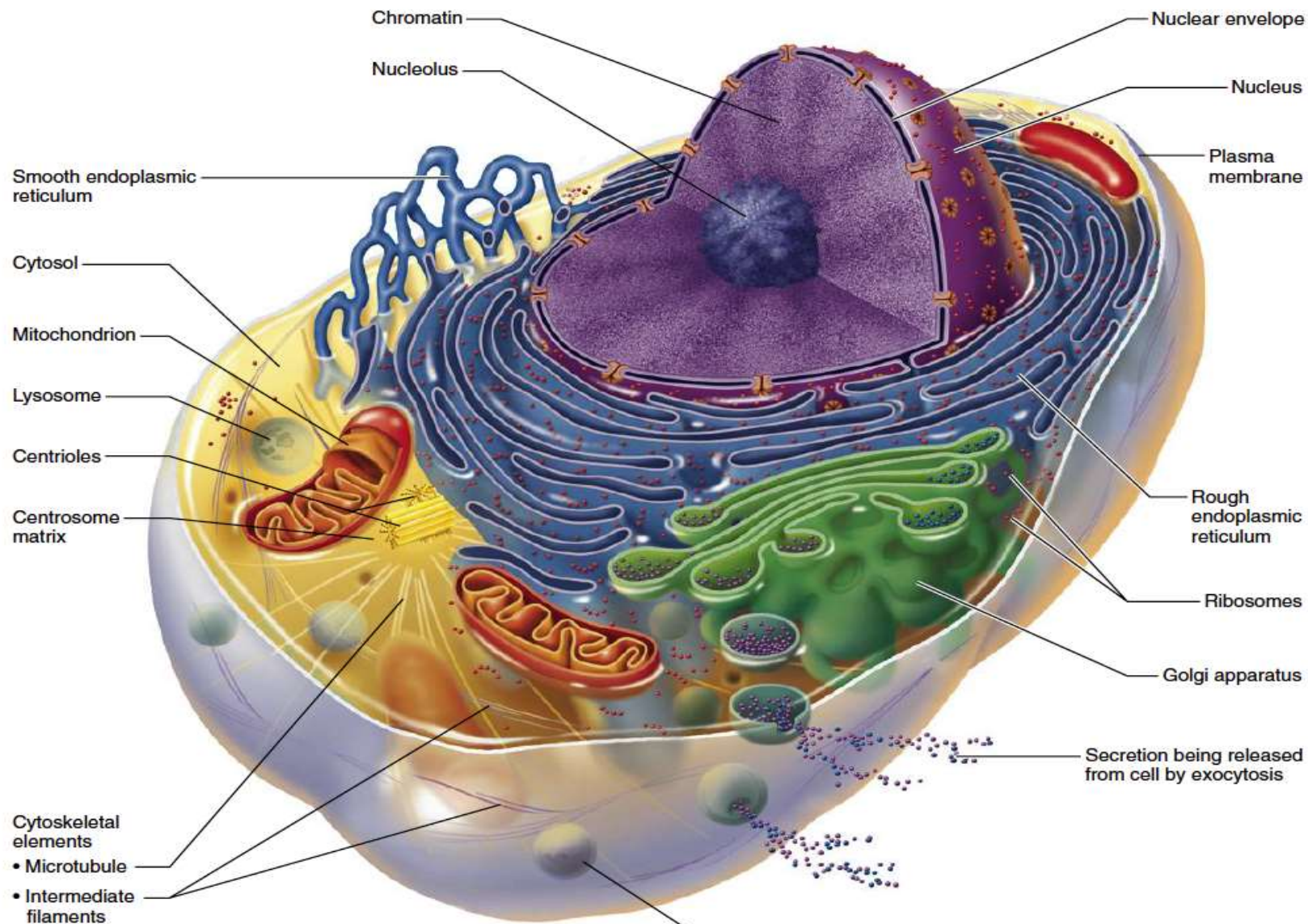


CELL

Dr Syed Gohar Taqi Kazmi

***Department of Chemistry
University of Sargodha***

CELL

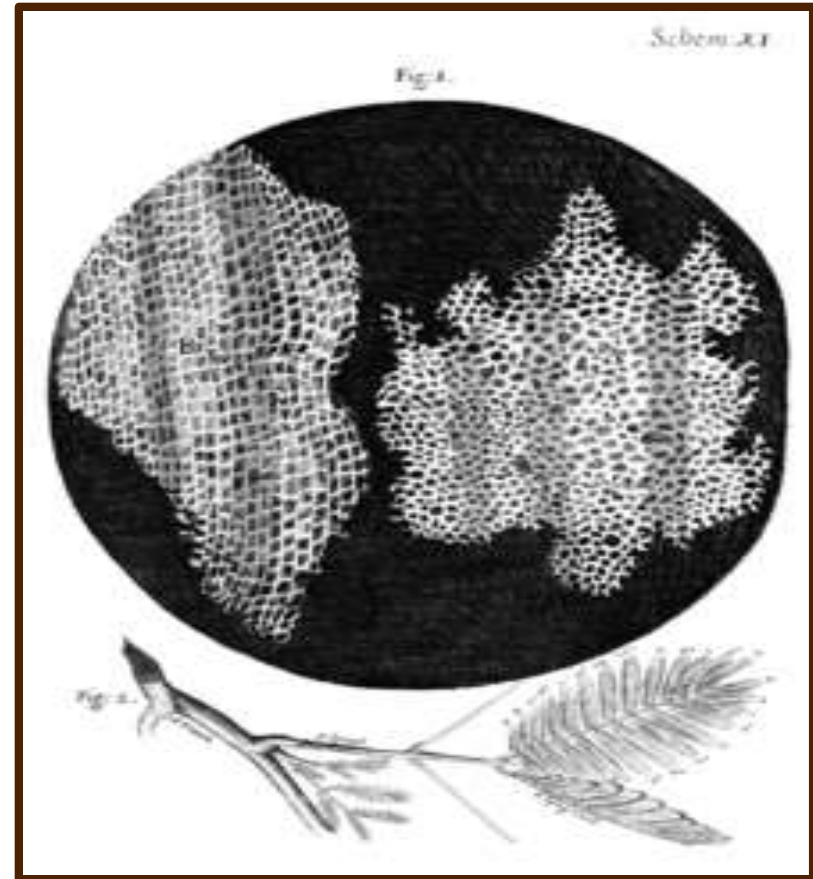


Discovery of Cell :

Cell was first discovered by **Robert Hooke in 1665**, which can be found to be described in his book Micrographia

- Hooke discovered a multitude of tiny pores in the cork that he named "cells".
- Latin word **Cella** , meaning 'a small room' also **Cellulae** , which meant the six sided cell of a **honeycomb** .

- .



But Unfortunately

- *Hooke did not know their real structure or function.*
- *What Hooke had thought were cells, were actually empty cell walls of plant tissues .*
- *He didn't know about Cell organelles or structure .*

Anton Van Leeuwenhoek :

*He made use of a microscope containing improved lenses that could magnify objects almost **300-fold**. Under these microscopes, Leeuwenhoek found motile objects.*

Leeuwenhoek named these “animalcules” which included protozoa and other unicellular organisms, like bacteria .

Cell Theory

- Credit for developing cell theory is usually given to two scientists:
- **Theodor Schwann** **Matthias Jacob Schleiden**



Matthias Jacob Schleiden

In **1838**, He suggested that :

“Structural part of a plant was made up of cells or the result of the cells were made by the Crystallization process either .”

Theodor Schwann

In **1839** , he suggested that :

“Animals are composed of cells or the product of cells in their structures .”

Cell Theory Postulates :

- *All living organism are composed of one or more cells.*
- *The cell is the most basic unit of life.*
- *All cells arise only from pre-existing cells.*

Modern Interpretations :

- All known **living things** are made up of one or more cells.
- All living cells arise from **pre-existing** cells by division.
- The cell is the **fundamental** unit in living organisms.
- The activity of an organism depends on the total activity of independent cells.
- Energy flow occurs within cells.
- Cells contain **DNA** and **RNA** .
- All cells have same chemical composition in similar species.

The Modern Version Of Cell Theory

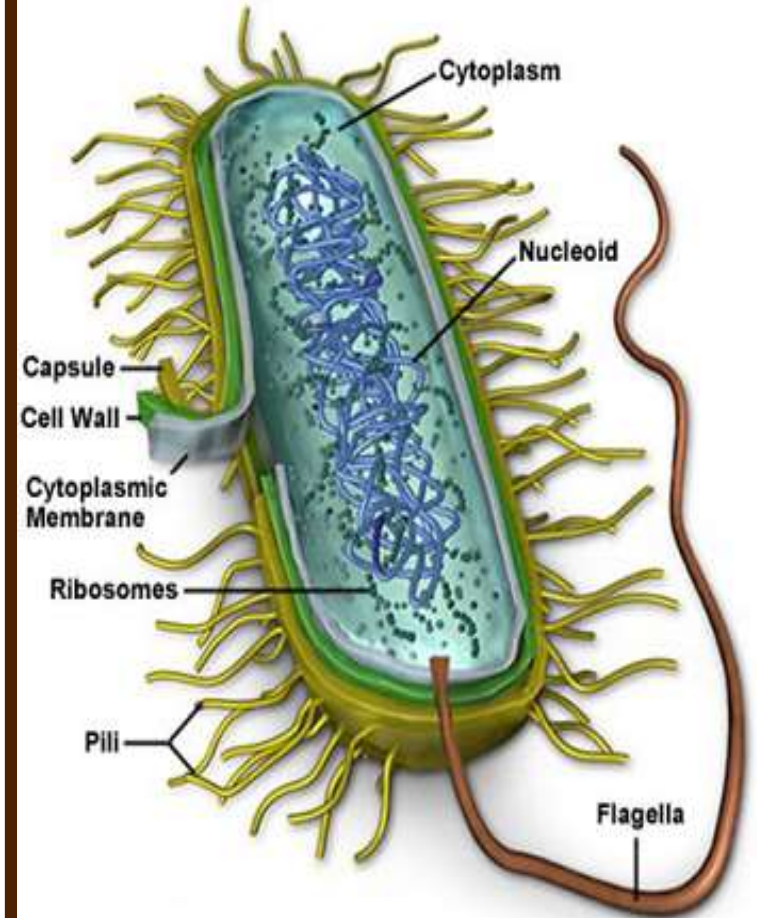
The modern version of the cell theory includes the ideas that:

- 1) Energy flow occurs within cells.*
- 2) Heredity information **DNA** is passed on from cell to cell.*
- 3) All cells have the same basic chemical composition.*

Types Of Cell :

Prokaryotes :

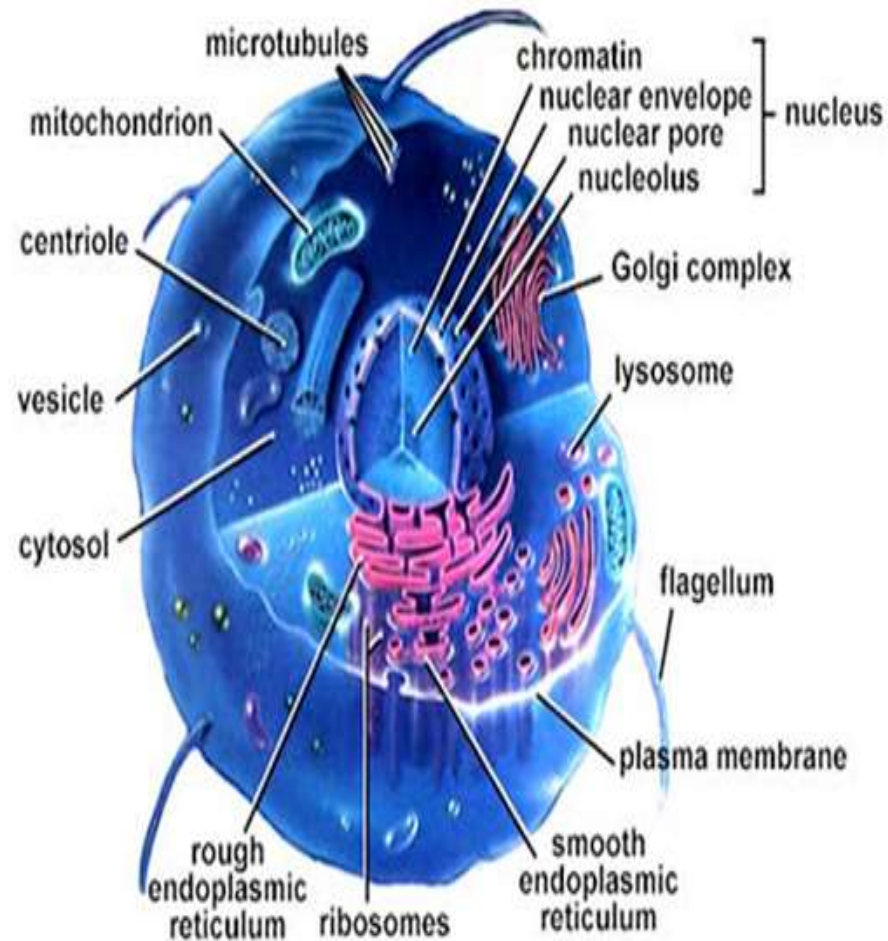
1. relatively small cells surrounded by the plasma membrane .
2. lack a nucleus although they do have circular or linear **DNA** and other membrane bound organelles ,they do contain ribosome
3. contains the chromosomal region- Centrosome .
4. Bacteria and Archae are the two domains of prokaryote



prokaryotic cell
(bacteria)

Eukaryotes :

- have distinct nuclei bound by a nuclear membrane or envelope.
- contain membrane-bound organelles, such as (mitochondria, chloroplasts, lysosomes, rough and smooth endoplasmic reticulum, vacuoles).
- They possess organized chromosomes which store genetic material.

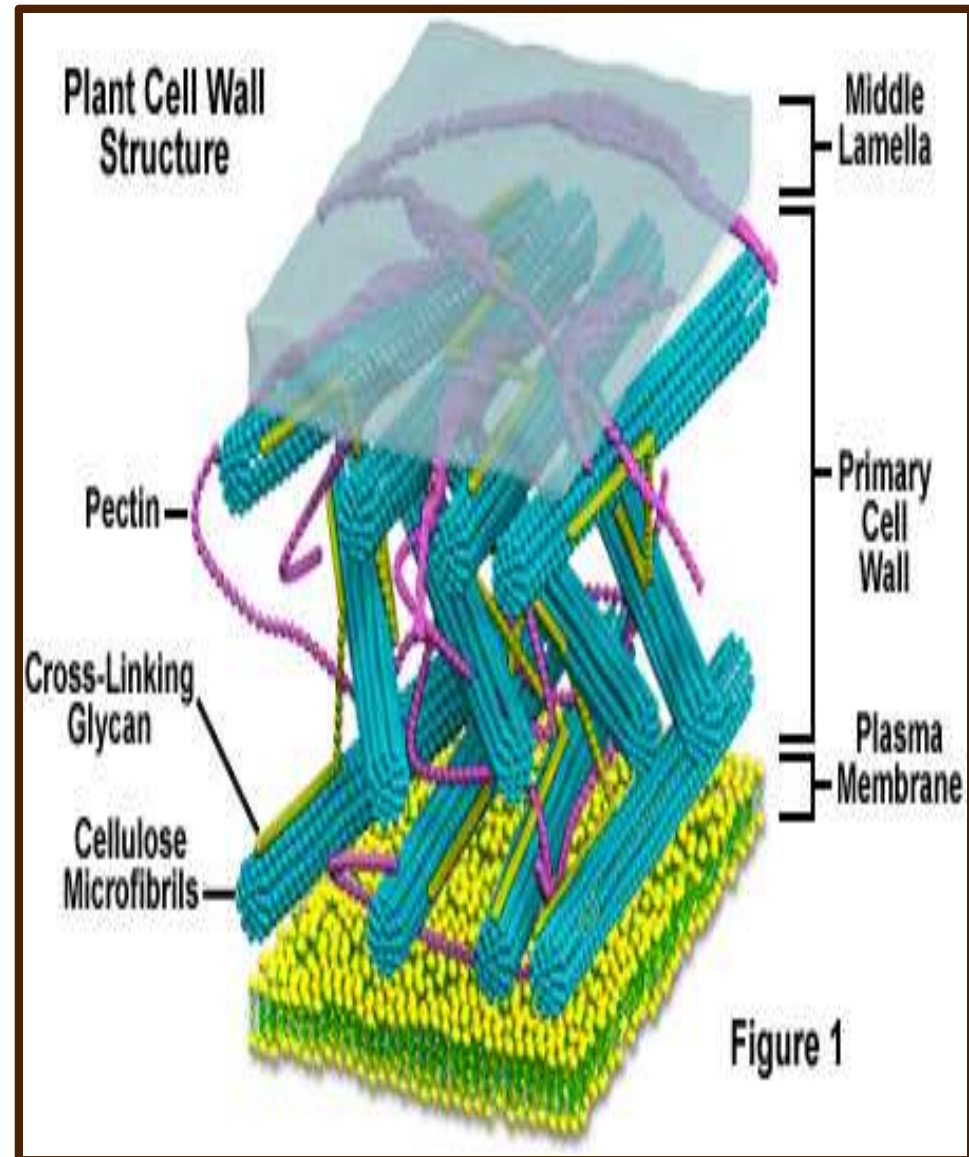


eukaryotic cell
(protists, fungi, animals, plants)

Cell Organelles :

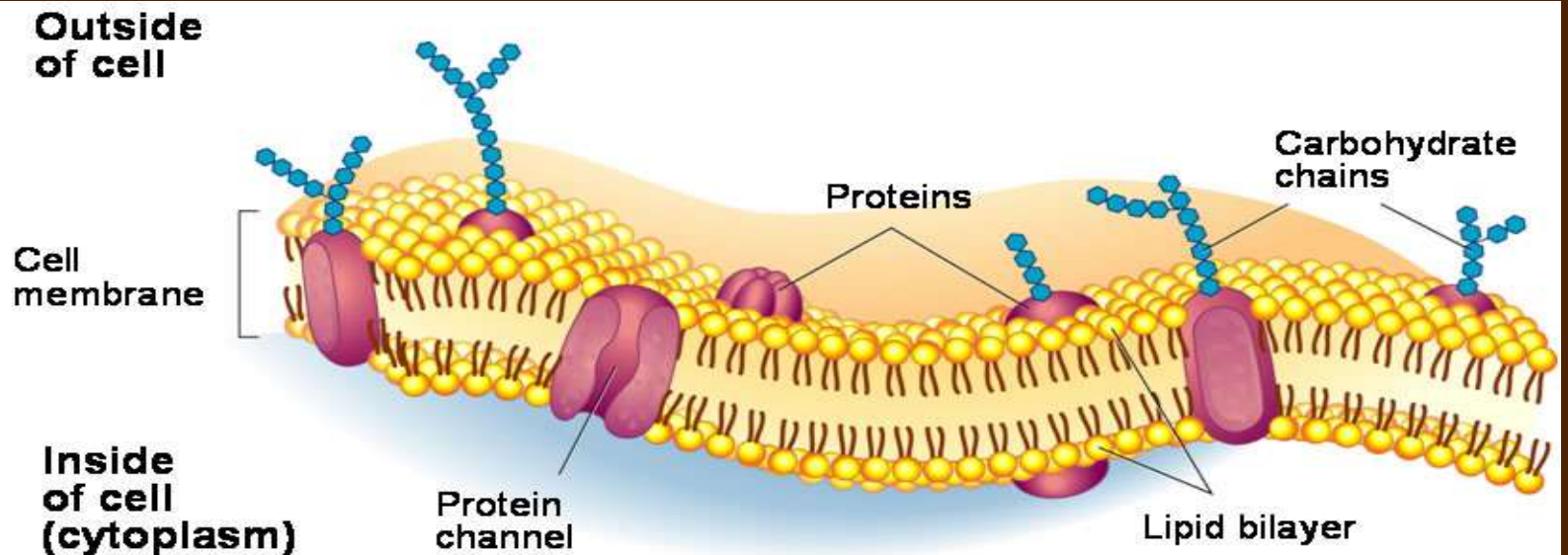
• Cell Wall

1. Present in plant cell not in animal .
2. It is outer layer of the cell, it is strong, stiff and rigid .
3. It is made of cellulose.
4. It helps in support, protection and allow H_2O , O_2 , CO_2 to pass into and out of the cell .

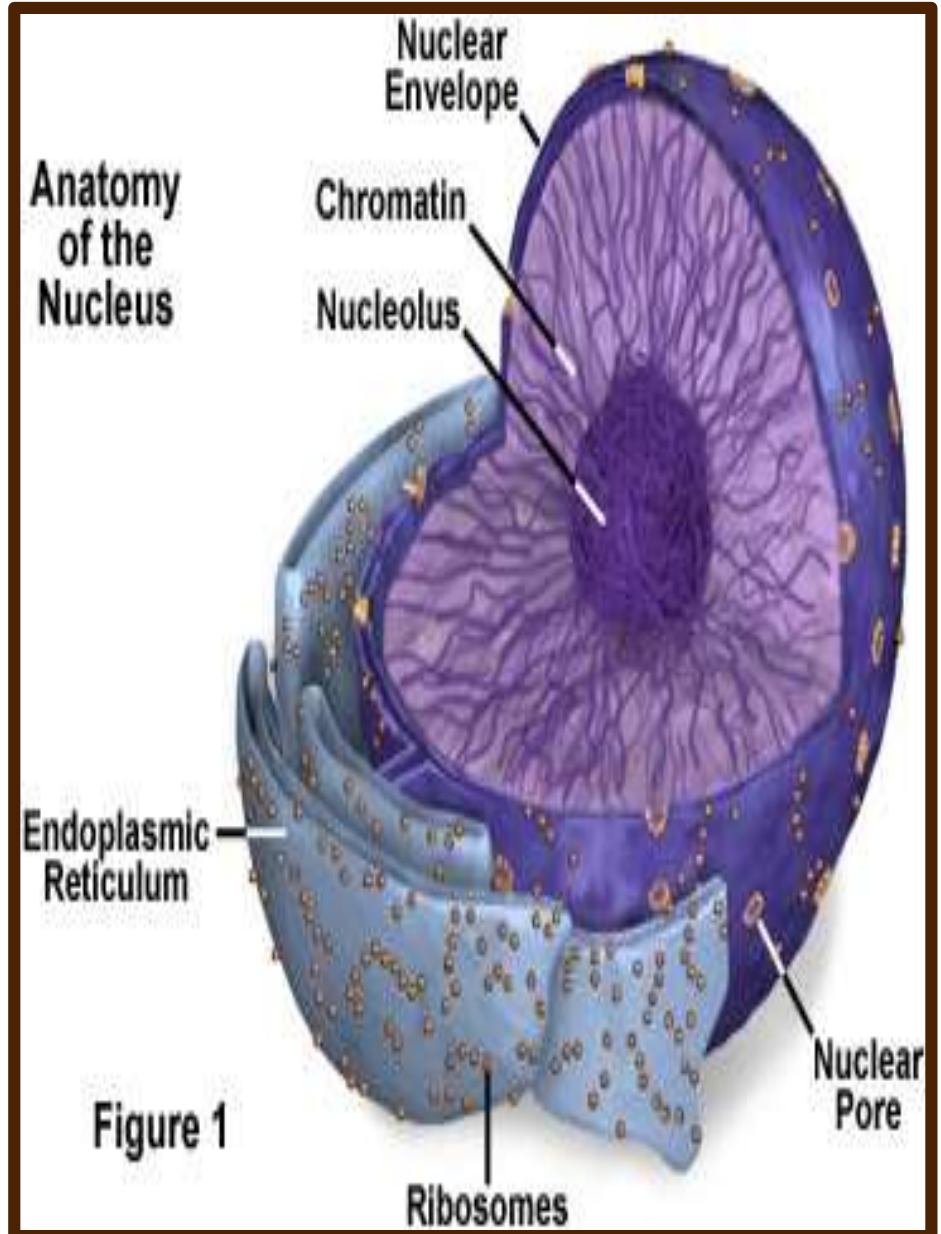


Cell Membrane:

1. Present in both plant & animal cell.
2. In Plant - inside cell wall.
In Animal - outer layer cholesterol.
3. It control movement of material **in** and **out** of the cell.
4. It is selectively permeable. It helps in support, protection
5. It is a **barrier** between cell and its environment.
6. It maintains **Homeostasis**.

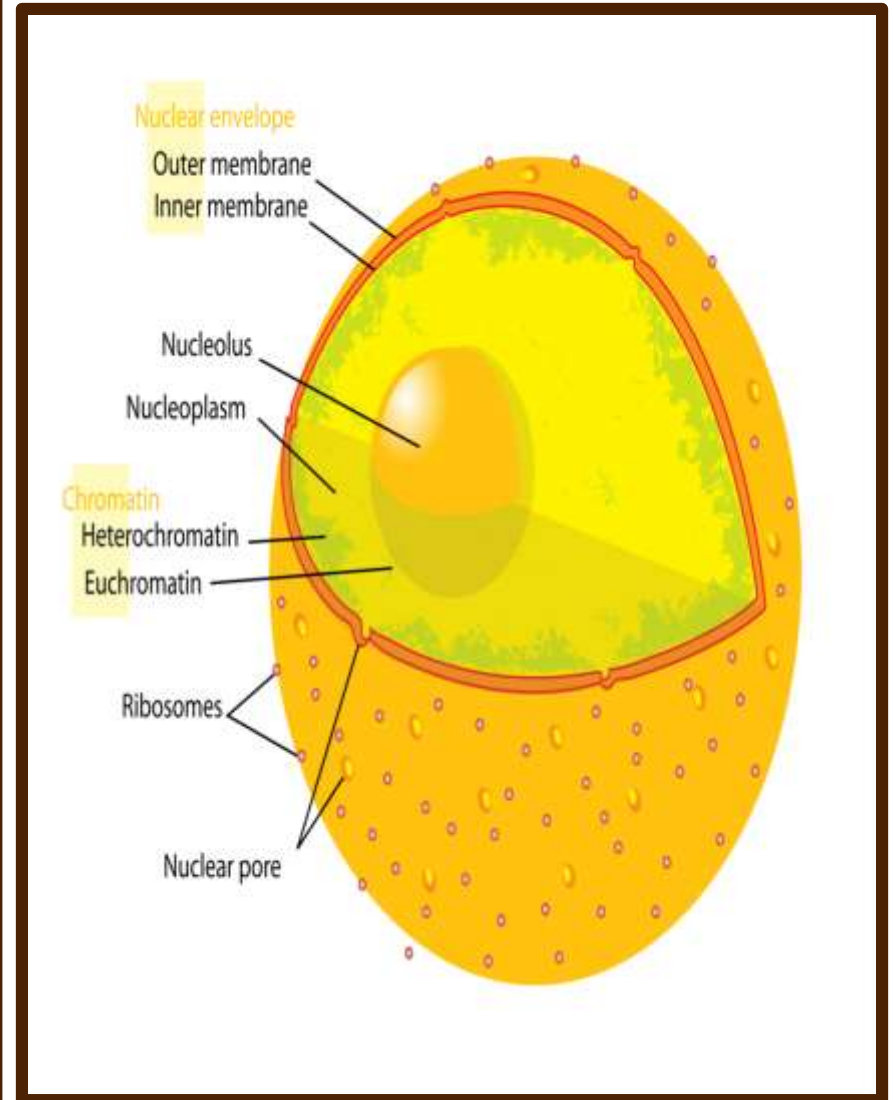


1. **Nucleus :**
2. Present in both Plant and Animal cell.
3. It is in large Oval shape.
4. Control cell activities.
5. It contains **DNA** and surrounded by double membrane.



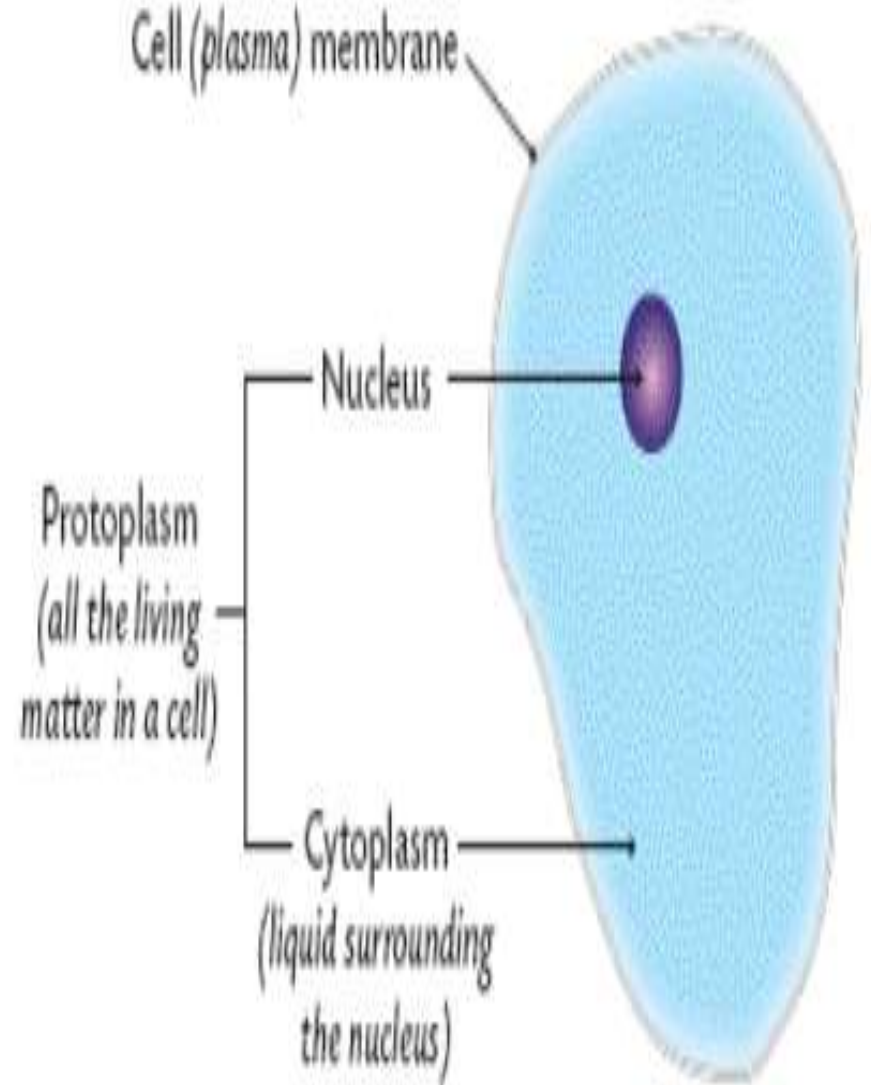
Nuclear Membrane :

1. Present in both plant and animal cell .
2. It surrounds **Nucleus**.
3. It is **selective permeable**.
4. Control movement of material In and Out of the Nucleus.



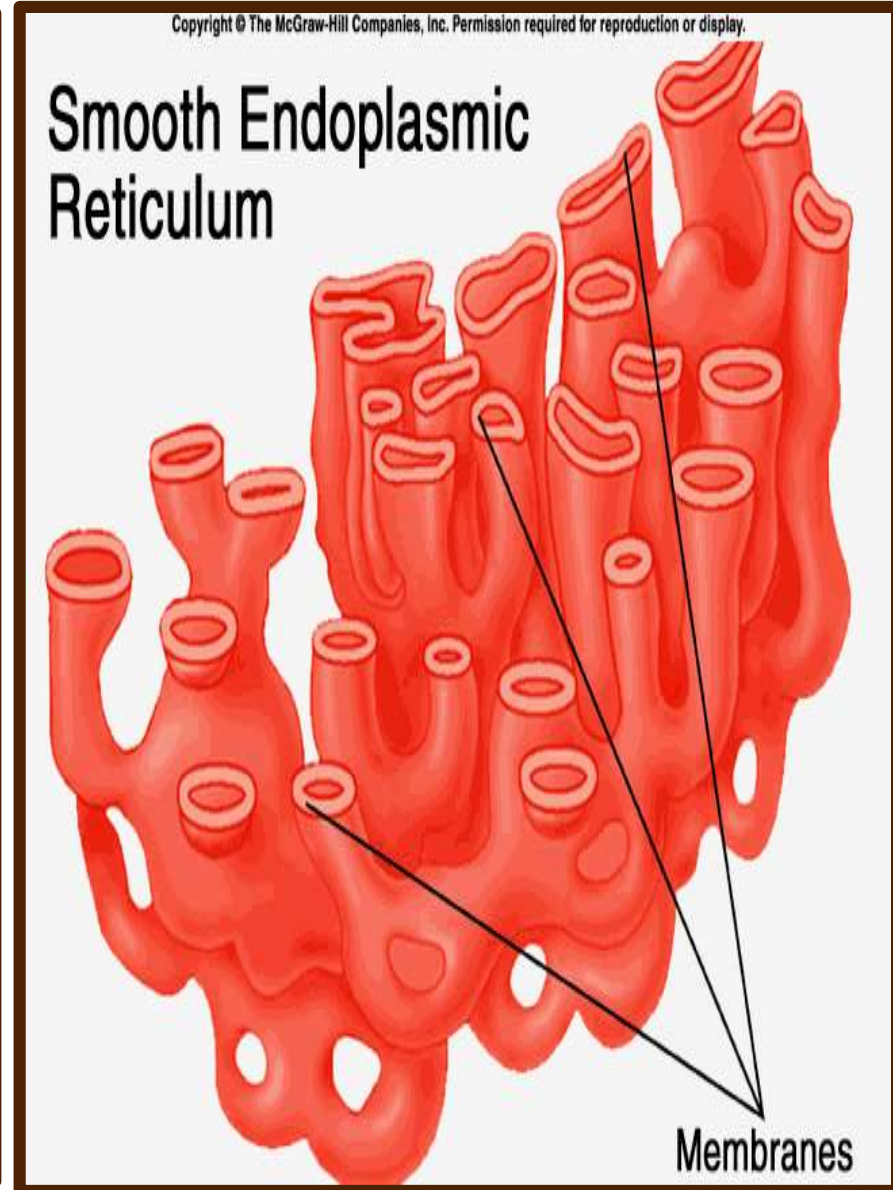
Cytoplasm :

1. It is present in both Plant and Animal cell.
2. It is **clear, thick** and **jelly like** material .
3. In Cytoplasm organelles found inside cell membrane
4. It provide **Supports** and **Protect** cell organelles .



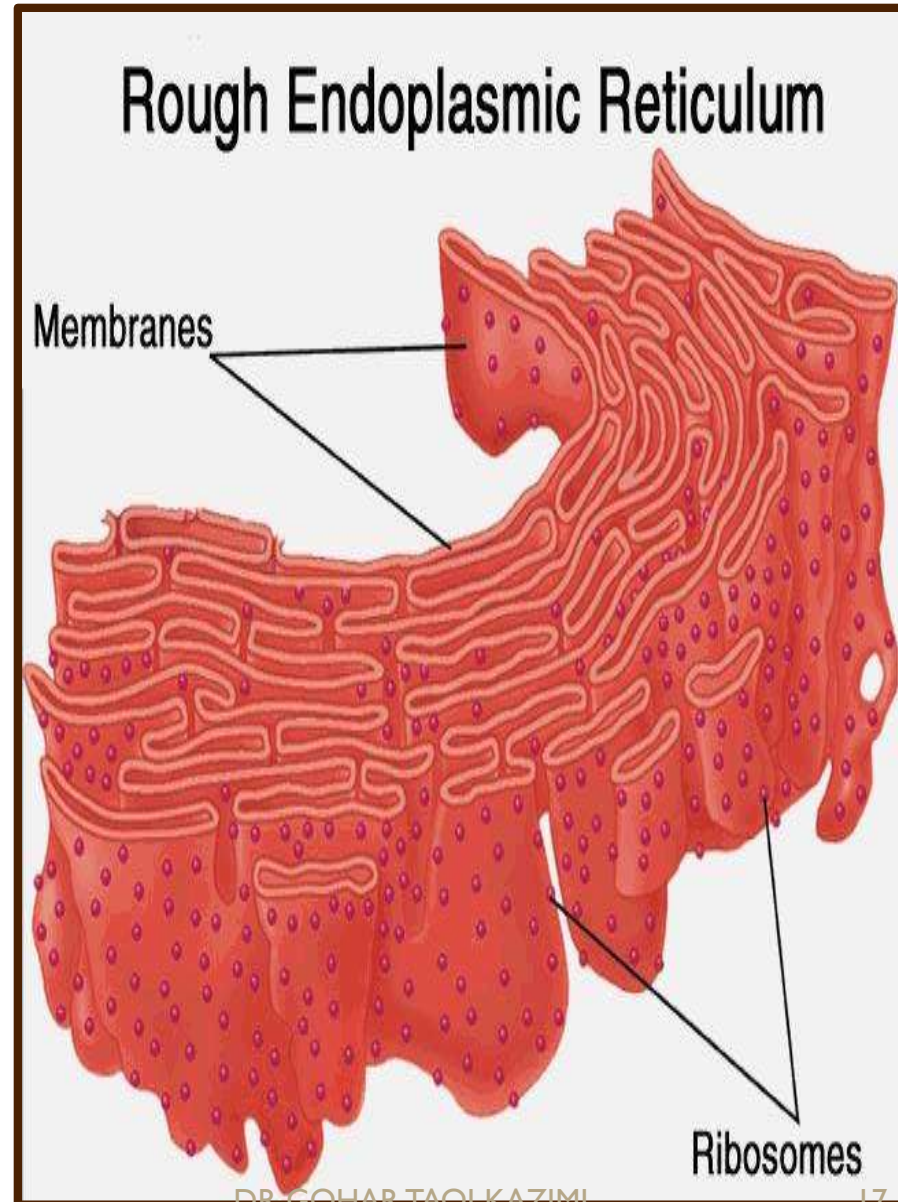
Smooth Endoplasmic Reticulum :

1. It consists of many interconnected membranous sacs called **cisternae**.
2. Many enzymes are either attached to the surface of the **SER** or located within its cisternae.
3. Chemical reactions within the **SER** vary with the type and location of cells.
4. E.g. : helps with protein folding and transport of synthesized proteins



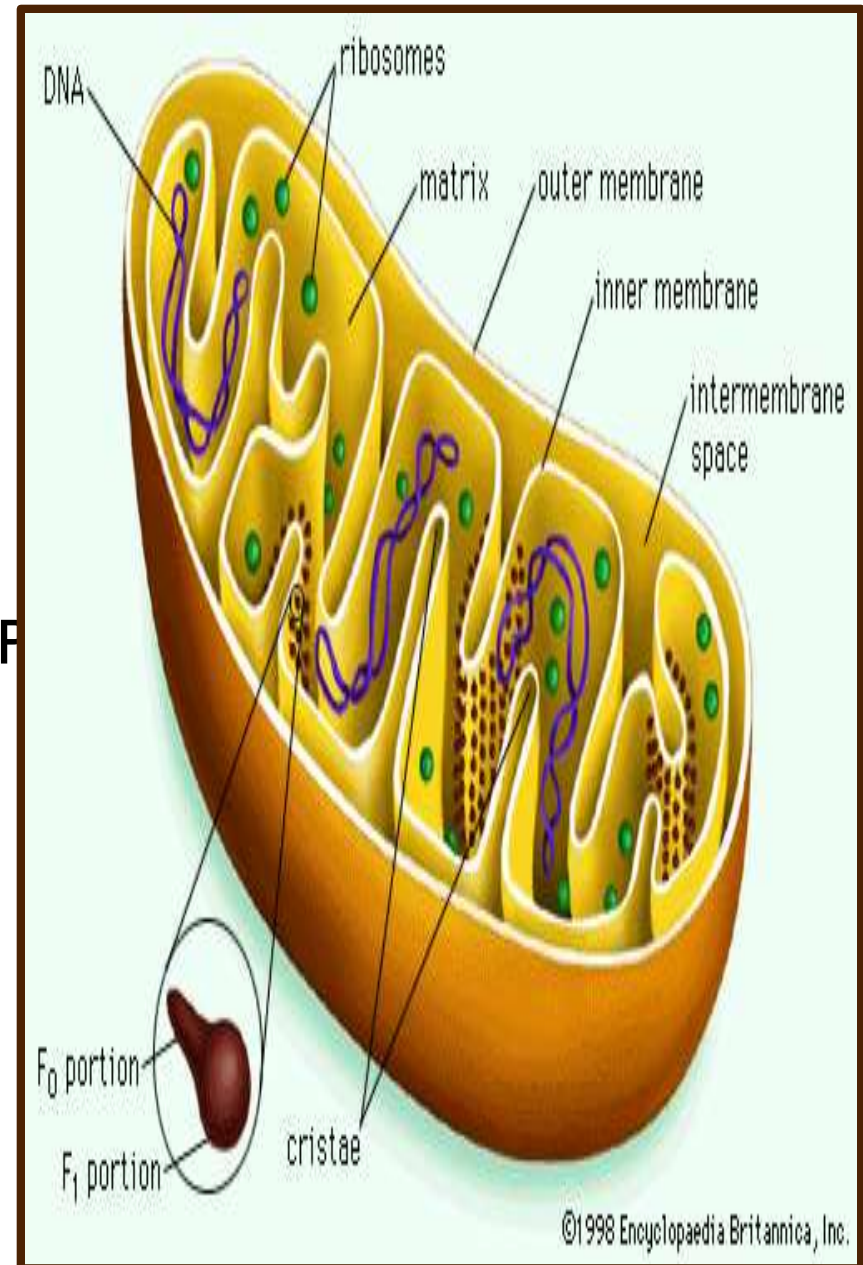
Rough Endoplasmic Reticulum

1. It consists of many interconnected membranous sacs called **cisternae** .
2. onto whose external surface ribosomes are attached .
3. It distinguish **RER** from **SER** on electron micrographs .
4. It carries material through cell .



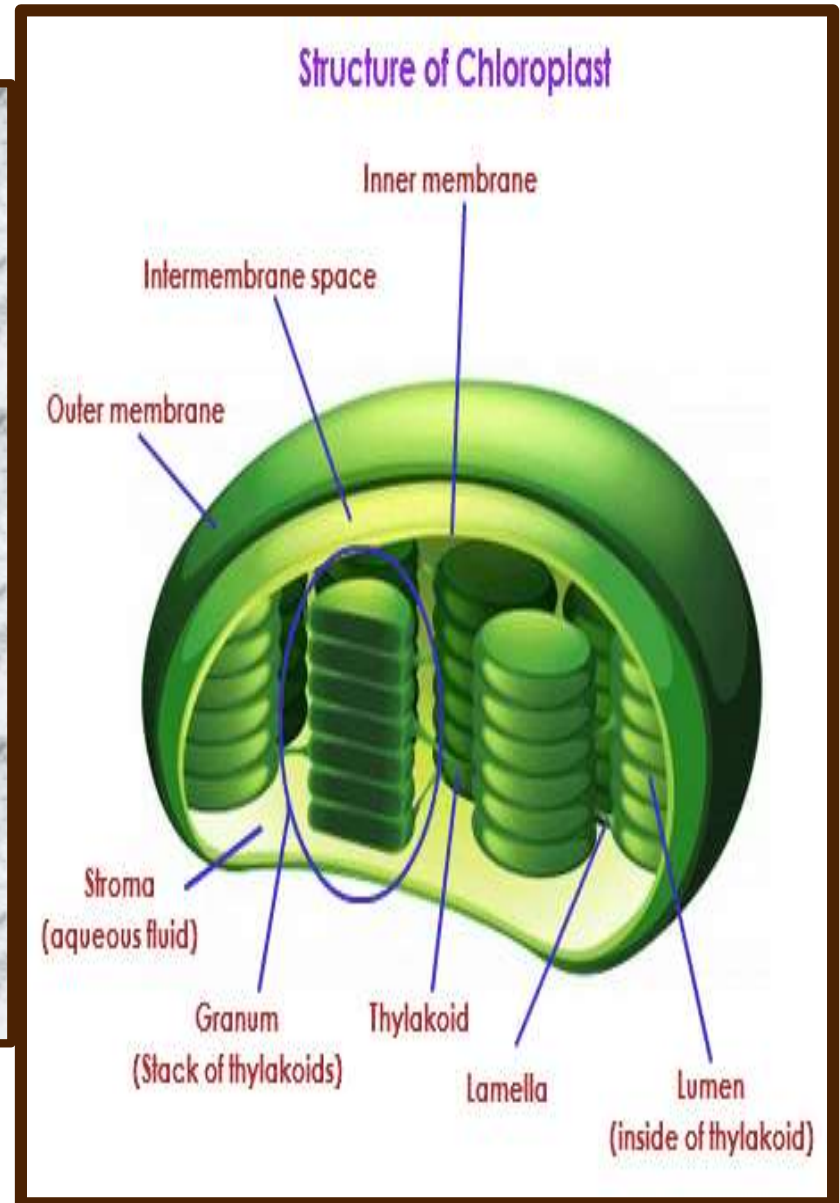
Mitochondria:

1. It present in both Animal and Plant cell .
 2. It is Bean shaped with inner membranes .
 3. The main function of mitochondria in aerobic cells is the production of energy by synthesis of ATP
- Processing and storage of calcium ions (Ca^{2+}).
 - Apoptosis.
 - Regulation of cellular metabolism
 - Synthesis of certain steroids



Chloroplast :

1. It is present in **Plant cell** not in **Animal cell** .
2. It is **green** and in **oval shape** .
3. Usually it contains **chlorophyll** .
4. Chloroplasts are the sites of **photosynthesis** with in plant cells .



Lysosomes:

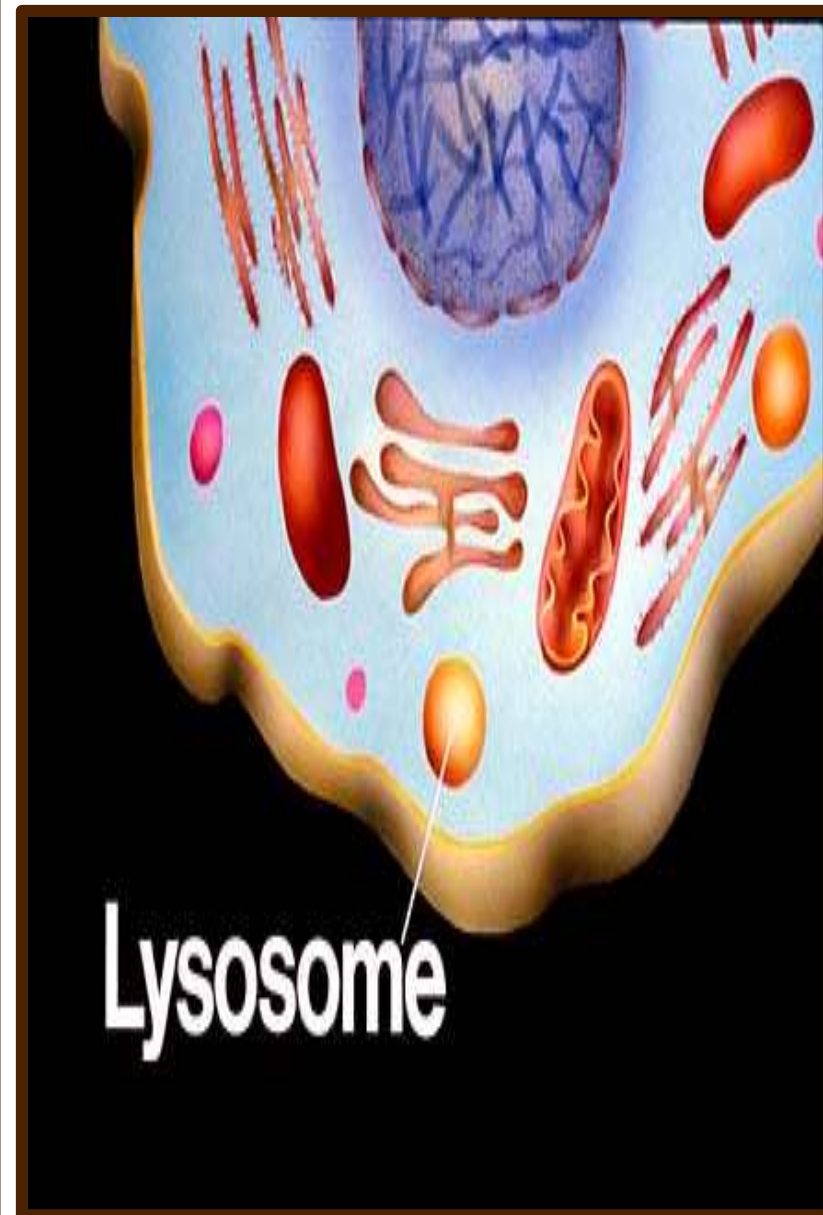
1. Lysosomes tiny sacs containing enzymes are the **main sites of intracellular digestion**. They enable the cell to make use of nutrients.
2. Their functions are;

Autophagy:

- digestion of materials from within the cell.

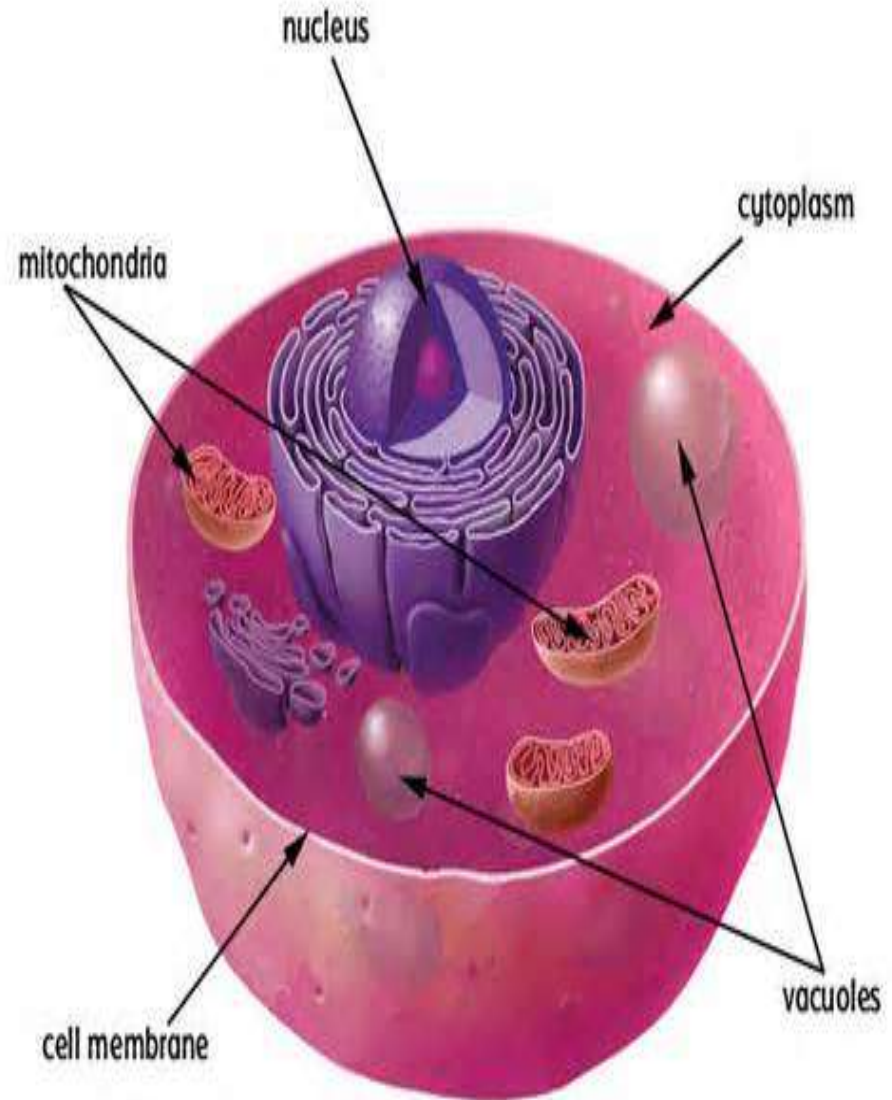
Heterophagy:

- digestion of materials originating from outside the cell



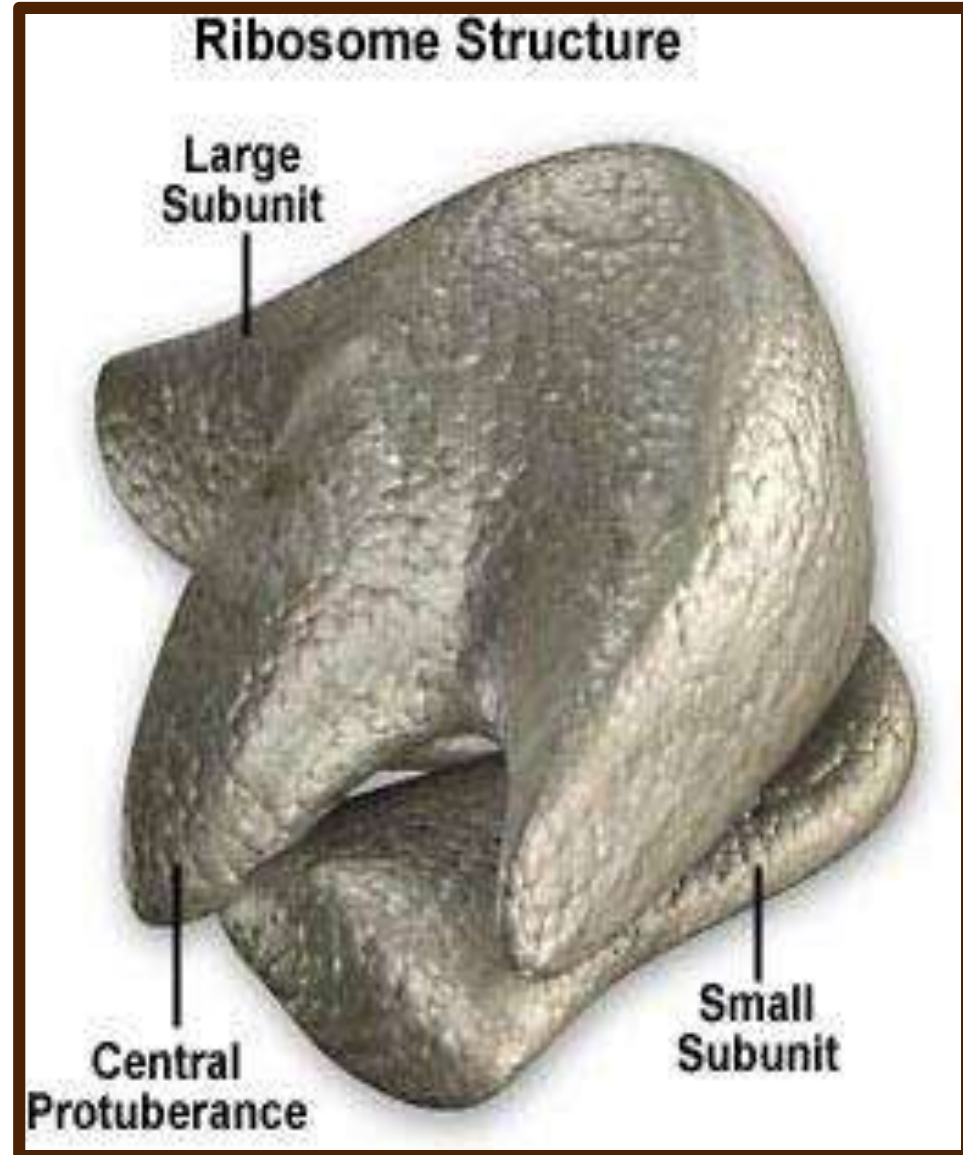
Vacuole:

1. In Plants cell, there are few and **large vacuole** presents while in Animal cell vacuole are small, they are **fluid filled sacs** .
2. Helps maintain **turgor pressure** inside the cell
3. Plants need turgidity to maintain rigidity .
4. Vacuole store **Food, Water, Waste** and plants needs to store large amount of food .



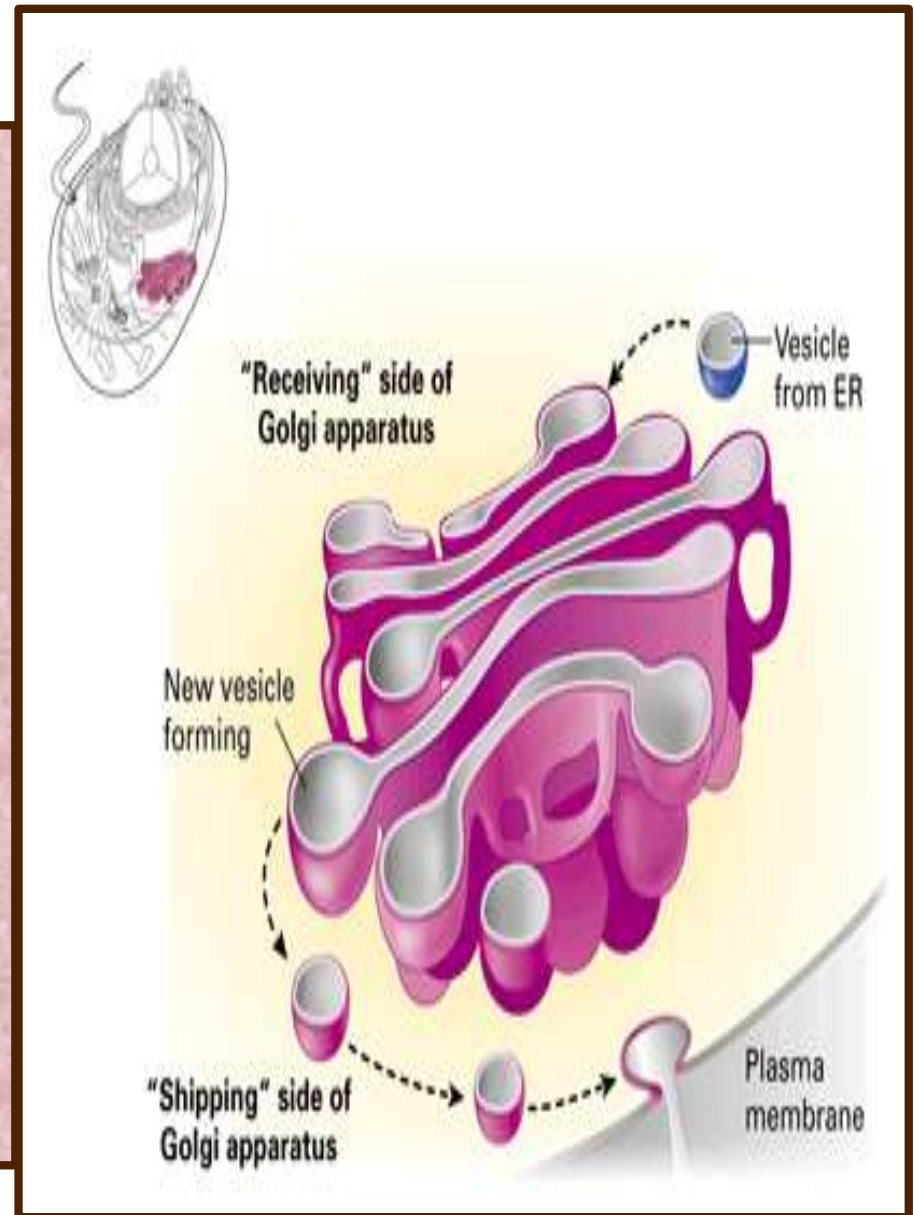
Ribosome:

1. Present in both Animal and Plant cell.
2. They are small bodies either **free** or attached with rough endoplasmic reticulum (**RER**) .
3. Ribosome produce **Proteins**



Golgi Apparatus:

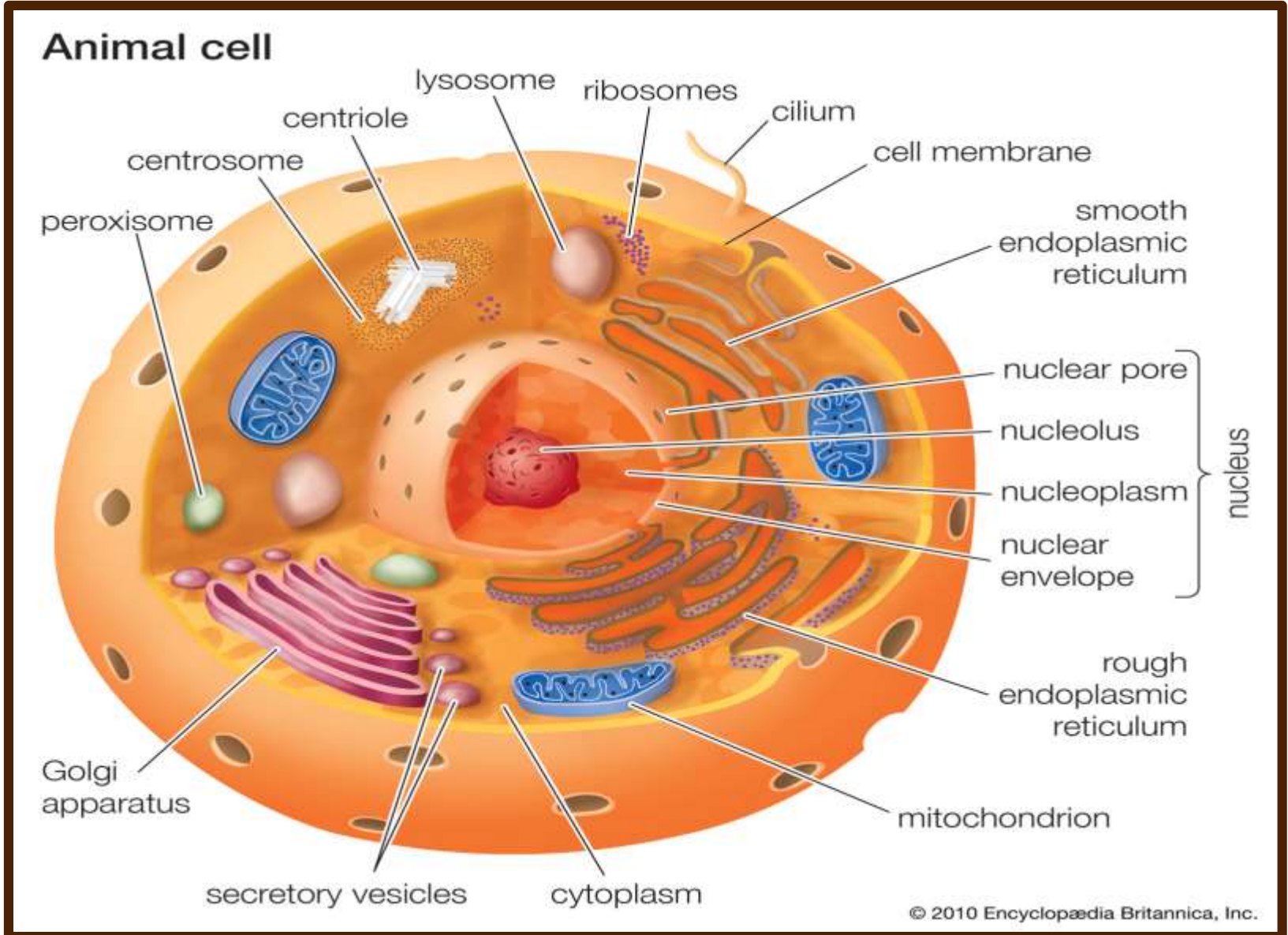
1. The Golgi apparatus **modifies, sorts and packages macromolecules** for delivery to other organelles or secretion from the cell via exocytosis .
2. **Exocytosis** : moving of particles outside of the cell .



Animal cell:

1. **Cell wall is absent**, Cellulose in any form is Absent .
2. Cytoplasm is **denser**, more **granular** and occupies most of the space in the cell .
3. **Vacuole absent**, if present, they are small, temporary and concerned with excretion and secretion .
4. **Plastids** are absent .
5. **Centrosome** is present with one or two **centrioles** .
6. Prominent and highly complex **Golgi Bodies** present near the nucleus .
7. Reserve Food stored in the form of **Glycogen** .

Animal cell :



Plant Cell:

1. **Cellulose** cell wall is **present** in Plant cell .
2. Cytoplasm is pushed to the **Periphery** and form a **thin lining** against the cell wall .
3. **Vacuoles** are **Large** and **Prominent**, may be one or more .
4. **Plastids** are generally Present .
5. **Centrosome** is Absent but Two small clear areas called **Polar Caps** are present . These participate in **Cell Division** .
6. Several Subunits of **Golgi Apparatus** called **Dictyosomes** present .
7. Reserve Food stored in the form of **Starch** .

Plant cell:

