Chapter- 8 Cell : Structure and Functions

Discovery of the Cell

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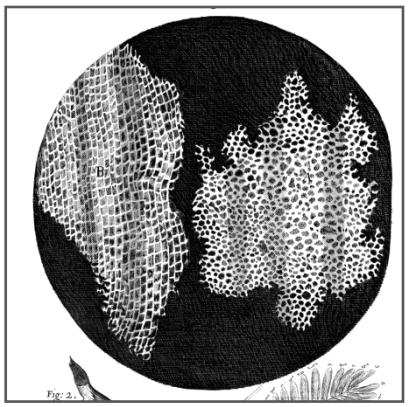
Robert Hooke in 1665 observed the slices of cork cells from the bark of the tree. These cells are non living. He observed them under a simple microscope and found many compartments separated from each other by a partition. He coined the term cell for each compartment.



Cork cells

The Cell

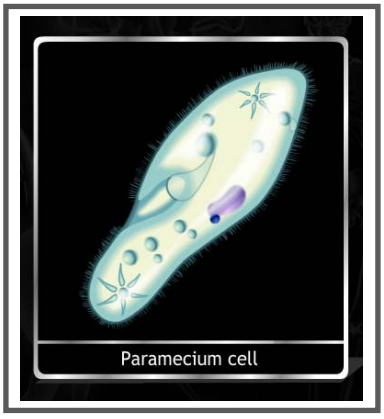
- The cell is the basic structural and functional unit of life; all organisms are composed of cells.
- All cells are produced by the division of preexisting cells through reproduction.
- Each cell contains genetic material that is passed down during this process.
- All basic chemical and physiological functions - for example, repair, growth, movement, immunity, communication, and digestion - are carried out inside of cells

Organisms show Variety in Cell Number, Shape and Size

There are millions of living organisms and each differs in shapes and sizes. Their organs also vary in shape, size and number of cells. Different groups of cells perform a variety of functions.

Number of Cells

An organism may be single cellular that is made up of one cell or multi cellular made of many cells. Amoeba and Paramecium for example are single celled. All the body processes like digestion, respiration, reproduction and excretion are carried out by that single cell while an elephant is multi celled and has complex organ system to carry out the body processes.

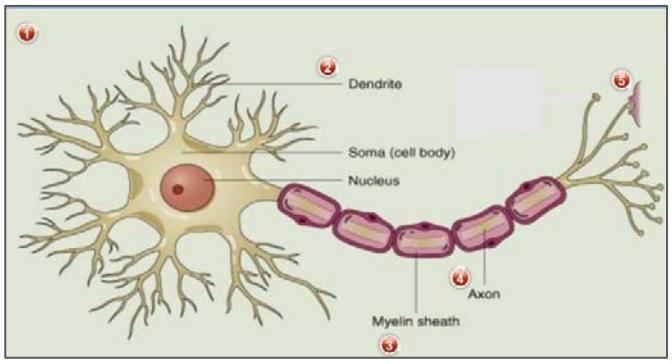


Shape of Cells

Generally, cells are round, spherical or elongated. Some cells are long and pointed at both ends. They exhibit spindle shape. Cells sometimes are quite long.

Cells may be irregular in shape like the amoeba. The white blood cell also does not have any fixed shape.

A red blood cell is disc shaped and its function is transportation of gases in the human body.
Some are branched like the nerve cell or a neuron which transmits the signals from throughout the body. It helps in the control and coordination of the body.
Another example is the muscle cells which facilitate the movement of muscles.



Nerve cells

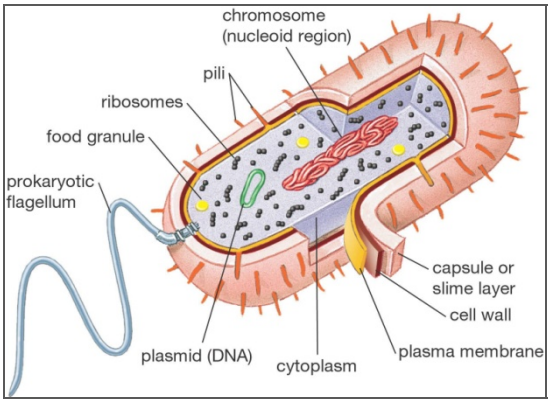
Size of Cells

The cells also vary in their sizes. The smallest cell is that of a bacteria which is 0.1 to 0.5 micrometer while the largest is an ostrich egg measuring 170 mm × 130 mm.

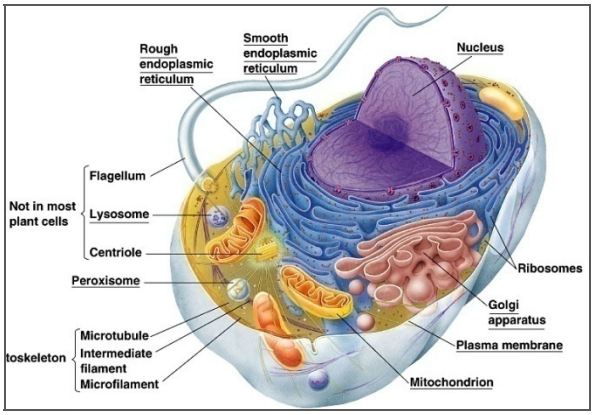
Cell Structure and Function

Our body has various organ system these contain specific organs. Each organ is made up a group of tissues and likewise each tissue is made of up several cells. A **tissue** is a group of similar cells performing a specific function. For example the function of the muscle tissues is the contraction and relaxation of muscles. There are two types of cells namely prokaryotic and eukaryotic cell.

Prokaryotic Cell	Eukaryotic Cell
The term pro means primitive and karyon means nucleus. It is devoid of well defined nucleus and also does not have the cell organelles like mitochondria, Golgi bodies and plastids. The genetic material is in form of nucleoid in the cytoplasm.	Eukaryotic cell on the other hand has a well defined nucleus with nuclear membranes and all the cell organelles.
The bacterial cell is an example of a prokaryotic cell.	Nerve cell or muscle cell is an example of eukaryotic cell.



Prokaryotic Cell



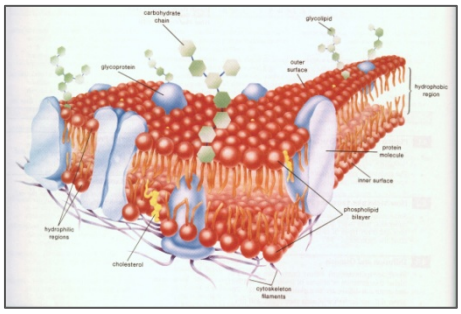
Eukaryotic Cell

Parts of the Cell

The cell is made of up cell wall, membrane, nucleus, cytoplasm, vacuole and the plastids and the mitochondria. These are called as cell organelles. Each cell organelle has its own particular function to carry out. Like for example the plastids in plant cell have chloroplast that contains the green coloured pigment chlorophyll. This chlorophyll traps the light energy from sun and converts it into chemical energy.

Cell Membrane

The cytoplasm and the other cellular components embedded in it are surrounded by the plasma membrane. The plasma membrane separates the cell from one another and also from the outside environment. It is semi-permeable that means it allows the movement of certain substances and restrict the movement of others.



Cell membrane structure

Cell wall

The cell is protected by the cell wall. It is not present in the animal cell. This cell wall provides the shape and rigidity to the cell. Plant cell are non motile therefore to protect themselves from unfavourable conditions like high wind speed, increase or decrease in temperature they have cell wall.

Cytoplasm

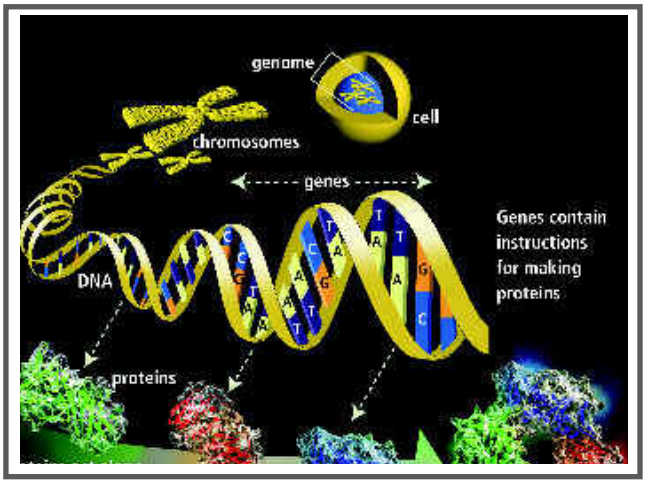
It is the jelly-like substance present between the cell membrane and the nucleus. Various other components, or **organelles**, of cells are present in the cytoplasm.

Nucleus

It is the dense round body at the centre of the cell. Like the brain in our body, the nucleus regulates all the functioning of the cell. The nucleus is separated from the cytoplasm by the nuclear membrane. The nucleus also has its cytoplasm called the **nucleoplasm**. Inside the nucleus you see another spherical body called the **nucleolus**. The nucleus contains thread like structures called the chromosomes. They have the genetic material or the genes that is transferred to the next generation. We appear similar to our parents; this is because we inherit genes from them. The entire content of a living cell is known as protoplasm. It includes the cytoplasm and the nucleus. Protoplasm is called the living substance of the cell.

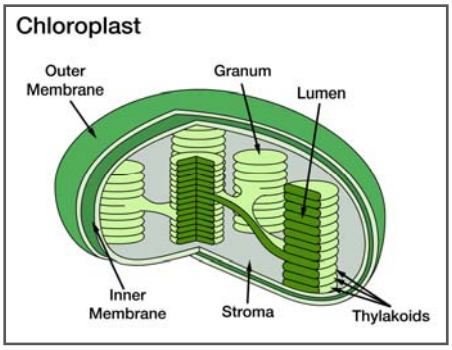
Genes

These are the units of inheritance in living organisms. A gene is a segment of the chromosomes. It controls the transfer of a hereditary characteristic from parents to offspring. This means that your parents pass some of their characteristics on to you. If your mother has brown eyes, you may also have brown eyes. If your father has curly hair, you might also end up having curly hair. However, the different combination of genes from parents results in different characteristics.



Structural organization of cell

Chloroplasts



Another cell organelle found only in the plant cell is the plastids. These contain coloured pigments. The green coloured plastid is called as chloroplast. They contain green colour pigment chlorophyll which is essential for the process of photosynthesis.

Mitochondria

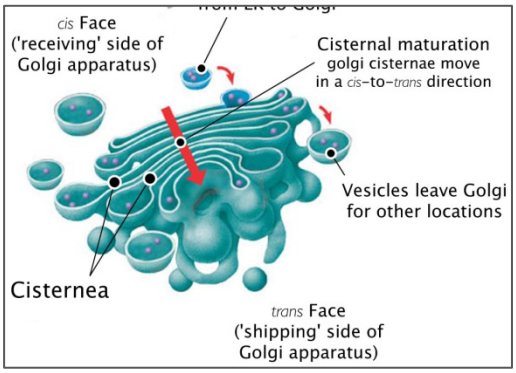
Mitochondria are the powerhouse of the cell. It is the. They are responsible for the generation of energy.

Golgi bodies

These are membrane bound vesicle that package and transport macromolecules.

Vacuoles

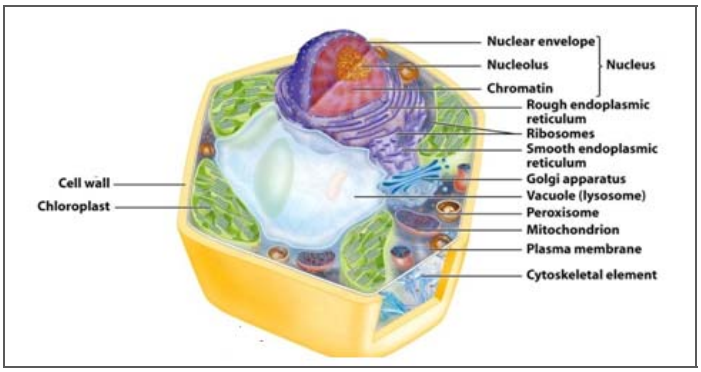
These are membrane bound sacs which help in intracellular digestion.



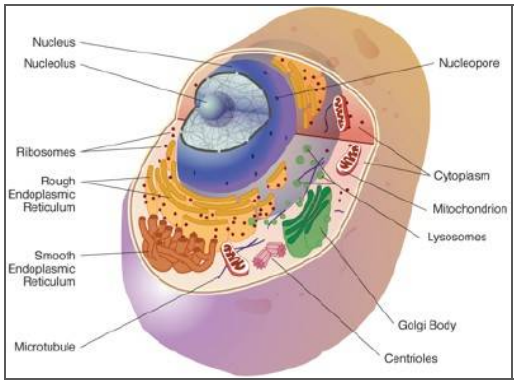
Golgi bodies

Comparison of Plant and Animal Cells

A plant cell varies from an animal cell as the animal cell is devoid of cell wall. Also the plant cell contain plastids which are absent in the animal cells. The vacuole occupies a larger portion in the plant cell unlike the animal cells that have vacuole scattered in the cell.



Plant cell



Animal cell