Introduction Dr.Emad AL-Radhi

The Dutch shopkeeper *Antoni van Leeuwenhoek* (1632–1723) may have been:

- The first person to see living cells.
- Using a microscope he built himself, he looked at everything possible.

History of biology

In 1831, the English botanist *Robert Brown* described the nucleus of cells. In 1838, the German botanist *Matthais Schleiden* stated that all plants are composed of cells. A year later, the German zoologist *Theodor Schwann* declared that all animals are composed of cells. As a result of their work, the field of cytology (study of cells) began, and we can conclude that a cell is the smallest unit of living matter.

In the 1850s, the German physician *Rudolph Virchow* viewed the human body as a state in which each cell was a citizen. Today, we know that various illnesses of the body, such as diabetes and prostate cancer, are due to a malfunctioning of cells, rather than the organ itself. It also means that a cell is the basic unit of function as well as structure in organisms.

Virchow was the first to tell us that cells reproduce "every cell comes from a preexisting cell." When unicellular organisms reproduce, a single cell divides, and when multicellular organisms grow, many cells divide. Cells are also involved in the sexual reproduction of multicellular organisms. In reality, there is a continuity of cells from generation to generation, even back to the very first cell (or cells) in the history of life. Due to countless investigations, which began with the work of Virchow, it is evident that cells are capable of self-reproduction.

The cell theory is based upon the work of *Schleiden Schwann*, and *Virchow*. It states that:

1- All organisms are composed of cells.
2- Cells are the basic units of structure and function in organisms, and
3- Cells come only from preexisting cells because cells are self-reproducing.

The characteristics of the life

Order:

The smallest unit of life is the cell.

Metabolism :

Organized synthesis and break down of molecules, can produce energy to power life processes.

Motility:

Organisms can move themselves or their parts.

Responsiveness :

Perceive and react to their environment.

Development:

Develop from simple to more complex organism.

Heredity:

Genes are passed from parent to offspring; gene control an organism's phenotype.

Evolution :

Populations change over time as they adapt to their environment.

Adaptations:

Are modifications that make organisms better able to function in a particular environment .

Molecular Biology

A science of biology deals with study the cell at molecular levels**.** The field overlaps with other areas of biology, particularly genetics and biochemistry.

Molecular biology concerns itself with understanding the interactions between the various systems of a cell, including the interrelationship of DNA, RNA and protein synthesis and learning how these interactions are regulated.

History of Molecular biology

Molecular biology is the scientific study of the molecular basis of life processes, including cellular respiration, excretion and reproduction. The term molecular biology was coined in 1938.

In 1940s, the process by which individual genes produce their unique products began to be understood as resulting from the different sequences of the base pairs that make up the genes.

In 1950s, *Pauling* described the 3-dimensional structure of proteins and *Watson* and *Crick* (1953)described the double helix of the DNA molecule .

In1970s, the technique of genetic engineering were enabling molecular biologists to study higher plants and animals genes to achieve the way for the development of gene therapy.

Modern Cell Theory

This theory is depending on molecular levels of metabolic activities of the cell. Its state that:

1- The cell is the fundamental unit of structure and function in living things.

2- All cells come from pre-existing cells by division.

3- Energy flow (metabolism & biochemistry) occurs within cells.

4- Cells contain hereditary information (DNA) which is passed from cell to cell during cell division.

5- All the cells are the same in chemical composition.

6- All known living things are made up of cells.

7- Some organisms are unicellular, some others are multicellular.

8- The activity of an organism depends on the total activity of independent cells.

Cell size

Cells are quite small. A frog's egg, at about 1 millimeter (mm) in diameter, is large enough to be seen by the human eye. But most cells are far smaller than 1 mm; some are even as small as one micrometer (μm)—one thousandth of a millimeter. Cell inclusions and macromolecules are smaller than a micrometer and are measured in terms of nanometers (nm).

Why are cells so small? To answer this question, consider that a cell needs a surface area large enough to allow adequate nutrients to enter and to rid itself of wastes. Small cells, not large cells, are likely to have an adequate surface area for exchanging wastes for nutrients.

Cell types

Fundamentally, two different types of cells exist. Prokaryotic cells are so named because they lack a membrane-bounded nucleus. The other type of cell, called a eukaryotic cell has a nucleus.