GENERAL INTRODUCTION

Botany is the branch of biology that embraces the study of plants and plant life. Prior to the 19th century, biology came under the general study of all natural objects and was called Natural History. The term 'biology' was coined by Jean-Baptiste de Lamark, and it is now a standard subject of study at schools and universities around the world. Historically, all living things were grouped as either animals or plants. Some organisms once included in the field of botany are no longer considered to belong to the plant kingdom—these include fungi, lichens, bacteria and viruses.

Botany includes the study of the structure, properties and biochemical processes of all forms of plant life as well as plant taxonomy, phytopathology, and plant ecology. A number of agricultural subjects have botany as their foundation. Among these are agronomy, floriculture, forestry, horticulture and plant breeding. Botany received an impetus in the 16th century mainly through the work of physicians and herbalists who started using plant for medicine. Today, the principal branches of botanical study are morphology, physiology, ecology and systematics.

From pre-historic times till the late eighteenth century, the medical utility of plants provided the primary motive for studying them. The Greek philosopher, Theophrastus (370–287 BC) made the first recorded systematic account of about 480 different kinds of plants and published *'Historia Plantarum'*. Theophrastus's *Historia Plantarum* served as a reference work in botany for many centuries. Between 1660 and 1704, John Ray, through a series of botanical books, gave a first-hand account of many previously undescribed plants. Carl Linnaeus (1754) performed the foundation work on identification and nomenclature of plants and divided the plant kingdom into 25 classes. The primary thrust of botany in early times was plant identification, description and classification. After the invention of the microscope, plant anatomy and cytology began to be studied. Robert Hooke (1635–1703), Nehemiah Grew (1641–1712) and Marcello Malphighi (1628–1694) reported their experimental investigations of plant cells and tissue structure. Stephen Hales (1720s), Joseph Priestley (1733–1804) and Jan Ingen-Housz (1730–1799) devised chemical and physical experiments to measure physiological processes in plants. Perhaps the most significant was the work of Mendel (1859), from which grew the science of genetics. Later various practical aspects of plants developed separately into specific scientific disciplines, e.g., agriculture, agronomy, horticulture and forestry.

Modern botany has expanded into all areas of biology including ethnobotany, biochemistry, molecular biology, cell biology, cell physiology and ecology. Biotechnology, genetic engineering and phytoremediation are the recent offshoots of botany. A considerable amount of new knowledge is being generated from studying model plants like *Arabidopsis thaliana* which is one of the first plants to have its genome sequenced. The sequencing of the relatively small genome of *Oryza sativa* has made rice an important model plant. *Brachypodium distachyon* is also emerging as an experimental model for understanding the genetic, cellular and molecular biology of temperate grasses. Other commercially important food crops like wheat, maize, barley, pearl millet, rye and soya bean are also undergoing genome sequencing. *Chlamydomonas reinhardtii* is another plant model organism that has provided important insight into cell biology. The phylogeny of flowering plants, based on the analysis of DNA sequences, has also been published. Modern developmental biology includes the study of genetic control of cell growth, differentiation and morphogenesis. Model organisms for developmental biology include the roundworm *Caenorhabditis elegans*, the fruit fly *Drosophila*

melanogaster, the zebrafish *Brachydanio rerio*, the mouse *Mus musculus* and the weed *Arabidopsis thaliana*. Conservation biology deals with the study of preservation, protection and restoration of the natural environment, ecosystems, vegetation and wildlife. As described by Carl Woese, on the basis of rRNA gene data, a phylogenetic relationship among all living things exists which separates the three domains—bacteria, archae bacteria and eukaryotes from each other. The exact relationship of the three domains is still being debated.

Molecular biology overlaps with other areas of biology, particularly with genetics and biochemistry. Molecular biology chiefly concerns itself with the understanding of interactions between various systems of a cell including the inter-relationship of DNA, RNA and protein synthesis. Study of *cell biology* includes the physiological properties of cells as well as their functions. This is done both on a microscopic and molecular level. *Genetics* is the science of genes, heredity and variation. Genes encode the information necessary for synthesising proteins, which in turn plays a large role in influencing the final phenotype of an organism. In modern research, genetics provides important tools in the investigation of the function of a particular gene or the analysis of genetic interactions. *Ecology* deals with the distribution and abundance of living organisms and the interactions between organisms and their environment. Ecological systems are studied at several different levels. *Biogeography* deals with the study of spatial distribution of organisms on the earth. These are a few examples that demonstrate how botanical knowledge has an ongoing relevance to the understanding of biological manifestations.