

# Cell Organelles 2

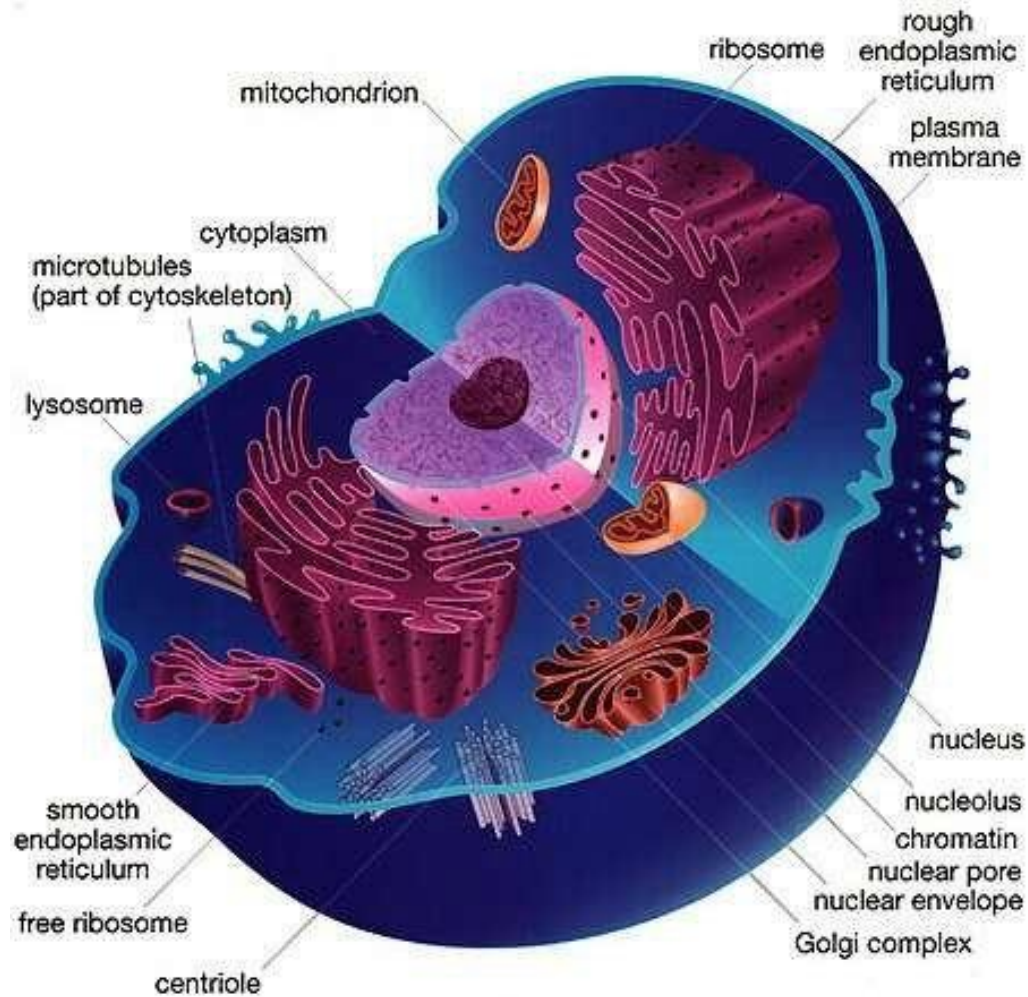
## LECTURE 2

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# Cell Organelles



# Why are there Organelles?

- Specialized Functions
- Act as containers (separate parts of the cell from other parts)
- Sites for chemical reactions (ex. Chloroplasts and Mitochondria)

# What is Nucleus ?

Nucleus” is a Latin word meaning Kernel. It is the “CONTROL CENTER” of the cell. It was First cell organelle to be discovered It is membrane bound organelle found in eukaryotic cells.

Main functions are - to maintain the integrity of genes - to control the activities of the cell by regulating gene expression .

# THE NUCLEUS:FUNCTIONS

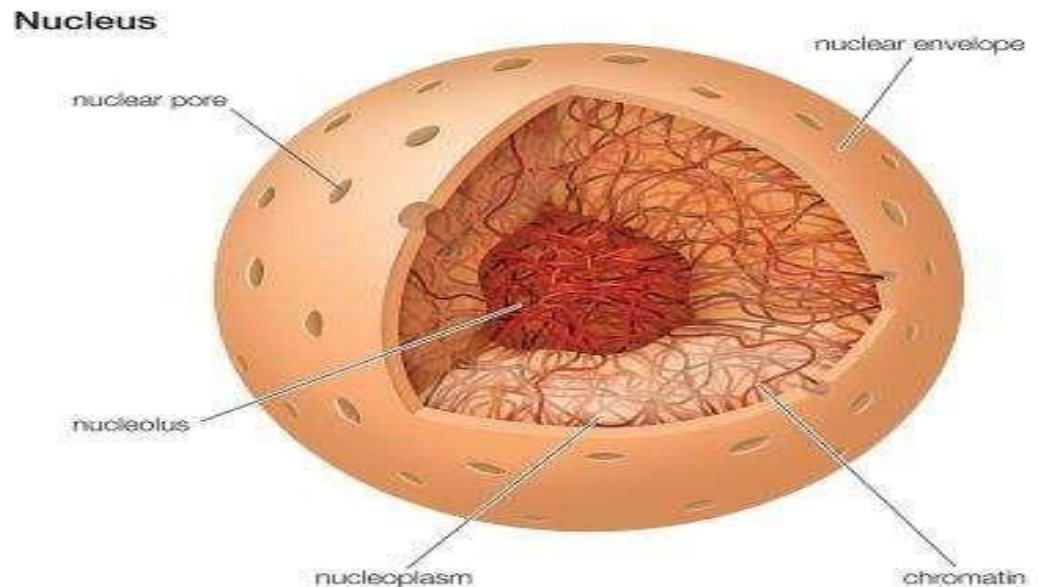
- It stores the cell's hereditary material, or DNA.
- Site of DNA replication
- Site of DNA transcription to mRNA
- Ribosomal formation
- -Nucleolus: RNA & protein required for ribosomal synthesis
- It coordinates the cell's activities, which include growth, intermediary metabolism, protein synthesis, and reproduction (cell division) by regulating gene expression.

# Basics of Nucleus

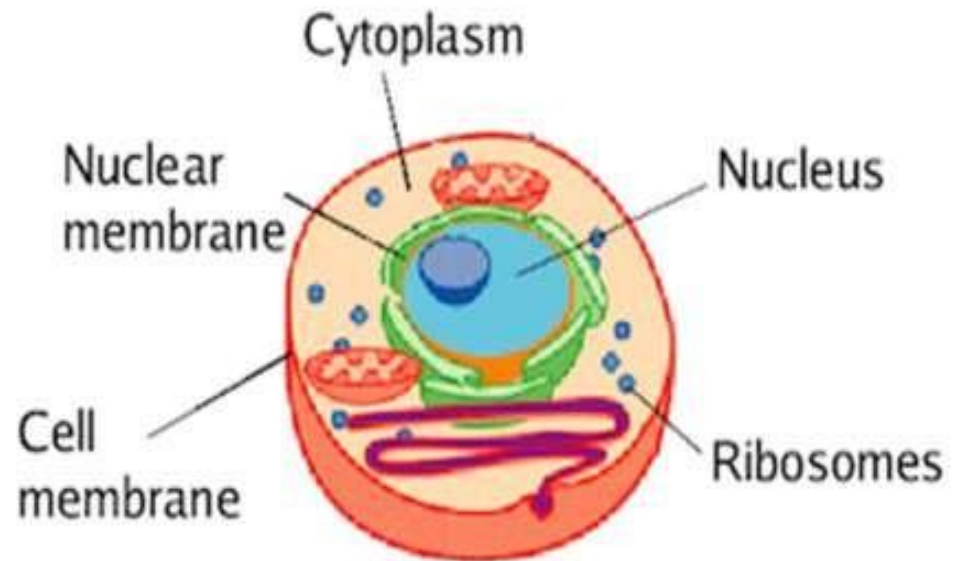
- Nucleus was discovered by an English biologist Robert Brown in 1831.
- It is the important part of the cell, exerting a controlling influence on all cell activities.
- It is usually spherical or oval structure mostly located in the Centre of the cell.
- Some sieve tube of vascular plants and the red blood cells of mammals lack nuclei at maturity.

# Nucleus

- The **nucleus** is a membrane bound structure that contains the cell's hereditary information and controls the cell's growth and reproduction.
- It is commonly the most prominent organelle in the cell. The **nucleus** is surrounded by a structure called the nuclear envelope.



- ❖ This membrane separates the contents of the nucleus from the cytoplasm. The cell's chromosomes are also housed within the nucleus.
- ❖ Chromosomes contain DNA which provides the genetic information necessary for the production of other cell components and for the reproduction of life.

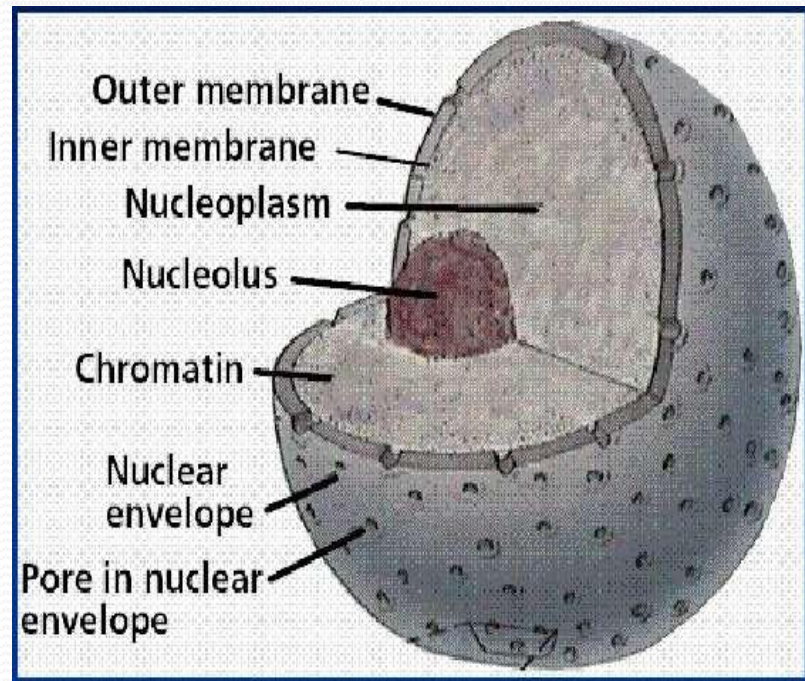




# Structure of the nucleus

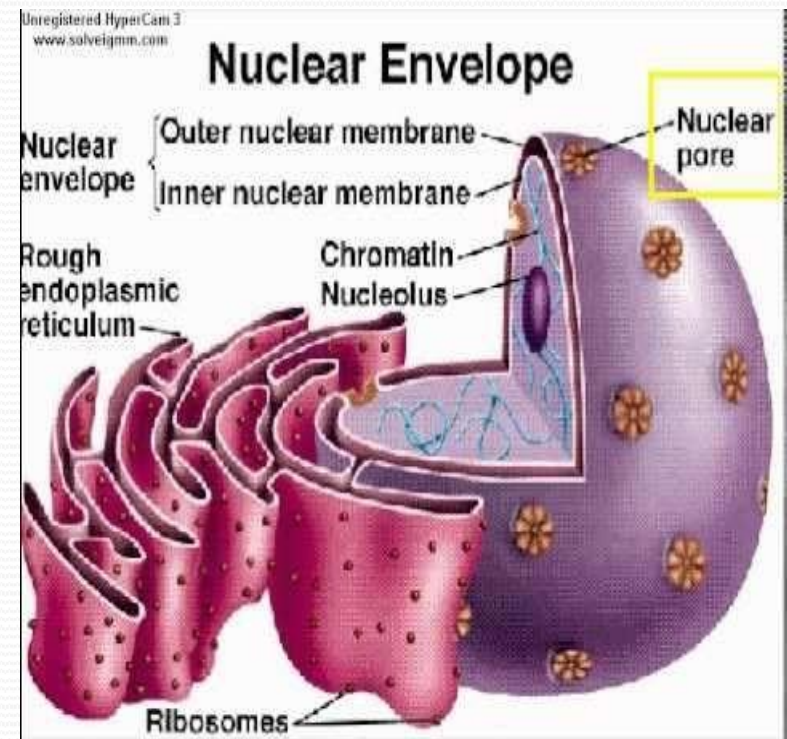
Average diameter of nucleus is 6  $\mu\text{m}$ , which occupies around 10% of cell volume.

- Nuclear Envelope
- Nuclear Membrane
- Nucleolus
- Chromosomes
- Nucleoplasm



# Nuclear envelope

- **nuclear envelope.** The double-layered membrane enclosing the nucleus of a eukaryotic cell.
- The **nuclear envelope** has pores that allow the passage of materials into and out of the nucleus.
- Also called **nuclear membrane**.

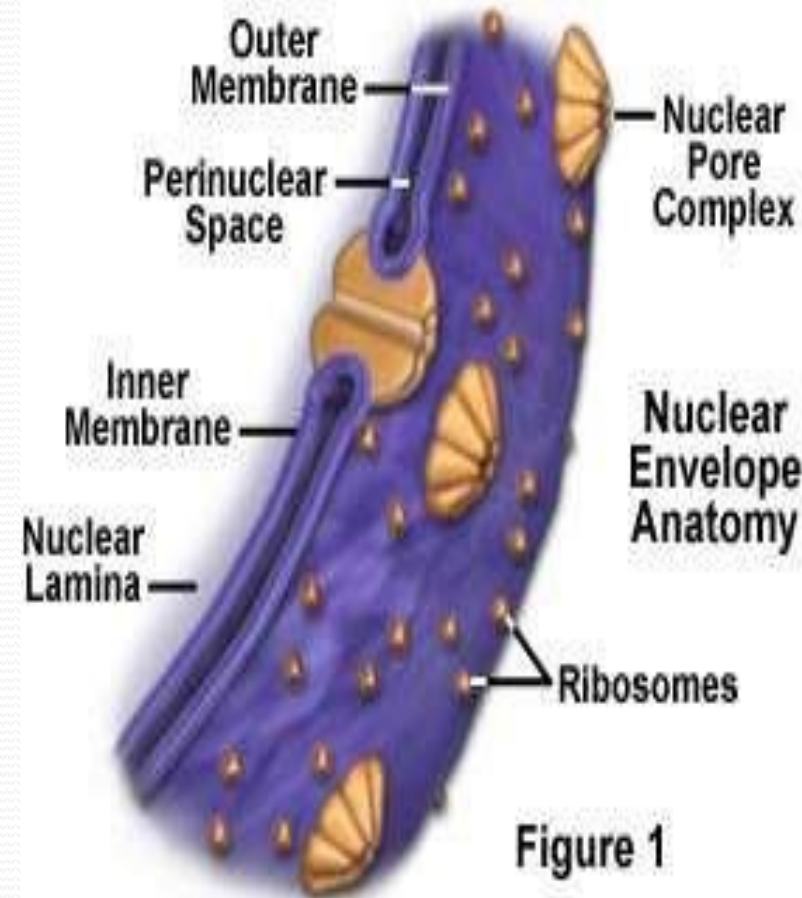


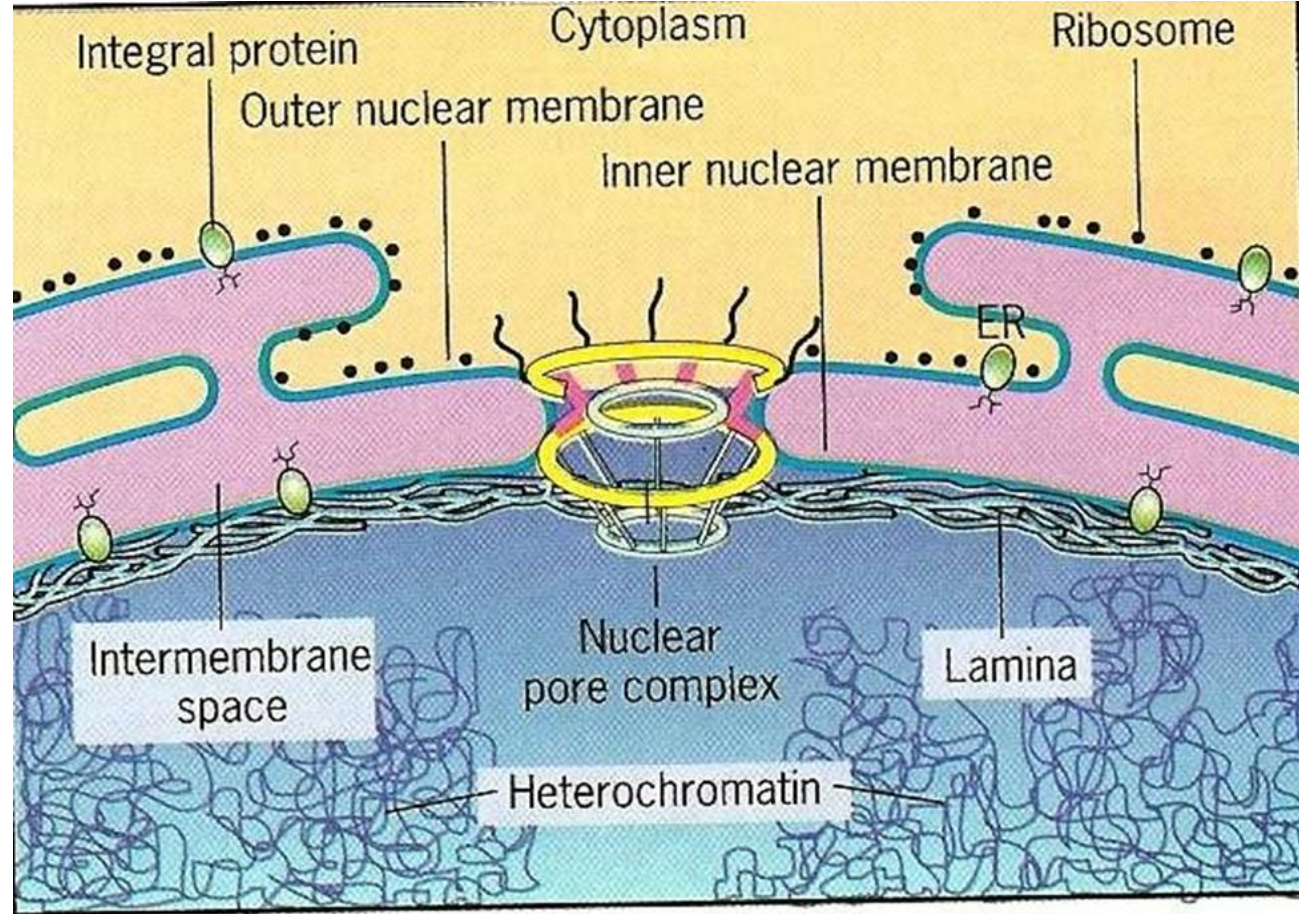
# Nuclear Membrane

A **nuclear membrane**, also known as the nucleolemma or karyotheca, is the phospho lipid bilayer **membrane** which surrounds the genetic material and nucleolus in eukaryotic cells.

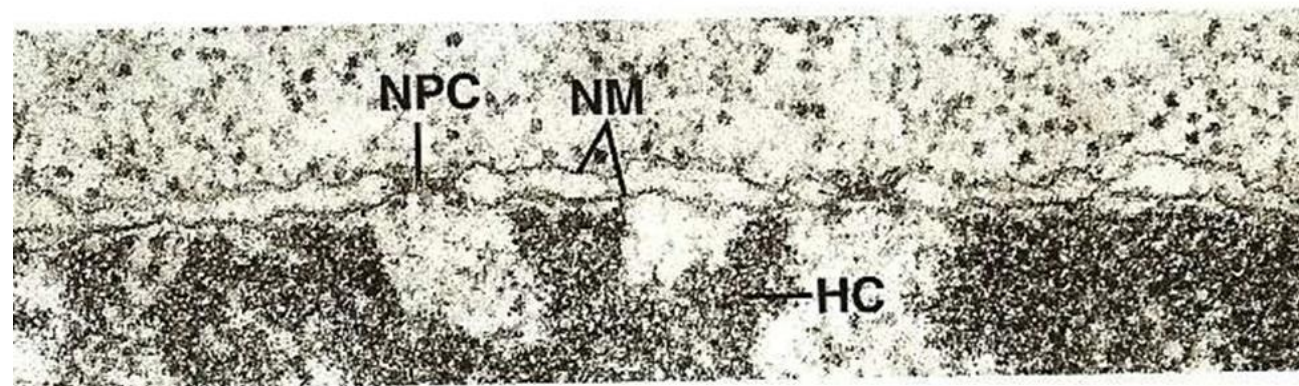
The **nuclear membrane** consists of two lipid bilayers—the inner **nuclear membrane**, and the outer **nuclear membrane**.

The space between the membranes is called the **Perinuclear Space** and is continuous with the RER lumen

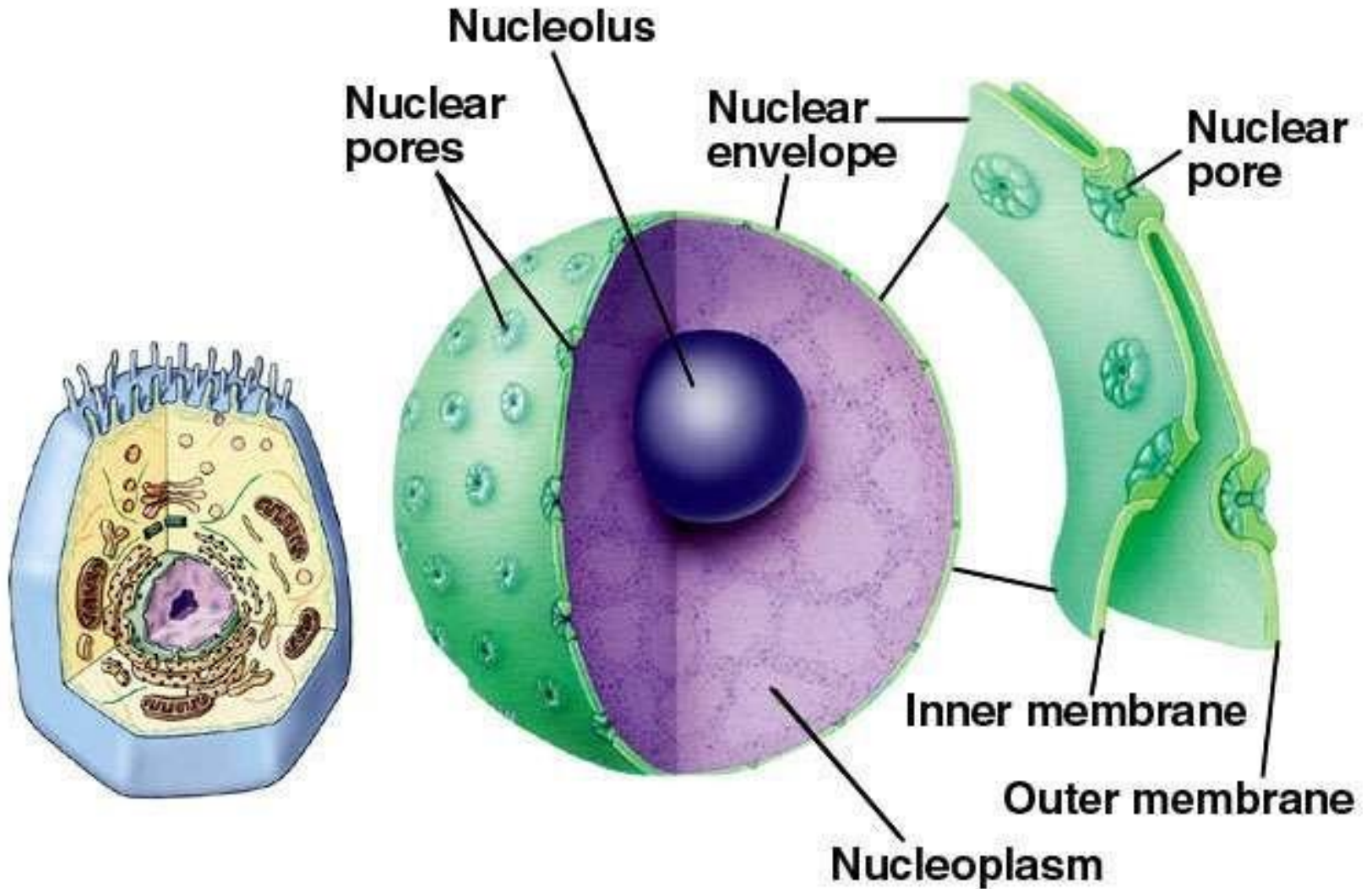




(a)



# Nucleus

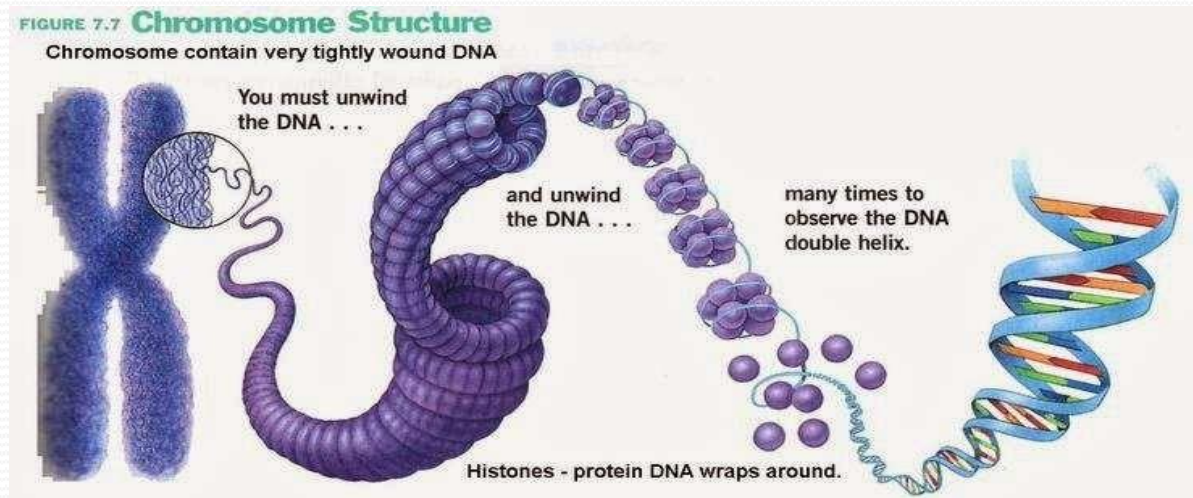


# Nucleolus

- The **nucleolus** takes up around 25% of the volume of the nucleus. This structure is made up of proteins and ribonucleic acids (RNA).
- Its main **function** is to rewrite ribosomal RNA (rRNA) and combine it with proteins. This results in the formation of incomplete ribosomes.
- Present in cells that are actively synthesizing proteins Its size depends on metabolic activity of cell Average size .5-5um in diam .

# Chromosomes

- The **Function of Chromosomes**.
- **Chromosomes** are the thread-like structure found in the nuclei of both animal and plant cells.
- They are made of protein and one molecule of deoxyribonucleic acid (DNA).



# Nucleoplasm

- Just like the cytoplasm found inside a cell, the nucleus contains **nucleoplasm**, also known as karyoplasm.
- It consists of a nuclear matrix and various types of particles Highly viscous liquid which scaffolds chromosomes, nucleolus and various granules like heterochromatin, perichromatin granules
- Many substances like nucleotides and certain enzymes are also dissolved in it Nucleoplasm



# Endoplasmic Reticulum (ER)



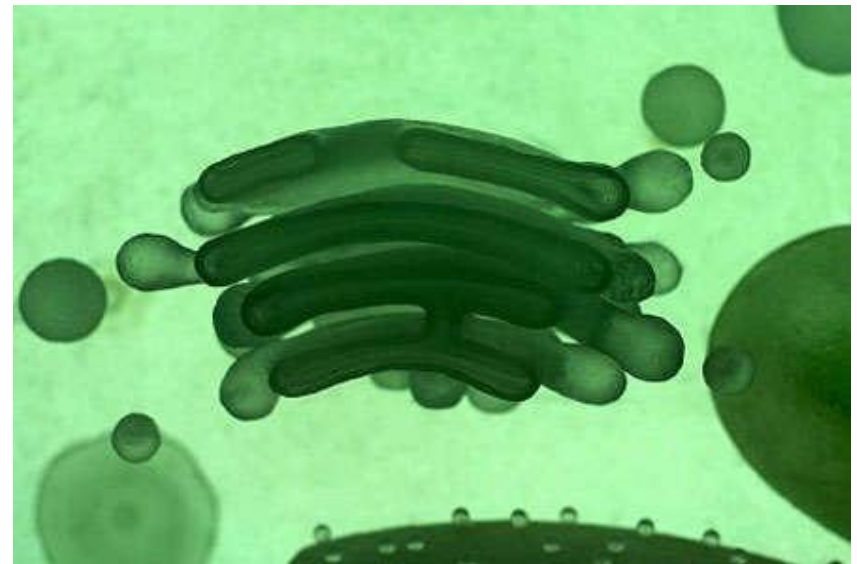
- Folded membrane that extends through the cytoplasm to the nuclear membrane
- 2 Kinds:
  - Rough- Has ribosomes attached and is involved with protein transport
  - Smooth- Lacks ribosomes and is involved with detoxification of poison and lipid synthesis

# Ribosomes

- Dot-like structures produced in the nucleus
- Site of protein synthesis
- Each ribosome is composed of 2 sub-units: small and large
- 2 type of ribosomes:
  - Free: floating in the cytoplasm
  - Attached: associated with the ER

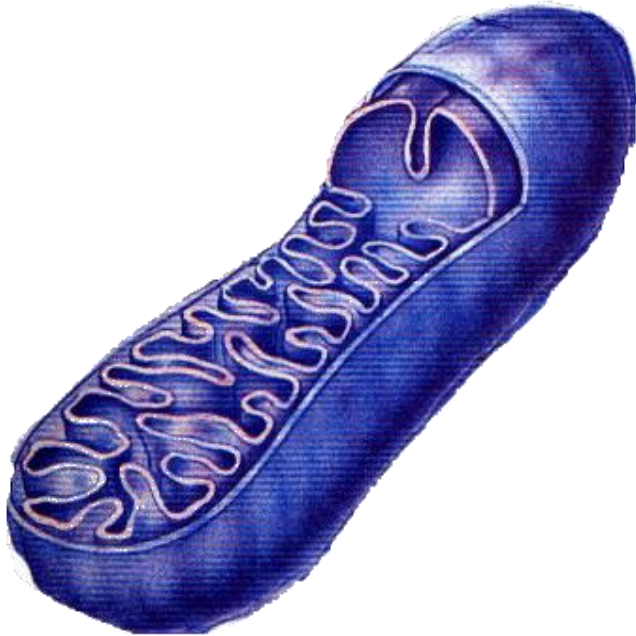
# Golgi Apparatus

- Stacks of sacs with vesicles pinching off from the edges
- Packages materials for export from the cell
- Will modify lipids and proteins
- Stores and packages materials for export out of cell



Power Plant

# Mitochondria



- Primary energy producers of cells
- Double membrane
- Produces ATP via aerobic respiration
- Have their own DNA and method of replication
- Endosymbiotic Theory

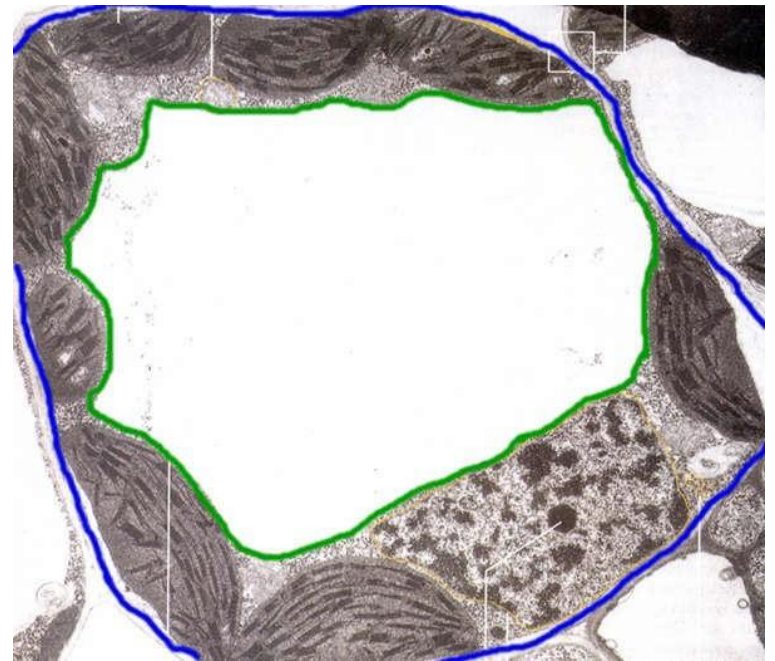
# Centrioles

- Found in eukaryotic cells
- Come in pairs
- Made from short microtubules
- Assist the cell with cell division

# Vacuoles

Storage Unit

- Single membranes that surround solid or liquid contents
- Vacuole will act as a container for the cell
- Plant cells usually have 1 large vesicle filled with water
- 50-90% of a plant cell's volume is a vacuole



<http://education.kings.edu/dsmith/vacuole.jpg>

# Vesicles

TCS/Delivery Service

- Sac surrounded by a single membrane
- Endocytotic- will bring contents into cell
- Exocytotic- takes materials out of cell

# Lysosomes

Dump or Garbage Truck

- Sacs within the cell that contains digestive enzymes
- Encased within a single membrane
- Used to digest/breakdown complex organic molecules
- Lysosome will merge with the “food” & the contents will begin the digestion

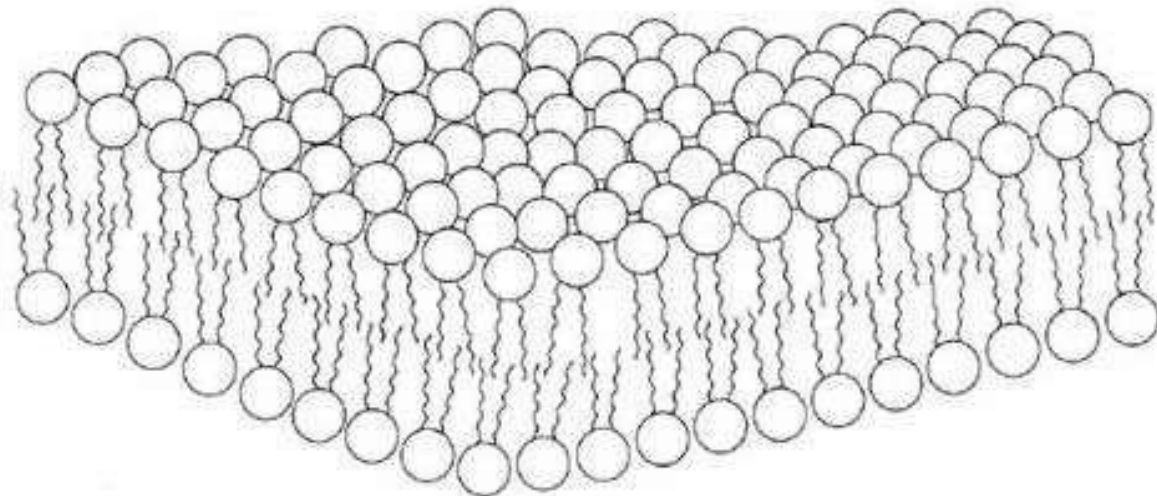


# Peroxisomes

- Resemble Lysosomes with structure and function
- Sac with a single membrane that break down amino acids, alcohol and fatty acids
- Unique because it produces and disposes of Hydrogen Peroxide, which is fatal to cells

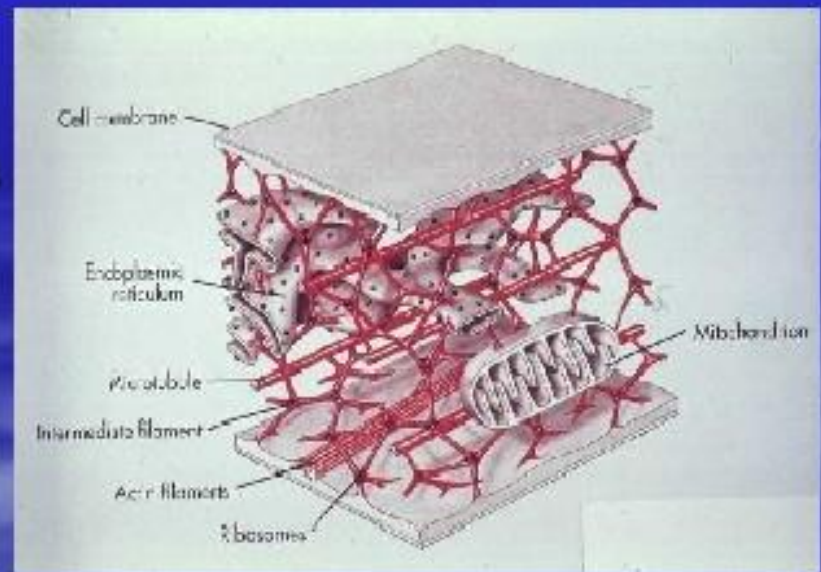
# Cell Membrane

- Semi-permeable membrane that lets some things in and prevents materials from leaving
- Provides limited structure
- Lipid bilayer



# CYTOSKELETON

- Maintains the shape and size of cell
- Network of long protein strands
- Not surrounded by a membrane
- Participates in the movement of organelles
- 2 major components – microfilaments and microtubules
- Microfilaments – threads made of actin (protein) – smallest strands
- Microtubules – largest strands that are hollow tubes – help the cell divide by forming spindle fibers that extend across the cell



# Microtubules

- Made from proteins within eukaryotic cells
- Provide the structure for the cell-cytoskeleton
- Tracks for transporting organelles & vesicles
- Pull apart chromosomes during division
- Ex: Cilia and flagella

THANK YOU

