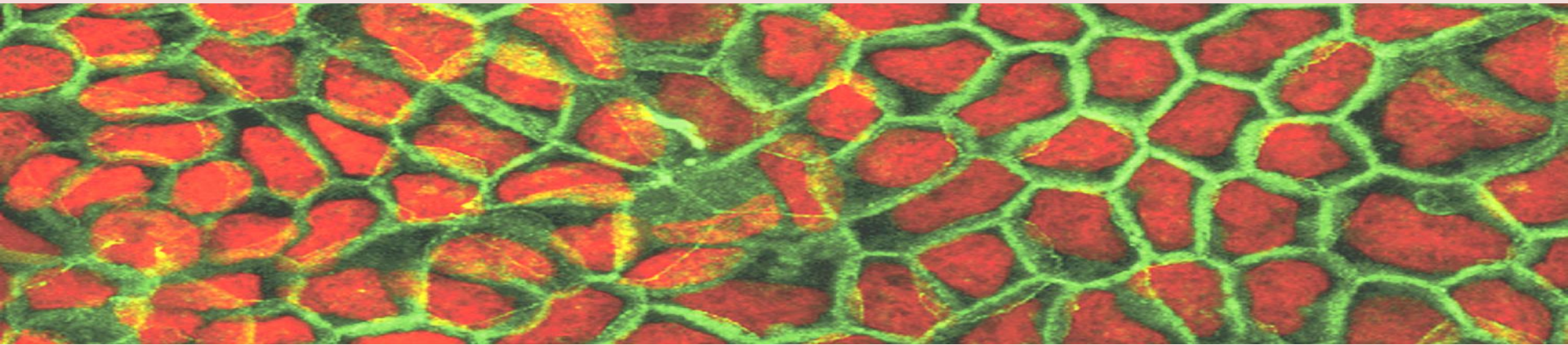


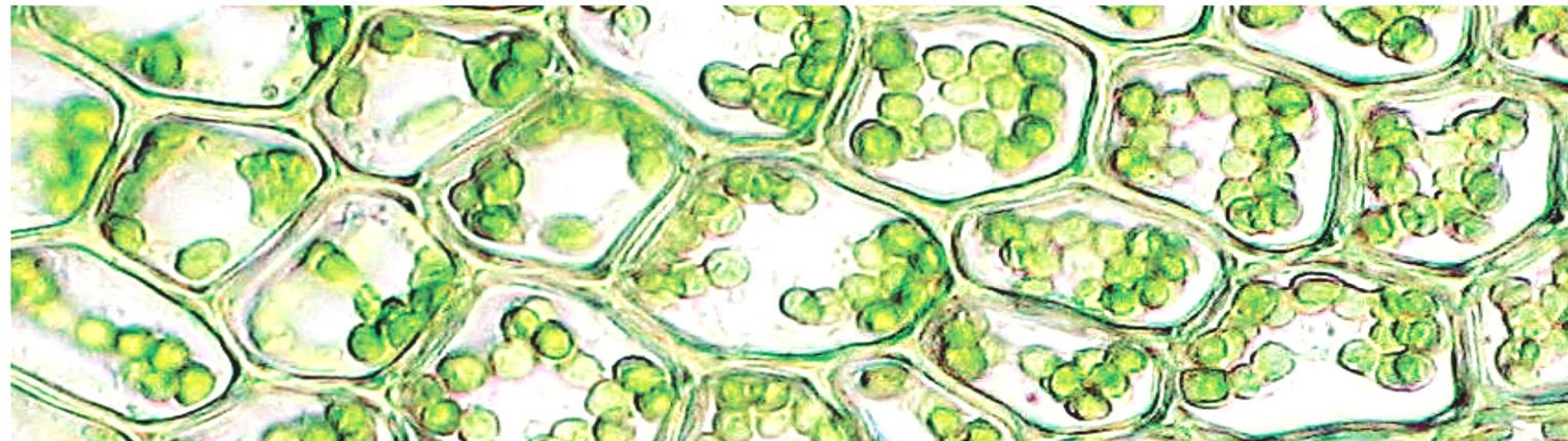
# CELL, ORGANELLS AND ITS FUNCTION



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# What is Cell?

- Cell is a structural and functional unit of Living Organism.

## Who Discovered Cell ?

**Robert Hooke** (about 1670) - first to use term in a biological sense. Used it to describe the small, organized compartments he observed in dead cork tissue

**Cell Theory** : According to Schleiden and Schwann (1832). All living organisms are made by small units called cells.



**Robert Hooke's Microscope**

human eye (no microscope)

largest organisms

small animals

frog eggs



100 m

10 m

1 m

10 cm

1 cm

1 mm

100  $\mu$ m

# TYPES OF CELLS

There are two types of cells

1. Prokaryotic cells (Bacteria and Viruses)
2. Eukaryotic cells (Plants and Animals)

## PROKARYOTIC CELLS

"Simple" organisms, including bacteria and blue-green algae

Lack a nucleus and other membrane-encased organelles

Usually exist as single, virtually identical cells

Most are 1–10 micrometers across

## EUKARYOTIC CELLS

The cells of "complex" organisms, including all plants and animals

Contain a nucleus and many other organelles, each surrounded by a membrane (the nucleus and mitochondrion have two membranes)

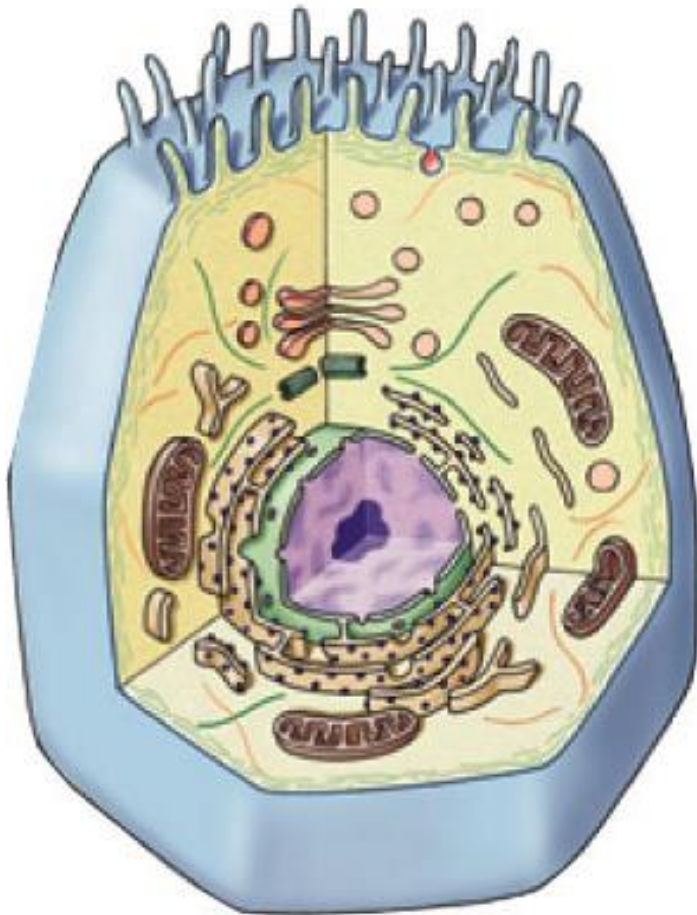
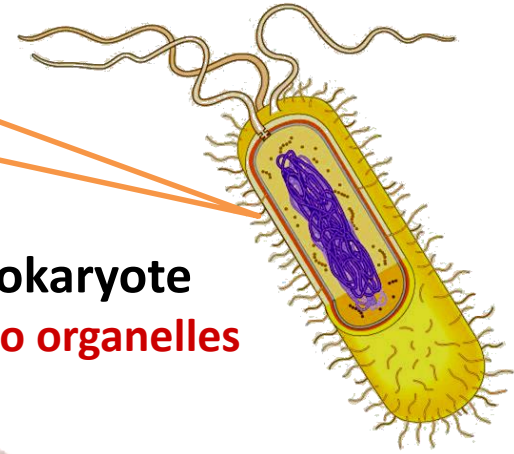
Can specialize for certain functions, such as absorbing nutrients from food or transmitting nerve impulses; groups of cells can form large, multicellular organs and organisms

Most animal cells are 10–30 micrometers across, and most plant cells are 10–100 micrometers across

# Types of cells

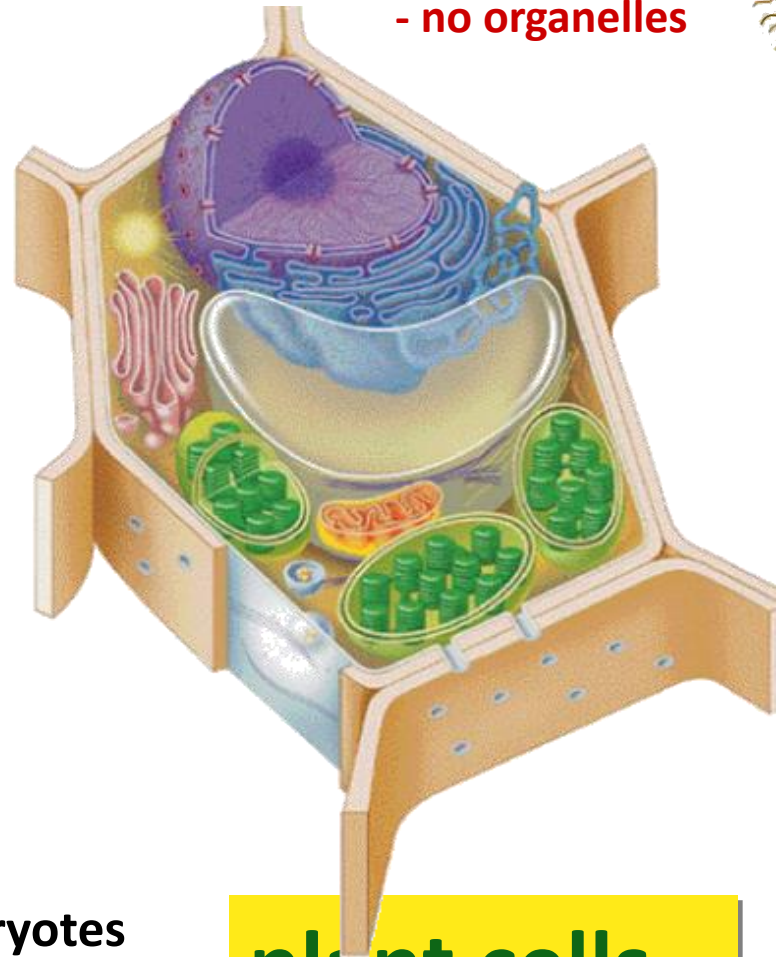
**Bacteria  
cells**

**Prokaryote**  
**- no organelles**



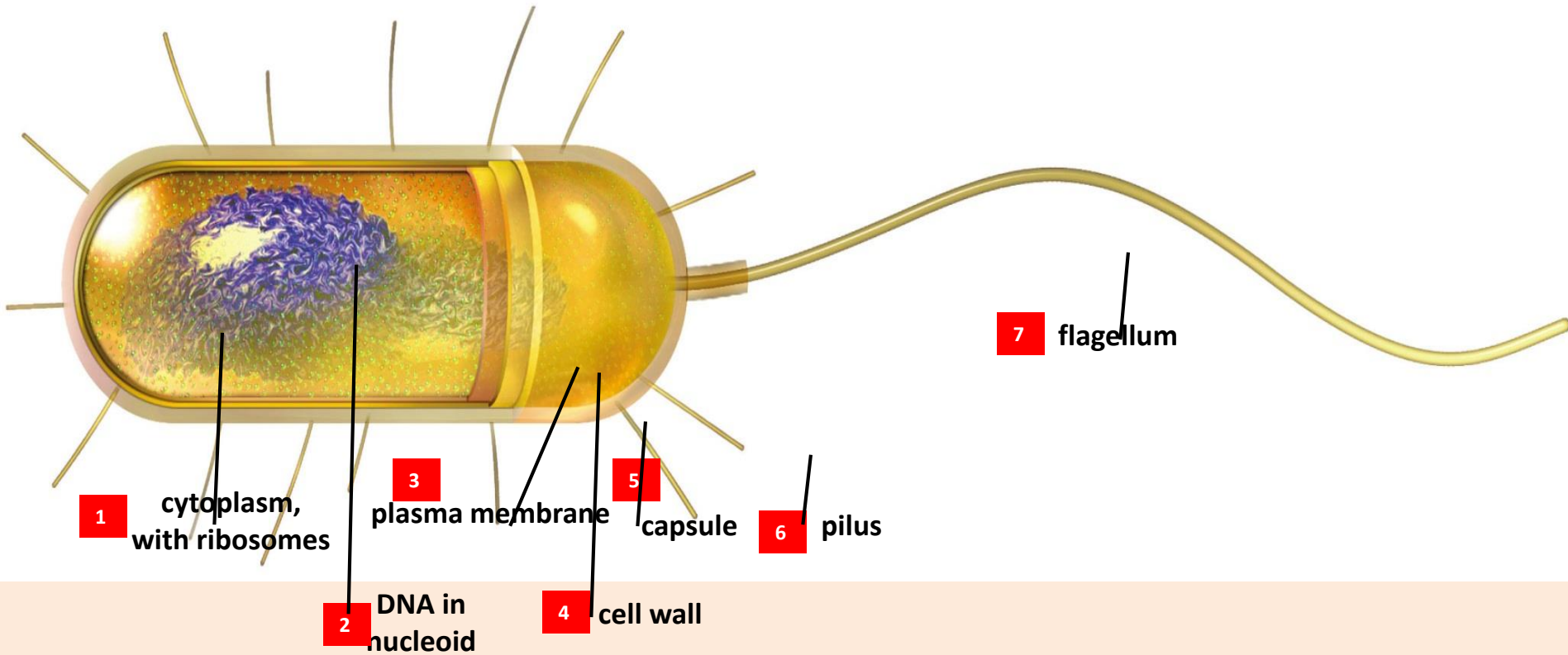
**animal cells**

**Eukaryotes**  
**- organelles**



**plant cells**

# General Prokaryote Cell



# Components of Eukaryotic Cells

**Table 4.2 Components of Eukaryotic Cells**

<b>Name</b>	<b>Main Function</b>
<b>Organelles with membranes</b>	
Nucleus	Protecting, controlling access to DNA
Endoplasmic reticulum (ER)	Routing, modifying new polypeptide chains; synthesizing lipids
Golgi body	Modifying new polypeptide chains; sorting, shipping proteins and lipids
Vesicles	Transporting, storing, or digesting substances in a cell
Mitochondrion	Making ATP by glucose breakdown
Chloroplast	Photosynthesis in plants, some protists

# Components of Eukaryotic Cells

Lysosome                      Intracellular digestion

Peroxisome                    Inactivating toxins

Vacuole                        Storage

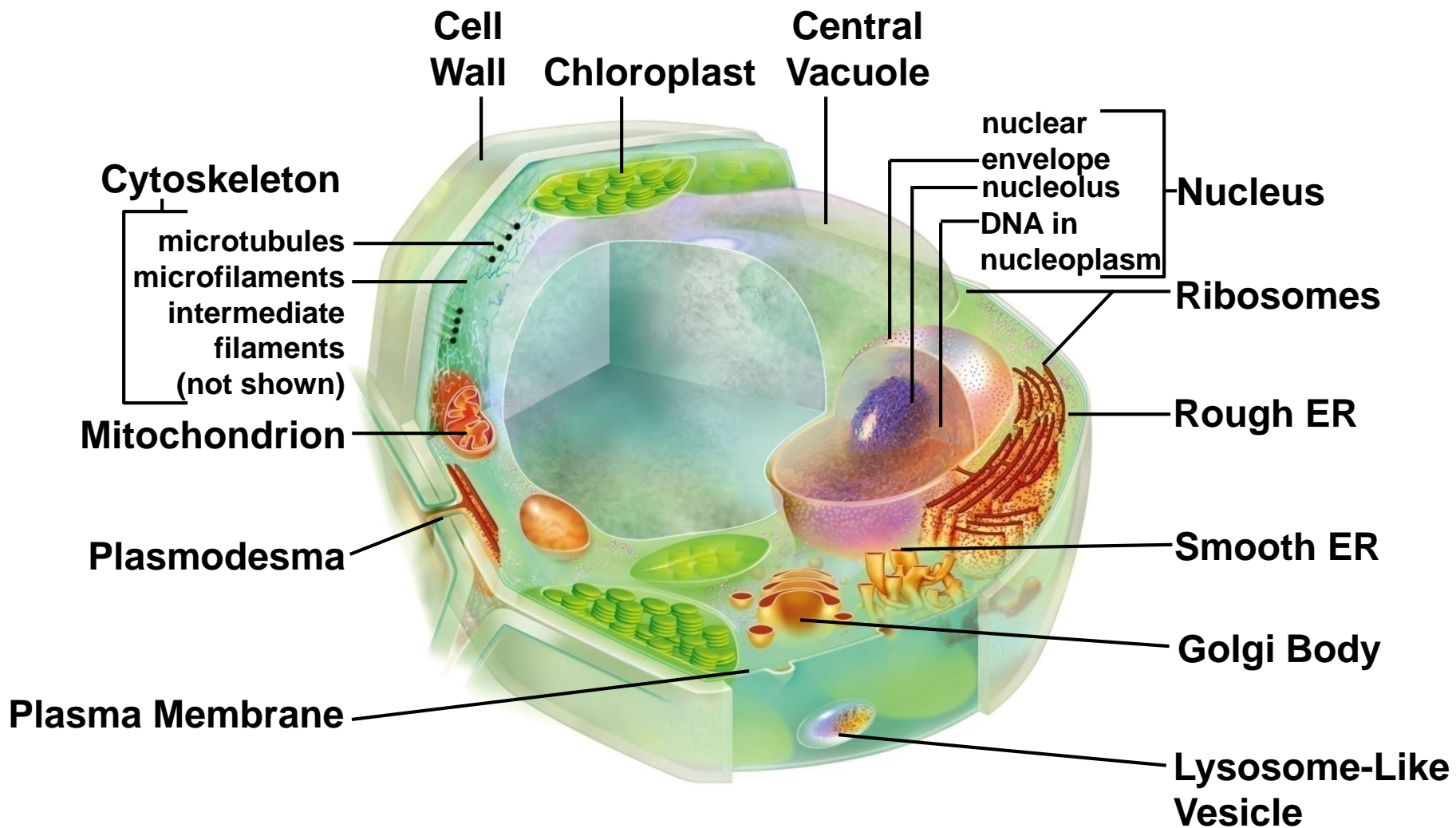
## **Organelles without membranes**

Ribosomes                      Assembling polypeptide chains

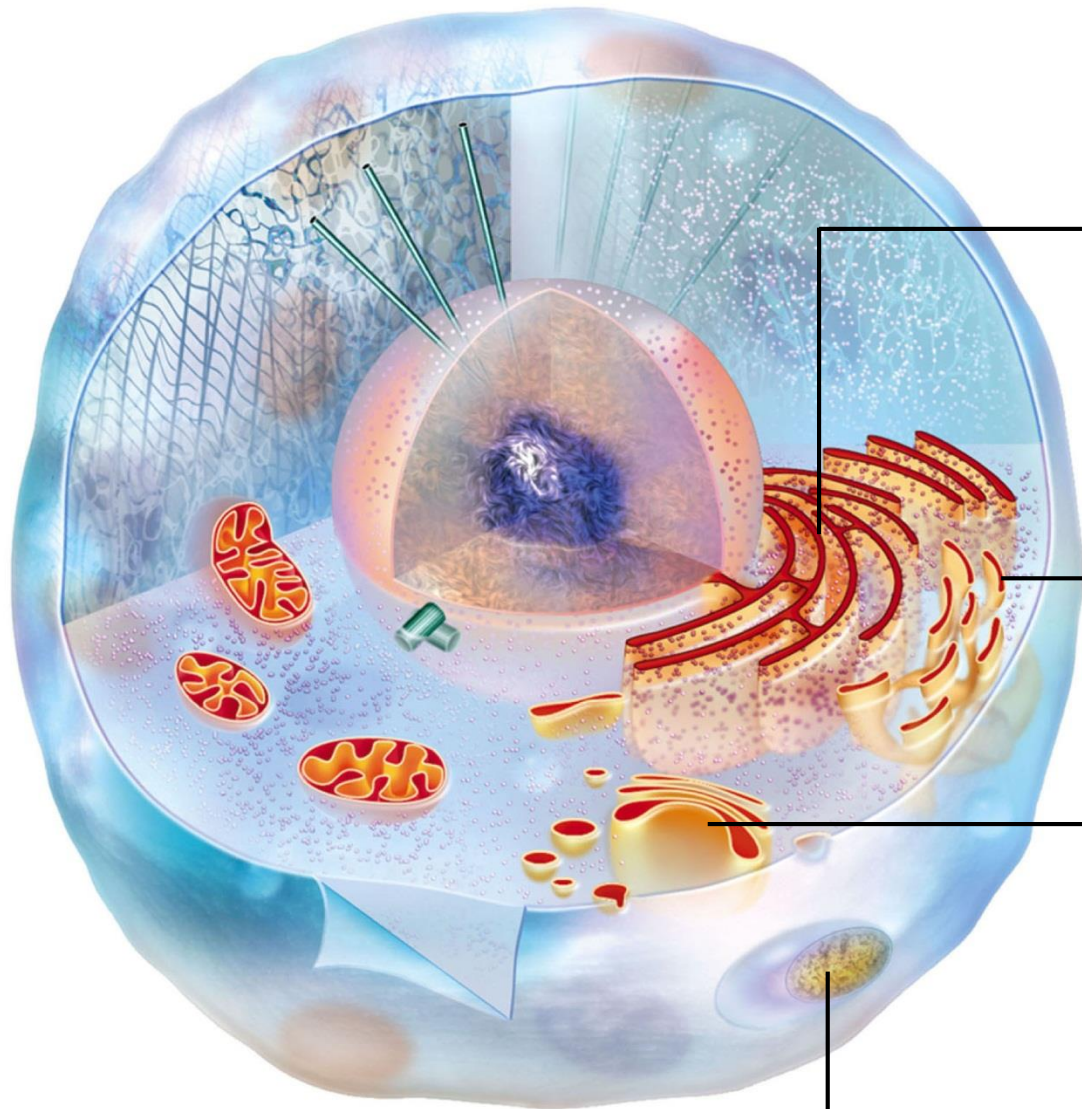
Centriole                      Anchor for cytoskeleton

## **Other components**

Cytoskeleton                    Contributes to cell shape, internal organization, movement



**TYPICAL PLANT CELL**



**Rough ER**

**Modifies proteins made by ribosomes attached to it**

**Smooth ER**

**Makes lipids, breaks down carbohydrates and fats, inactivates toxins**

**Golgi Body**

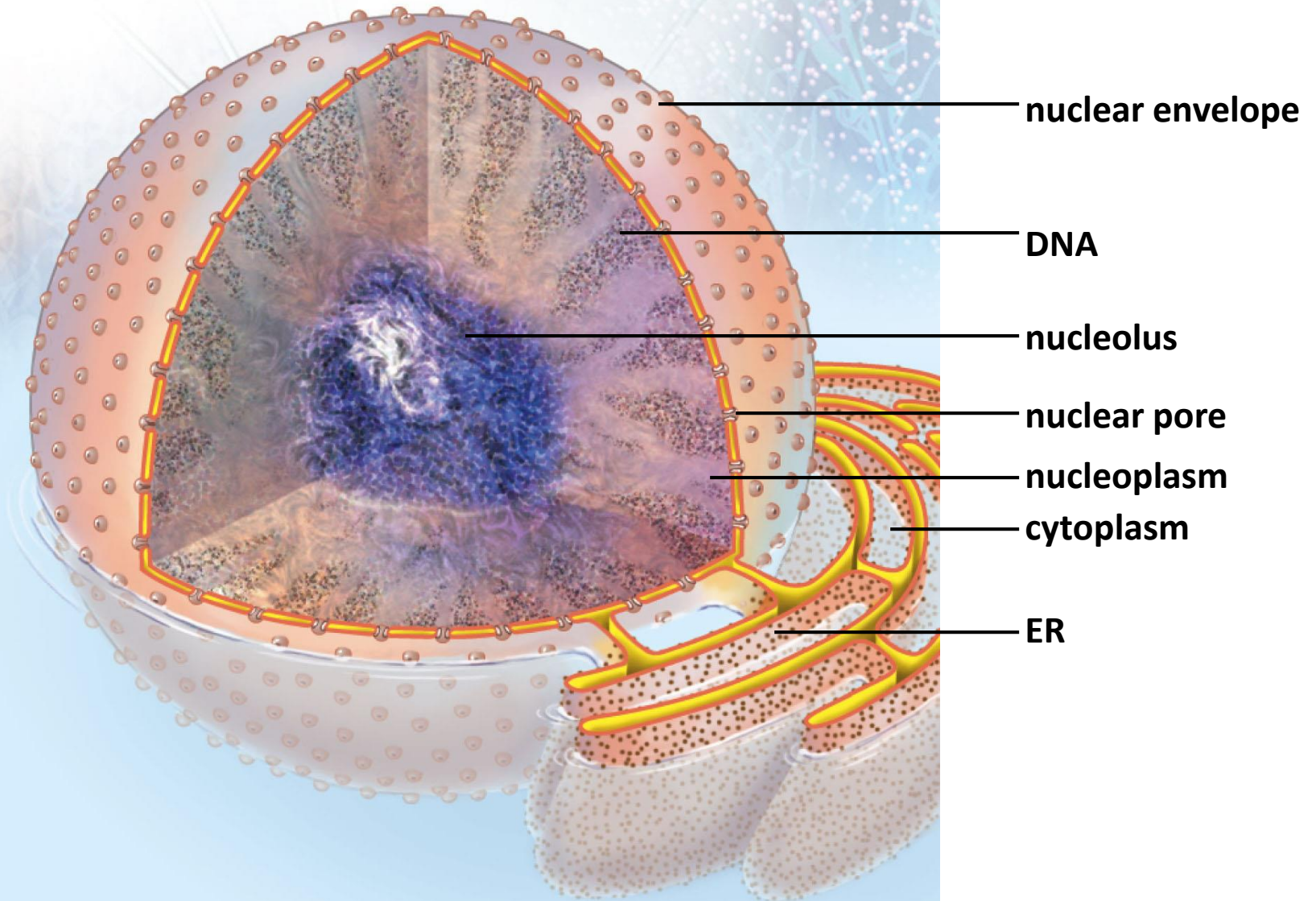
**Finishes, sorts, ships lipids, enzymes, and proteins**

**Lysosome**

**Digests, recycles materials**

**TYPICAL ANIMAL CELL**

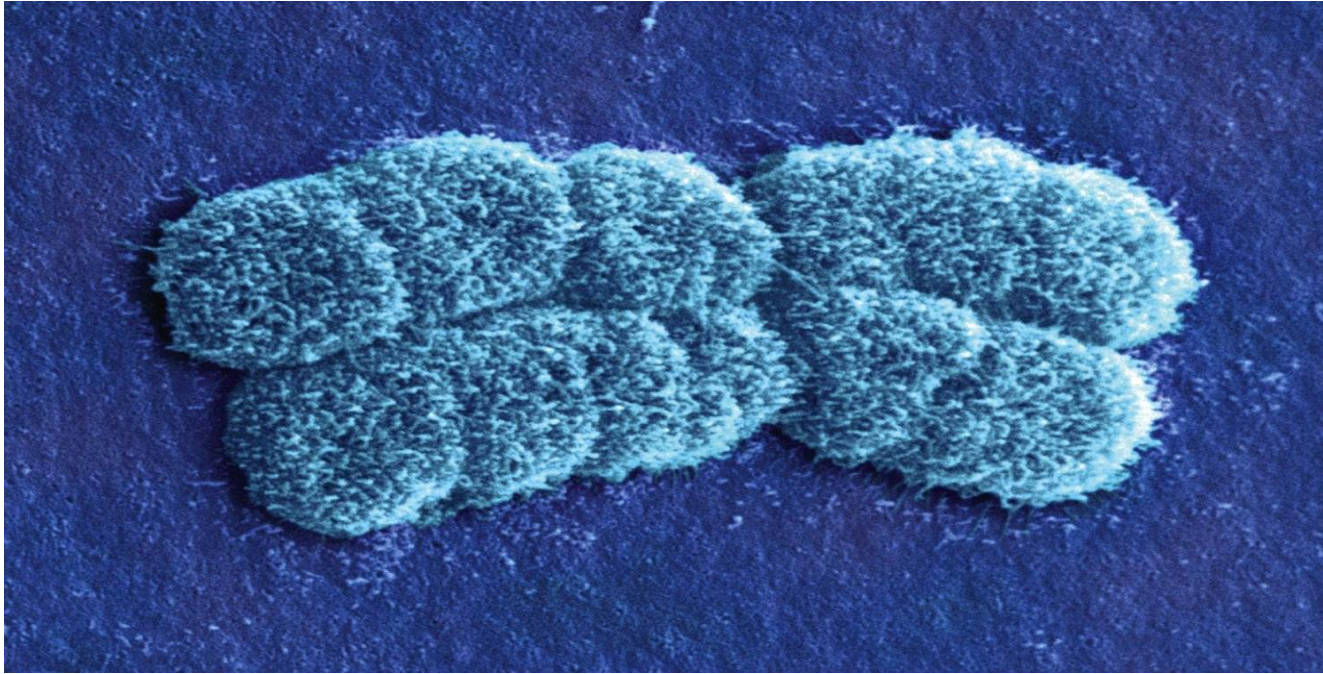
# THE NUCLEUS



# The Nucleus

- The nuclear envelope is a double lipid bilayer.
- A nucleus protects and controls access to a eukaryotic cell's DNA
- Proteins embedded in it control the passage of molecules between the nucleus and the cytoplasm
- All of a eukaryotic cell's DNA is in its nucleus
- The nucleus keeps eukaryotic DNA away from potentially damaging reactions in the cytoplasm
- The nuclear envelope controls when DNA is accessed

# Chromosome



Chromosomes are the coloured component of the nucleus and it is the condensed coiling of DNA.

## **Chromatin**

All DNA and its associated proteins in the nucleus

## **Chromosome**

A single DNA molecule with its attached proteins During cell division, chromosomes condense and become visible in micrographs. Human body cells have 46 chromosomes.

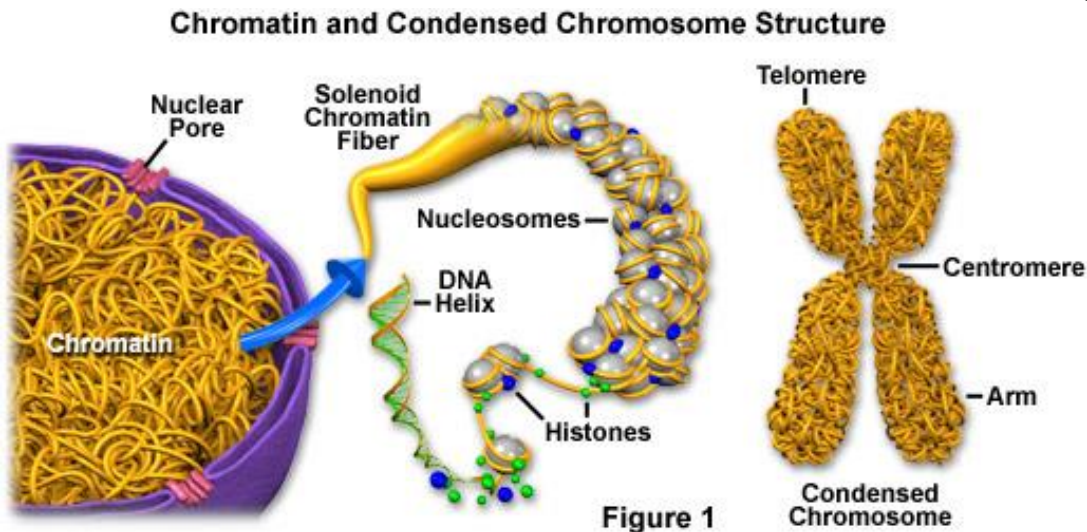
# DNA as Chromatin

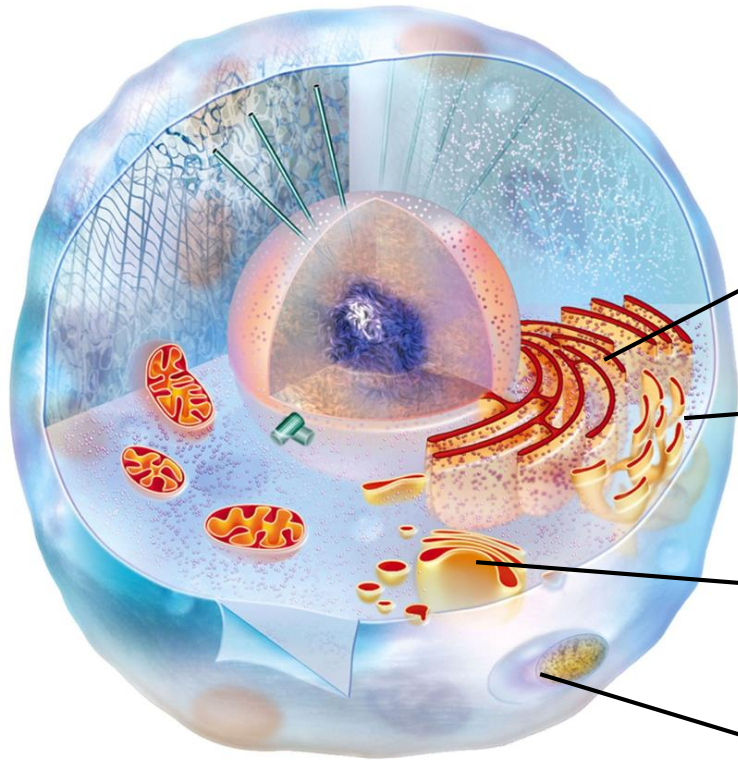
## *Structure*

- A fine strand of DNA coiled around proteins

## *Function*

- Contains all the information for making proteins
- Is the inherited information that is given to the offspring during reproduction



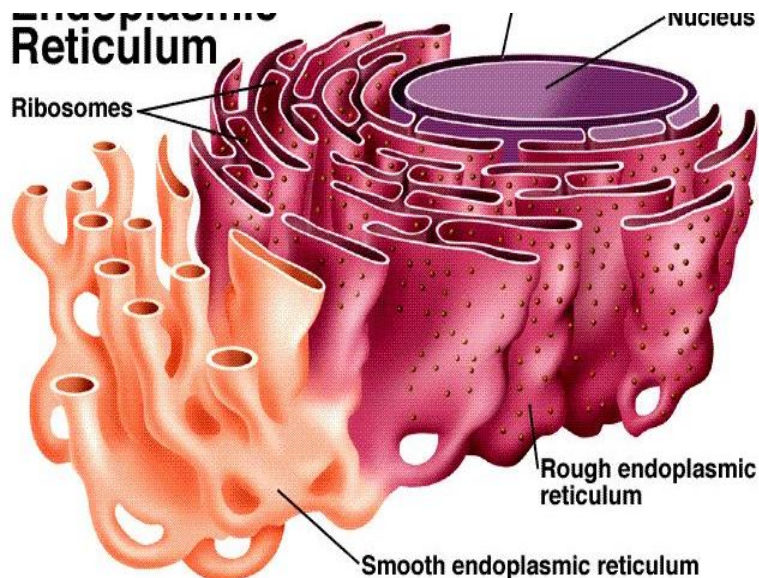


**Rough ER**  
Modifies proteins made by  
ribosomes attached to it

**Smooth ER**  
Makes lipids, breaks down  
carbohydrates and fats,  
inactivates toxins

**Golgi Body**  
Finishes, sorts, ships lipids,  
enzymes, and proteins

**Lysosome**  
Digests, recycles materials



# The Endoplasmic Reticulum

- **Endoplasmic reticulum (ER)**
  - An extension of the nuclear envelope that forms a continuous, folded compartment
- **Two kinds of endoplasmic reticulum**
  - Rough ER (with ribosomes) folds polypeptides into their tertiary form
  - Smooth ER (no ribosomes) makes lipids, breaks down carbohydrates and lipids, detoxifies poisons

# Ribosomes

- Function

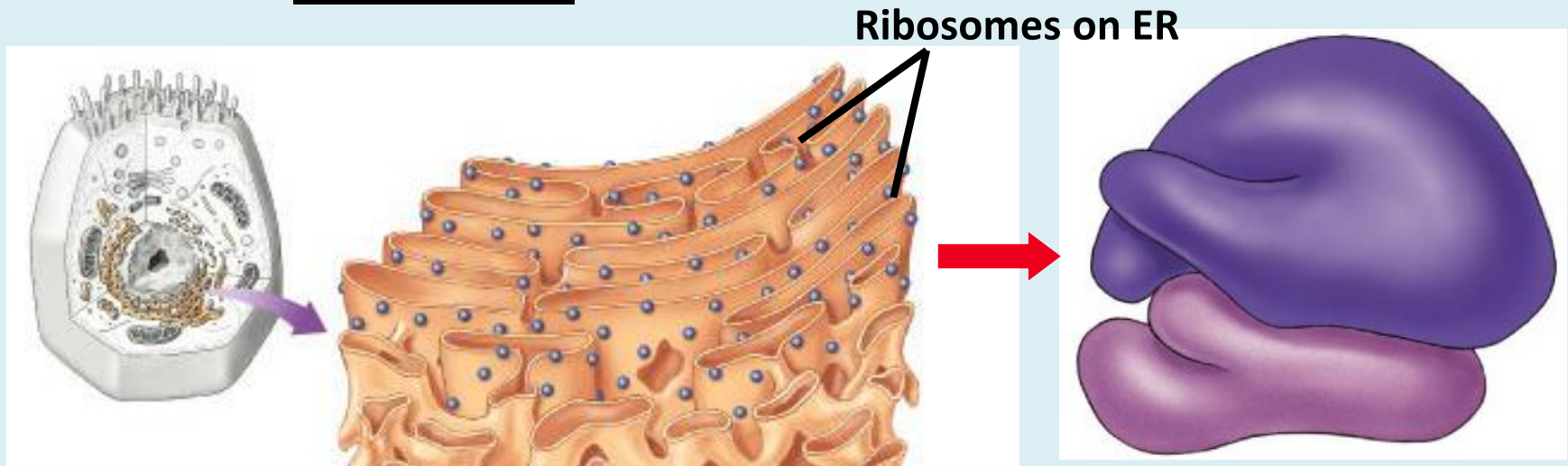
- protein factories

- read instructions to build proteins from DNA

- Structure

- some free in cytoplasm

- some attached to ER



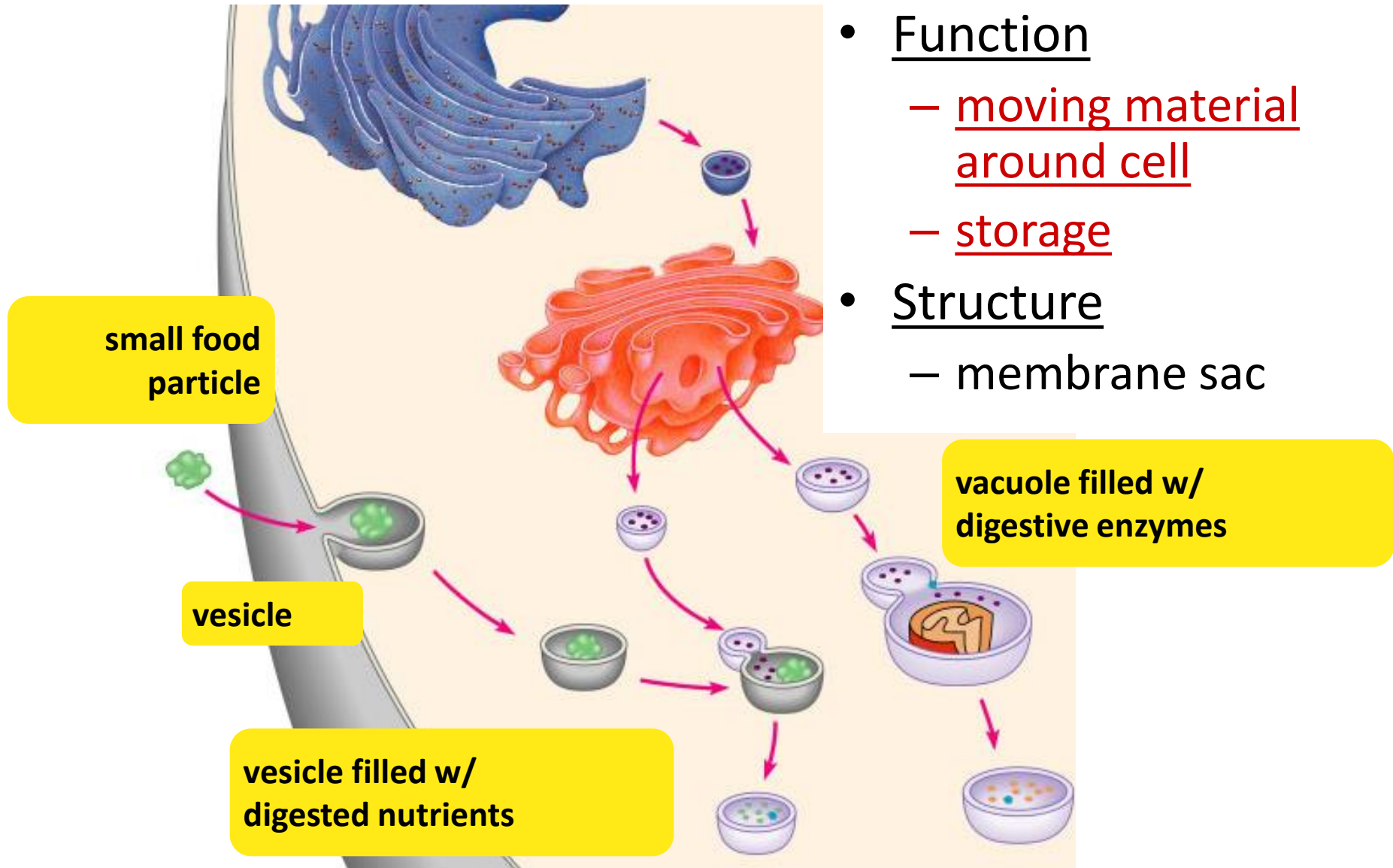
# Vesicles

- **Vesicles**
  - Small, membrane-enclosed saclike organelles that store or transport substances
- **Peroxisomes**
  - Vesicles containing enzymes that break down hydrogen peroxide, alcohol, and other toxins
- **Lysosomes**
  - Vesicles containing enzymes that fuse with vacuoles and digest waste materials

# Vacuoles

- **Vacuoles**
  - Vesicles with various functions depending on cell type
  - Many isolate or dispose of waste, debris, and toxins
- **Central vacuole**
  - Occupies 50 to 90 percent of a cell's interior
  - Stores amino acids, sugars, ions, wastes, toxins
  - Fluid pressure keeps plant cells firm

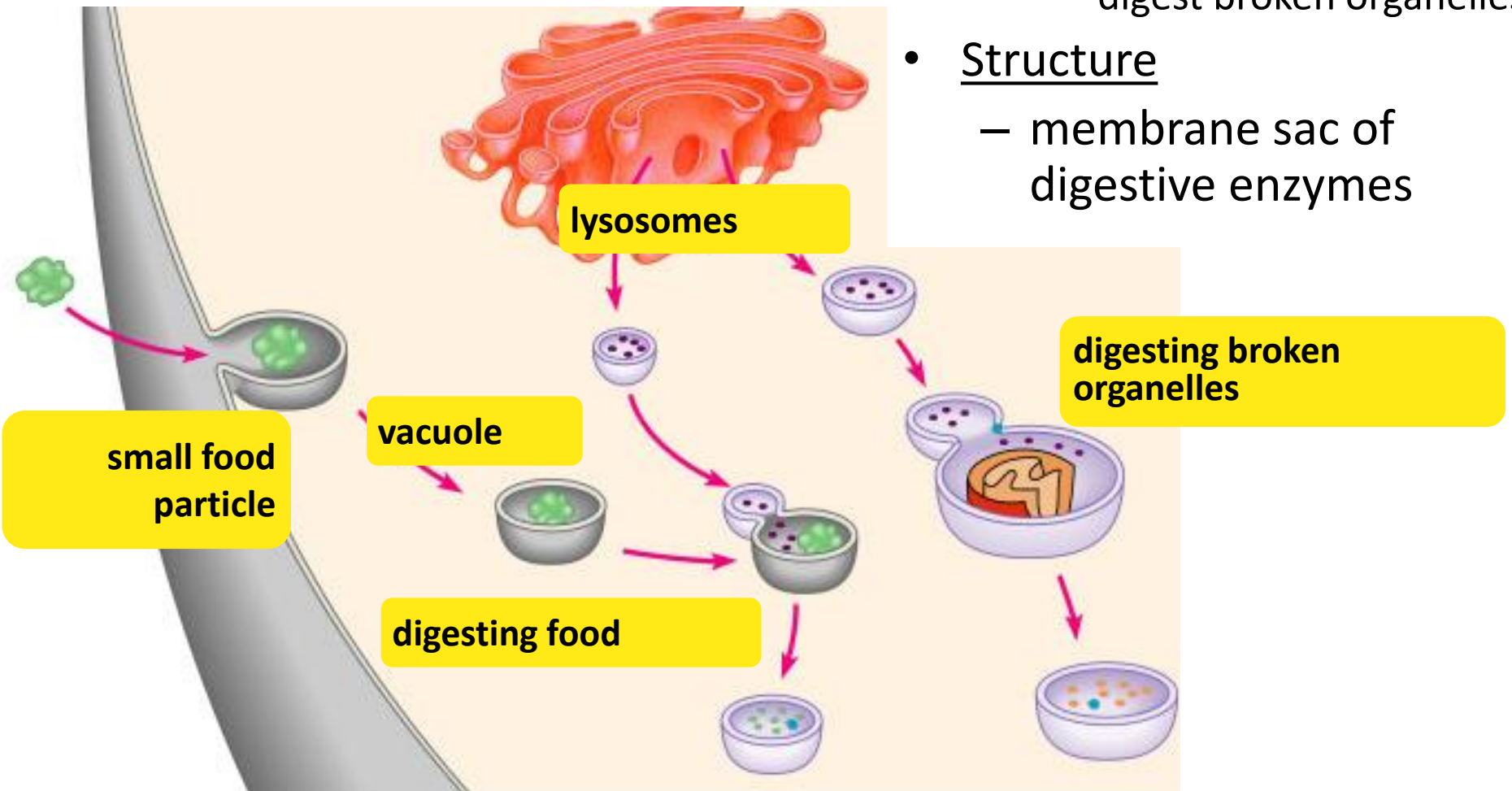
# Vacuoles And vesicles



- Function
  - moving material around cell
  - storage
- Structure
  - membrane sac

# Lysosomes

- Function
  - digest food
    - used to make energy
  - clean up & recycle
    - digest broken organelles
- Structure
  - membrane sac of digestive enzymes



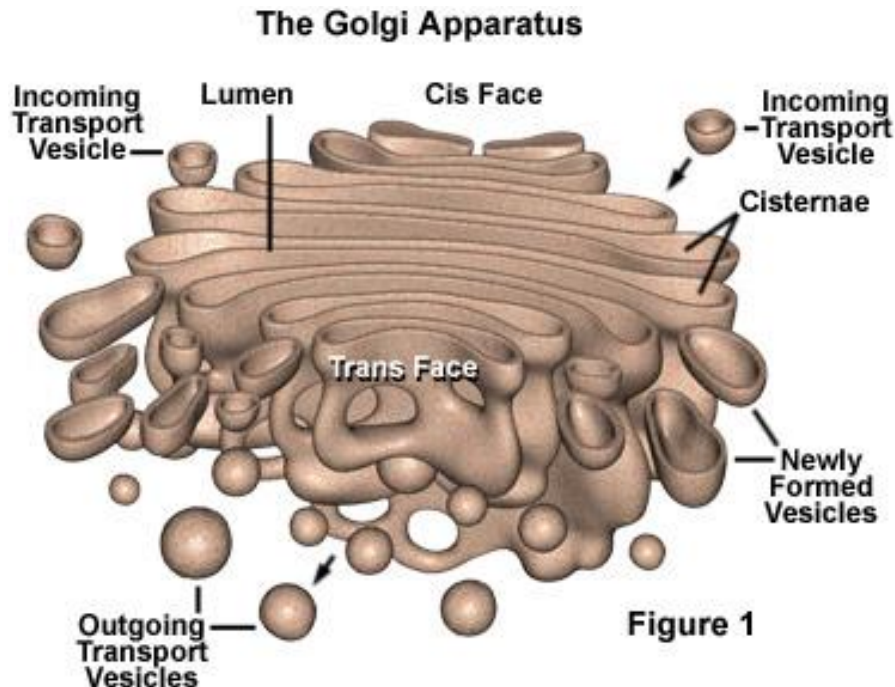
# Golgi Apparatus

## *Structure*

- A system of flattened sacs & membranes that emerge from the ER

## *Function*

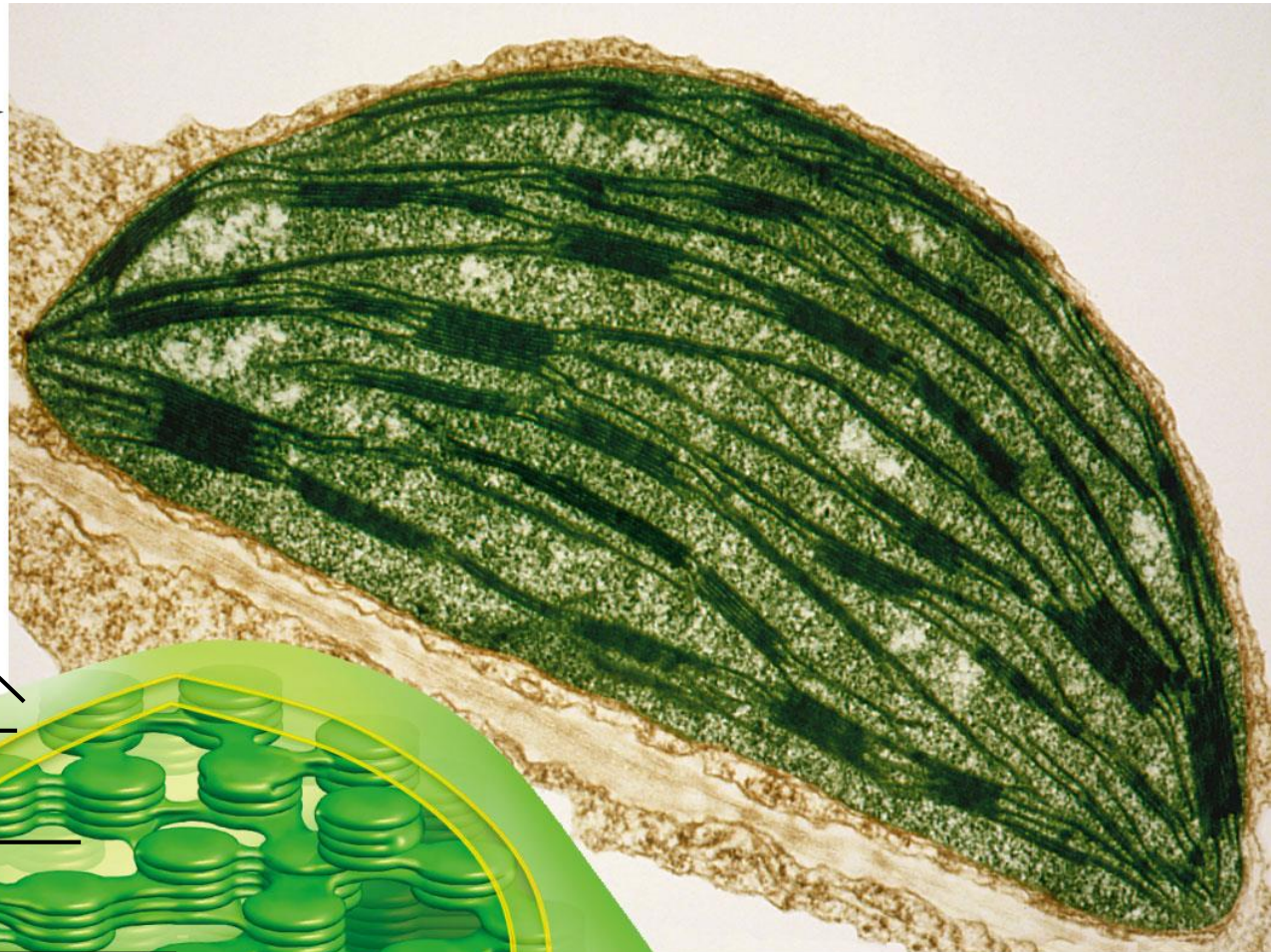
- Modifies the proteins made in the ER so they can be put into packages and exported from the cell



# Golgi Bodies

- **Golgi body**
  - A folded membrane containing enzymes that finish polypeptides and lipids delivered by the ER
  - Packages finished products in vesicles that carry them to the plasma membrane or to lysosomes

# CHLOROPLAST



two outer  
membranes

stroma

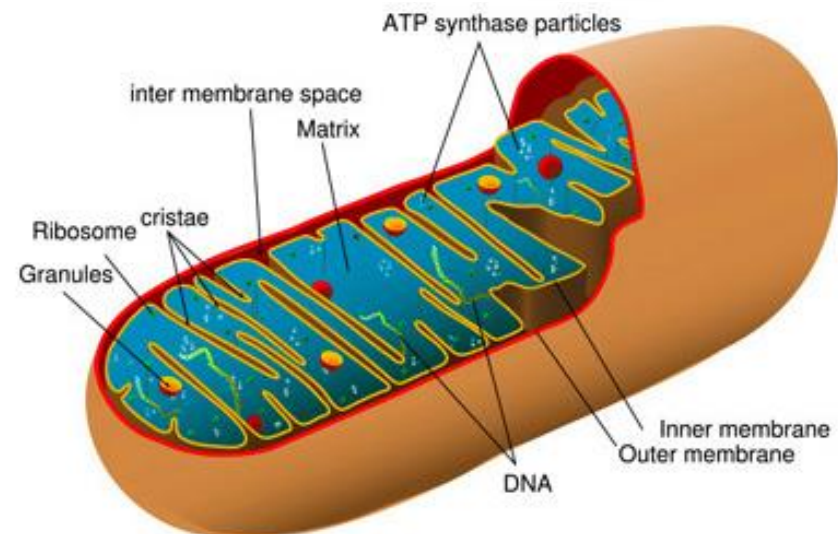
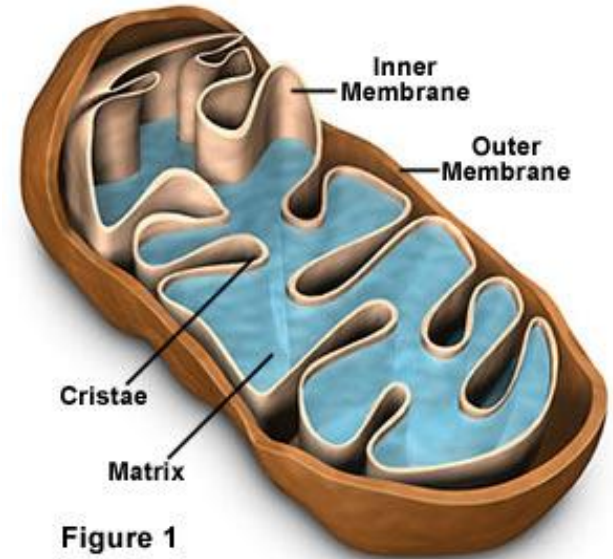
thylakoids  
(inner membrane  
system folded into  
flattened disks)

# Mitochondria

## Structure

- Large organelles that contain their own DNA
- Has a bilayer: a smooth outer membrane and very folded inner membrane (cristae)

Mitochondria Inner Structure



# Mitochondria

- **Mitochondrion**

- Eukaryotic organelle that makes the energy molecule ATP through aerobic respiration
- Contains two membranes, forming inner and outer compartments; buildup of hydrogen ions in the outer compartment drives ATP synthesis
- Has its own DNA and ribosomes
- Resembles bacteria; may have evolved through endosymbiosis

**nucleus**

- control cell
- protects DNA

**nucleolus**

- make ribosomes

**endoplasmic reticulum**

- processes proteins
- makes membranes

**ribosomes**

- make proteins

**cytoplasm**

- jelly-like material around organelles

**Golgi apparatus**

- finish & ship proteins

**central vacuole**

- storage: food, water or waste

**mitochondria**

- make ATP in cellular respiration

**cell wall**

- support

**cell membrane**

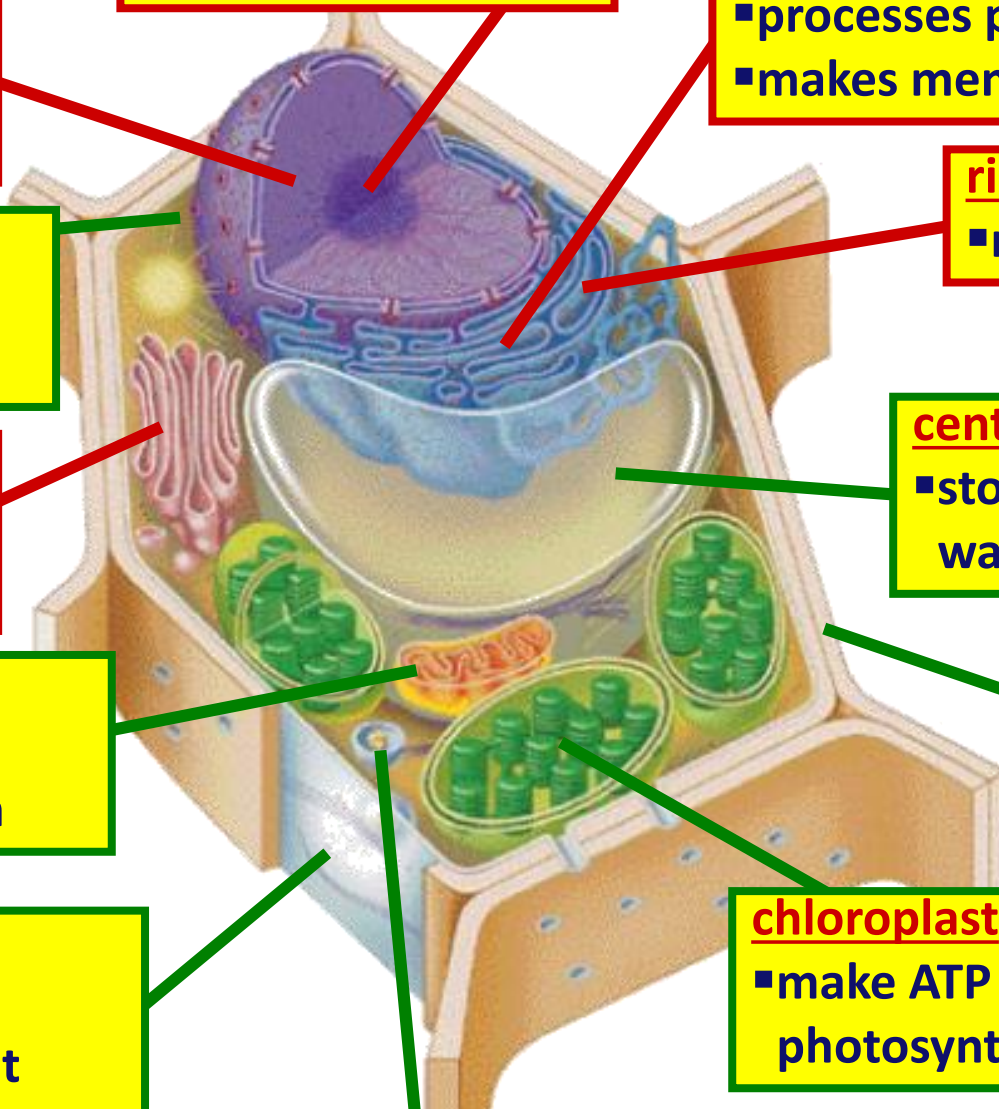
- cell boundary
- controls movement of materials in & out
- recognizes signals

**chloroplast**

- make ATP & sugars in photosynthesis

**lysosome**

- digestion & clean up



## cytoplasm

- jelly-like material holding organelles in place

## vacuole & vesicles

- transport inside cells
- storage

## lysosome

- food digestion
- garbage disposal & recycling

## nucleus

- protects DNA
- controls cell

## mitochondria

- make ATP energy from sugar + O<sub>2</sub>

## ribosomes

- builds proteins

## cell membrane

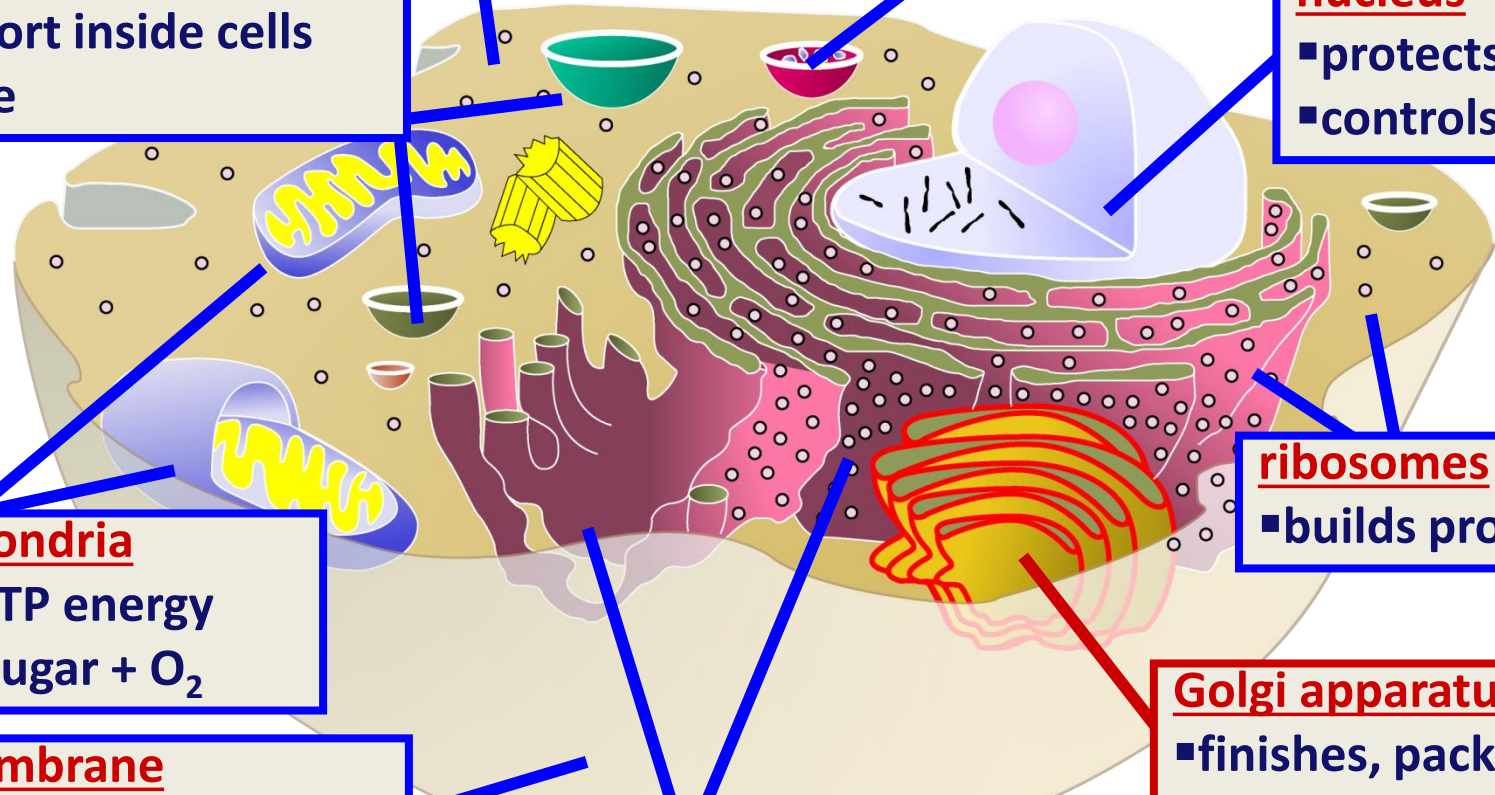
- cell boundary
- controls movement of materials in & out
- recognizes signals

## ER

- helps finish proteins
- makes membranes

## Golgi apparatus

- finishes, packages & ships proteins



THANK YOU