

PLANT:

Plants included those organisms that possess photosynthesis, cell walls, spores, and a more or less sedentary behavior. This contained a variety of microscopic organisms, all of the algae, and the more familiar plants that live on land.

WHY STUDY PLANTS?

The tremendous importance of plants cannot be overstated. Without them, we and most other species of animals (and many other groups of organisms) would not be here.

Photosynthesis in plants and the other photosynthetic organisms changed the earth in two major ways. First, the fixation of carbon dioxide and the release of molecular oxygen in photosynthesis directly altered the earth's atmosphere over billions of years. As a critical mass of oxygen accumulated in the atmosphere, selection for oxygen dependent respiration occurred, which may have been a necessary precursor in the evolution of many multicellular organisms, including all animals. In addition, an oxygen-rich atmosphere permitted the establishment of an upper atmosphere ozone layer, which shielded life from excess UV radiation. This allowed organisms to inhabit more exposed niches that were previously inaccessible. Second, the compounds that photosynthetic species produce are utilized, directly or indirectly, by non-photosynthetic, heterotrophic organisms. For virtually all land creatures and many aquatic ones as well, land plants make up the so-called primary producers in the food chain, the source of high-energy compounds such as carbohydrates, structural compounds such as certain amino acids, and other compounds essential to metabolism in some heterotrophs. Thus, most species on land today, including millions of species of animals, are absolutely dependent on plants for their survival. As primary producers, plants are the major components of many

communities and ecosystems. The survival of plants is essential to maintaining the health of those ecosystems.

To humans, plants are also monumentally important in numerous, direct ways. Agricultural plants, most of which are flowering plants, are our major source of food. We utilize all plant parts as food products: roots (e.g., carrots; stems (e.g., potatoes; leaves (e.g., cabbage, celery, lettuce; flowers (e.g., broccoli; and fruits and seeds, including grains such as rice, wheat, corn, barley, and oats, legumes such as beans and peas, and a plethora of fruits such as bananas, tomatoes, peppers, pineapples, apples, cherries, peaches, melons, citrus, olives, and others too numerous to mention. Other plants are used as savoring agents, such as herbs and spices, as stimulating beverages, such as chocolate, coffee, and tea. Woody trees of both conifers and flowering plants are used structurally for lumber and for pulp products such as paper. In tropical regions, bamboos, palms, and a variety of other species serve in the construction of human dwellings. Plants are important for their aesthetic beauty, and the cultivation of plants as ornamentals is an important industry. Finally, plants have great medicinal significance, to treat a variety of illnesses or to maintain good health. Plant products are very important in the pharmaceutical industry; their compounds are extracted, use to synthesize new drugs.

Some of the fields in the plant sciences are very practically oriented. Agriculture and horticulture deal with improving the yield or disease resistance of food crops or cultivated ornamental plants, e.g., through breeding studies and identifying new cultivars. Forestry is concerned with the cultivation and harvesting of trees used for lumber and pulp. Pharmacognosy deals with crude natural drugs, often of plant origin. But many aspects of the pure sciences also have important practical applications, either directly by applicable discovery or indirectly by providing the foundation of knowledge used in the more practical sciences. Among these are plant anatomy, dealing with cell and tissue structure and development; plant chemistry and physiology, dealing with biochemical and

biophysical processes and products; plant molecular biology, dealing with the structure and function of genetic material; plant ecology, dealing with interactions of plants with their environment; and, of course, plant systematics. A distinction should be made between botany and plant sciences. **Plant science** is the study of plants, treated as equivalent to land plants here. **Botany** is the study of most organisms traditionally treated as plants, including virtually all eukaryotic photosynthetic organisms (land plants and the several groups of algae) plus other eukaryotic organisms with cell walls and spores (fungi). Thus, in this sense, botany is inclusive of but broader than the plant sciences.