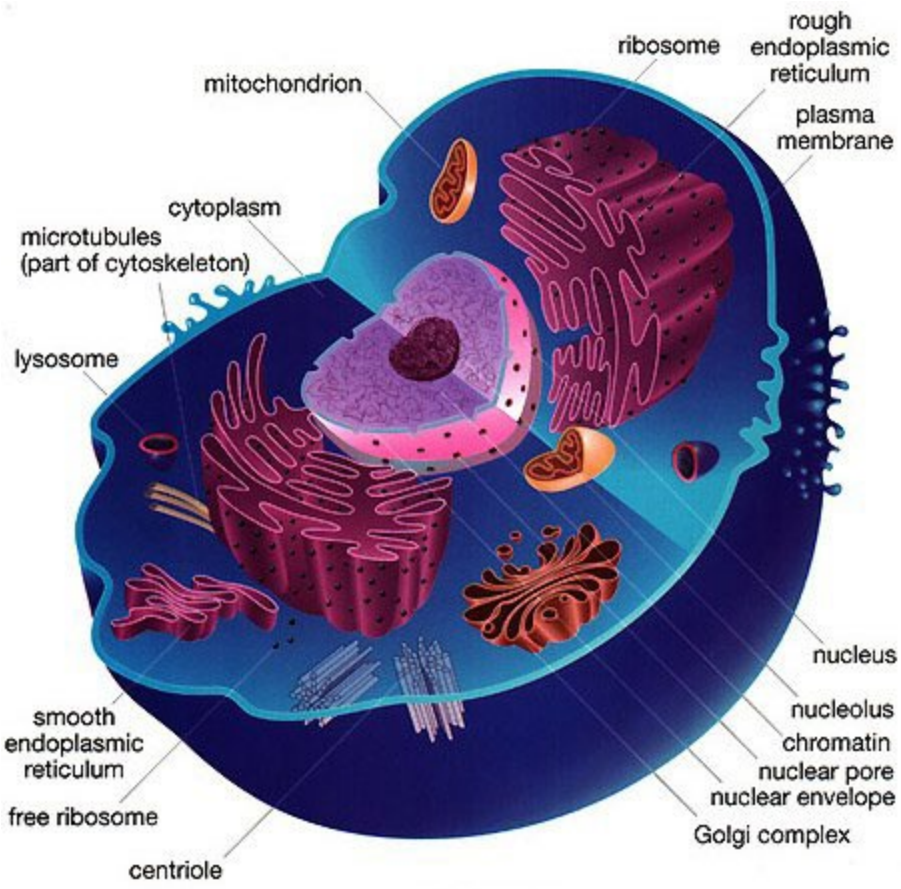
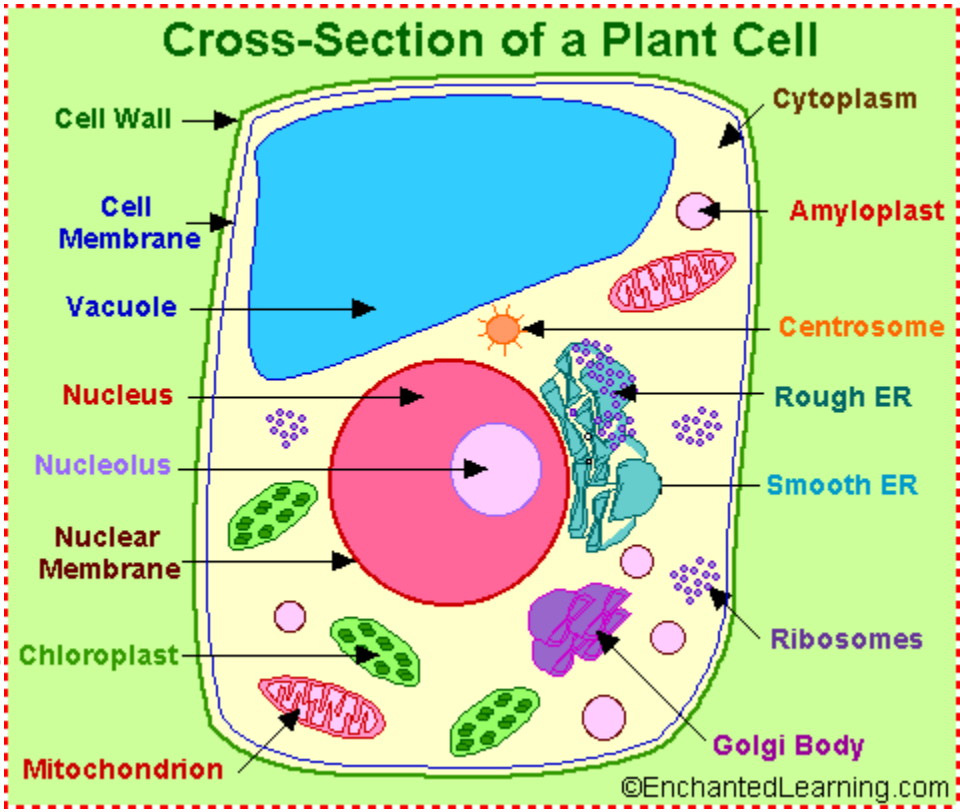
Science 10 Unit C: Biology

The Cell





As we have already seen, the cell is the smallest living unit of life.

A cell is an **open system**, meaning **it allows matter and energy in and out** of it.

There are two basic types of cells:

Prokaryotic

Eukaryotic

Prokaryote: “before nucleus”

- No membrane bound organelles are present

- Has a dark concentration of genetic material (DNA) known as the nucleoid region

- Single celled organisms only

bacteria

algae

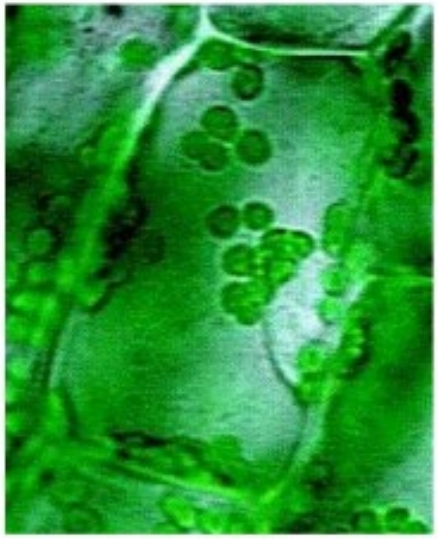
Eukaryote: “true nucleus”

- Has organelles surrounded by a membrane, including a nucleus

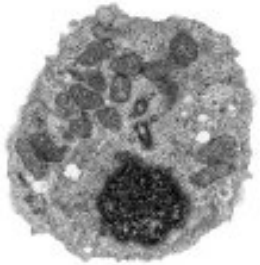
- Larger than prokaryotic cells

- Can be single or multi-cellular organisms

amoeba



plant cell



animal cell

Parts of the Cell: Organelles

Just as we are made up of body systems and organs, cells are also made up of smaller parts, tiny organelles which take on all of the tasks of keeping a cell running.

Let's look at some of these "little organs".

Cell Membrane (Plasma Membrane)

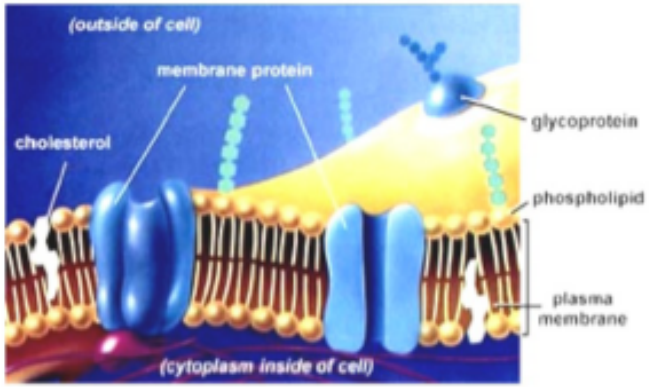
- flexible structure that surrounds the cell and holds it together and acts as a protective barrier

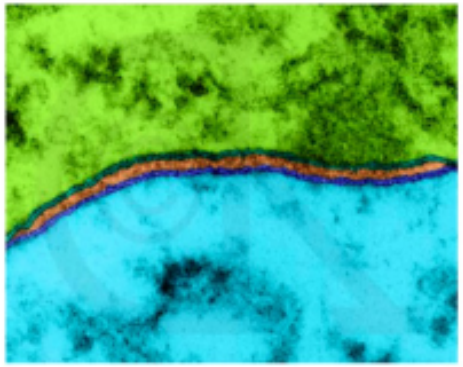
- made of proteins floating in a fat (lipid) "sea"

- controls what is allowed to pass in and out of the cell

- important for cell interaction, communication and recognition

Analogy: Like a security guard because it decides what goes in and out and it protects the cell.





Cell Membranes from Opposing Neurons TEM 436,740x

Nucleus

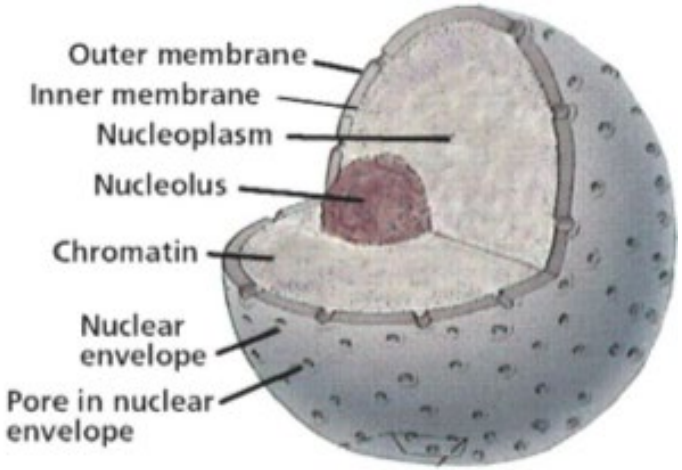
- Control centre of the cell; like the cell's "brain" (directs all activities in cell)

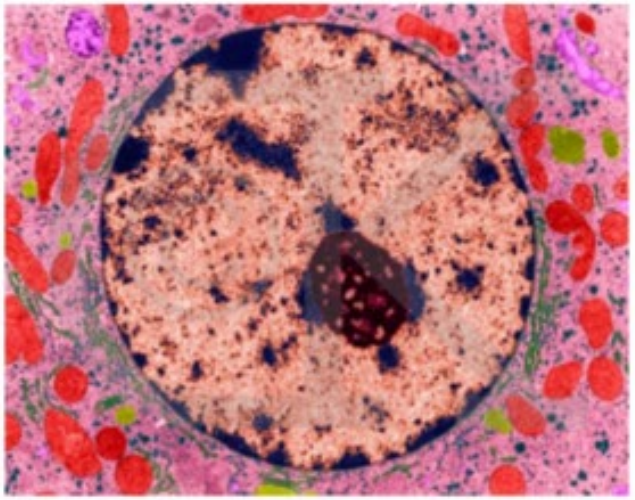
- Contains the genetic information (DNA)

- Initiates and controls cellular division

- Surrounded by a nuclear membrane (envelope) that has pores to allow movement of materials

- Analogy: like the brain, controls the cell

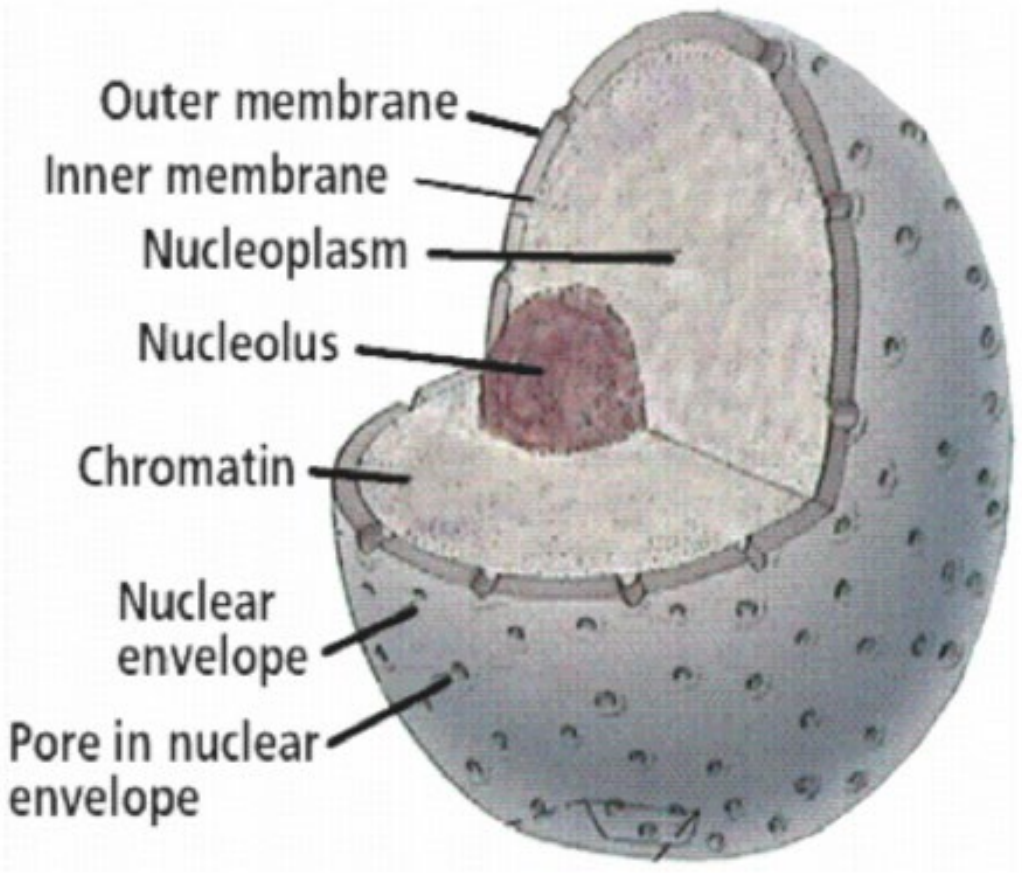




Liver cell nucleus TEM 20,740 x

Nucleolus

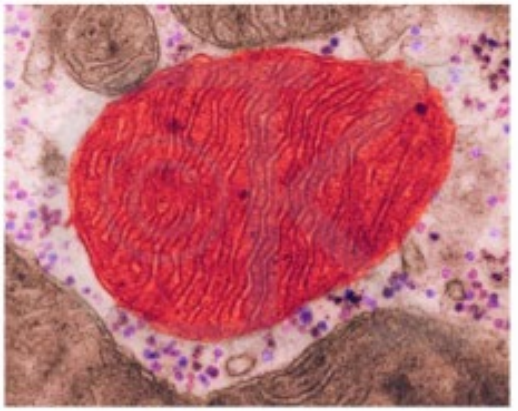
- Found inside the nucleus
- Produces ribosomes that are involved in protein synthesis



Mitochondria

- The “powerhouse” of the cell

- Produces the cell’s energy by converting sugar into ATP (adenosie triphosphate) energy

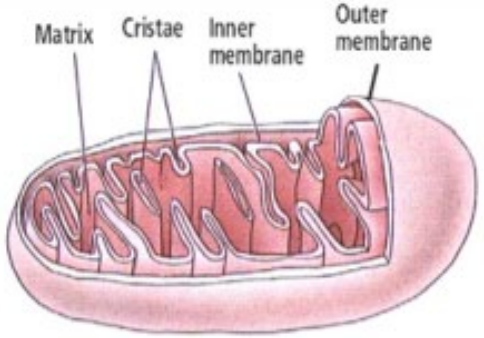


Muscle Cell Mitochondrion (TEM 190,920x)

- This process is called cellular respiration:

Glucose + oxygen ——— carbon dioxide + water + energy

- Analogy: like the energy station



Endoplasmic Reticulum

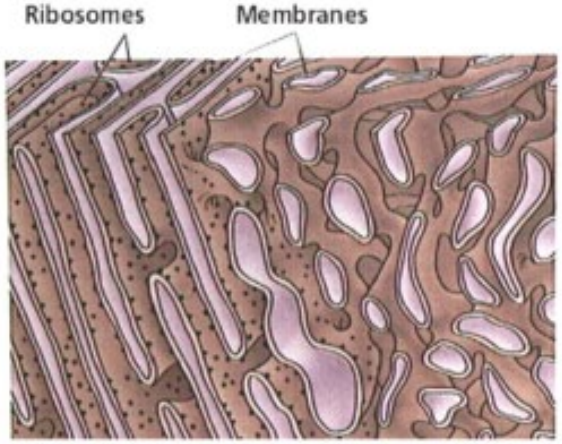
- A series of tubes that run through the cytoplasm, connecting organelles together

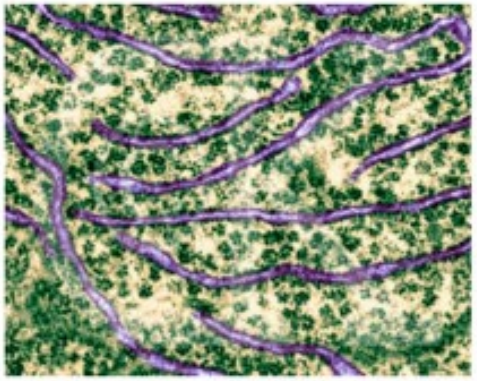
- Transports and stores material

- ER with ribosomes - “rough ER”

- ER without ribosomes - “smooth ER”

- Analogy: like a highway



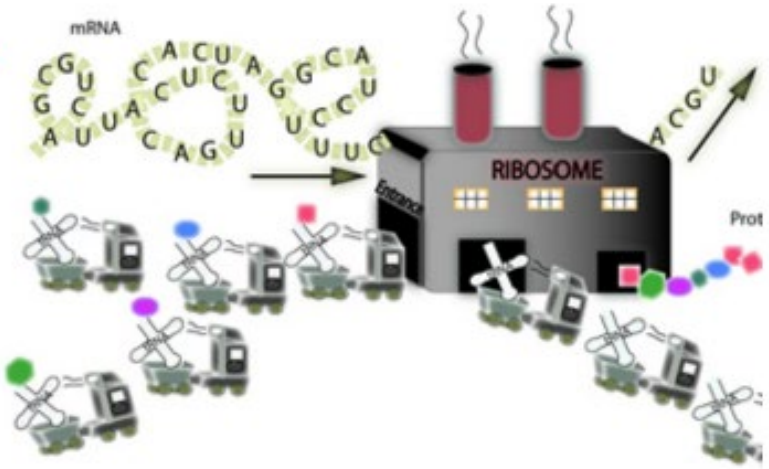


Rough Endoplasmic Reticulum

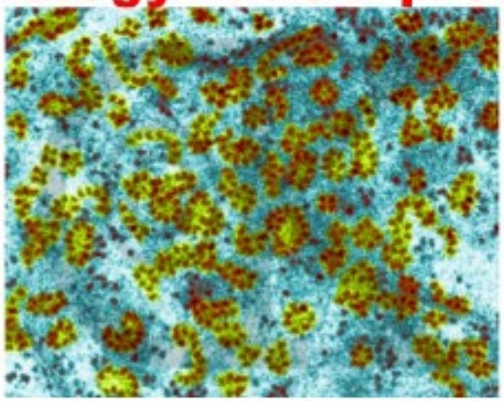
Ribosomes

- Sites where proteins are made (protein synthesis)

- Often attached to the endoplasmic reticulum but are also found throughout the cytoplasm



- Analogy - like a protein factory



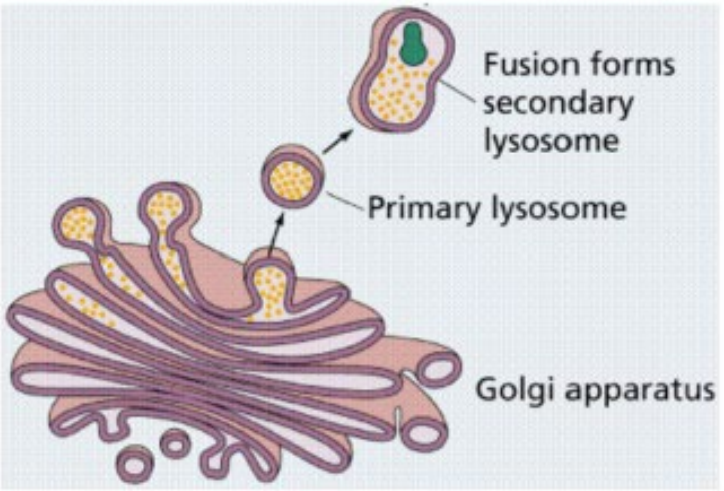
Ribosomes and Polyribosomes - liver cell (TEM 173,400x)

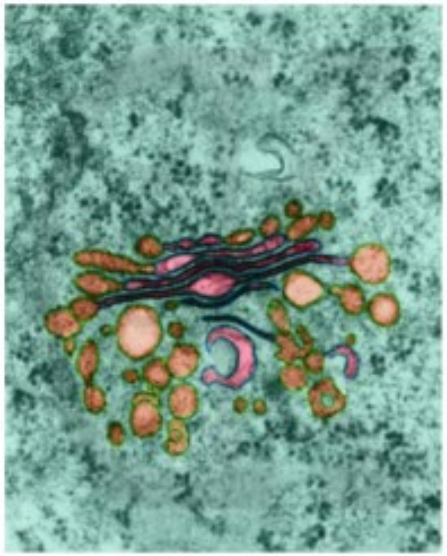
Golgi Apparatus

- Folded stacks of membrane

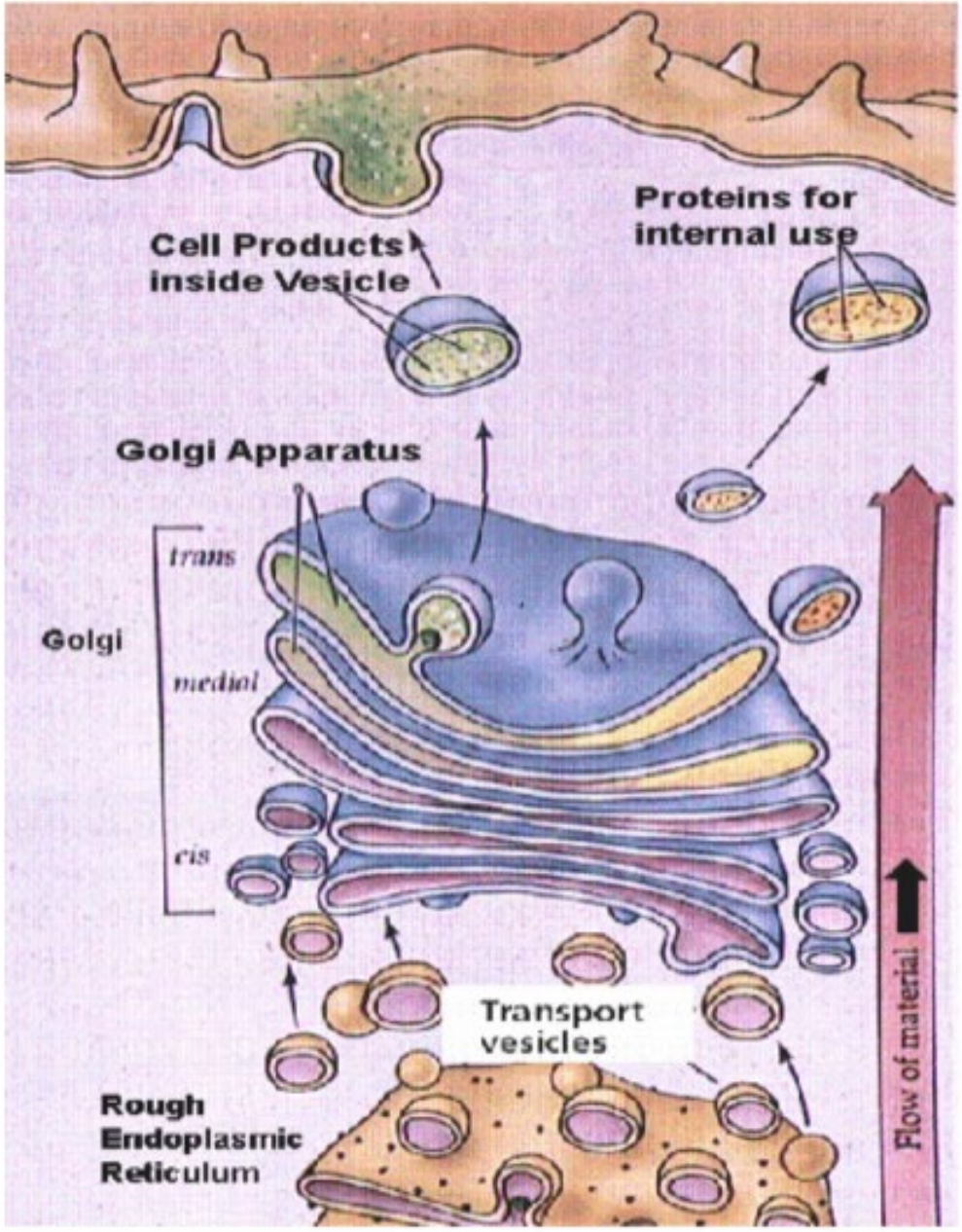
- Receives substances from the ER and is responsible for storing, modifying, and transporting these substances

-Analogy: like your mom, getting you ready to go outside





A plant cell from *Sauromatum guttatum* (TEM 145,700x).



Notice how the rough ER produces proteins and the golgi apparatus preps them for use in the cell.

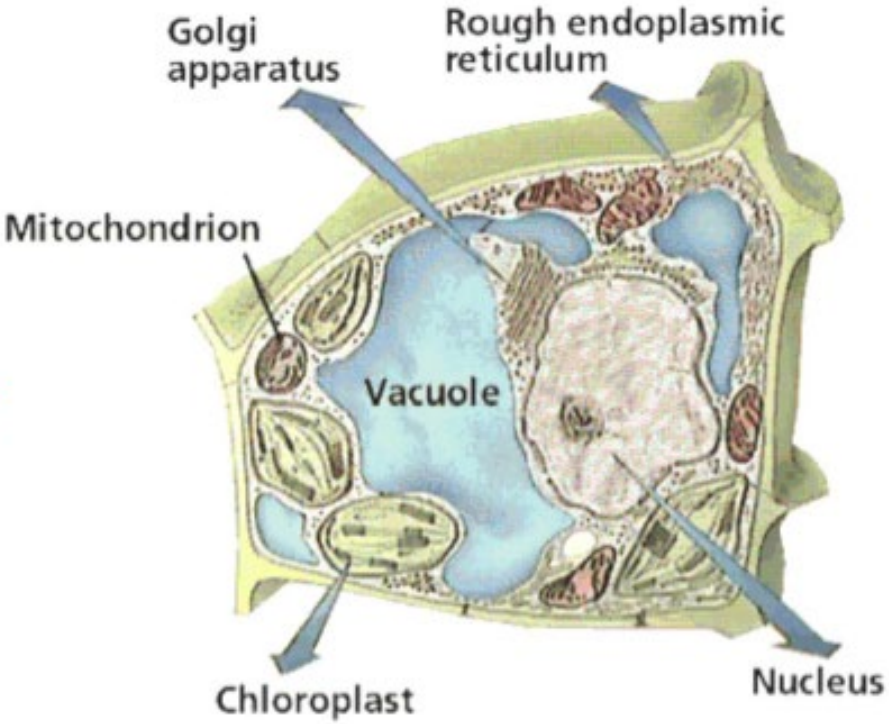
Vacuoles

- Round structure enclosed in a membrane

- Animal Cells (smaller + many) - stores food, cell products, and excess fluids

- Plant Cells (large + one) - primarily used to store water and maintain shape of plant cells

- Analogy - like a sack to hold things



Lysosomes (Animals Only)

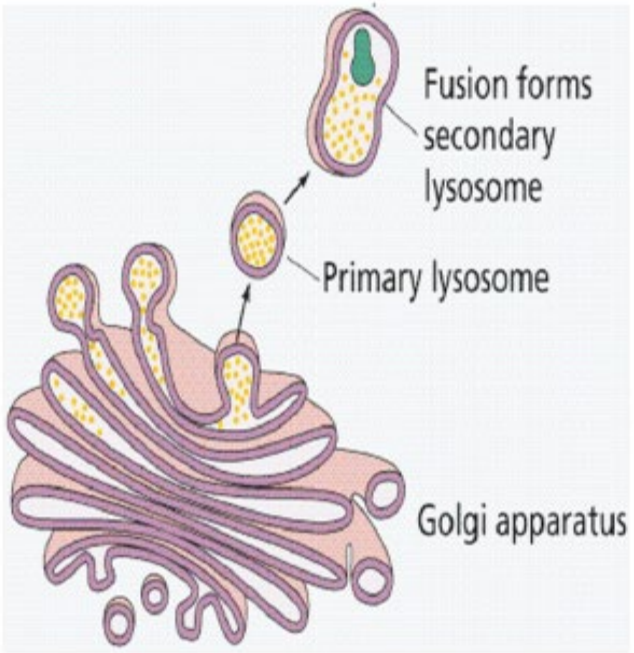
- Membrane sacs of digestive enzymes

- Breaks down food products or foreign products that enter the cell

- When an organism dies, lysosomes self-destruct within cell

- Breaks down worn out cell organelles

- Analogy - like a trash compactor, getting rid of waste



Cell Wall (Plants Only)

- Rigid structure protects the cell and provides structural support

- Made of complex carbohydrates

- Protects the inner cell and connects neighboring cells

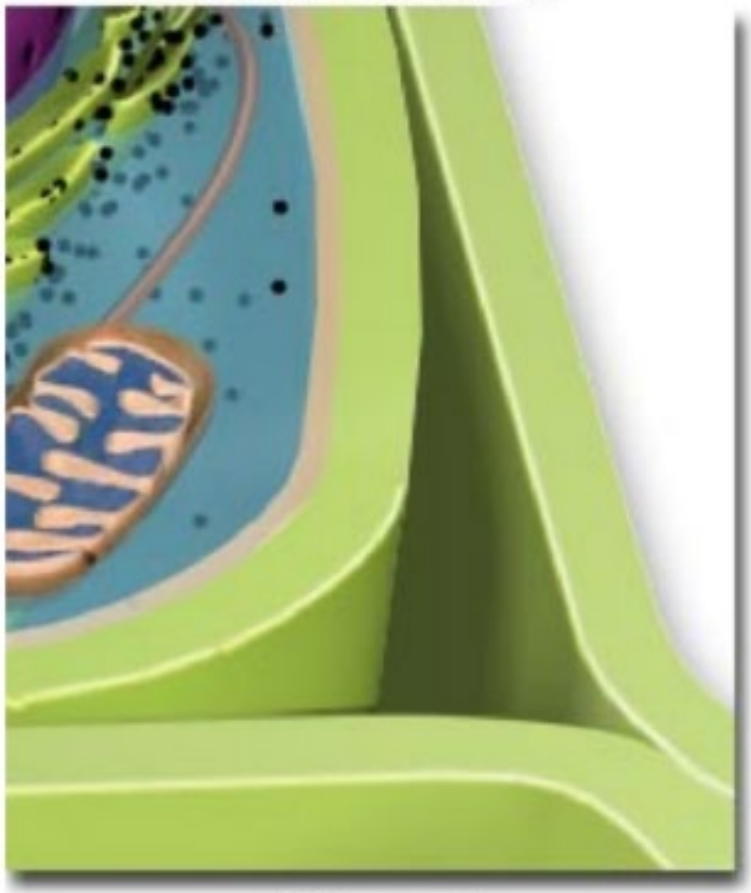
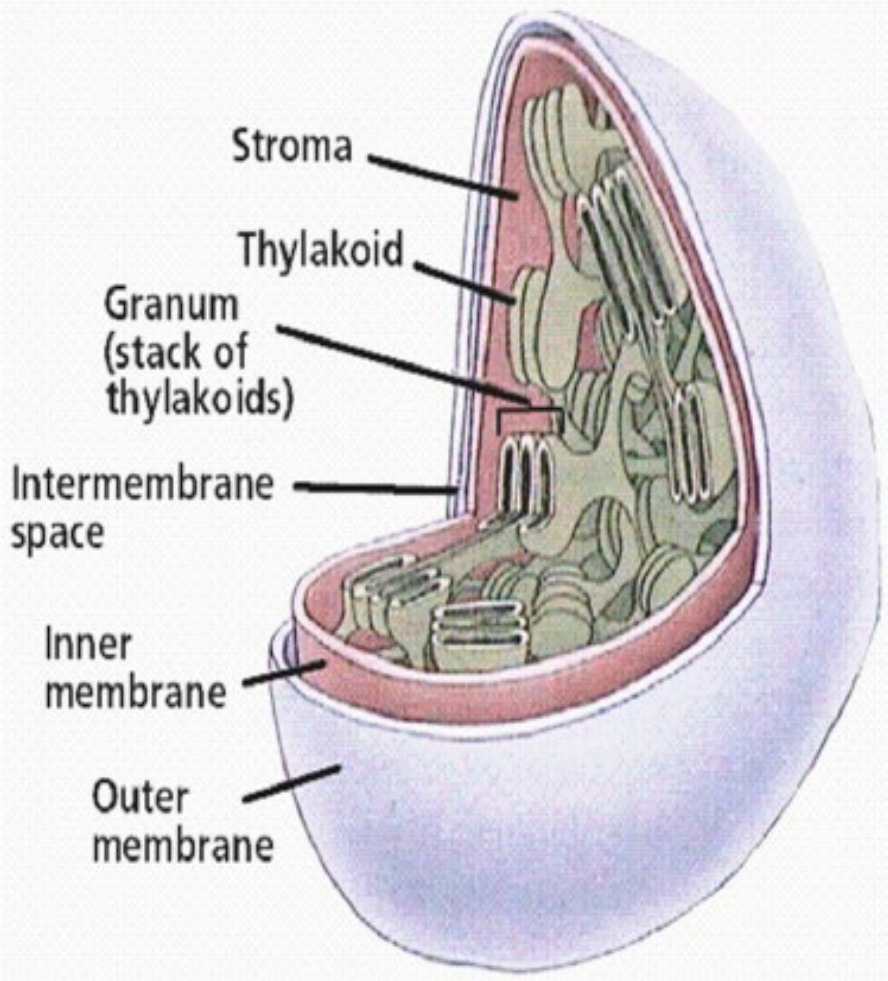


Figure 1

Chloroplast (Plants Only)

- Use energy from the sun to carry out photosynthesis

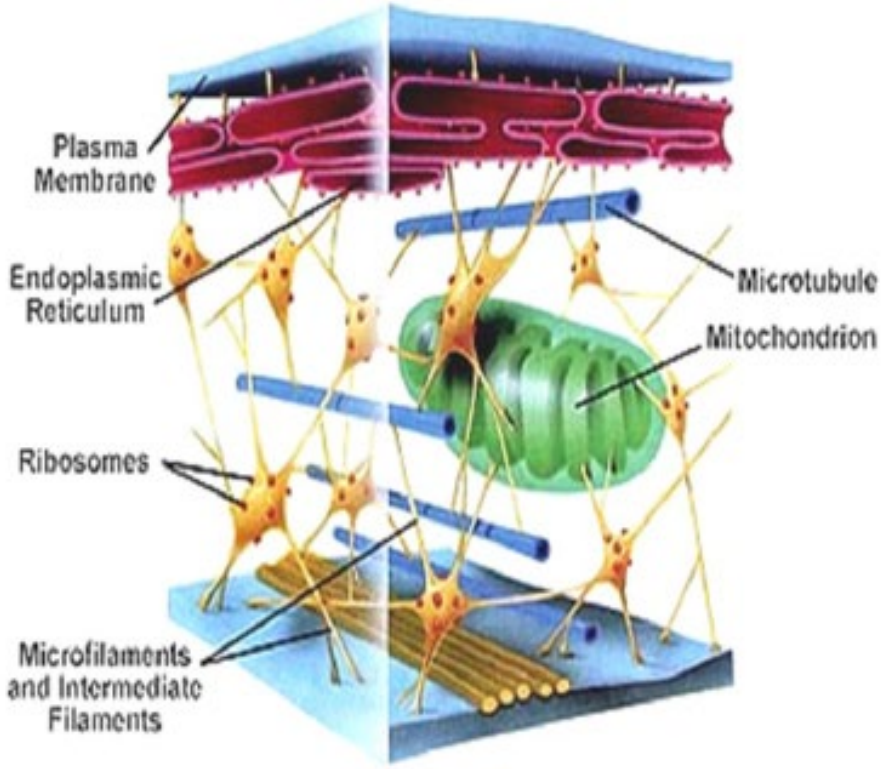
- Contains CHLOROPHYLL which is the pigment that gives plants its green color and absorbs sun energy



Cytoskeleton

- Intricate network of fibre-like structures

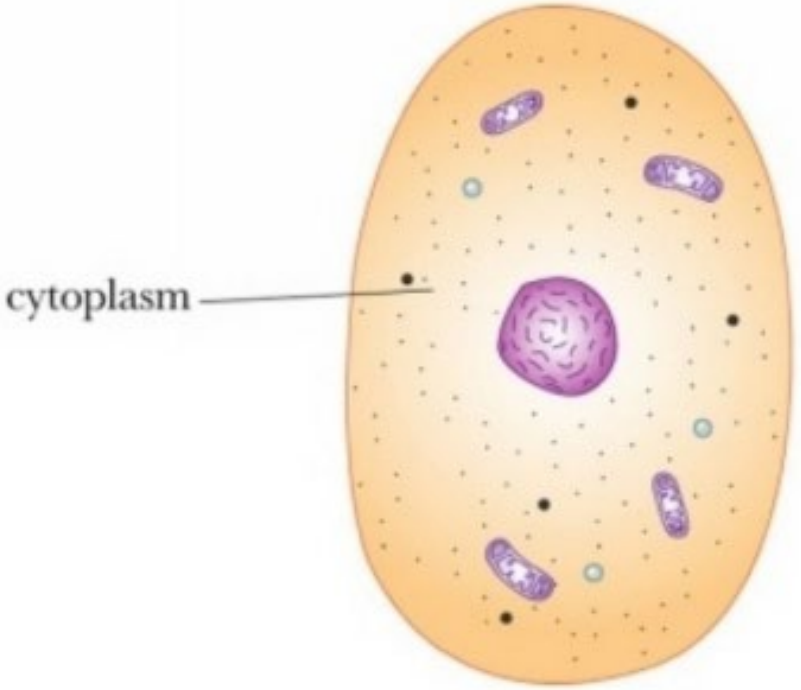
- Maintains the shape of the cell and provides pathways for the transport of cellular materials



Cytoplasm

- Cellular fluid which is composed of 70 % water

- All the organelles are found “floating” in the cytoplasm



Centrioles (Animal Cells Only)

- made up of small clusters of tubes

- involved in cell division

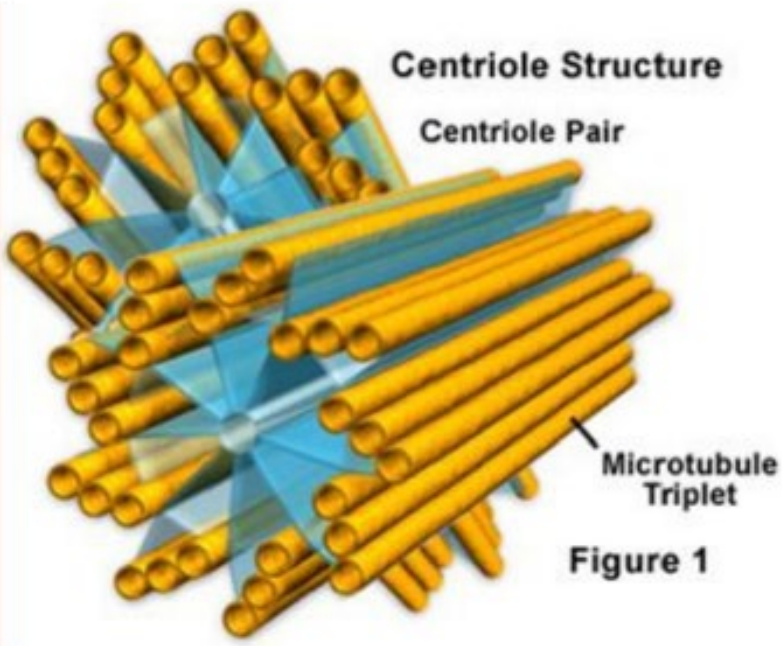


Figure 1

You may have noticed that most organelles are present in
both plant and animal cell while others appear in only one.

Brainstorm a summary of the differences between plant and animal cells:

Animal Cells	Plant Cells