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## INTRODUCTION OF THE CELL

### STRUCTURE AND FUNCTION

### OF THE CELL

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Both living and non-living things are composed of molecules made from chemical elements such as Carbon, Hydrogen, Oxygen, and Nitrogen. The organization of these molecules into cells is one feature that distinguishes living things from all other matter.

Before the 17<sup>th</sup>, no one knew that cells existed, since they are too small to be seen with the naked eye. The invention of the microscope enabled **Robert Hooke**, (1665) to see and draw the first '**cells**', a word coined by Hooke to describe the cells in a **thin slice of cork**.

**The cell** is the smallest unit of matter that can carry on all the processes of life. Every living thing - from the tiniest bacterium to the largest whale - is made of one or more cells. **The cell** from Latin *cella*, meaning "small room".

**Cell** is the basic structural, functional, and biological unit of all known living organisms, and is often called the "**building blocks of life**".

**Cells** consist of **cytoplasm** enclosed within **a membrane**, which contains many biomolecules such as **proteins** and **nucleic acids**.

**The characteristics** that allow a cell to perform these functions include:

1. A cell membrane that keeps the chemical reactions of life together.
2. At least one **chromosome**, composed of the genetic material that contains the important information of the cell.
3. Cytoplasm – the fluid inside the cell, in which the chemical processes of life occur.

**Organisms** can be classified as **unicellular** (consisting of a single cell; including **bacteria**) or **multicellular** (including **plants** and **animals**).

## Cell Theory:

Cell Theory was eventually proposed in 1838 by **Matthias Schleiden** and **Theodor Schwann**. However, many other scientists like **Rudolf Virchow** contributed to the theory and in 1855 'Cell Theory' came – i.e. 'cells only come from other cells'. This theory has become the foundation of modern biology.

Cell Theory consists of three principles:

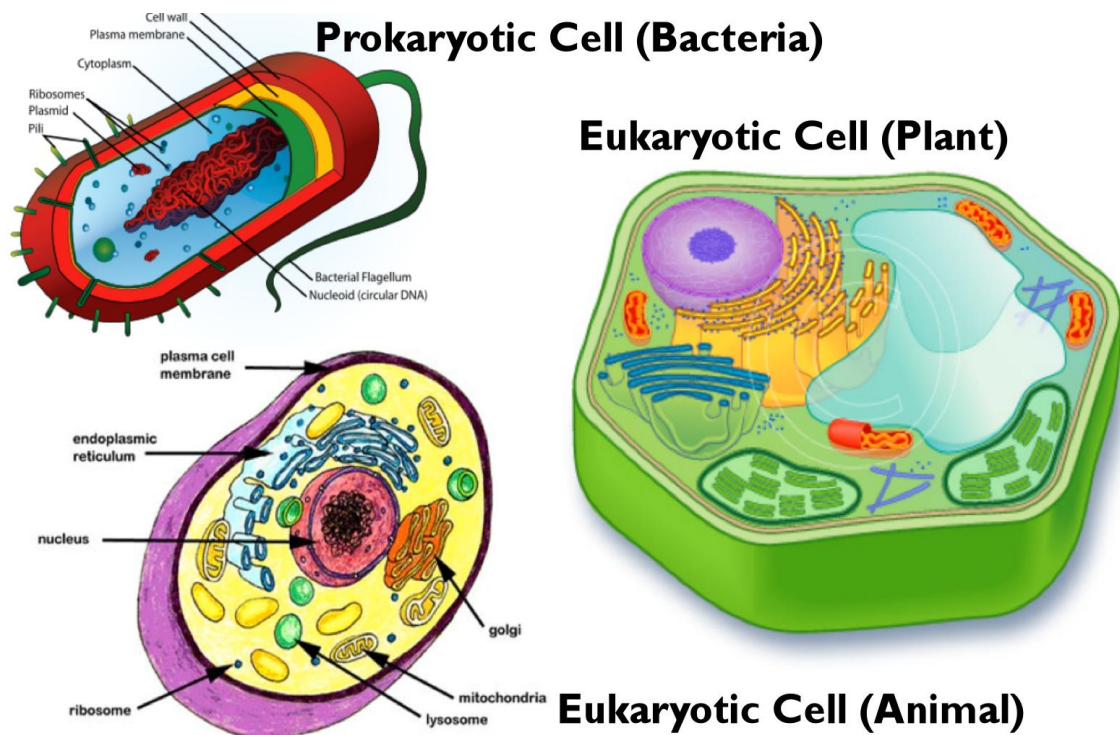
1. All living organisms are composed of one or more cells.
2. The cell is the most basic unit of life.
3. All cells come only from the replication of existing, living cells.

## Prokaryotes and Eukaryotes Cells

On earth there are two types of Cells, **eukaryotic**, which contain a nucleus, and **prokaryotic**, which do not. **Prokaryotes** are single-celled organisms, while **eukaryotes** can be either **single-celled** or **multicellular**.

## Comparison between prokaryotes and eukaryotes cells

	Prokaryotes	Eukaryotes
<b>organisms</b>	Bacteria, Blue-green algae	fungi, plants, animals
<b>Typical size</b>	~1-10 $\mu\text{m}$	~ 10-100 $\mu\text{m}$
<b>Type of nucleus</b>	Nuclear body, No nucleus	real nucleus with nuclear envelope
<b>Ribosomes</b>	70S	80S
<b>Cytoplasmatic structure</b>	very few structures	highly structured by membranes and a cytoskeleton
<b>Organization</b>	usually single cells	single cells, colonies, higher multicellular organisms with specialized cells
<b>Cell division</b>	Binary fission (simple division)	Mitosis (normal cell replication) Meiosis (gamete production)
<b>DNA</b>	Circular (usually)	Linear molecules (chromosomes)
<b>Chromosomes</b>	Single chromosome	More than one chromosome
<b>Membranes</b>	Cell membrane	Cell membrane and membrane-bound organelles



## CELL VARIABILITY

Not all cells are similar. Even cells within the same organism show difference in size, shape, and internal organization.

## CELL SIZE

A few types of cells are large enough to be seen by the eye ex : chicken egg , where's most cells are small for two main reasons:

- the ratio of nuclear material to the cytoplasm.
- the ratio of the surface area to volume.

## CELL SHAPE

Cells come in a variety of shapes – depending on their function ex.  
Blood cells are rounded disks, so that they can flow smoothly.

## INTERNAL ORGANIZATION

1. Cells contain a variety of internal structures called **organelles**.
2. **An organelle is a cell component that performs a specific function in that cell.**
3. The organelles of a cell maintain the life of the cell.
4. There are many different cells; however, there are certain structures common to all cells. For example, the entire cell is **surrounded by a thin cell membrane**. All membranes have the same basic structure.
5. Organelles often have their own membranes too – once again, these membranes have a similar structure.
6. The **nucleus, mitochondria** and **chloroplasts** all have double membranes, more correctly called **envelopes**.

## Function of Cells

Scientists define seven functions that must be performed by a living organism :

1. A living thing must respond to changes in its environment.
2. A living thing must grow and develop across its lifespan.
3. A living thing must be able to reproduce, or make copies of itself.
4. A living thing must have metabolism.
5. A living thing must maintain homeostasis, or keep its internal environment the same regardless of outside changes.
6. A living thing must be made of cells.
7. A living thing must pass on traits to its offspring.

In biological terms, a cell's main purpose is to survive – especially in the cases of single cell, so, although different types of cells generally have different specialized functions, some types of processes are common that all cells need to perform in order to survive, includes:

- **Transport** : Biochemical particles such as ions and molecules need to travel through the structures, e.g. tissues, of organisms to reach locations where they are needed. Particles can travel via various transport mechanisms.
- **Chemical reactions**: **Metabolic processes** including energy conversion
- **Motility** : in general motility can refer to movement of some components of the cell or to the movement of the whole cell.
- **Reproduction ( Division )**: transmission of genetic material from one generation to the next occurs via **cell division**. There are two types of cell division: **mitosis and meiosis**.