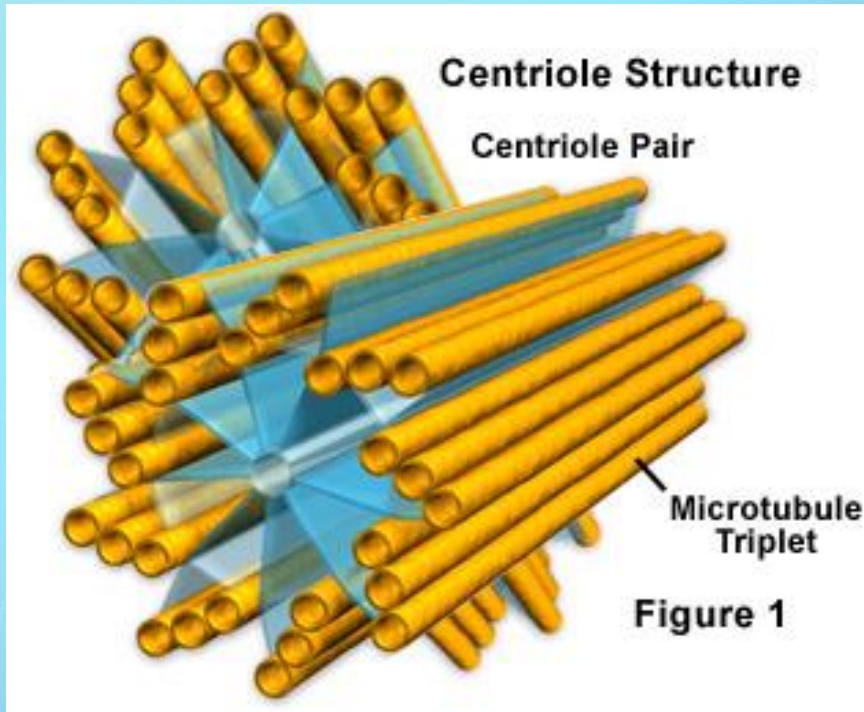
- Tube-like (hollow)
- Made of **TUBULIN** (protein)
- They can assemble and disassemble rapidly, causing **movement**.
- **Functions:**
 - Cell Shape
 - Separation of Chromosomes during **Cell Division**
 - Formation of **Flagella, Cilia,** and **Centrioles**

Cilia and Flagella

- Made of **microtubules** arranged in **9 + 2 arrangement**
- **Cilia** move materials across the cell surface.
 - Shorter and more numerous.
 - Ex. Respiratory system to move mucus.
- **Flagella** propel cells
 - Longer and fewer
 - E.g. Human Sperm

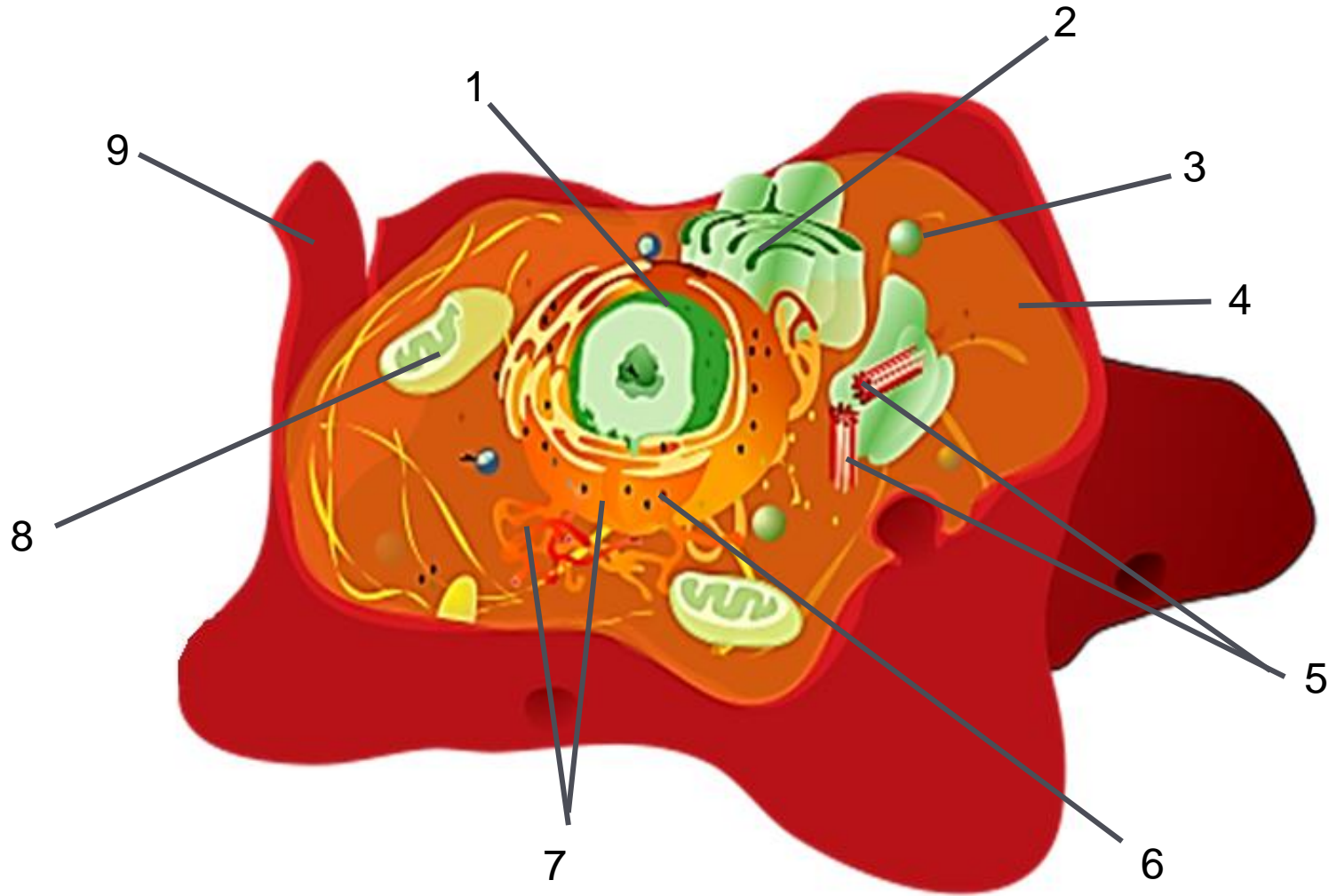


Centrioles

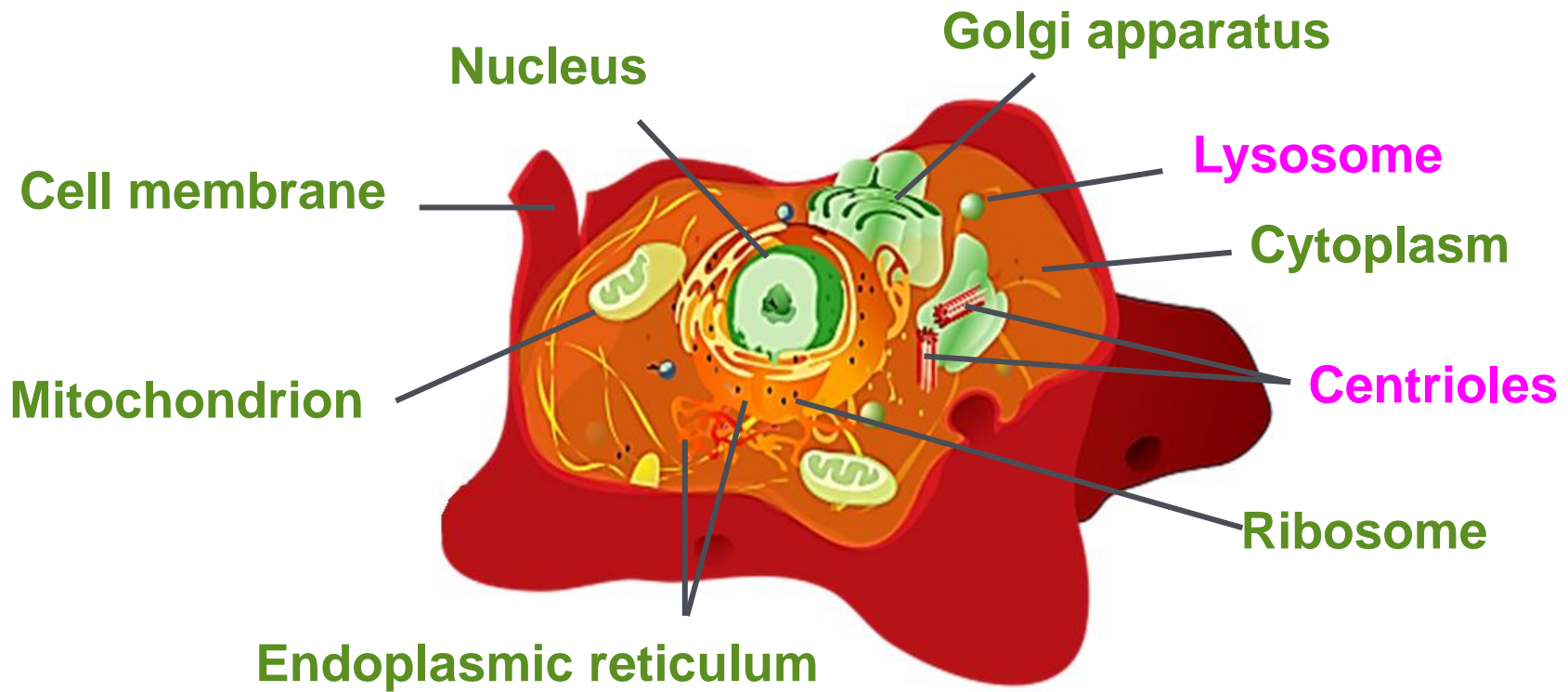


- Found **only in animal cells.**
- **Paired** structures near nucleus.
- Made of **9 triplets** of microtubules.
- Appear during **cell division** forming **mitotic spindle.**
- Help to **pull chromosome pairs apart** to opposite ends of the cell.

Label the Organelles of an Animal Cell

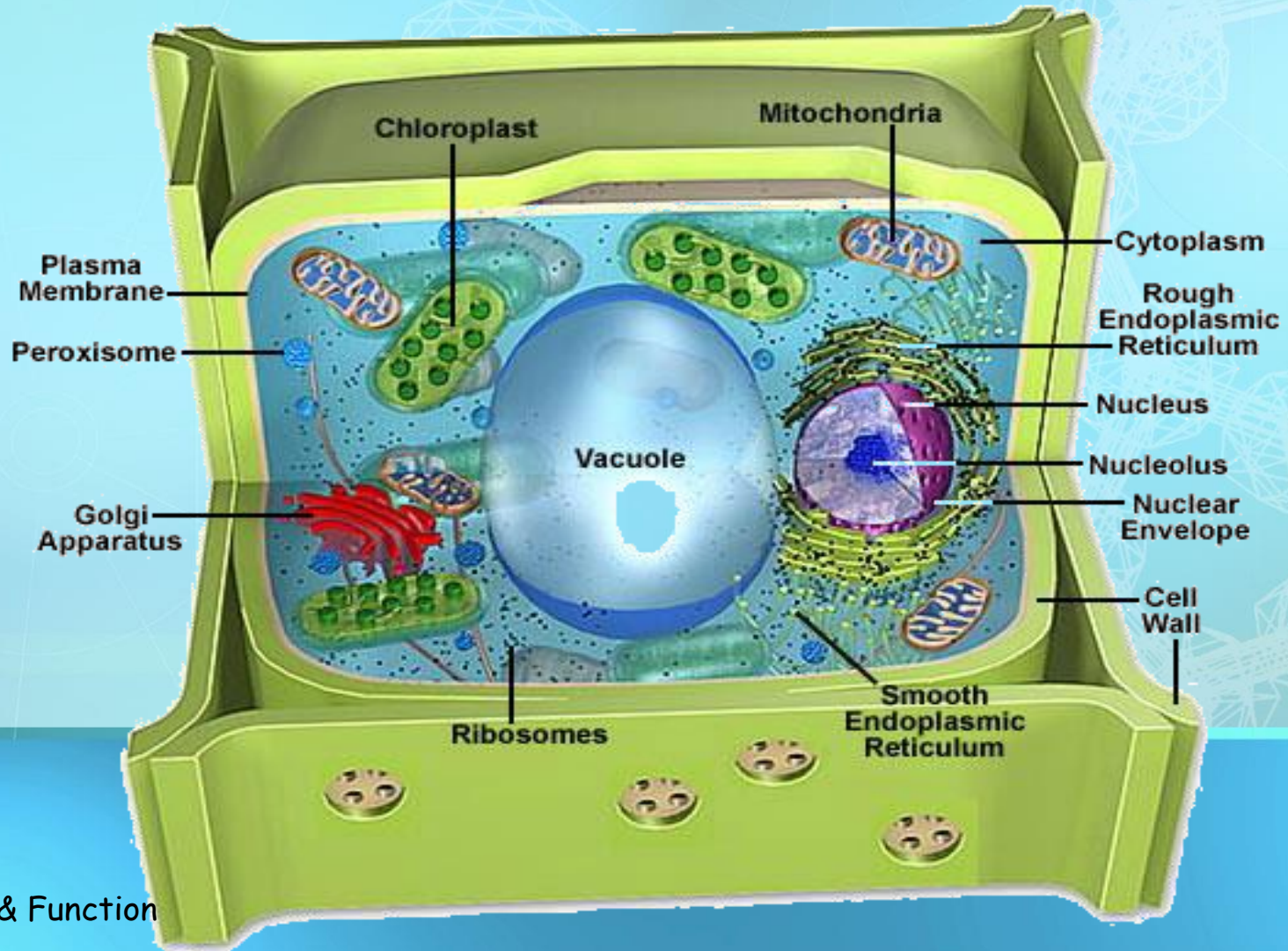


Label the Organelles of an Animal Cell



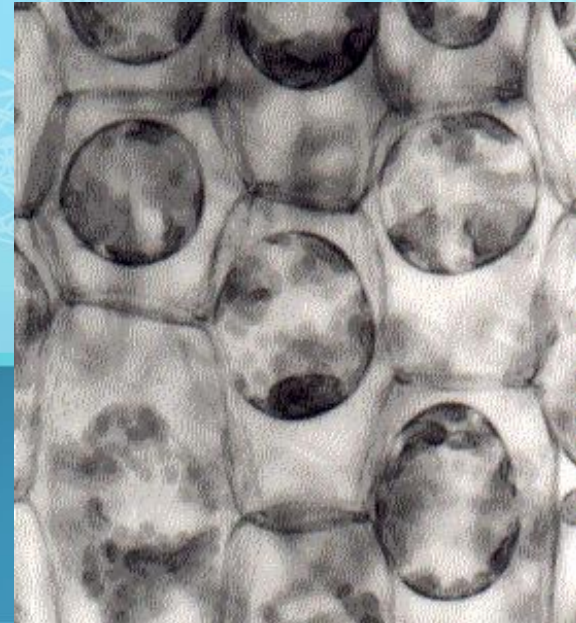
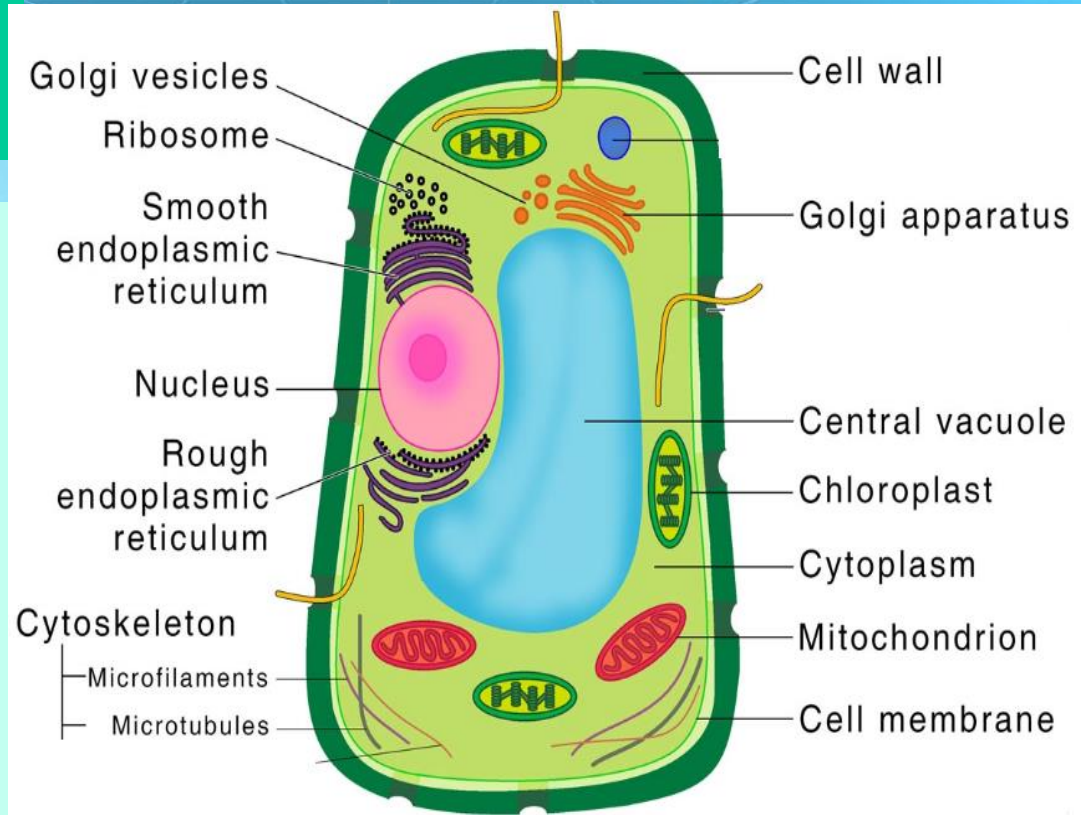
Plant Cell Organelles

A **PLANT CELL** has many of the same parts found inside an **animal cell**, but there are a few organelles that are only found in plant cells.

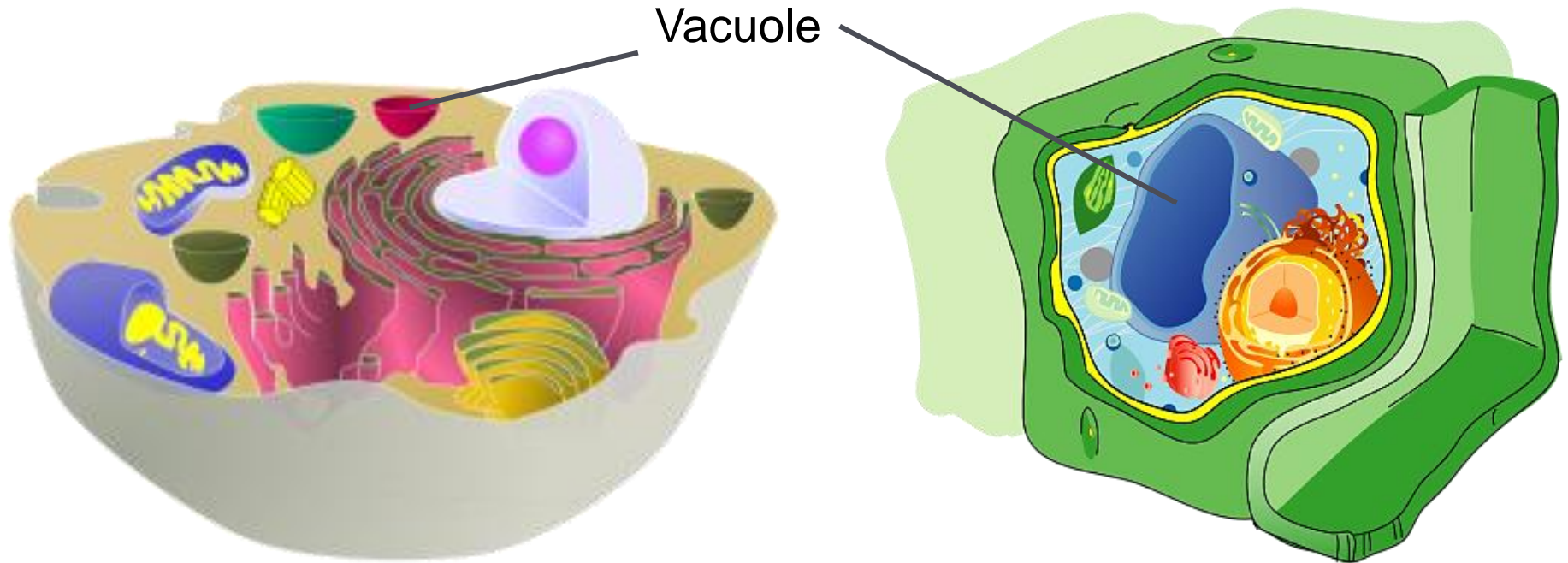


Central Vacuole

- Plant cells have a **Large, Central Vacuole**.
- When filled with water, it creates **turgor pressure** to give **strength and support** to the cell.
- This allows the plant to support heavy structures such as flowers and leaves.



Vacuoles in Animals versus Plants

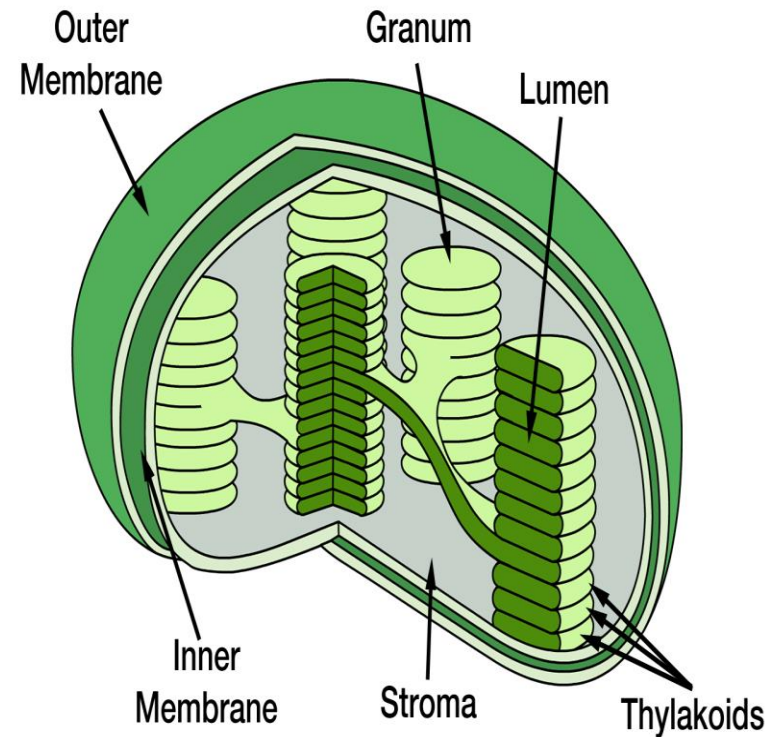


Vacuoles serves as a **storage area** for organic molecules.

- Found only in **producers** (organisms that perform **photosynthesis**).
- Absorb energy from sun and convert it to the chemical energy of a molecule of **glucose**.
- Similar to a solar power plant.
- Contains **enzymes and pigments** for **Photosynthesis**.
- Contains its **own DNA**.
- **Never** in animal or bacterial cells.

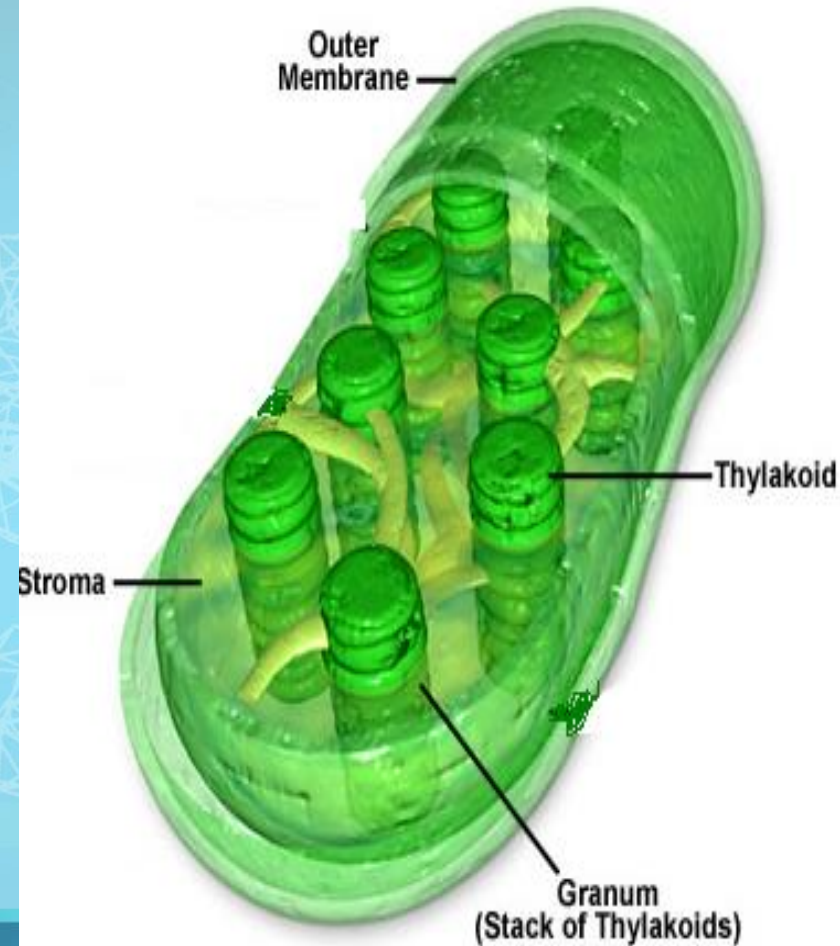
Chloroplasts

Chloroplast



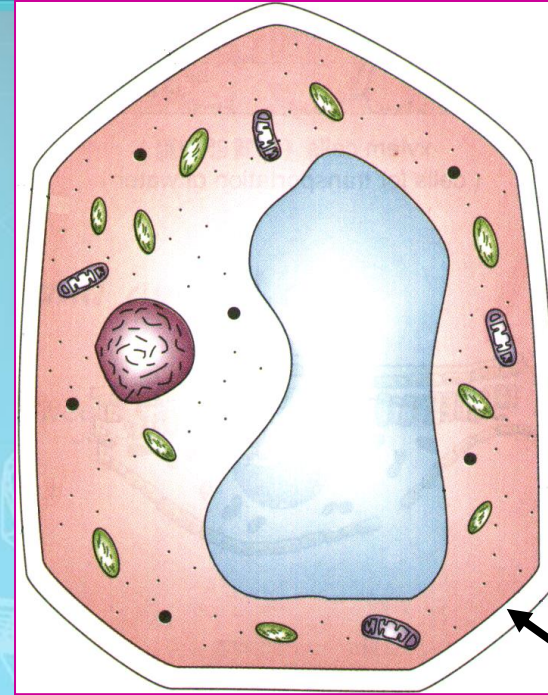
Chloroplasts

- Surrounded by **DOUBLE** membrane.
- Smooth **Outer** membrane.
- **Inner membrane** modified into sacs called **Thylakoids**.
 - Thylakoids contain the green pigment **Chlorophyll** which is required for photosynthesis.
- **Grana**: Stacks of Thylakoids.
- **Stroma**: gel like material surrounding thylakoids.

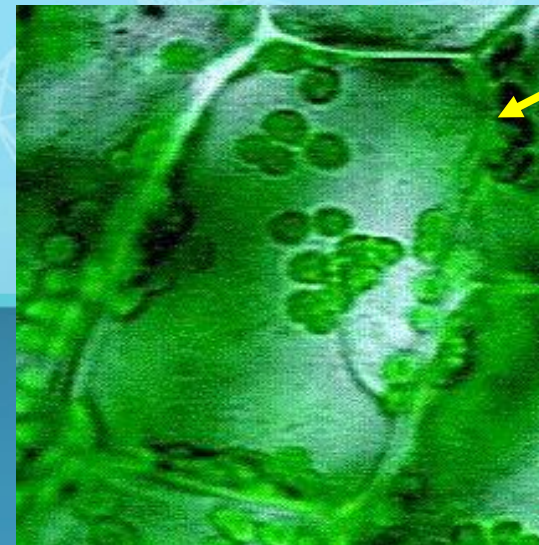


Cell Wall

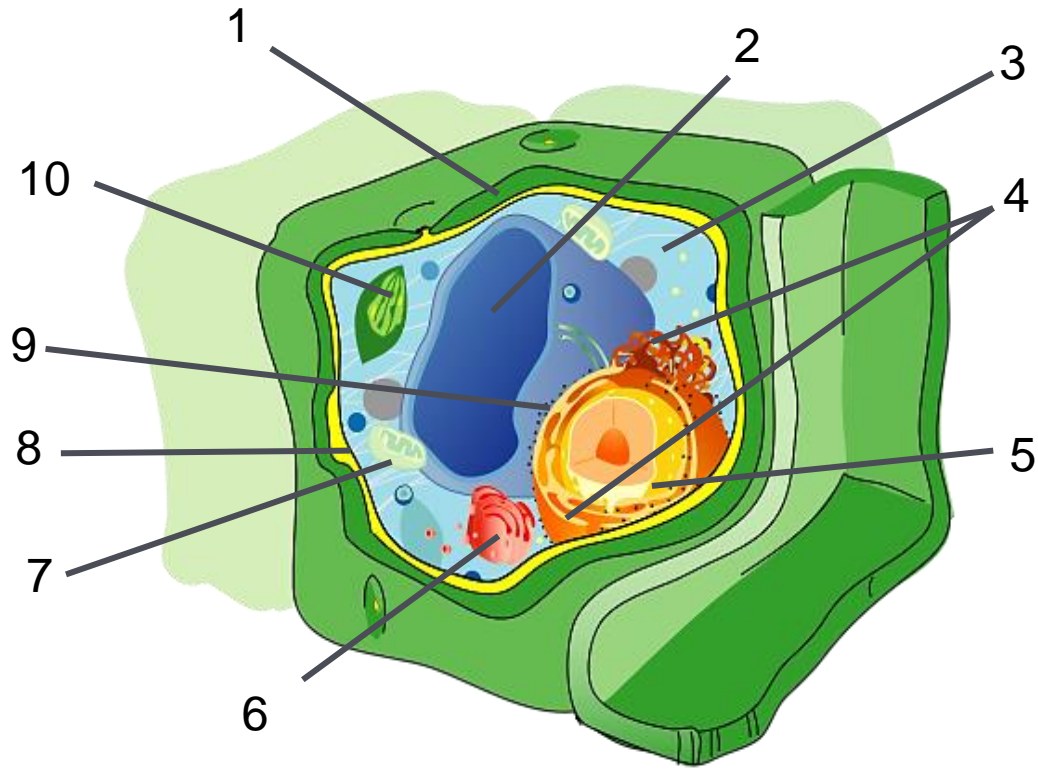
- Supports and protects cells of plants and fungi.
- Found outside of the cell membrane.
- In plants, it is composed mostly of cellulose, a tough carbohydrate fiber.



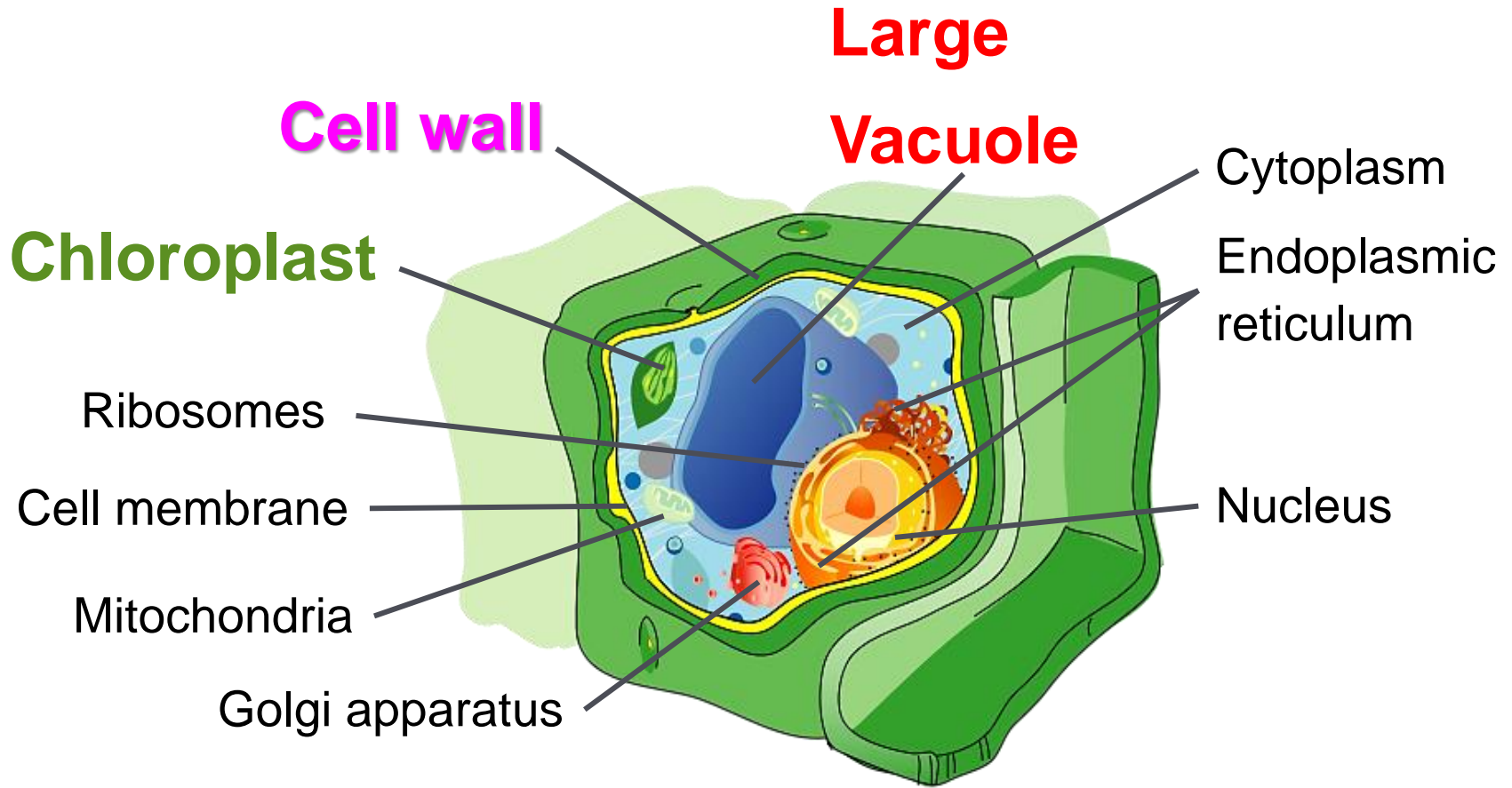
Cell wall



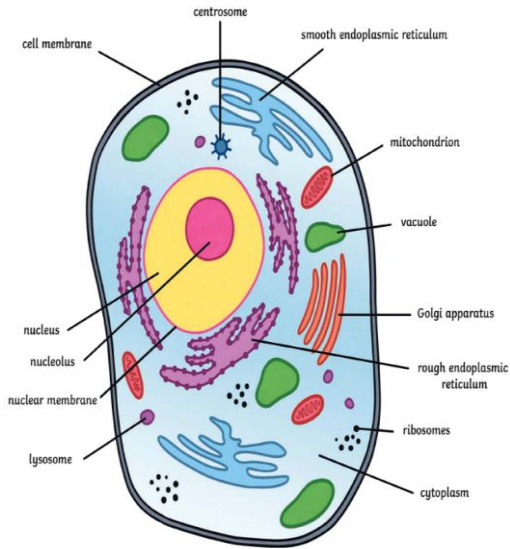
Label the Organelles. Distinguish those of a Plant Cell.



Label the Organelles of a Plant Cell



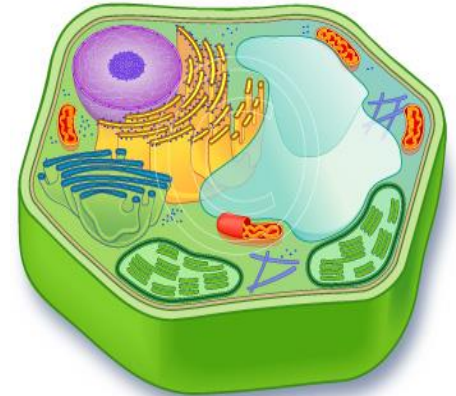
Differences Between Plant and Animal Cells



Animal Cells

Structures **ONLY** found in animal cells:

- ◆ Lysosomes
- ◆ Centrioles
- ◆ Flagella



Plant Cells

Structures **ONLY** found in plant cells:

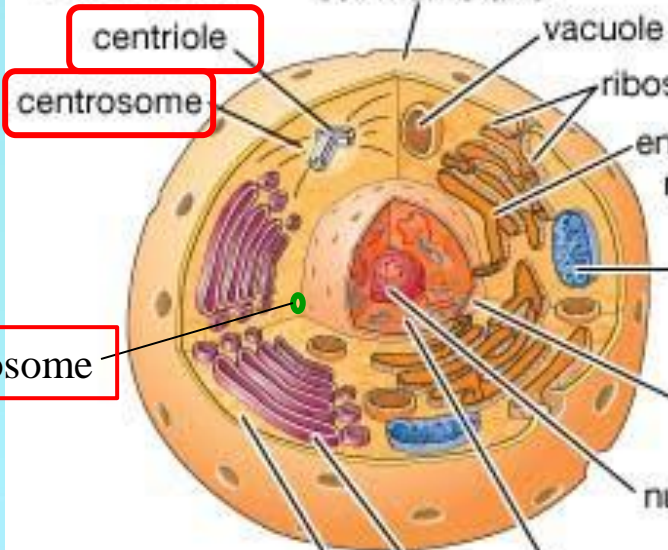
- ◆ Chloroplasts
- ◆ Central Vacuole
- ◆ Cell Wall



Some typical cells

plant and animal cells are **eukaryotic** cells

animal cell



centriole

centrosome

lysosome

cell membrane

vacuole

ribosomes

endoplasmic reticulum

mitochondrion

nucleus

nucleolus

chromosomes

Golgi complex

cytoplasm

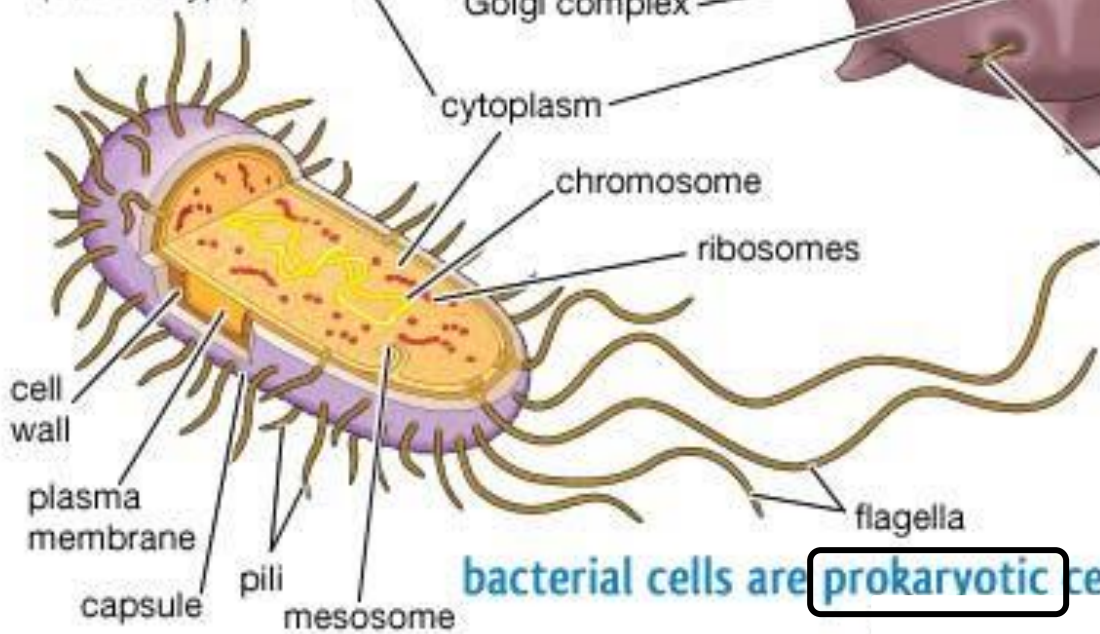
chromosome

ribosomes

mesosome

bacteria cell

(bacillus type)



cell wall

plasma membrane

capsule

pili

mesosome

cell wall

plasma membrane

capsule

pili

mesosome

chromosome

ribosomes

mesosome

cytoplasm

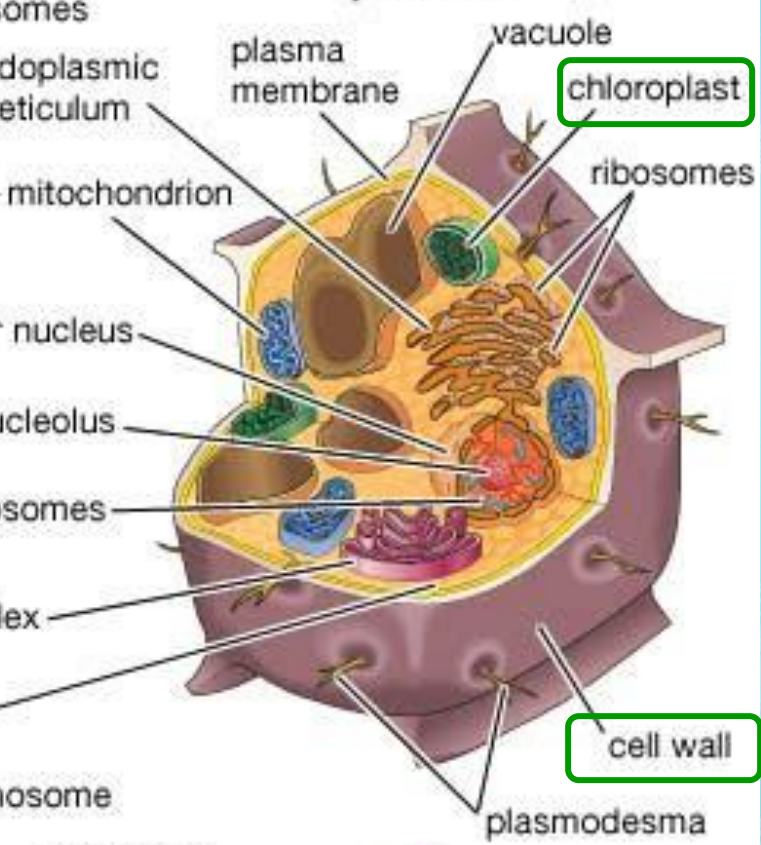
chromosome

ribosomes

mesosome

flagella

plant cell



vacuole

chloroplast

ribosomes

plasma membrane

vacuole

chloroplast

ribosomes

nucleus

nucleolus

chromosomes

Golgi complex

cytoplasm

chromosome

ribosomes

mesosome

flagella

cell wall

plasmodesma

bacterial cells are **prokaryotic** cells

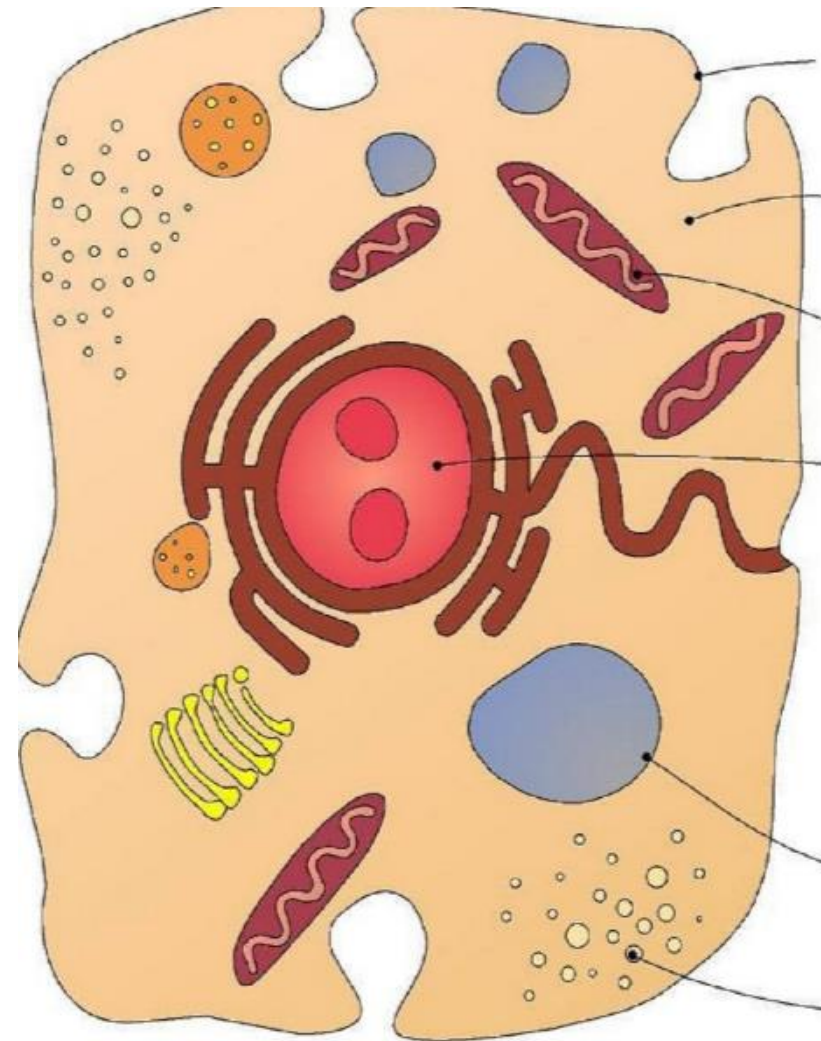
Name the Cellular Components based on their Functions

Component	Type of Cell	Function
	All	Boundary; Gatekeeper; Protection; Selectively Permeable
	Prokaryotes, Plants, Fungi	Protection; Support
	All	Site of most chemical reactions; Contains molecules and ions
	Eukaryotes	Houses Genetic Material; Controls ALL cell activities
	Eukaryotes	Manufactures Ribosomes
	All	Cell Structure; Internal Transport
	Mostly Animal	Cell Division
	All	Locomotion of cell
	Eukaryotes	"Powerhouse of Cell"; Energy Production; Cell Respiration
	All	Protein Synthesis; Attached to RER or Free-floating
	Eukaryotes	Internal Transport; Smooth or Rough
	Eukaryotes	Storage and Packaging; "Stack of Pancakes"
	Animal	Intracellular Digestion; "Stomachs"
	Plant, Fungi, Protists, Animal	Storage (large in plants; small in animals)
	Plant	Photosynthesis

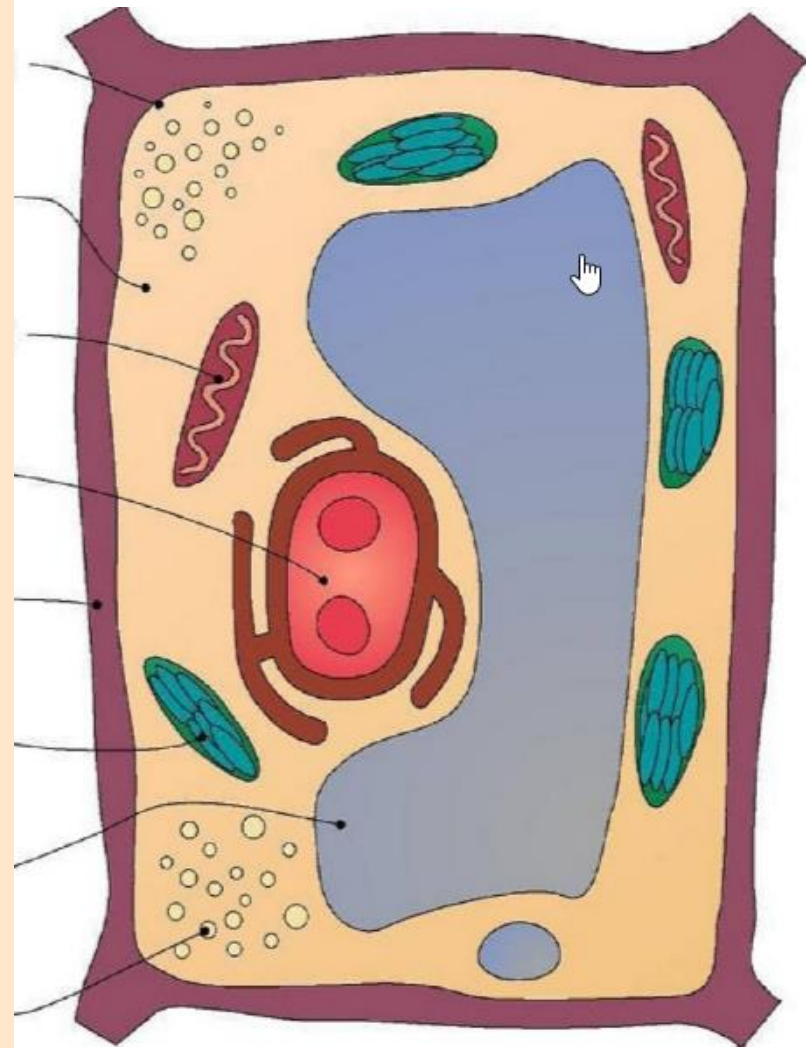
Cellular Components and their Functions

Component	Type of Cell	Function
Plasma Membrane	All	Boundary; Gatekeeper; Protection; Selectively Permeable; "Cell Membrane"
Cell Wall	Prokaryotes, Plants, Fungi	Protection; Support
Cytoplasm	All	Site of most chemical reactions; Contains molecules and ions
Nucleus	Eukaryotes	Houses Genetic Material; Controls ALL cell activities
Nucleolus	Eukaryotes	Manufactures Ribosomes
Cytoskeleton	All	Cell Structure; Internal Transport
Centrioles	Mostly Animal	Cell Division
Cilia and Flagella	All	Locomotion of cell
Mitochondria	Eukaryotes	"Powerhouse of Cell"; Energy Production; Cell Respiration
Ribosomes	All	Protein Synthesis; Attached to RER or Free-floating
Endoplasmic Reticulum	Eukaryotes	Internal Transport; Smooth or Rough
Golgi Apparatus	Eukaryotes	Storage and Packaging; "Stack of Pancakes"
Lysosomes	Animal	Intracellular Digestion; "Stomachs"
Vacuoles	Plant, Fungi, Protists, Animal	Storage (large in plants; small in animals)
Chloroplasts	Plant	Photosynthesis

Compare Plant and Animal Cells

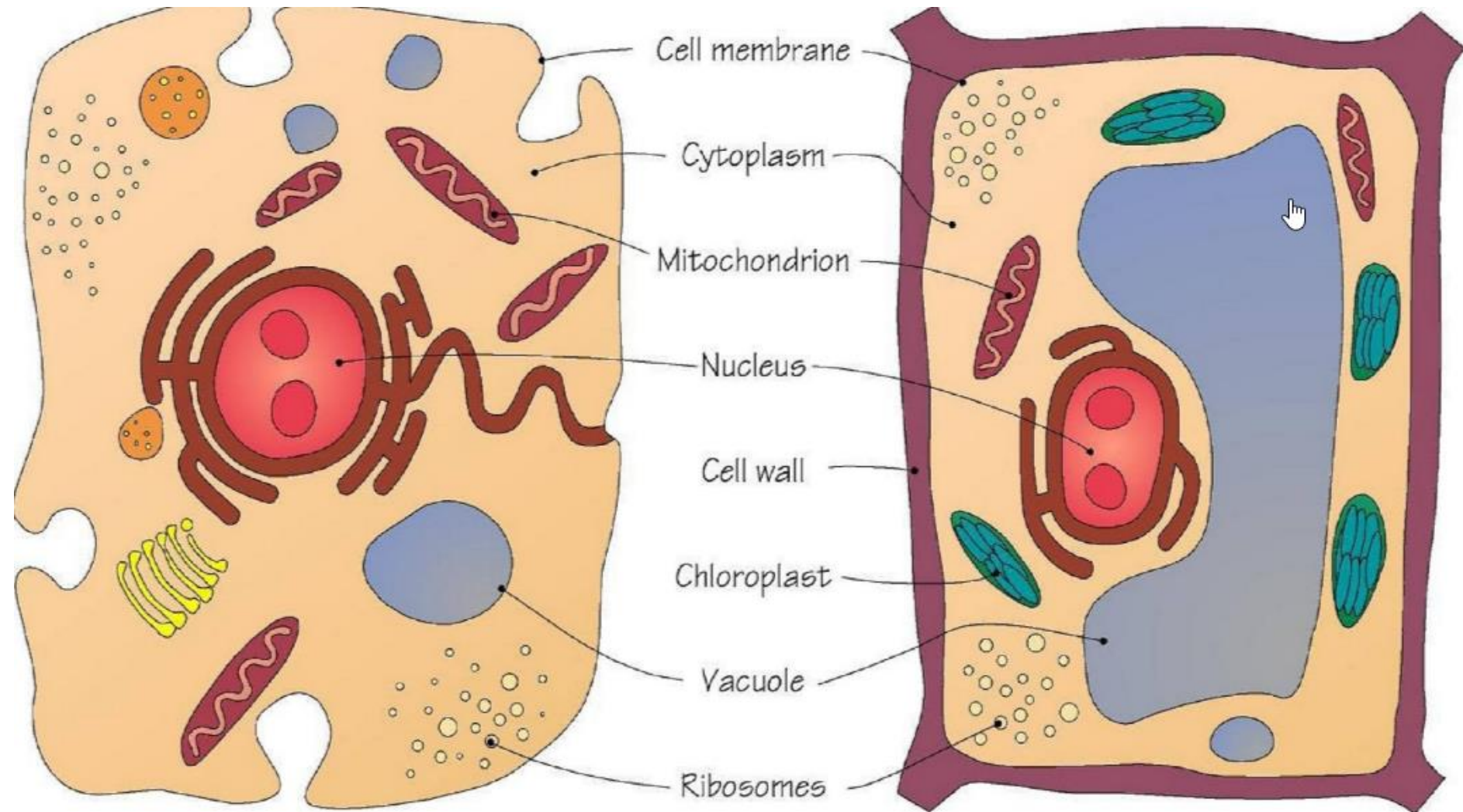


Label



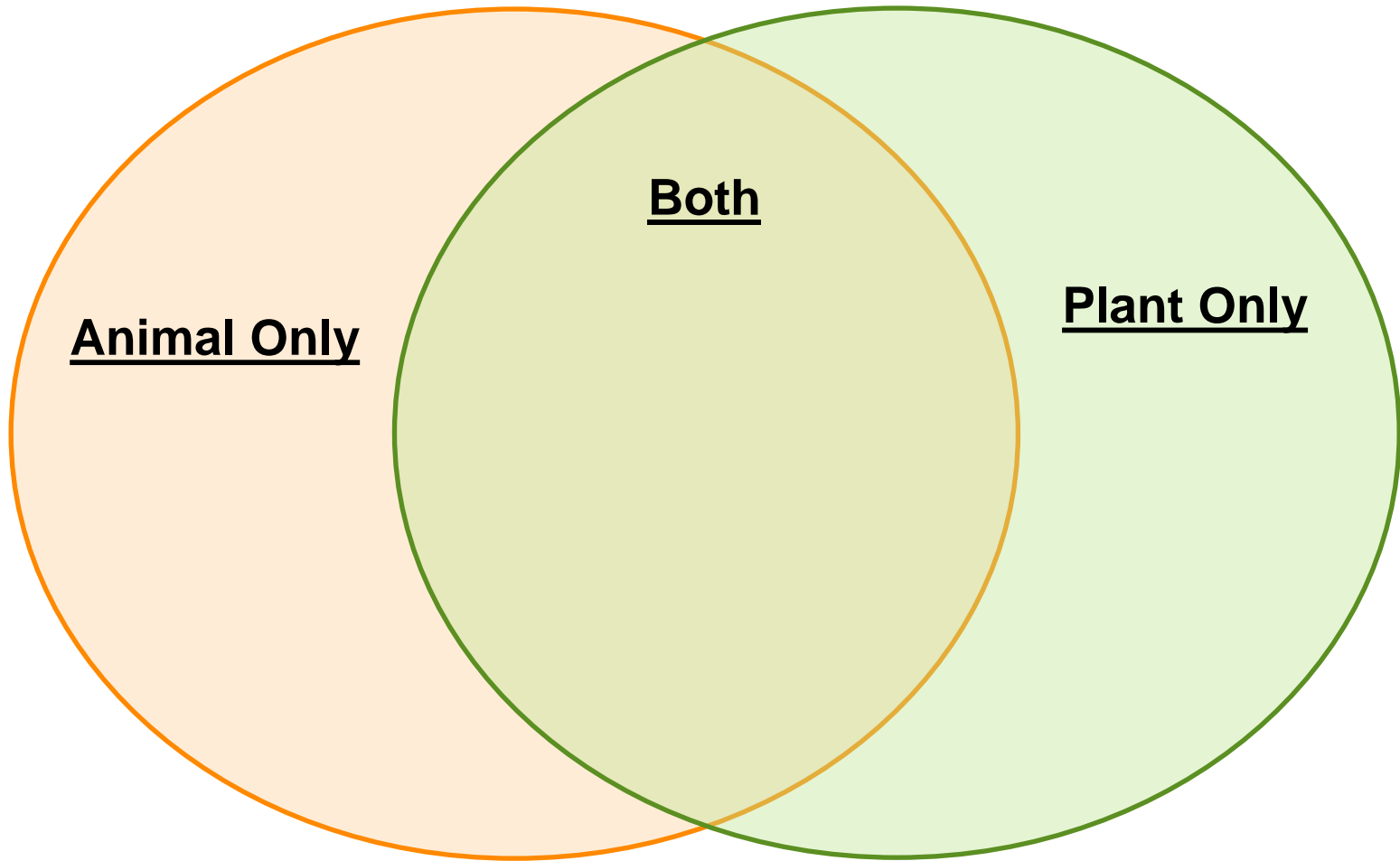
Compare Plant and Animal Cells

TRY IT





Complete the Venn Diagram of Plant & Animal Cells





Complete the Venn Diagram of Plant & Animal Cells

