

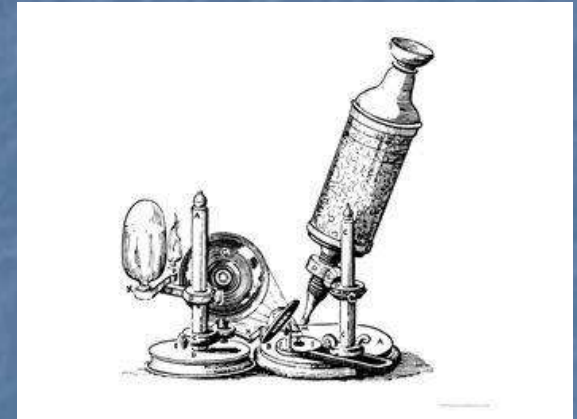
# Cell Structure and Cell organelles

# History of Cells

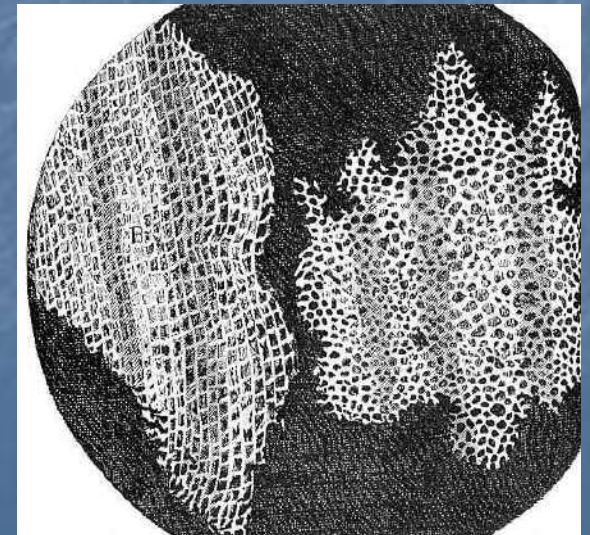
First  
microscope!



- No history prior to 1600
- light microscope was invented around 1600
- Robert Hooke first examined a slice of cork in 1665.
  - He named the small empty compartments, "cells," after the similar cell rooms at the local monastery.



What he  
saw!



# The Cell Theory

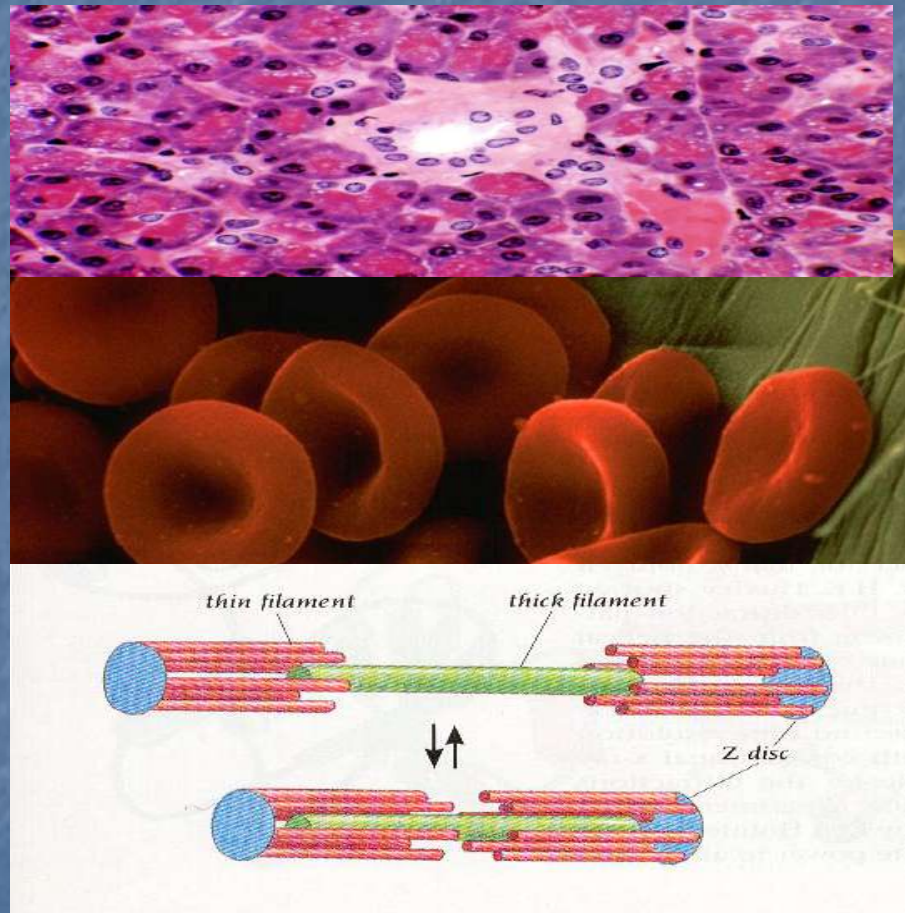


1. All organisms are made up of one or more cells.
2. Cells are the basic unit of structure and function.
3. Cells can only come from other cells.



# Cell's job: produce proteins

- Pancreas cells =  
Insulin to control  
blood sugar
- Blood cells =  
Hemoglobin for transport  
of Oxygen
- Muscle cells =  
Myosin for muscle  
contraction

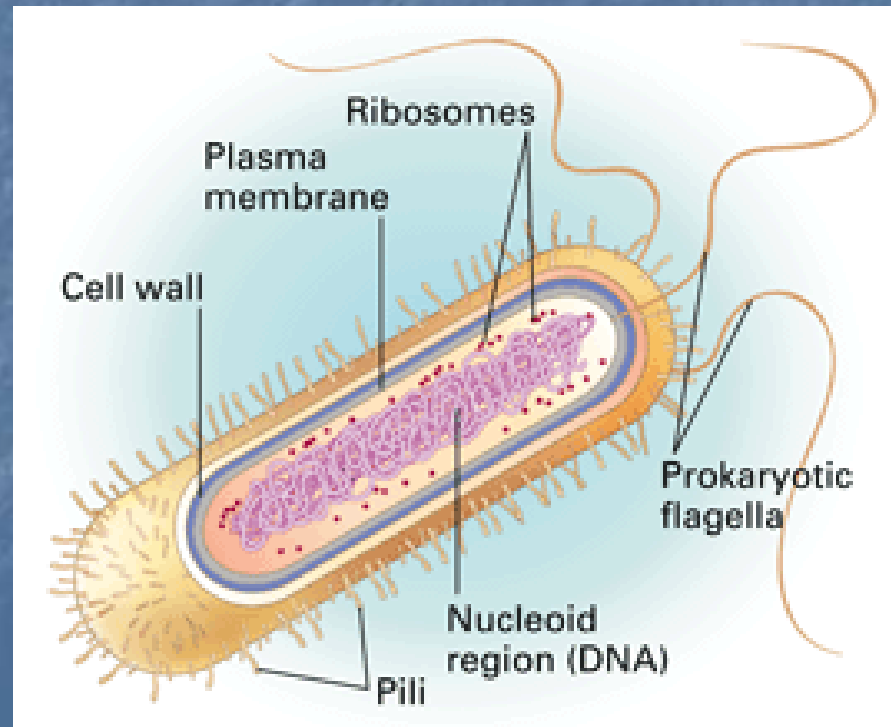


# Two types of cells

- Prokaryotic cells
- Eukaryotic cells

# Prokaryotes

- The most primitive of cells that do not contain a nucleus
  - Example: bacteria





# Eukaryotic Cells

- Eukaryote Cells: Cells that contain a nucleus.
- Two types: plant cells and animal cells
- All eukaryotes have membranes that surround tiny structures that perform distinct functions.
- Any cell structure with a specific job is called an organelle.

# Prokaryote vs. Eukaryote

## ■ Prokaryote:

- -has no organelles  
(no nucleus)

## Both:

- are living
- have DNA
- Have cytoplasm
- Have ribosomes
- are cells

## Eukaryote:

- has organelles  
(has a nucleus)

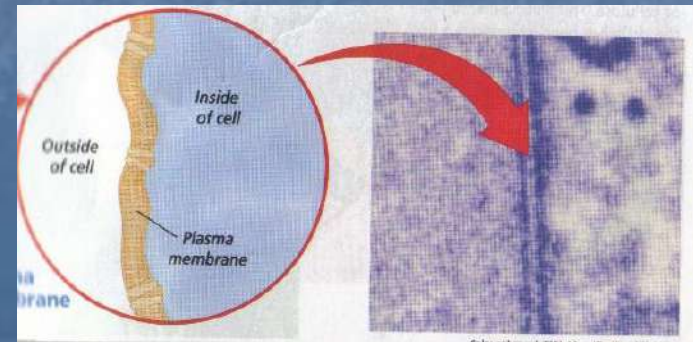


# Cell organelles

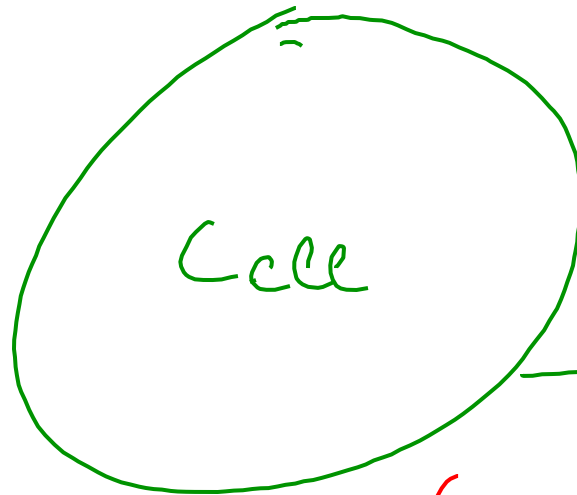
- Found in eukaryotic cells
  - Plants and animals

# Cell/Plasma membrane

- Structure: It is a phospholipid bilayer-the boundary between the inside of the cell and the outside of the cell
- Function: selectively permeable; determines what goes into and out of cell. This helps maintain homeostasis
- Found in both plant and animal cells



Outside  
of the  
cell



Also called as  
Plasma membrane

Cell membrane

(Phospholipid  
bilayer)

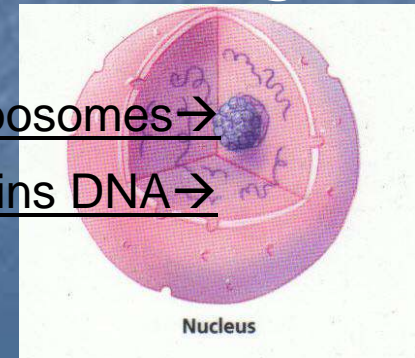


# Nucleus

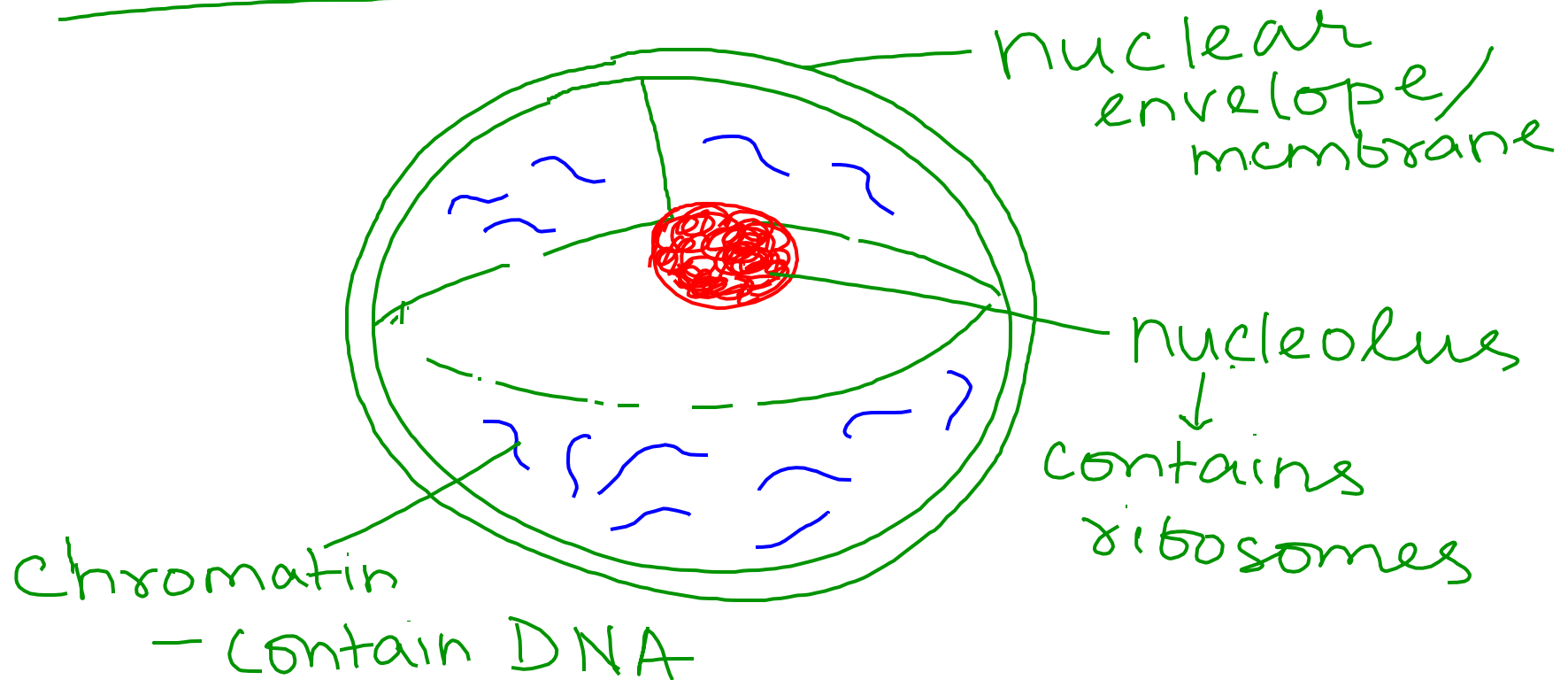
- Structures- Nucleus has pores around the membrane, which let the ribosomes leave
- **The nucleolus is found inside the nucleus and is where ribosomes are made.**
- Nucleus is surrounded by nuclear envelope/membrane which is double layered
- Function- The control center of the cell because it stores DNA which contain directions for making proteins.
- Found in both plant and animal cells

Nucleolus contains ribosomes →

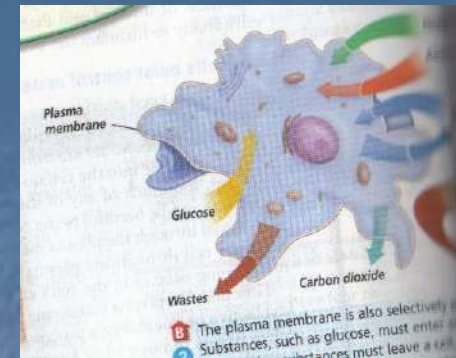
Nucleus contains DNA →



# Nucleus



# CYTOPLASM

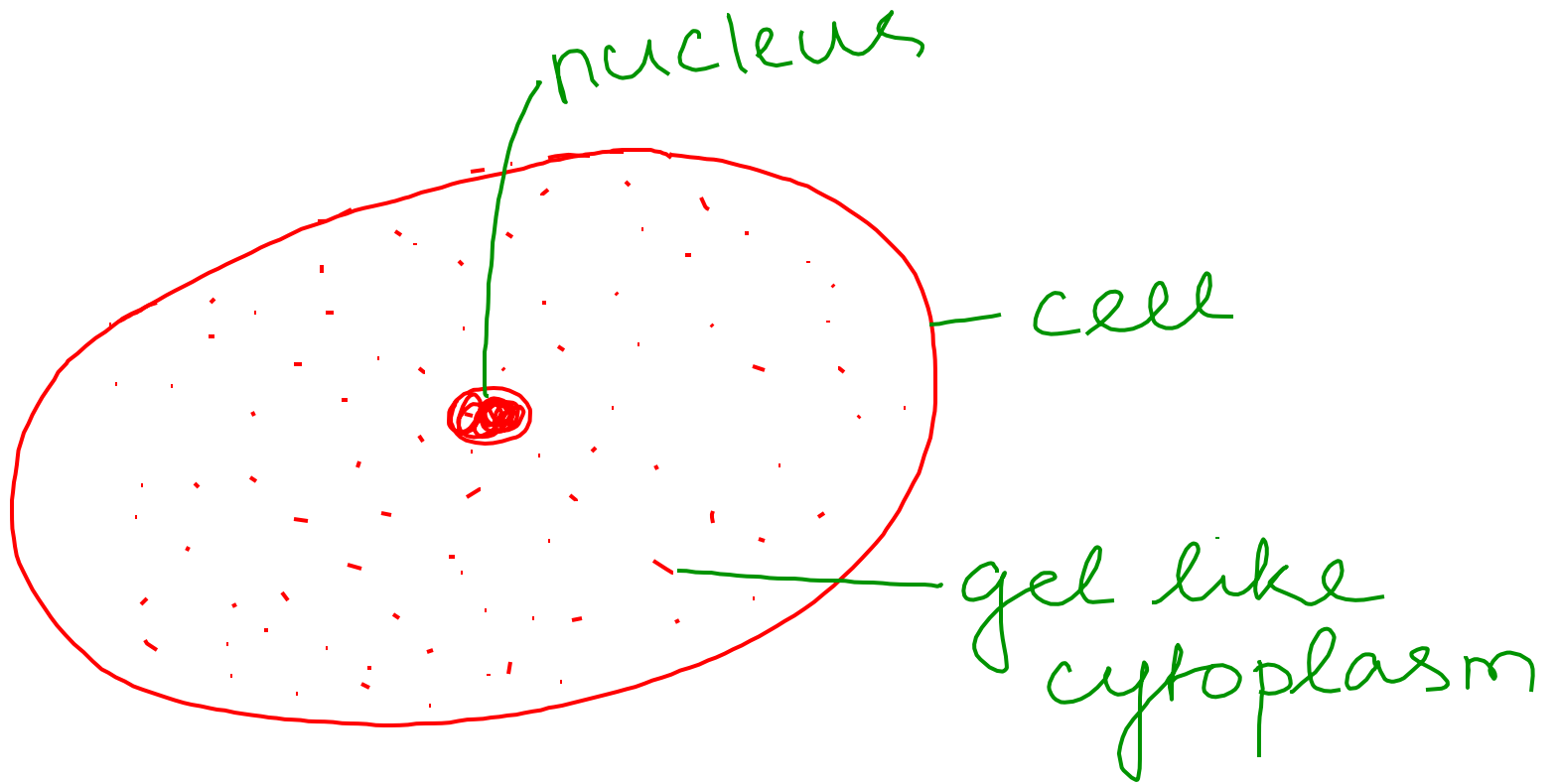


Structure- Gel like Fluid surrounding nucleus and filling the cell. Enclosed in a membrane called the cell membrane

Function: Contains organelles

Found in both plant and animal cells



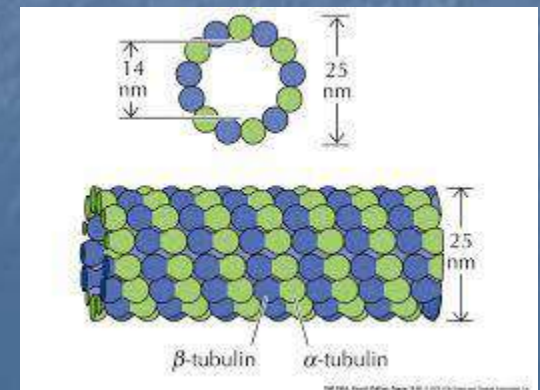


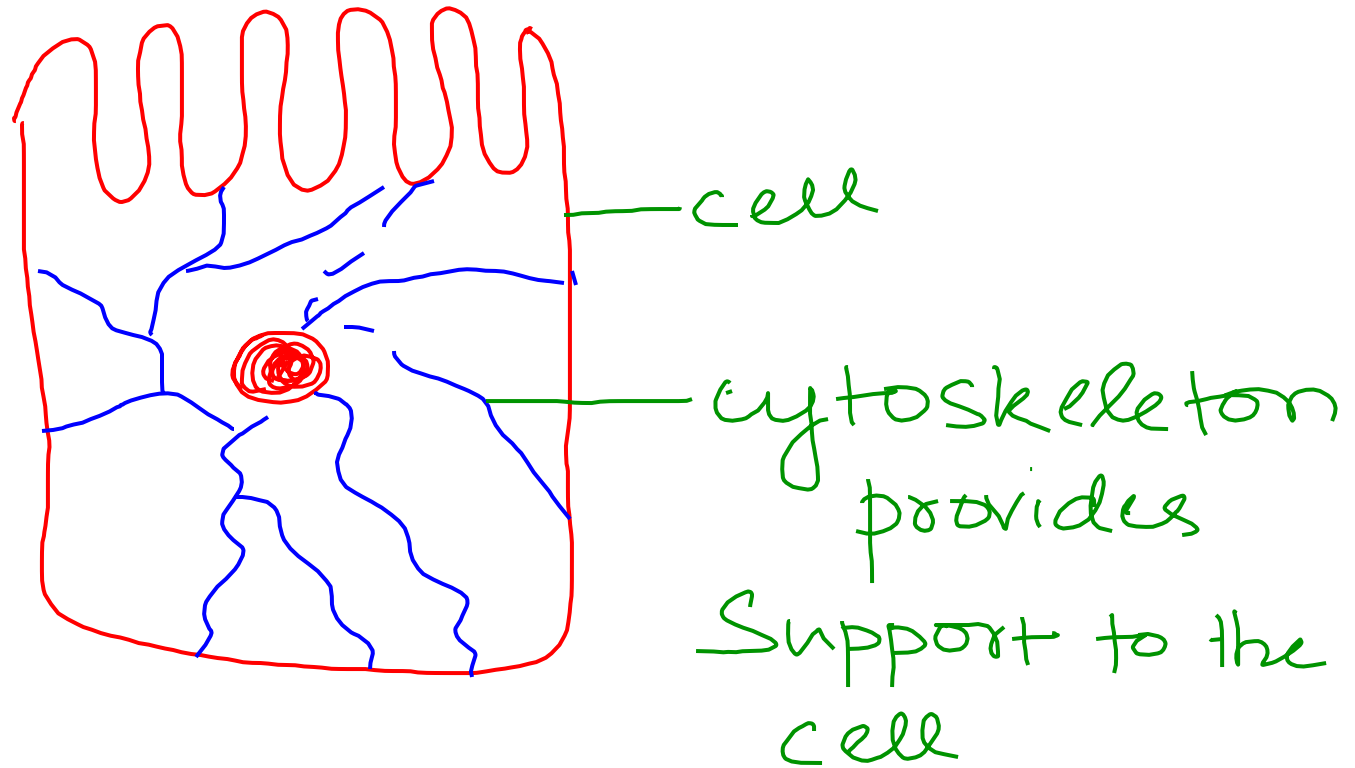
# CYTOSKELETON

Structure: It is a network of protein fibers

Function-It forms a framework for the movement of organelles around the cytoplasm - most of the organelles are attached to the **cytoskeleton**

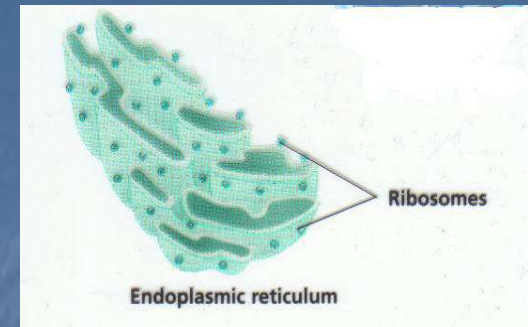
Found in both plant and animal cells







# Endoplasmic reticulum

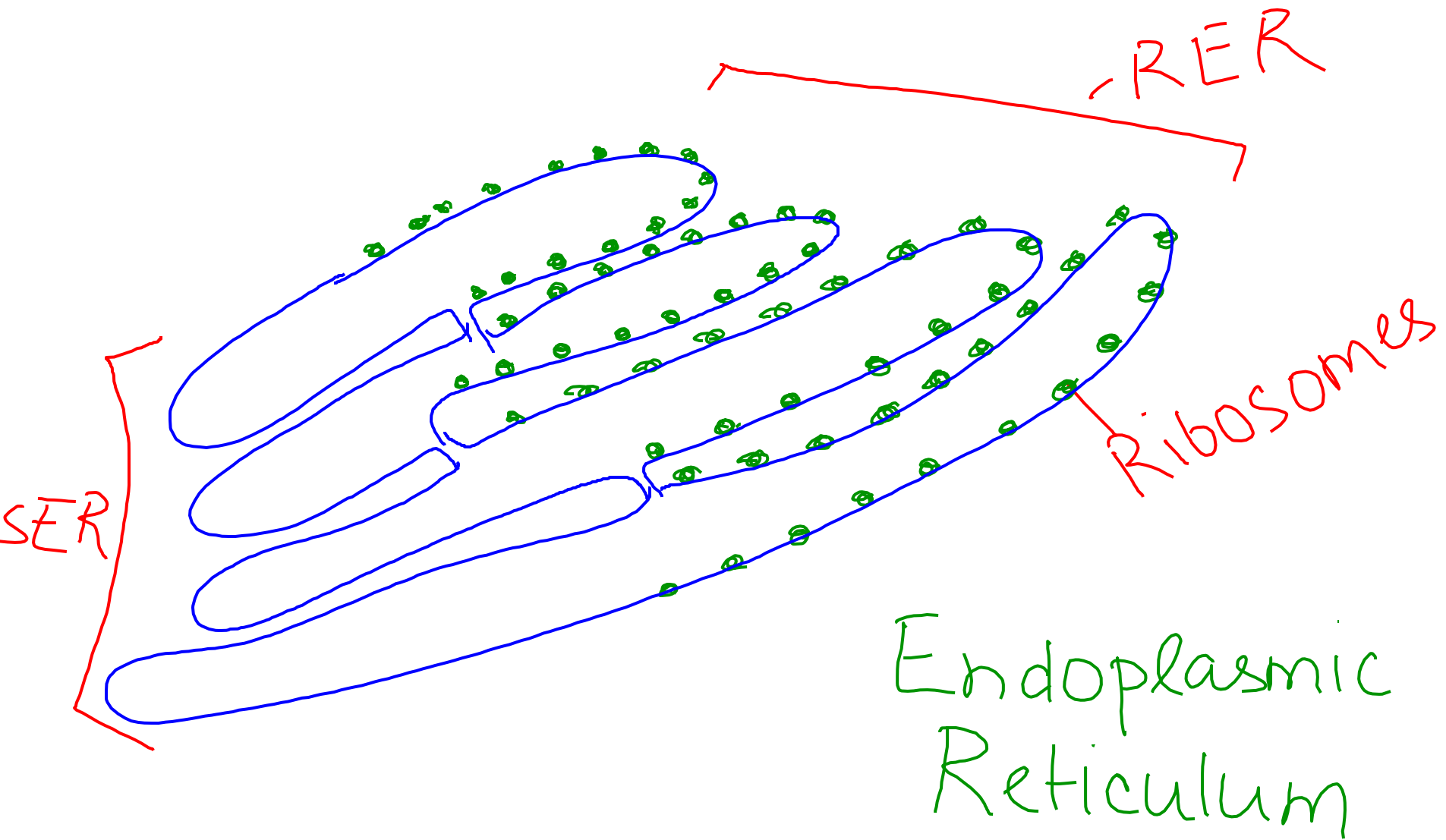


Structure: Connected to and surrounds the nucleus. Two types: Smooth ER and Rough ER

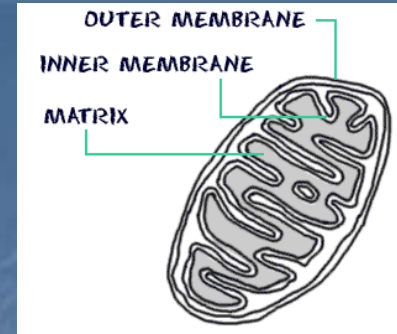
Function: Rough ER: has ribosomes attached; place where proteins are made

Smooth ER: no ribosomes attached; place where lipids are made

Found in both plant and animal cells



# Mitochondria

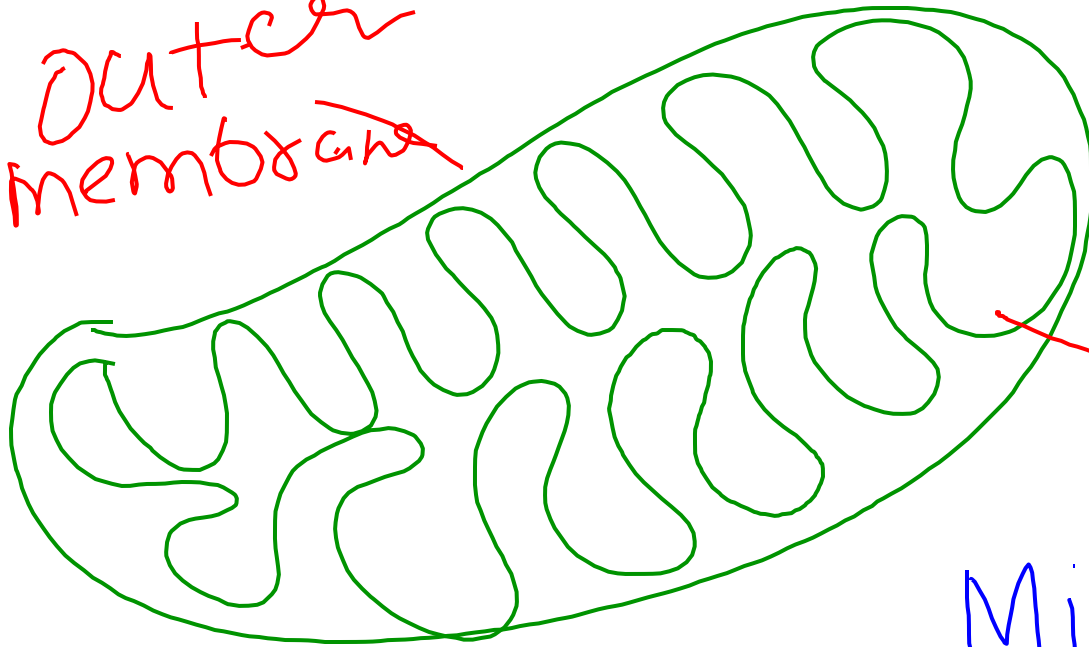


**Structure: Mitochondria** are shaped perfectly to maximize their productivity. They are made of two membranes. The outer membrane covers the organelle and contains it like a skin. The inner membrane folds over many times and creates layered **structures** called cristae.

**Function:** Powerhouse of the cell because it breaks down sugar and converts it into energy in the form of ATP.

Found in both plant and animal cells

outer  
membrane



inner  
membrane

Mitochondrion

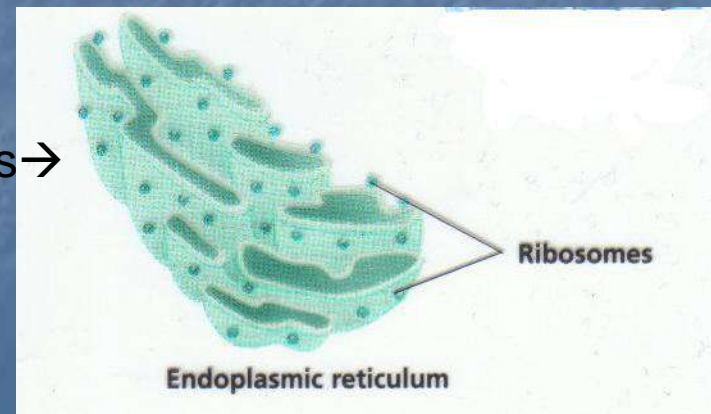
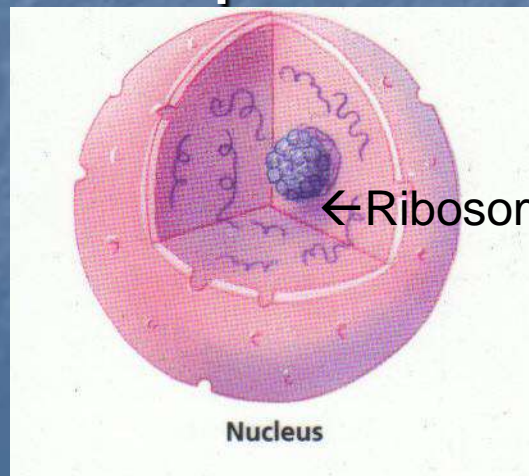


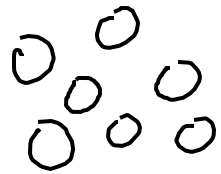
# Ribosomes

Structure: Found free floating in the cytoplasm or attached to the ER

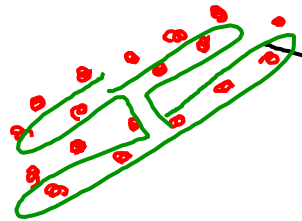
Function: makes proteins

Found in both plant and animal cells





(1) free  
floating



Ribosomes

(2) Attached  
to ER

Ribosomes

# Golgi apparatus/Golgi body

Structure: Looks like a flattened stack of pancakes

Function: sorts and packages the proteins and lipids made in the ER and sends them around the cell.

- The Golgi Apparatus is like the post office of the cell!
- Found in both plant and animal cells



— arranged as  
flattened stacks of  
pancakes

GOLGI APPARATUS



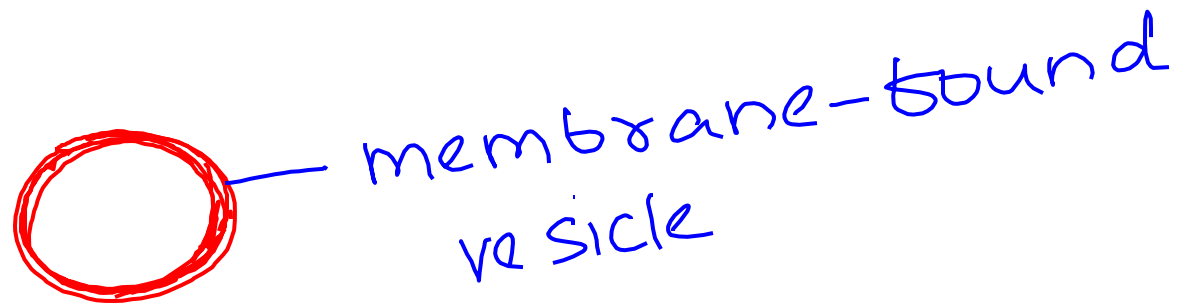
# Lysosomes



Structure: They are membrane bound vesicles

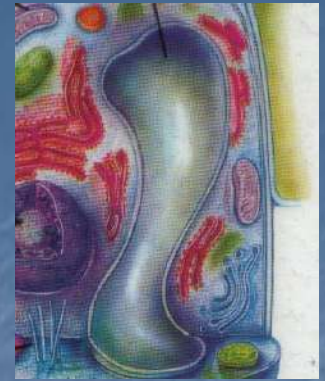
Function: contain digestive enzymes which break down waste. The lysosomes help digest things we no longer need in our cells so that the cell can get rid of these waste products.

Found only in Animal cells



LYSOSOME

# Vacuole

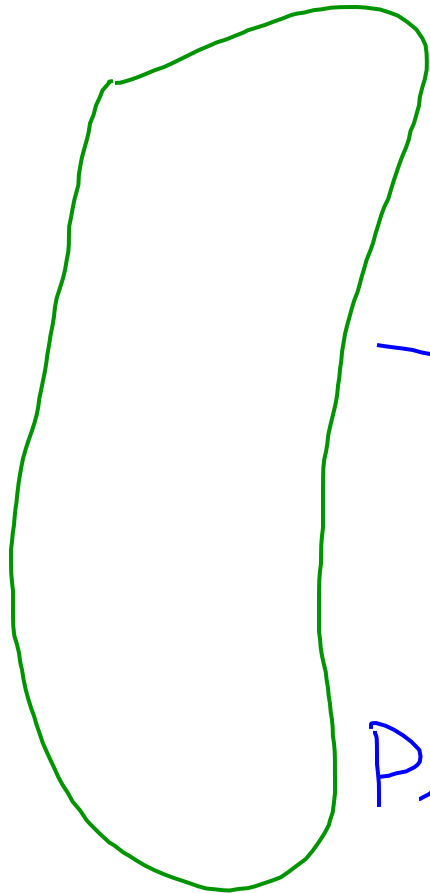


Structure: Membrane bound sacs

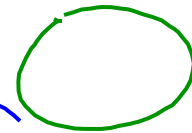
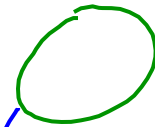
Function: Vacuole-stores food and water.

- Vacuoles in animal cells are very small
- Vacuole in plant cells is very large
- Found in both plant and animal cells

# Vacuole



membrane  
bound  
sacs



Plant  
cell  
(large)

Animal  
cell  
(Small)



# Chloroplast- Plant Organelle

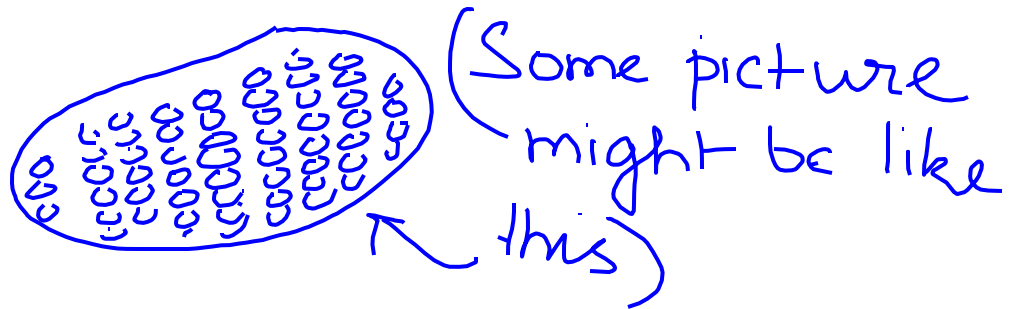
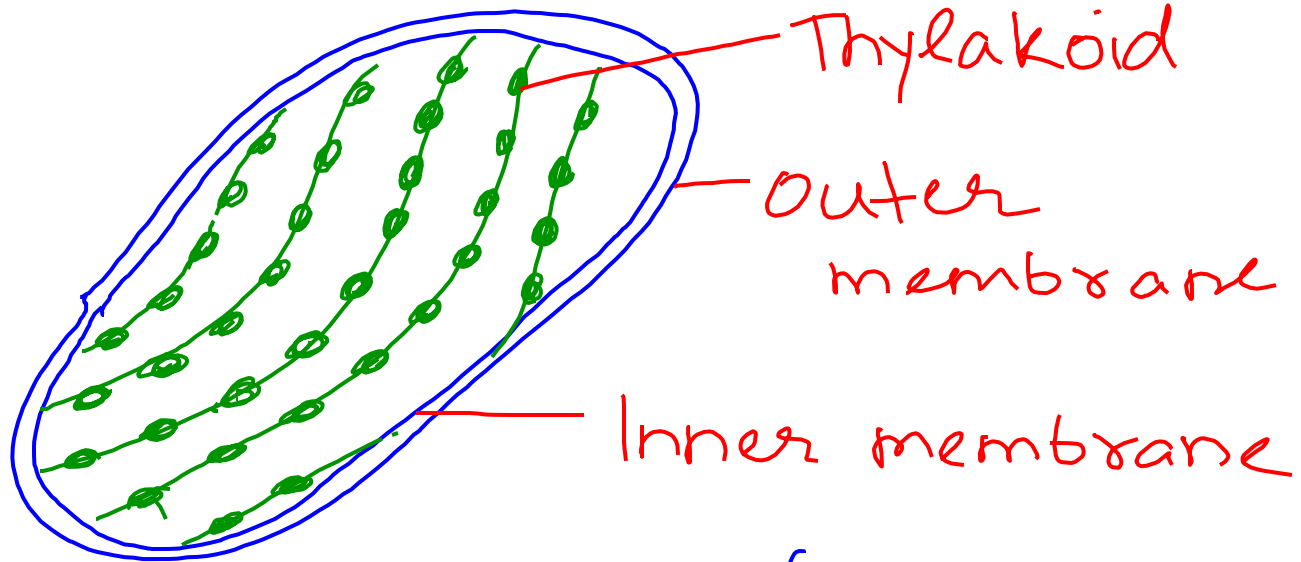
Structure: Composed of two membranes and thylakoids

Function: Chloroplast convert light energy into sugar.

Found only in plant cells



# Chloroplast



# Cell wall-Plant Organelles

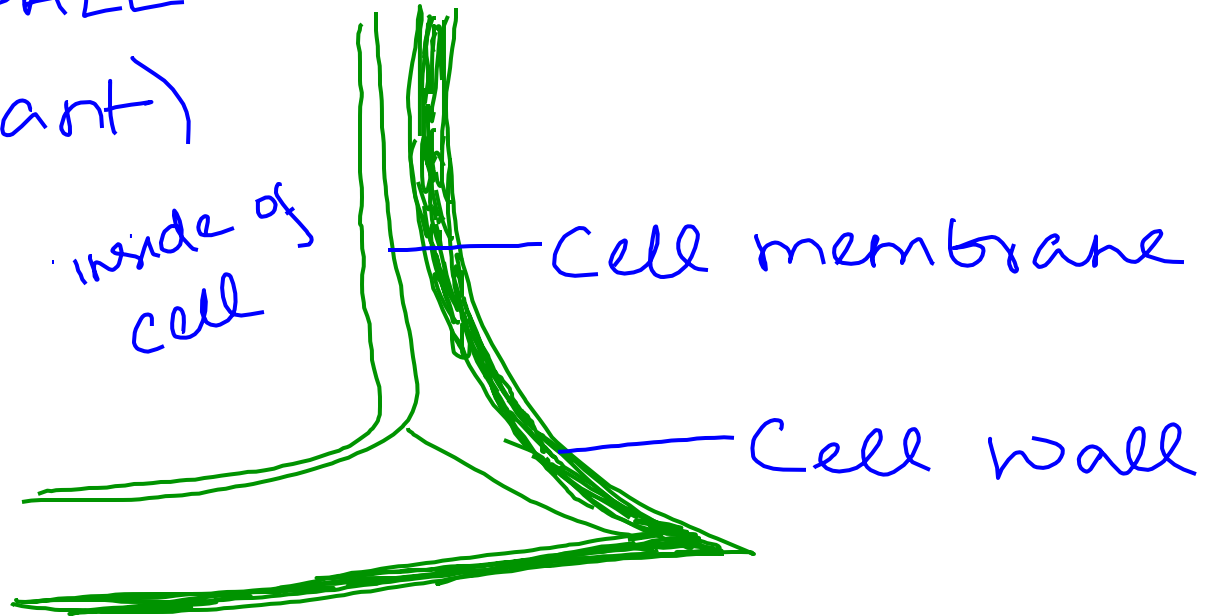
Structure: hard structure  
outside the cell membrane

Function: It protects and gives  
plant cells shape and rigidity.

Found only in plant cells



CELL WALL  
(only in plant)



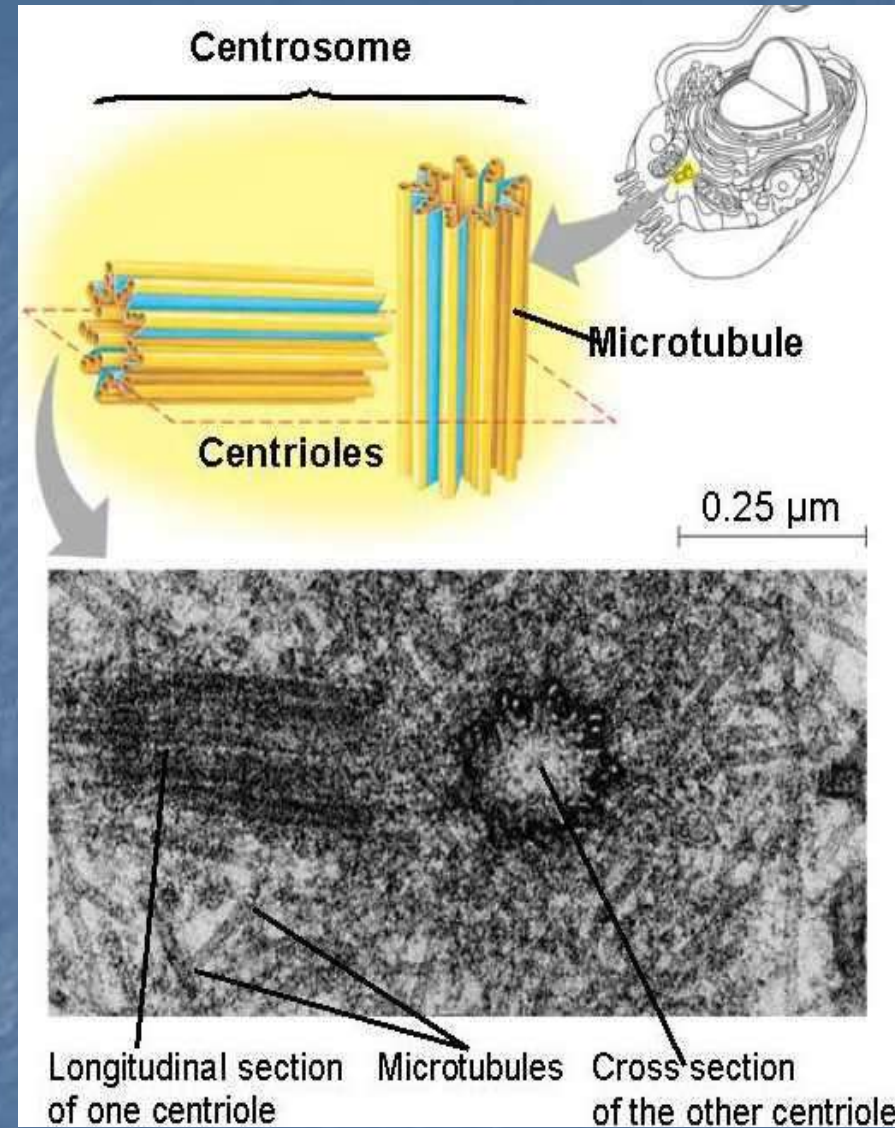


# CENTRIOLES

Structure: two hollow cylinders called centrioles

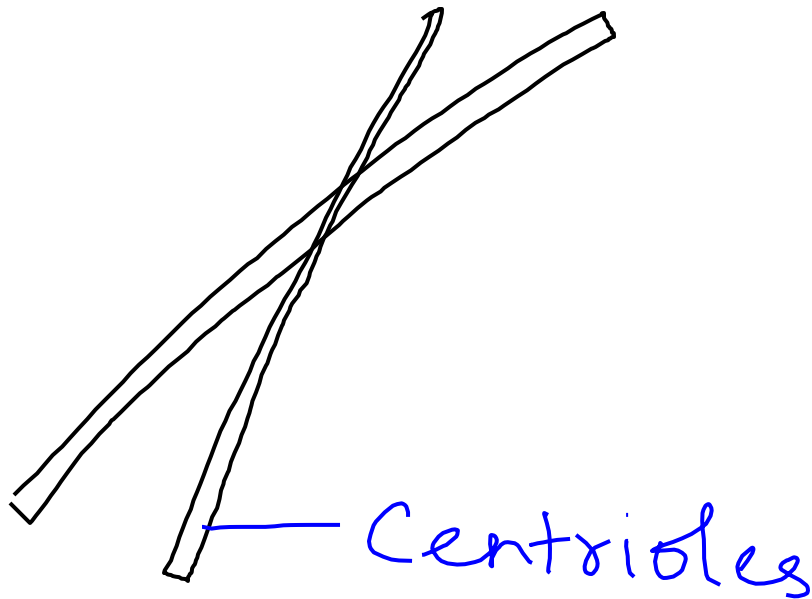
Function: This functions in cell reproduction by directing the separation of the DNA strands

Found only in animal cells



# CENTRIOLES

(only in  
animal)



# Plant vs. Animal Cells

- Plant and animal cells do not have exactly the same organelles. Some organelles are found only in plant cells or only in animal cells.

# V. Plant vs. Animal Cells

## ■ Plant Cells

- -have chloroplasts and cell walls
- -can make their own food through photosynthesis
- -have large vacuoles to store water

Both Plant & Animal Cells

-both have:

Plasma membranes

Mitochondria

Cytoplasm

Nucleus'

Nucleolus'

Golgi

E.R.

DNA

-both are living

## Animal Cells

-have centrioles used in cell division

-can't make their own food

*have lysosomes*

*have small vacuole*



# Summary

- Cell organelles have a specific function that helps the cell operate normally

# Exit assessment

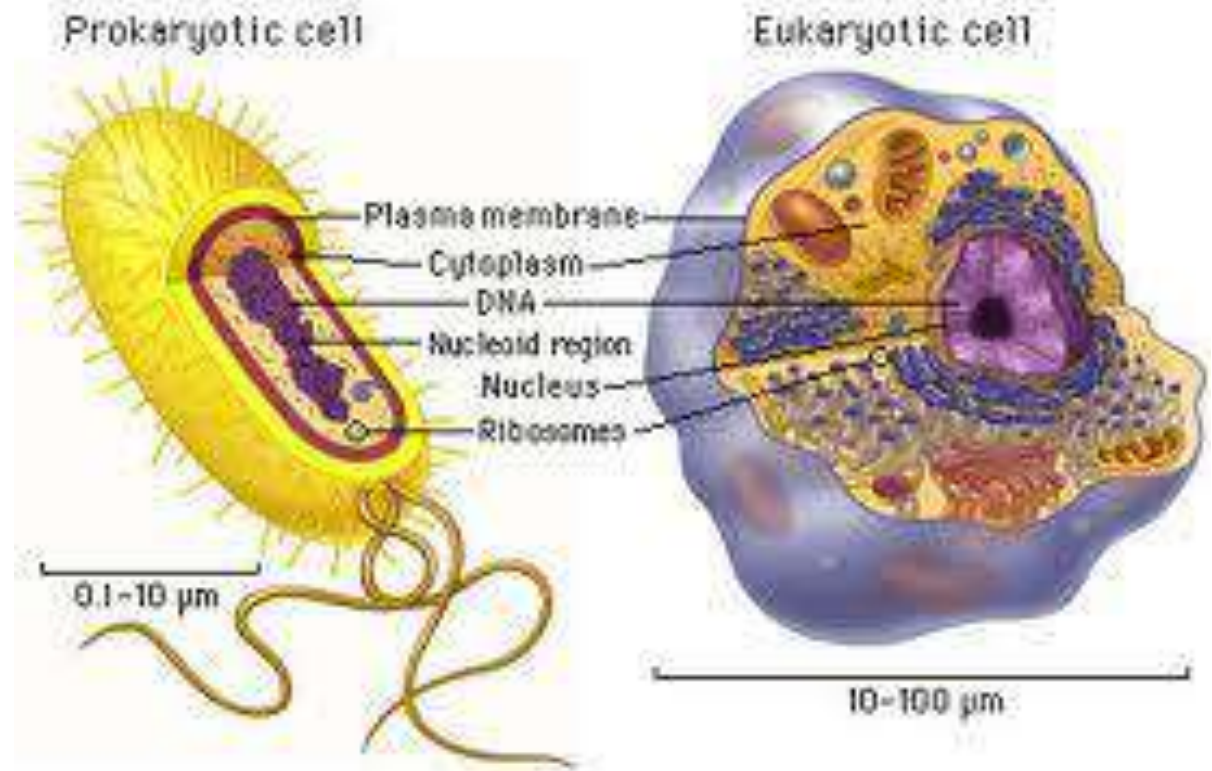
- Compare and contrast Prokaryotic and Eukaryotic cells.
- Compare and contrast plant and animal cells.

# Eukaryotic and Prokaryotic Cells

1. Cells come in two types

1a. Eukaryotic Cells

1b. Prokaryotic Cells

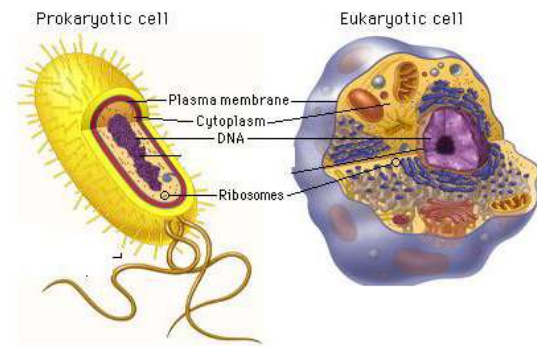


# Eukaryotic and Prokaryotic Cells

## 2. How are they similar?

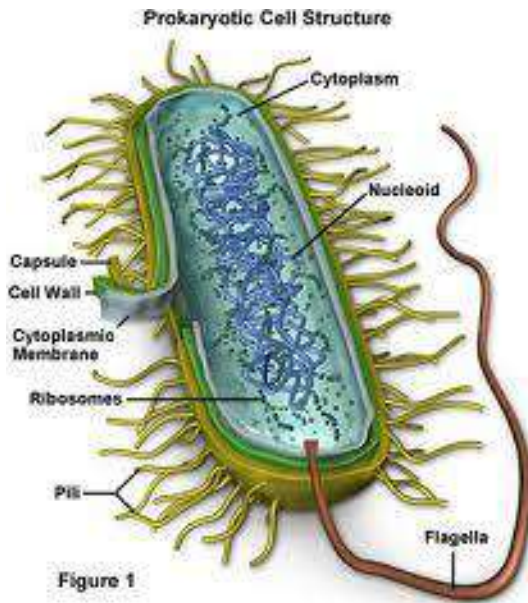
### 2a. They both have:

- Plasma Membranes / *cell membrane*
- Nucleic Acids (DNA)
- Ribosomes (organelles that make proteins.)
- Cytoplasm (a jellylike substance that makes up most of a cells inside)



# Eukaryotic and Prokaryotic Cells

## 3. Prokaryotic Cells



3a. Always a single celled organism  
(unicellular)

3b. Its DNA floats freely in the cell

3c. It has very few organelles

3d. Some have flagella (whip-like structure that helps the cell move)

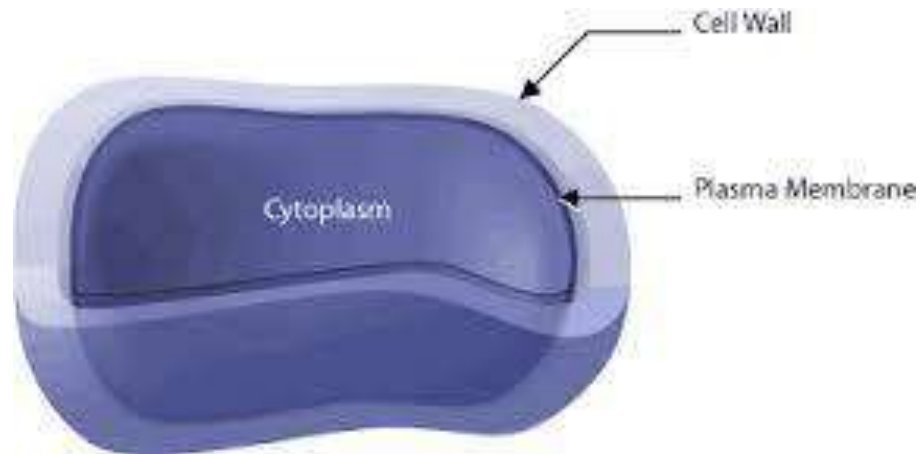
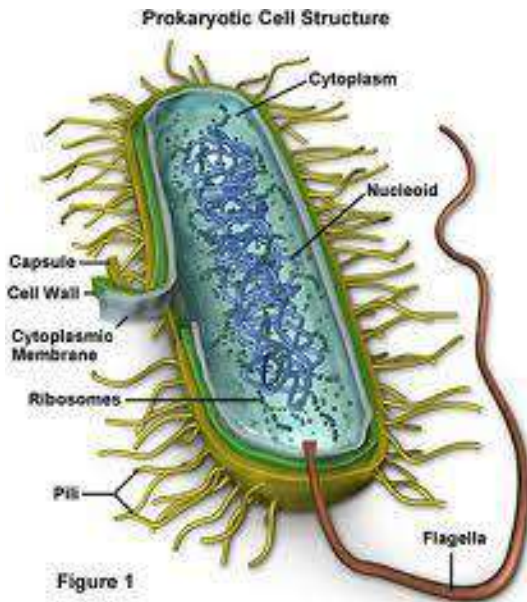


# Eukaryotic and Prokaryotic Cells

## 3. Prokaryotic Cells (continued...)

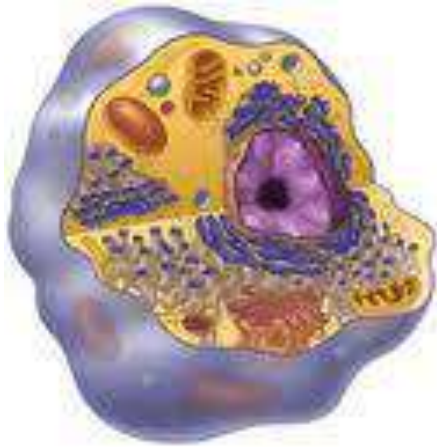
3e. All prokaryotes have a cell wall  
AND a cell membrane.

- The **cell wall** maintains the cells structure
- The **cell membrane** controls what enters and leaves the cell.



# Eukaryotic and Prokaryotic Cells

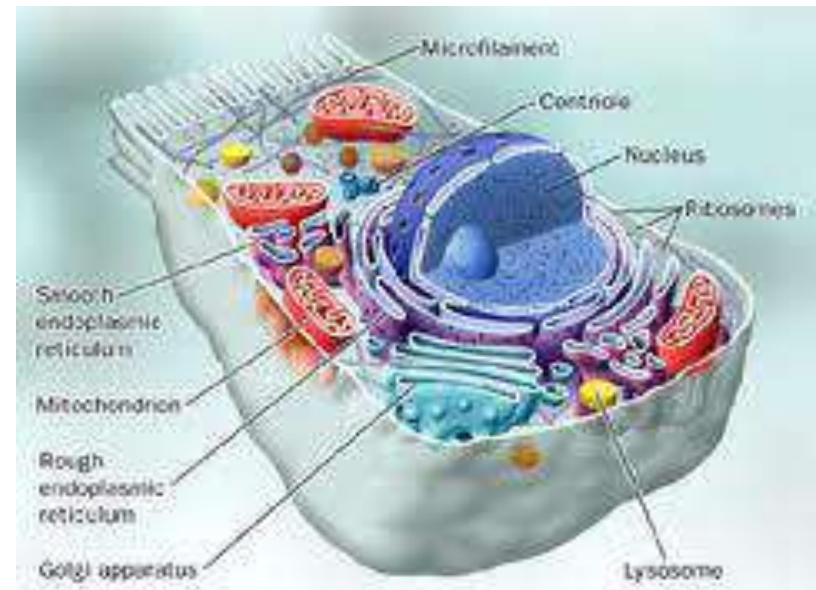
## 4. Eukaryotic Cells



4a. Can be a single celled organism or part of a multicellular organism.

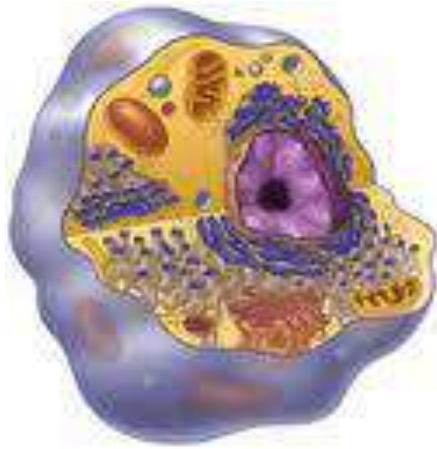
4b. DNA is located within the nucleus.

4c. Contains many different organelles.



# Eukaryotic and Prokaryotic Cells

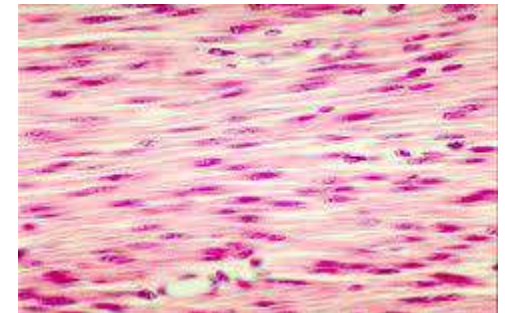
## 4. Eukaryotic Cells (continued...)



4d. Eukaryotic cells are much more specialized in function.

4e. A cell that is part of a multicellular organism are dedicated to doing one thing.

- Nerve cells transfer electrical impulses
- Muscle cells help muscles contract.





Name: \_\_\_\_\_

Organelle	Description	Function	Animal, Plant or Both
CELL WALL	Rigid, tough, made of cellulose	Protects and supports the cell	Plant
CELL MEMBRANE	Thin, covering, protects cells	Protects the cell, performs active transport and passive transport, moves materials in and out of the cell, communication	Both
CYTOPLASM	Jelly like substance that contains organelles	Pads and supports organelles inside the cell. Moves by cyclosis	Both
NUCLEUS	Dense, ball shaped structure, contains DNA	Controls all of the cell's activities	Both
NUCLEAR MEMBRANE	Thin covering over the nucleus	Covers and protects the nucleus	Both
NUCLEOLUS	Small dark area in the nucleus	Produces ribosome's	Both
CHROMATIN	In the nucleus, made of DNA and protein, contains genes	Provides instructions for the cells activities, (growth, reproduction)	Both
ENDOPLASMIC RETICULUM	Clear, tubular system of tunnels throughout the cell	Transports materials like proteins around the cell	Both
RIBOSOME	Small specks made of RNA. Found in cytoplasm or on the endoplasmic reticulum	Makes proteins	Both
MITOCHONDRIA	Location in the cytoplasm, bean shaped	Supplies energy or ATP for the cell through cell respiration using glucose and	Both



		oxygen	
VACUOLE	Large open storage area, smaller in animal cells	Storage tank for food, water, wastes or enzymes	Both
CHLOROPLAST	Green structures that contain chlorophyll	Captures sunlight and uses it to produce food through photosynthesis	Plant
GOLGI BODY	Small bags with tubes connecting them	Packages and secretes proteins for use in and out of the cell	Both
LYOSOME	Small, round structures, containing enzymes	Digests older cell parts, food or other objects	Both
CENTRIOLE	Small cylindrical	Used with the spindle apparatus during mitosis	Animal

Complete the following table by writing the name of the cell part or organelle in the right hand column that matches the structure/function in the left hand column. A cell part may be used more than once.

Structure/Function	Cell Part
Stores material within the cell	
Closely stacked, flattened sacs (plants only)	
The sites of protein synthesis	
Transports materials within the cell	
The region inside the cell except for the nucleus	
Organelle that manages or controls all the cell functions in a eukaryotic cell	
Contains chlorophyll, a green pigment that traps energy from sunlight and gives plants their green color	
Digests excess or worn-out cell parts, food particles and invading viruses or bacteria	
Small bumps located on portions of the endoplasmic reticulum	
Provides temporary storage of food, enzymes and waste products	
Firm, protective structure that gives the cell its shape in plants, fungi, most bacteria and some protists	
Produces a usable form of energy for the cell	
Packages proteins for transport out of the cell	
Everything inside the cell including the nucleus	
Site where ribosomes are made	
The membrane surrounding the cell	
Provides support for the cell, has two “subparts”	

Name for the collection of DNA in the nucleus of eukaryotic cells	
Consist of hollow tubes which provide support for the cell	
Small hair-like structures used for movement or sensing things	
Composed of a phospholipid bilayer	
Longer whip-like structures used for movement	

Put a check in the appropriate column(s) to indicate whether the following organelles are found in plant cells, animal cells or both.

Organelle	Plant Cells	Animal Cells
Cell Wall		
Vesicle		
Chloroplast		
Chromatin		
Cytoplasm		
Cytoskeleton		
Endoplasmic reticulum		
Golgi apparatus		
Lysosome		

Organelle	Plant Cells	Animal Cells
Mitochondria		
Nucleolus		
Nucleus		
Plasma membrane		
Central vacuole		
Ribosome		
Vacuole		

## Cell City Analogy

In a far away city called Grant City, the main export and production product is the steel widget. Everyone in the town has something to do with steel widget making and the entire town is designed to build and export widgets. The town hall has the instructions for widget making, widgets come in all shapes and sizes and any citizen of Grant can get the instructions and begin making their own widgets. Widgets are generally produced in small shops around the city, these small shops can be built by the carpenter's union (whose headquarters are in town hall).

After the widget is constructed, they are placed on special carts which can deliver the widget anywhere in the city. In order for a widget to be exported, the carts take the widget to the postal office, where the widgets are packaged and labeled for export. Sometimes widgets don't turn out right, and the "rejects" are sent to the scrap yard where they are broken down for parts or destroyed altogether. The town powers the widget shops and carts from a hydraulic dam that is in the city. The entire city is enclosed by a large wooden fence, only the postal trucks (and citizens with proper passports) are allowed outside the city.

Match the parts of the city (underlined) with the parts of the cell.

1. Mitochondria \_\_\_\_\_
2. Ribosomes \_\_\_\_\_
3. Nucleus \_\_\_\_\_
4. Endoplasmic Reticulum \_\_\_\_\_
5. Golgi Apparatus \_\_\_\_\_
6. Protein \_\_\_\_\_
7. Cell Membrane \_\_\_\_\_
8. Lysosomes \_\_\_\_\_
9. Nucleolus \_\_\_\_\_

**\*\* Create your own analogy below of the cell using a different model. Some ideas might be: a school, a house, a factory, or anything you can imagine\*\***



ANSWER THE FOLLOWING QUESTIONS:

In what organelle does cellular respiration take place?

Name two storage organelles?

What is the list of organelles that take part in protein synthesis?

How is the nucleus involved in protein synthesis?

What organelle is considered a “factory”, because it takes in raw materials and converts them to cell products that can be used by the cell?

How does the membrane of the cell differ from the nuclear membrane? What advantages does this difference have for the nucleus?

What do ribosomes do? Are they found freely floating in the cytoplasm? OR are they found attached to another organelle? OR both. Explain why this occurs.

What does the endoplasmic reticulum do?

What is the difference between rough ER and smooth ER? What is the ER doing that is different in each case?

What are lysosomes? What types of molecules would be found inside a lysosome?

Why might a lysosome fuse with or link up with a food vacuole?

In what organelle do molecules move from the ER to the Golgi bodies?

What is a centriole? In what type of cell (plant or animal) is it found? What does it do for the cell?

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Part of the Cell	What is the function of this part of the cell?	What is the structure of this part of the cell like?	Which types of cells have this part? Plant Cell/Animal Cell	DRAW a quick sketch of this part of the cell. Label the parts of your drawing.
Cell Membrane				
Nucleus				
Cytoplasm				

Cytoskeleton				
Endoplasmic Reticulum				
Mitochondria				

Part of the Cell	What is the function of this part of the cell?	What is the structure of this part of the cell like?	Which types of cells have this part?	DRAW a quick sketch of this part of the cell.Label the parts of your drawing.
Golgi Apparatus				
Lysosome				
Vacuole				



Chloroplast				
Cell Wall				
Centriole				

