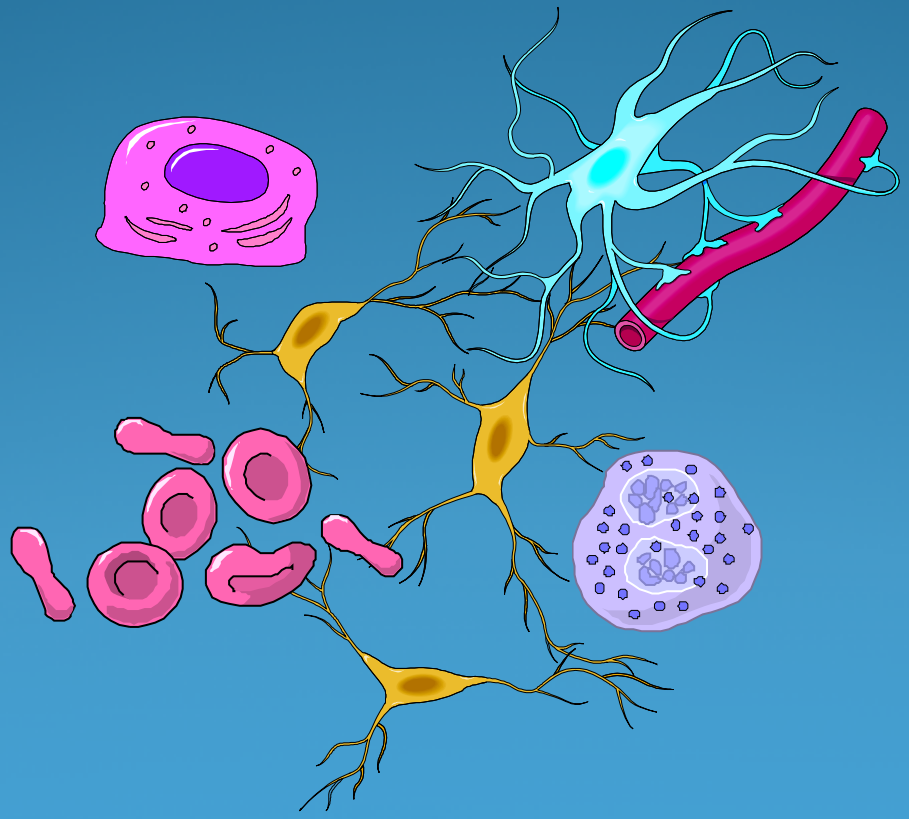
Cell Structure and Function



The Cell Theory

1. The cell is the basic unit of structure of all living things.
   - The smallest living things are one-celled or **unicellular**
   - Large organisms contain millions of cells. They are many-celled or **multicellular**.
2. The cell is the basic unit of function of all living things
   - All of the organism's life functions are carried out by cells or parts of cells.
3. Cells arise (come) from other living cells – not from nonliving matter.

Exceptions to the Cell Theory

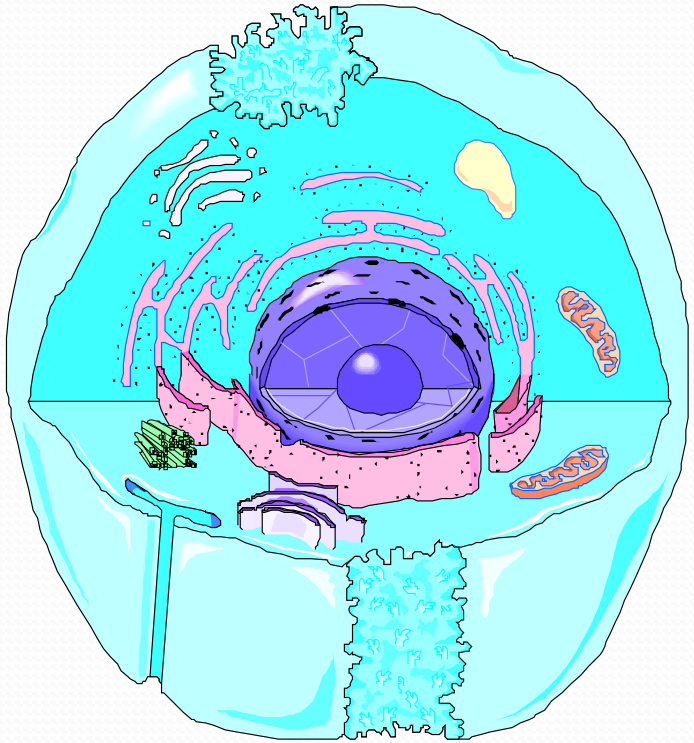
- Viruses are not made up of cells.
  - They do contain genetic material.
  - Viruses reproduce inside another cell, called the host cell.
- The first cell could not have arisen from a previously existing cell.
  - Scientists do not know the origin (beginning) of the first cell.

Cell Size

If the nucleus were the size of a penny, the cell would be the size of a football field.

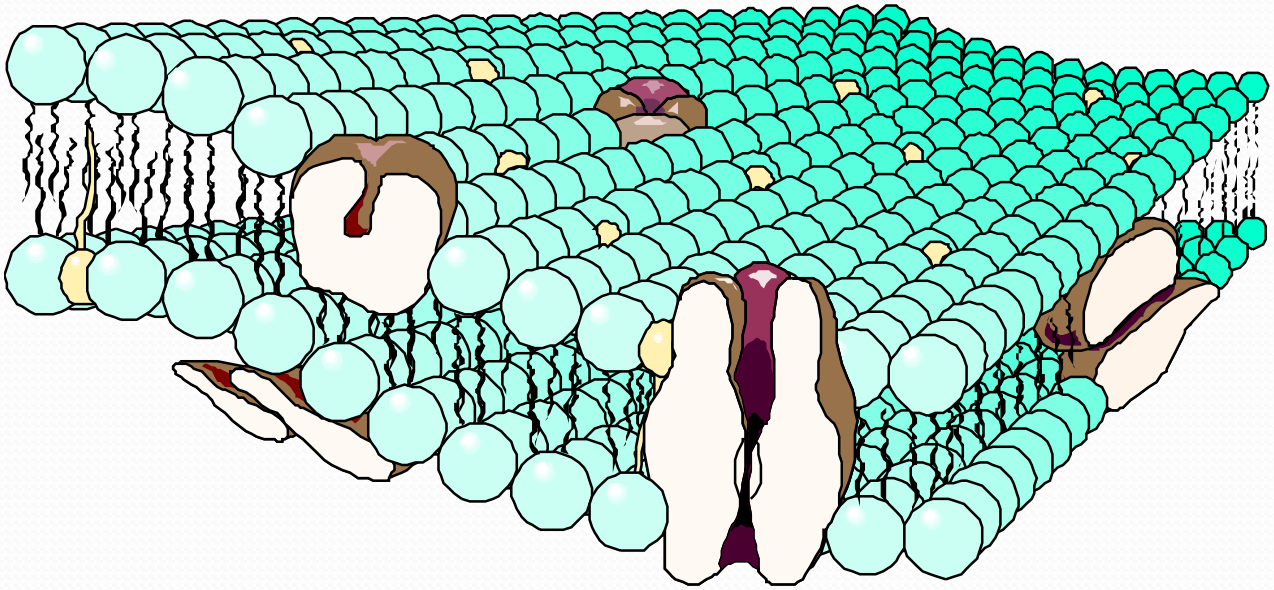
Organelles

- There are many small structures located inside the cell.
  - "little organs"
- These tiny structures perform certain functions that keep the cell (and the organism) alive.
- Some organelles are found only in animal cells and others are located only in plant cells.
- Most organelles are found in both plant and animal cells.



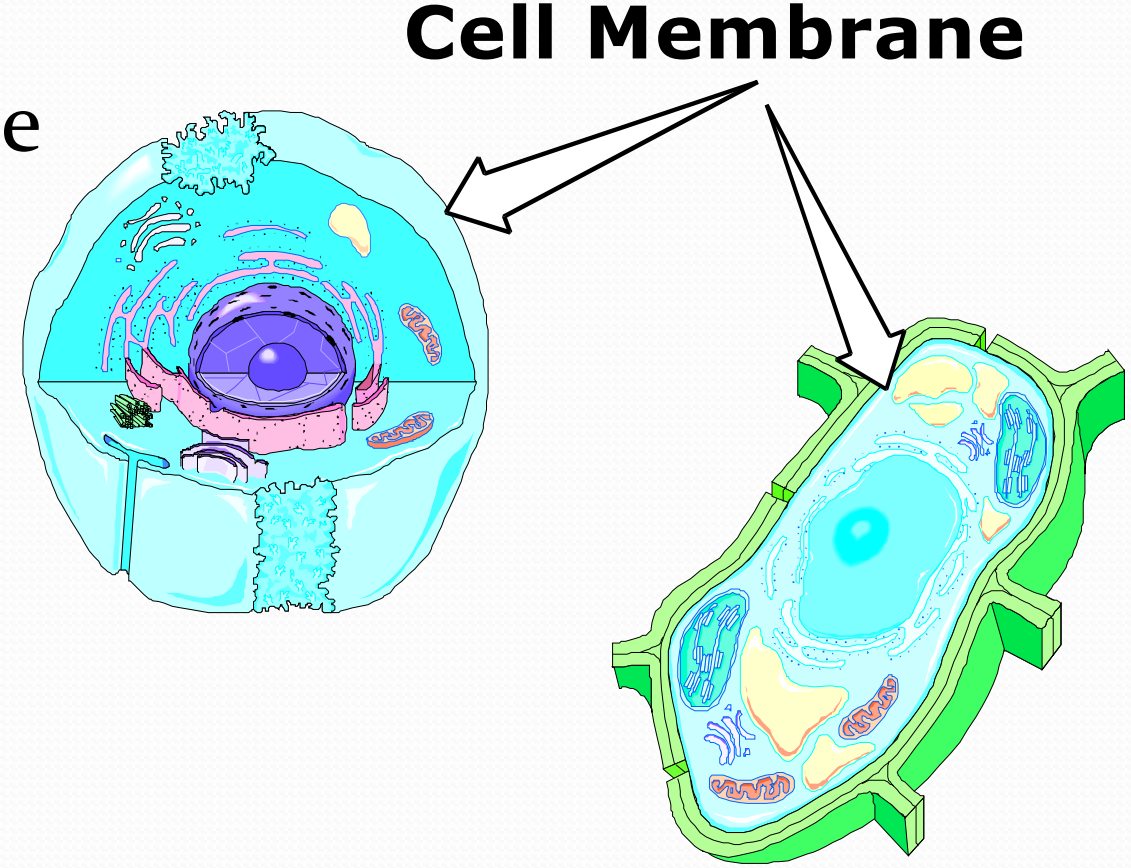
Cell (Plasma) Membrane

- A double-layered structure that surrounds the cell.
- Also called a phospholipid bilayer.
- Provides a boundary between the cell and its environment.



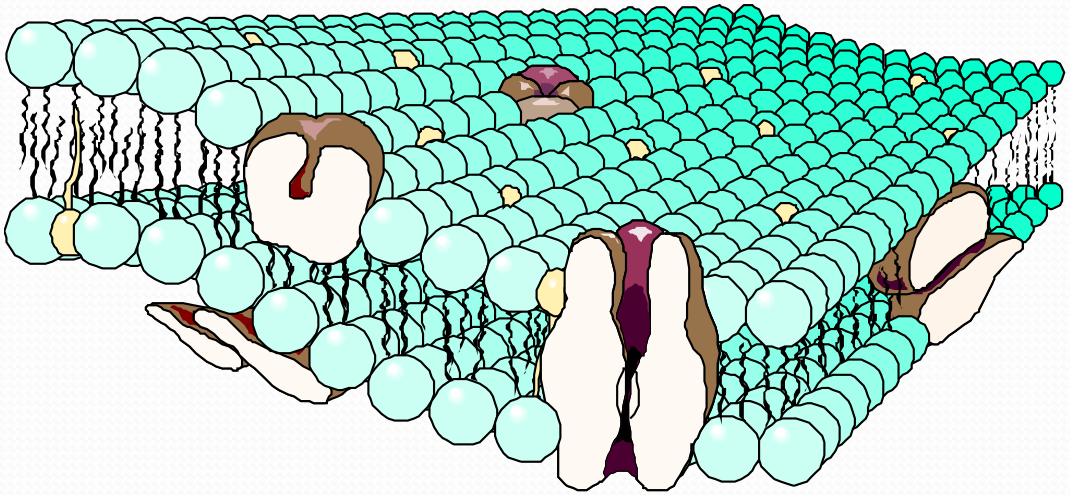
Cell (Plasma) Membrane

- In animal cells the membrane is located outside the cell border.
- In plant cells the membrane is located inside the cell wall.



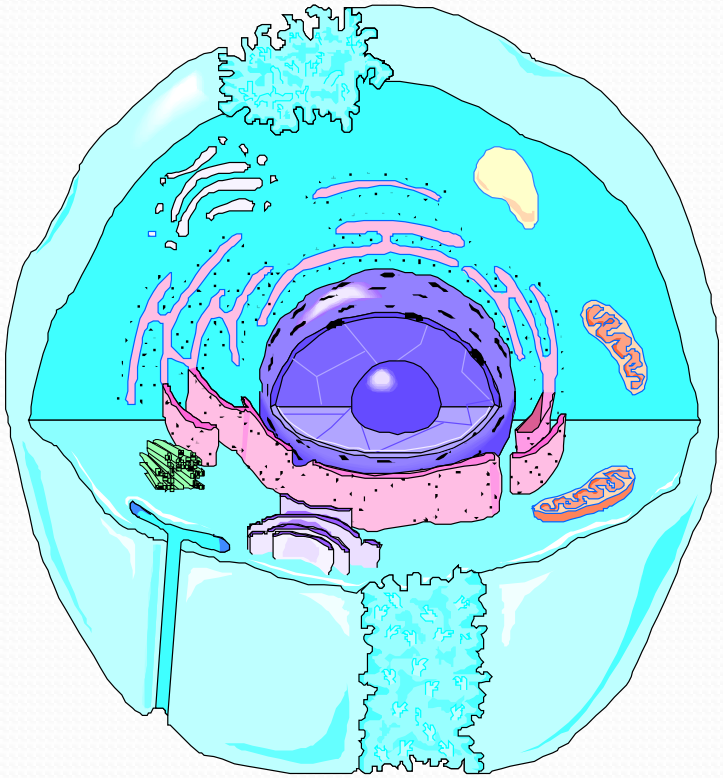
Cell (Plasma) Membrane

- The function (job) of the membrane is to regulate or control the passage of materials into and out of the cell and to help maintain cell shape.
- Cell membranes are **selectively permeable**, some substances can pass through it and others cannot.



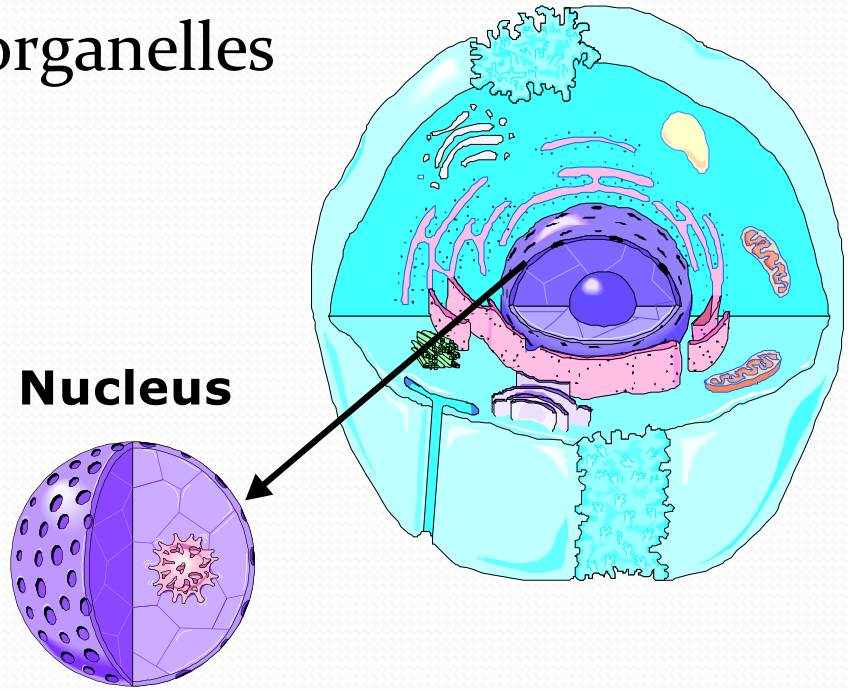
Cytoplasm

- The watery cell fluid that contains the cell organelles.
- The cytoplasm is located between the cell membrane and the nucleus.
- Many life processes take place in the cytoplasm.
- Nutrients and minerals spread through the cytoplasm to all parts of the cell.



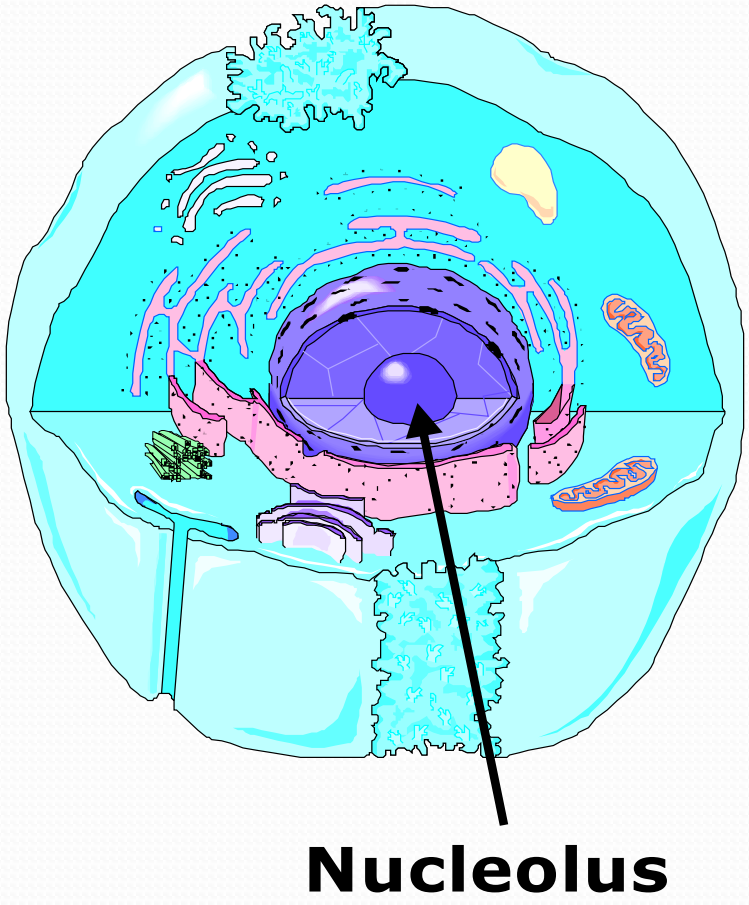
Nucleus

- A large round structure located inside the cytoplasm of the cell.
- The nucleus is surrounded by its own membrane, called the **nuclear membrane**.
- The nucleus contains other organelles (chromosomes - DNA and the nucleolus).
- Cell activities are controlled by the nucleus



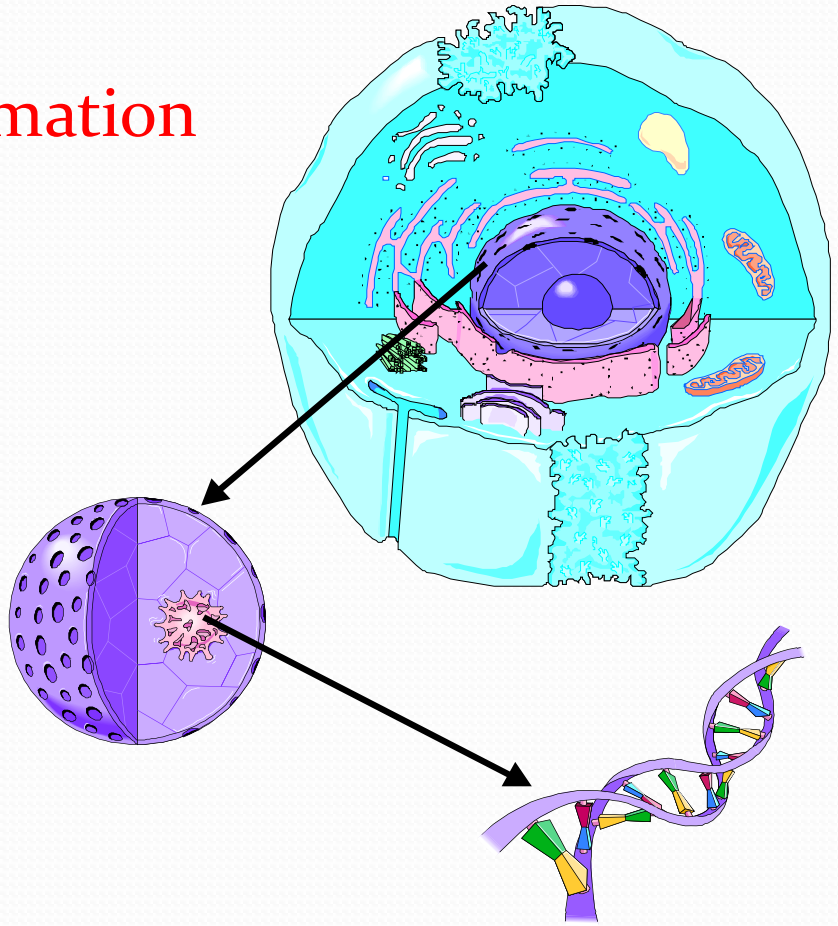
Nucleolus

- Located in the nucleus.
- Is involved in the production of ribosomes.



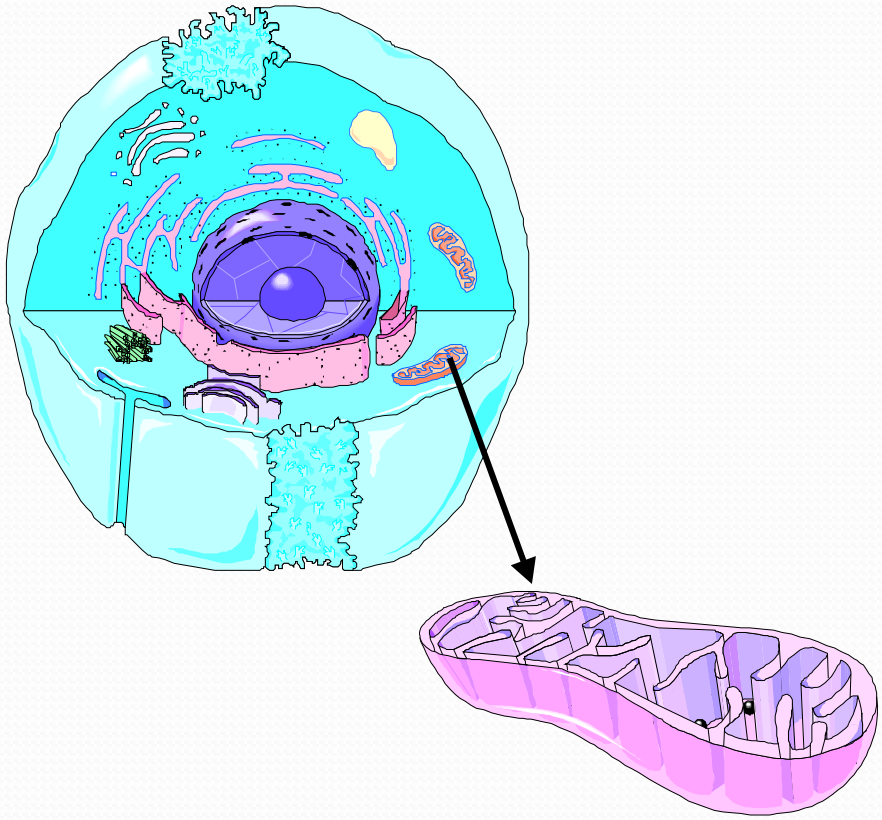
Chromosomes

- Long threadlike structures located in the nucleus of the cell.
- They contain heredity information organized as genes.
- **Genes** are heredity units made up of **DNA** that control cell activities and may be passed on to the next generation.



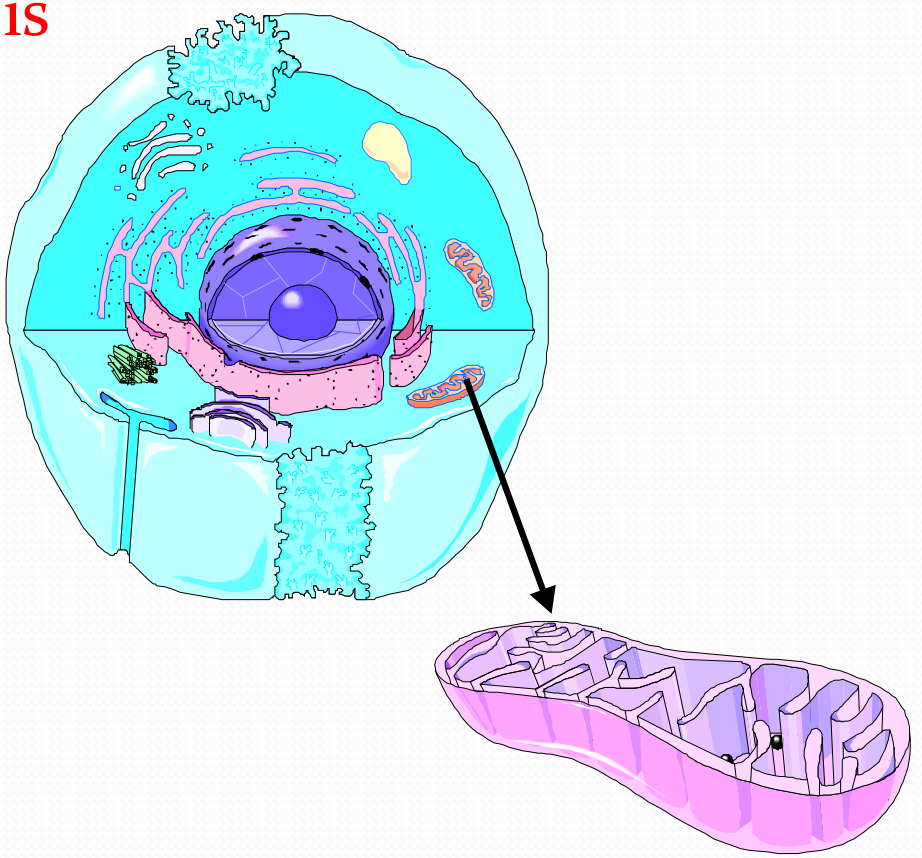
Mitochondria

- The organelle involved in cellular respiration.
- They are called the "powerhouses" of the cell.
- They are large organelles scattered through most cells.
- They are most numerous in cells that use a lot of energy.



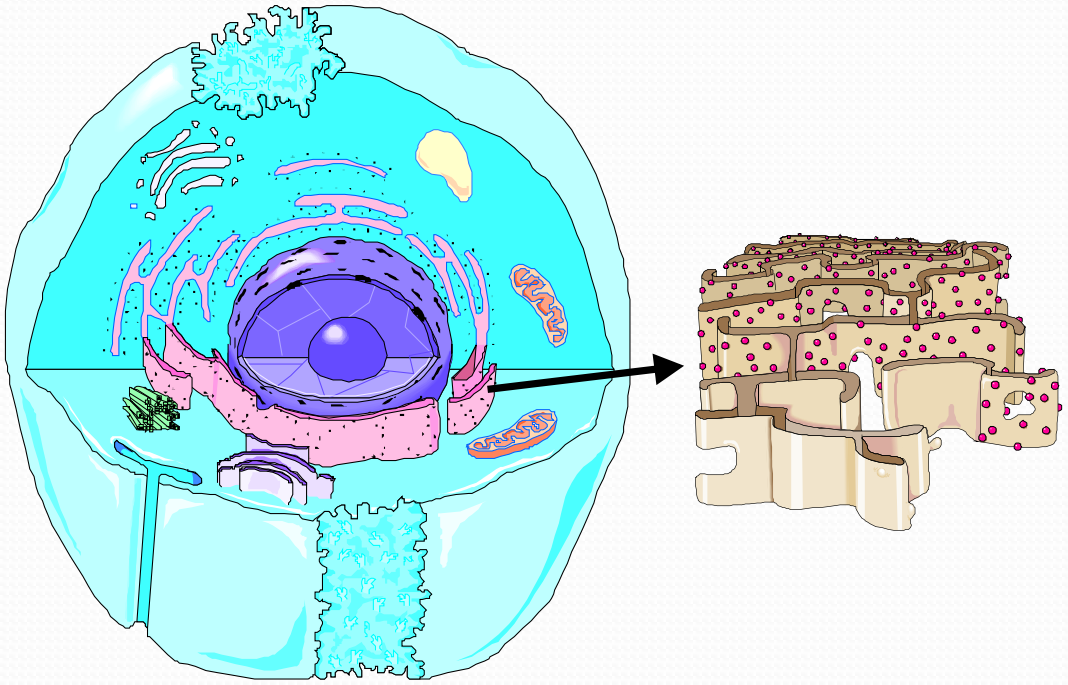
Mitochondria

- Mitochondria contain materials necessary for respiratory reactions.
- It is here that energy (ATP) is released from nutrients in the cell.
- Without the constant supply of energy (ATP) produced by respiration, the cell would die.



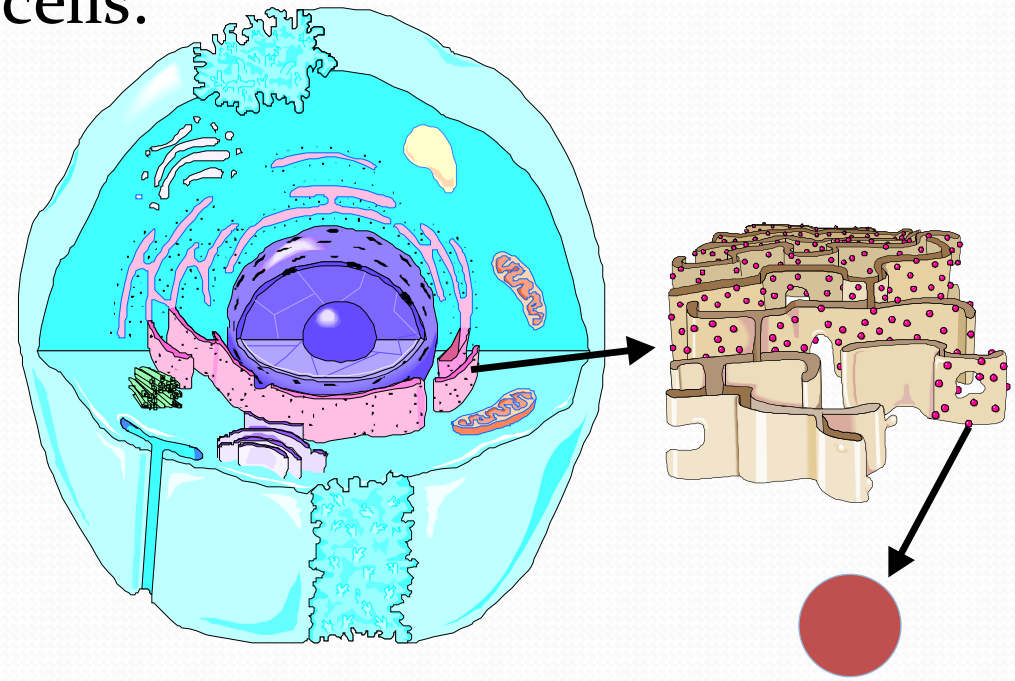
Endoplasmic Reticulum

- Materials are transported throughout the cell by a system of channels or canals called the **ER**.
- Chemical reactions take place on the surface of ER.
- In some places it has a rough surface and in other places it is smooth.
- The rough surface is due to the presence of ribosomes.
- Cells making proteins contain a large amount of rough ER.



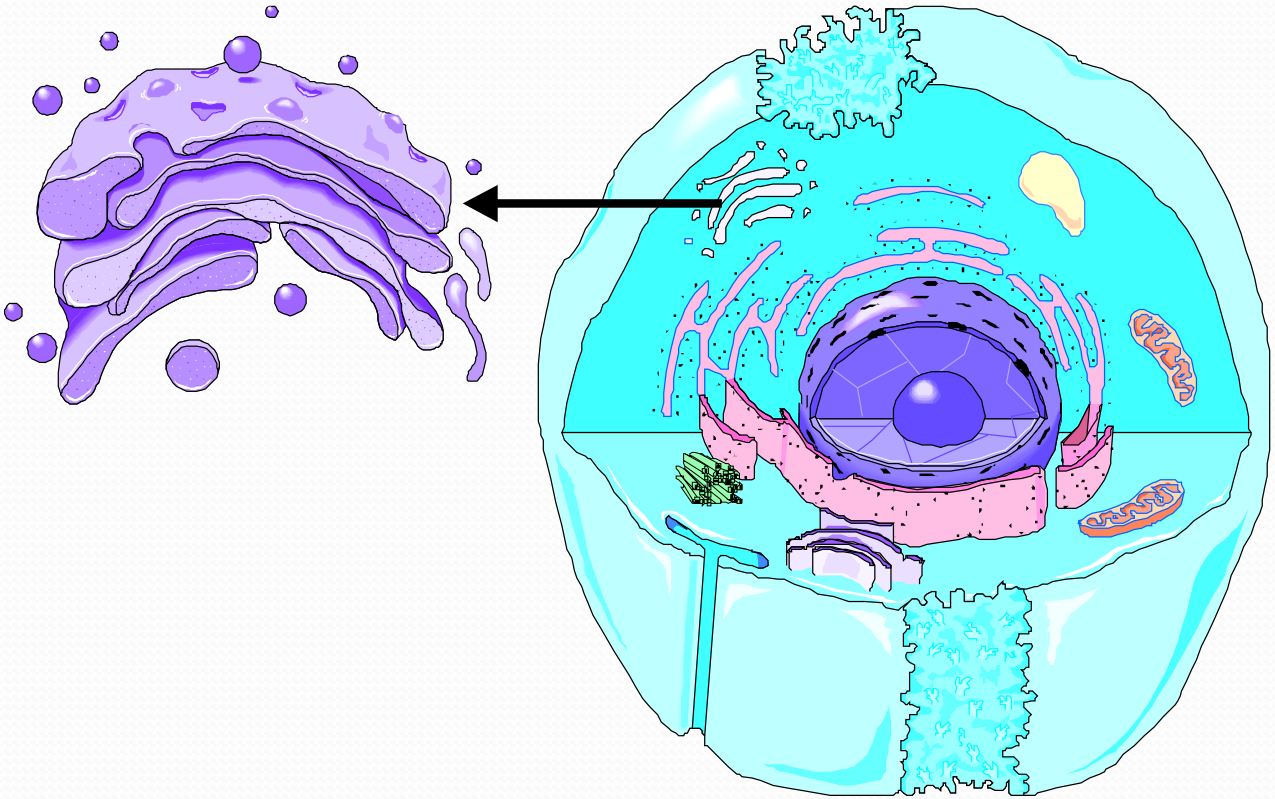
Ribosome

- Proteins are synthesized(made) at the **ribosomes**.
- They may be attached to the endoplasmic reticulum or free in the cytoplasm.
- These small, spherical structures are the most numerous organelles in almost all cells.



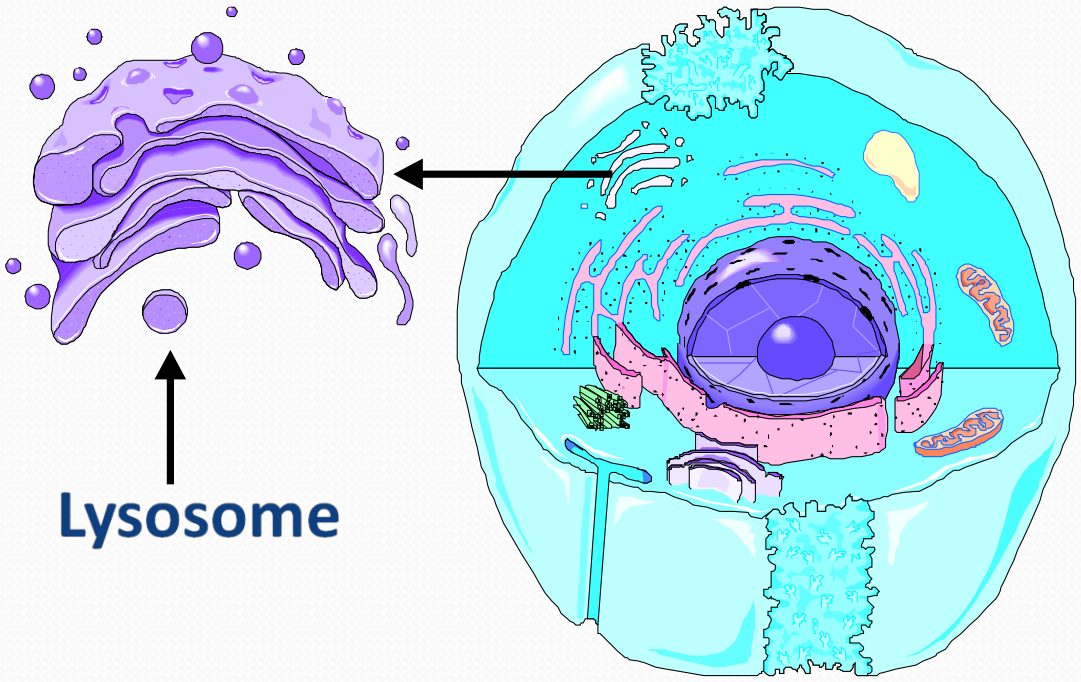
Golgi Complex

- A stack of membrane-bounded channels and vacuoles.
- They synthesize, package, and secrete cell products.



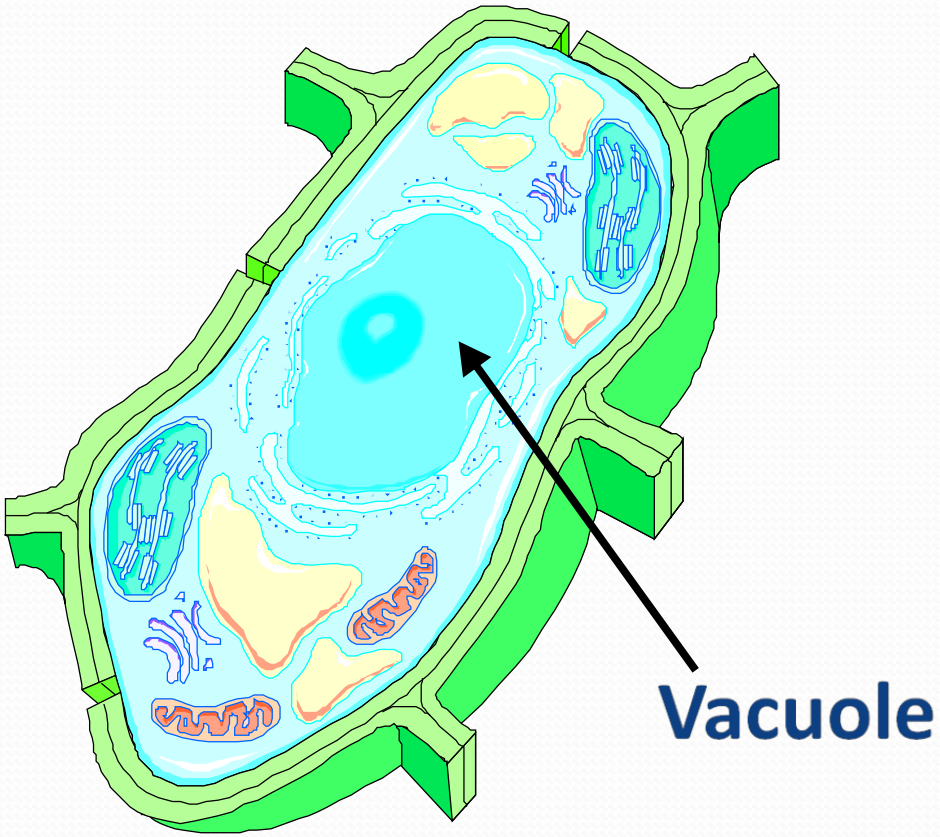
Lysosome

- Membrane-bound sac that contains digestive enzymes.
- They are involved in food digestion in one-celled animals.
- Lysosomes destroy damaged or old cell parts or cells in multicellular animals.
- Although they have been seen only in animal cells, plant cells are now thought to have a similar organelle.



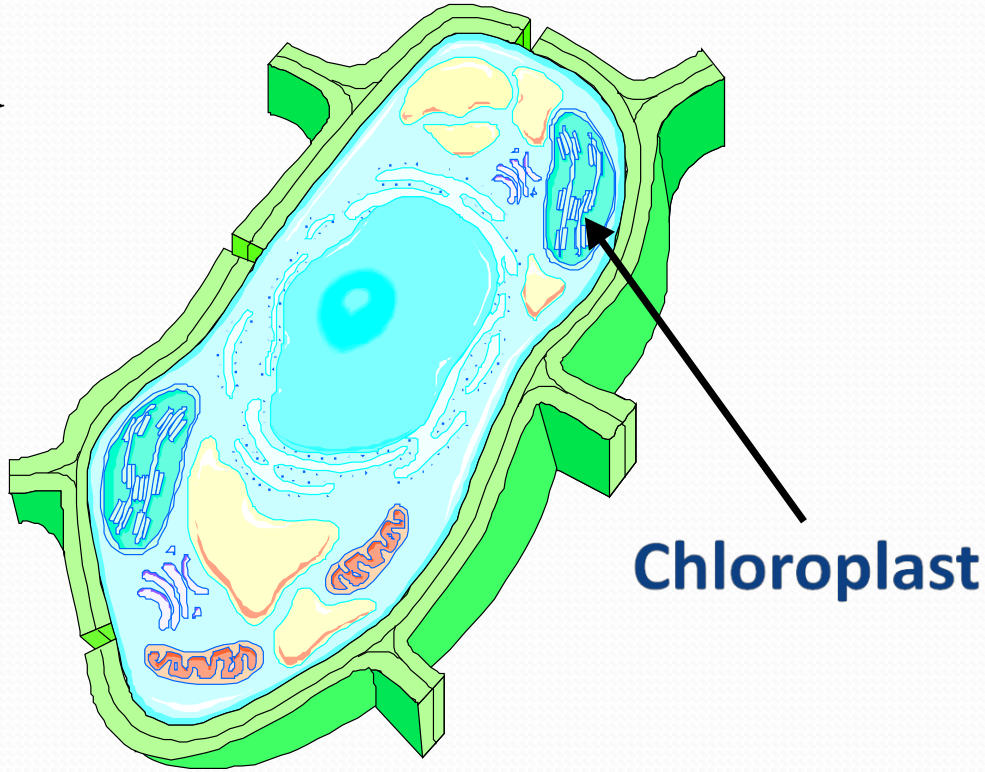
Vacuole

- Membrane bound, sac-like structures used by the cell to store various materials, including food and water.
- Located in the cytoplasm.
- Plant cell vacuoles are bigger than those found in animal cells.
- In plants, their pressure is involved in enabling the plant to stand upright.



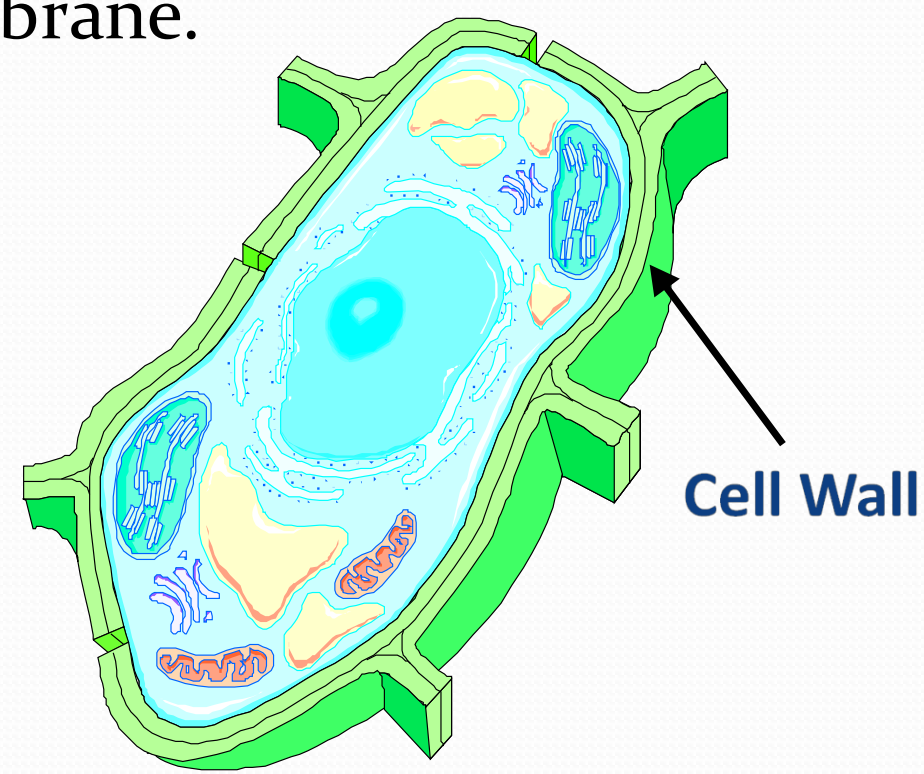
Chloroplast

- The organelle involved in the manufacture of food in plants (**photosynthesis**).
- They are located in the cytoplasm and contain the green pigment **chlorophyll**.
- Chloroplasts are found in green plants and one-celled organisms called **algae**.



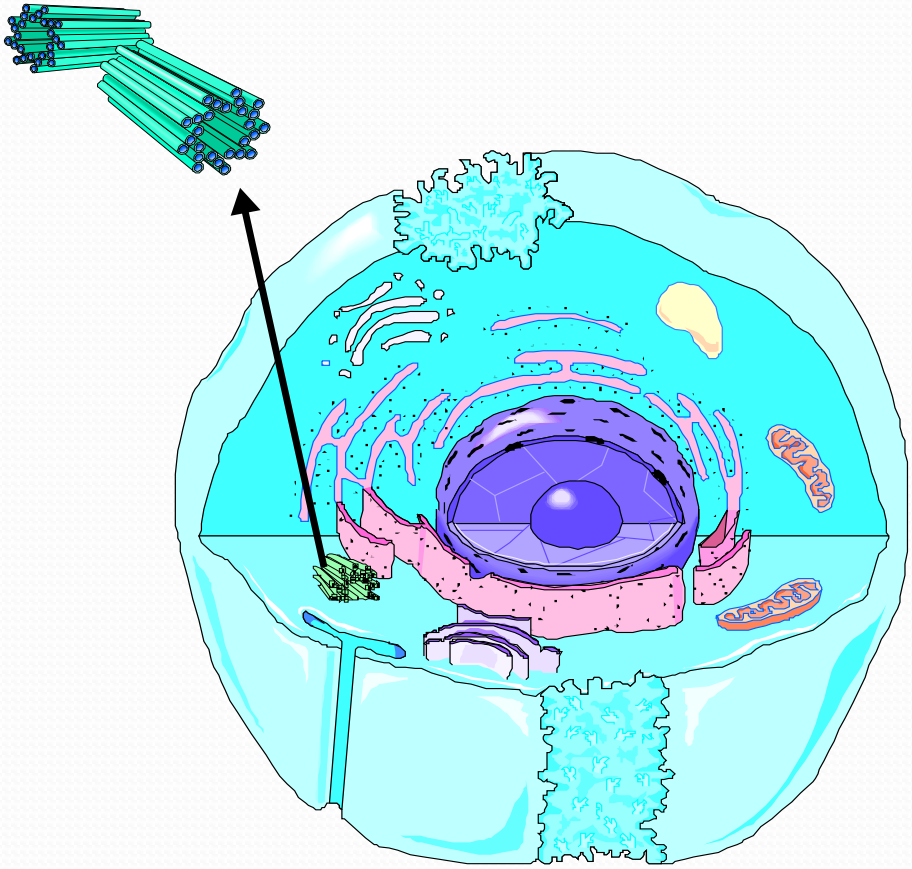
Cell Wall

- The stiff outer layer of plant cells.
- It surrounds the cell membrane and its contents.
- Pores in the cell wall allow substances to come in contact with the cell membrane.
- Composed of a nonliving material called **cellulose**.
- The stiffness of the cell wall limits the plants growth and movement.
- The cell wall gives the plant its shape.



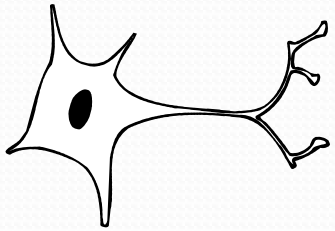
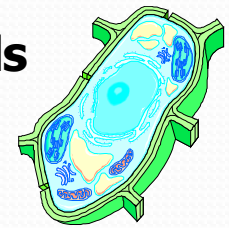
Centrioles

- These structures are found mainly in animal cells.
- They look like cylinders and are located in pairs near the nucleus.
- Centrioles are involved in cell division.



Cell Specialization

- Certain cells in multicellular organisms do certain jobs.
- Advanced organisms have more specialized cells.

Cell Type	Function
Red Blood Cells 	Carry oxygen to body cells.
Muscle Cells 	Move parts of organism.
Nerve Cells 	Carry impulses (messages) throughout organism.
Xylem and Phloem Cells 	Transport materials throughout plants.

Cell Organization

- **Cells**: The cell is the basic unit of structure and function of all living things.
  - Example: white blood cell, muscle cell
- **Tissue**: A group of similar cells performing the same function.
  - Example: muscle tissue, blood tissue
- **Organ**: A group of specialized tissues performing one main function.
  - Example: stomach, kidney
- **System**: A group of organs that carry on one of the major body functions.
  - Example: digestive system, nervous system
- **Organism**: An organism is made up of systems that perform its life functions.
  - Example: plants and animals