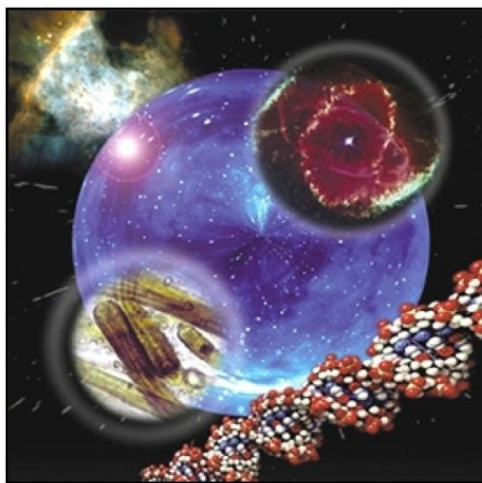




## **Molecular Biology**

### **2nd stage**

#### **Introduction to Molecular Biology**



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## The Three Domains of Life

- Current research theories support the division of living organisms into three domains
  1. Bacteria
  2. Eukaryota
  3. Archaea living in the most inhospitable regions
    - Thermophiles tolerate extremely high temperatures
    - Halophiles tolerate very high salt concentrations
- Cells may be categorized based on their complexity “Cellular Diversity”

**Molecular Biology** is the study of biology at a molecular level. Molecular biology chiefly 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

● also plays important role in understanding formations, actions, and regulations of various parts of cells which can be used to efficiently target new drugs, diagnose disease, and understand the physiology of the cell

• Molecular Biology focuses more on the structure and the relationships between four molecules (proteins, lipids, carbohydrates and nucleic acids) in the body

### What is molecular biology?

- The attempt to understand biological phenomena in molecular terms
- The study of gene structure and function at the molecular level
- As a result, It is the study of molecular basic of the process of replication, transcription and translation of the genetic material.

- **Molecular biology mainly concerns itself with**
- 1- Understanding of interactions between the various systems of a cell, including the interactions between DNA, RNA and protein biosynthesis**
  - 2- learning how these interactions are regulated.**

## **Molecular Biology**

- **This field overlaps with other areas of biology and chemistry, particularly genetics and biochemistry.**
- **It is the joining of aspects between genetics and biochemistry**

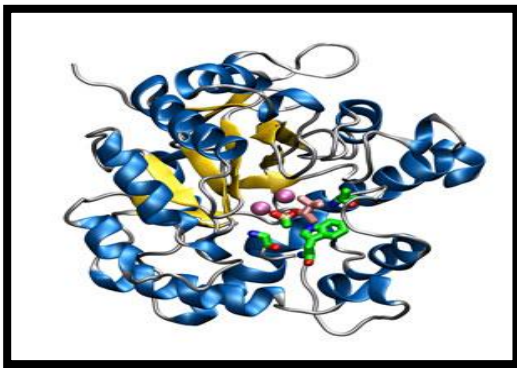
## **A Brief History**

- **Since the late 1950s and early 1960s, molecular biologists have learned to**
  - **Characterize, isolate, and manipulate the molecular components of cells and organisms, which are:**
- 1. DNA, the storage of genetic information**
  - 2. RNA**
  - 3. Proteins, the major structural and enzymatic type of molecule in cells.**
- **Microscopic biology began in 1665**
  - **Robert Hooke (1635-1703) discovered organisms are made up of cells**
  - **Matthias Schleiden (1804-1881) and Theodor Schwann (1810-1882) further expanded the study of cells in 1830s**

## Some Terminology

- **Nucleic acid: Biological molecules (RNA and DNA) that allow organisms to reproduce**
- **Gene:**
- **Basic physical and functional units of heredity**
- **located on the chromosomes**
- **consisting of specific sequences of DNA bases**
- **Gens encode instructions on how to make proteins**
- **Genotype: The genetic makeup of an organism**
- **Phenotype: the physical expressed traits of an organism**
  
- **Components Involve in Molecular Biology**  
**All Life depends on 3 critical molecules**

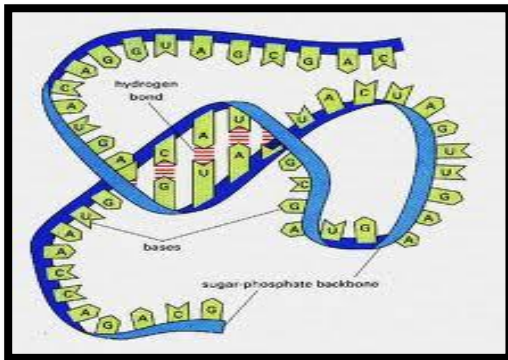
- **PROTEIN**



- **DNA**



▪ **RNA**



## **Protein Structure**

Proteins are chain-like polymers of small subunits, amino acids

- DNA has 4 different nucleotides
- Proteins have 20 different amino acids with:
  - An amino group
  - A hydroxyl group
  - A hydrogen atom
  - A specific side chain

## **Types of Protein Structure**

- Linear order of amino acids is a protein's primary structure
- Interaction of the amino acids' amino and carboxyl groups gives rise to the secondary structure of a protein
  - Secondary structure is the result of amino acid and carboxyl group hydrogen bonding among near neighbors

## Protein Function

### Proteins:

- 1- Provide the structure that helps give cells integrity and shape
- 2- Serve as hormones carrying signals from one cell to another
- 3- Bind and carry substances
- 4- Control the activities of genes
- 5- Serve as enzymes that catalyze hundreds of chemical reactions

