CELL AND THE CELL THEORY

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- 'Cell' came from a Latin word Cellula meaning "a small compartment"

- The Cell : (i) All living organisms are made up of cells.
  (ii) In unicellular organisms - a single cell represents the whole body and carries out all the vital functions.
  [Viruses and similar organisms like viroids prions etc are acellular, and require host cell for the survival and multiplication]
  (iii) In multicellular organisms - all the cells of the body work harmoneously.
  Cell —— tissue —— tissue System —— organs.

- A cell can be defined as "the basic structural and functional unit in all organisms"
  - Loewy and Siekevitz (1963) defined cell as "a unit of biological actively delimited by a selective (differentially) permeable membrane and capable of self reproduction in a medium free of other living systems
  - Earlier, Brachet (1961) called cell as "well equipped molecular factory".
- The branch under which cell and its structure is studied is called Cytology.
  Cell biology, on the other hand covers the study of cell physiology, biochemistry, genetics besides the cellular organisation.

- HISTORY :
  (1) Robert Hooke (1665) was the first person to see a cell. [an Englishman - mathematician, physicist]
  - He observed many natural objects with his improved microscope.

- Among these were the thin section of bottle cork.
- Hooke discovered a multitude of tiny pores that he named "cells" - came from the Latin word cellula.
- What he infact saw was the cell wall that surrounded the cavities.
- He published his observations which he made with the help of his microscope in a book entitled "Micrographia"

(2) Antony Van Leeuwenhoek (1674), a Dutch, was the first person to see living cells with the help of much improved lenses that could magnify objects almost 300-fold or 270x. Under these microscopes, he found motile objects and reported the same to "The Royal Society". He stated that motility is a quality of life. Therefore these were living organisms. He observed bacteria, yeast, Protozoa, RBC, Spermatozoa etc. He named "animalcules" to the organisms like protozoa and bacteria etc.

(3) M.J. Schleiden (1838), a German botanist, suggested that every structural part of a plant was made up of cells or the result of cells. He also suggested that cells were made by a crystallisation process either within other cells or from the outside. This crystalisation process is no longer accepted with modern cell theory..

In 1839, Theodor Schwann, also a German zoologist, stated that alongwith plants, animals were composed of cells or the product of cells in their structures. This was a major advancement in the field of biology.

From these reports about plants and animals, two of the three tenets of cell theory were postulated -

1. All living organisms are composed of one or more cells.
2. The cell is the most basic unit of life.

Schleiden's theory of cell formation through crystallization was refuted.

(4) Rudolf Virchow (1858), a German Scientist, stated that the new cells originate from the pre-existing cells only (Omnis cellula e cellula in Latin). Thus the three tenets to the cell theory are as follows —

1. All organism are composed of one or more cells,
2. The cell is the basic unit of structure and organisation in organisms.
3. All cells arise from the pre-existing cells of the similar kinds. Thus, the continuity of life from one generation to another is through living cells.

Although, Rudolf Virchow made important contribution towards the formulation of cell theory, the credit for the theory was given to Schleiden and Schwann, as they attracted the attention of biologists of that time.

The main features of the cell theory as it is known today and generally accepted as parts of modern cell theory are as follows —

1. All organisms are made up of one or more cells
2. All living cells arise from pre-existing cells by division.
3. The cell is the fundamental unit of structure and function in all living organisms.
4. The chemical composition and metabolism of cells are basically alike and energy flow occurs within cells.
5. The function of an organism as a whole is the outcome of the activities and interactions of the constituent cells.
6. Heredity information (DNA) is passed on from cell to cell.

Basic division of organism

- **Cellular**
  - **Prokaryotes**
    - Bacteria
    - Archaebacteria
  - **Eukaryotes**
    - All other organism
    - Unicellular
    - multicellular
- **Acellular**
  - Viruses
  - Viroids
  - Prions
  - Virusoid

Classification of living organism based on cellular complexity or organisation

- **PROKARYOTES**
  - I- Kingdom - MONERA
- **EUKARYOTES**
  (Further divided based on body organisation)
  - **Unicellular**
    - II Kingdom - PROTISTA
  - **Multicellular**
    (Based on mode of nutrition)
    - **Heterotrophs**
      - **By absorption**
        - III. Kingdom - FUNGI
      - **By ingestion**
        - IV Kingdom - ANIMALIA
    - **Autotrophs**
      - V - Kingdom PLANTAE

- The classification was given by WHITTAKER (1969), which was based on
  (i) Nature of the cell or cellular organisation,
  (ii) Complexity or body organisation,
  (iii) Mode of nutrition

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