

# CHAPTER 1: Introduction to the History of Biological Sciences

## Introduction:

The **history of biological sciences** reflects humanity's continuous quest to understand life in all its forms. From the earliest observations of nature in **prehistoric times**, when humans relied on plants and animals for survival, to the development of **systematic natural philosophy** in ancient civilizations, biology has always been central to human thought.

In **Antiquity**, scholars such as **Aristotle, Hippocrates, and Galen** laid the foundations of anatomy, physiology, and natural classification. The **Middle Ages and the Renaissance** revived and expanded this knowledge through translation, experimentation, and the birth of scientific inquiry.

By the **seventeenth and eighteenth centuries**, the invention of the **microscope**, the rise of **taxonomy** (Linnaeus), and the discovery of circulation (Harvey) transformed biology into a more empirical science. The **nineteenth century** was marked by the formulation of the **cell theory**, Darwin's **theory of evolution by natural selection**, and the beginnings of **genetics**, setting the stage for modern biology.

The **twentieth century** brought an unprecedented revolution: the rise of **molecular biology, genetics, ecology, biotechnology, and medicine**. Discoveries such as the **DNA double helix**, the **genetic code**, antibiotics, vaccines, and later **gene therapy and cloning** redefined the scope of biology, while the **Human Genome Project** ushered in the genomic era.

Today, biology is a **multidisciplinary and global science**, deeply interconnected with **chemistry, physics, informatics, and environmental studies**. Its history illustrates not only scientific progress but also the interaction between **knowledge, culture, technology, and ethics**, showing how humanity's understanding of life has evolved through observation, experimentation, and innovation.

## 1. Science: Definition and Scope

The word **science** comes from the Latin *scientia*, meaning *knowledge* (from *scire*, "to know"). Science is the **systematic study of the natural world**, based on observation, experimentation,

and reasoning. It is a **body of knowledge of universal value**, aiming to explain phenomena and discover the laws governing nature.

## 2. What is Biology?

The term **biology** derives from the Greek words *bios* (life) and *logos* (study). Biology is **the science of life**—the study of living organisms and those that once lived. It investigates their **structure, function, growth, reproduction, evolution, and interactions** with the environment.

## 3. History of Science

Science has developed through the **progressive transformation of human thought**, evolving from ancient speculations to a modern, evidence-based discipline. The **history of science** traces this evolution of knowledge, showing how humans gradually moved from intuitive explanations to experimental methods.

## 4. Key Concepts in Knowledge

- **Knowledge:** Understanding the properties and characteristics of phenomena, such as the laws of nature.
- **Intuition:** Immediate awareness of a truth without reasoning or direct experience.
- **Technology:** The practical application of scientific knowledge to improve living standards and the human environment.

## 5. Major Disciplines of Biology

Biology covers all levels of life, from **molecules and cells** to **organisms, populations, and ecosystems**. Its many branches often overlap and complement each other.

### a. Biochemistry

The study of the chemical processes of life: metabolism, enzymes, and the molecules of living organisms (proteins, lipids, carbohydrates, nucleic acids). **Pioneers:**

- **Justus von Liebig (1803–1873):** Discovered the role of nitrogen in plant nutrition and founded **agricultural chemistry**, explaining how minerals and fertilizers help plants grow.
- **Melvin Calvin (1911–1997):** Discovered the **Calvin Cycle**, the biochemical pathway by which plants convert carbon dioxide into glucose during photosynthesis.

## **b. Microbiology**

Focuses on microscopic organisms—bacteria, viruses, protozoa, certain fungi, and unicellular algae. It examines their structure, metabolism, life cycles, and roles in health and disease.

### **Pioneers:**

- *Antonie van Leeuwenhoek*, developer of early microscopes.
- *Louis Pasteur*, founder of modern microbiology.

## **c. Zoology**

The study of animals, including their anatomy, physiology, behavior, classification, and evolution.

### **Pioneers:**

- *Aristotle*, first systematic observer of animals.
- *Georges Cuvier*, founder of comparative anatomy.

## **d. Botany**

The study of plants, from their structure and physiology to their classification and ecology.

### **Pioneers:**

- *Theophrastus*, father of botany.
- *Carl von Linné* (Linnaeus), creator of modern taxonomy.

## **e. Ecology**

The study of relationships between living organisms and their environment.

### **Pioneers:**

- *Alexander von Humboldt*, founder of biogeography.
- *Ernst Haeckel*, who coined the term “ecology.”

## **f. Biophysics**

Applies physical principles to explain biological processes such as cell mechanics, energy transfer, and molecular interactions. This field bridges biology, physics, and chemistry.