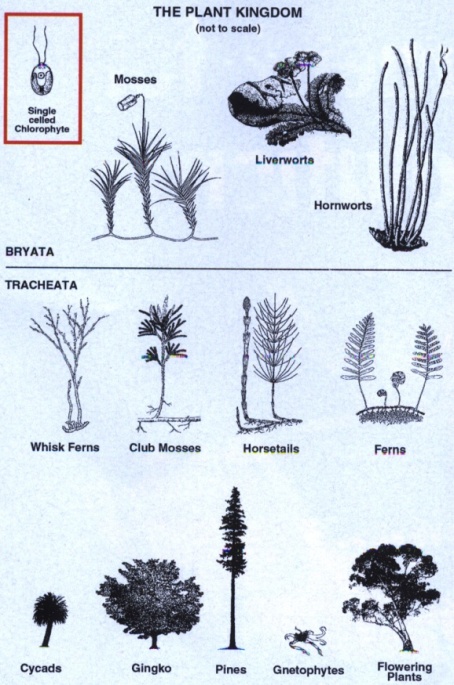
**Kingdom Plantae**

<http://classic.sidwell.edu/us/science/vlb5/Labs/Classification_Lab/Eukarya/Plantae/>

The plant kingdom, one of four eukaryotic kingdoms, is composed of multicellular, autotrophic organisms that photosynthesize to fix inorganic carbon (from atmospheric CO2) into organic molecules. Plants are the foundation of all terrestrial habitats, and serve as terrestrial Earth’s primary autotrophs, making organic molecules that will cycle through the food webs of most ecosystems. The photosynthetic capabilities of plants ultimately allow all terrestrial members of the animal kingdom to survive.

One hallmark of plant cells is the cell wall, which is made of cellulose. The cell walls provide support for plant cells, as well as support and cohesiveness for plant tissue. Unlike the plasma membrane, the cell wall is not a semipermeable membrane, and so the shared cell walls between adjoining plant cells must have openings, plasmodesmata, to allow material transport and communication. Another distinguishing feature of plant cells is the large central vacuole, which stores a water reserve as well as essential chemicals. The central vacuole can also aid in cell growth by absorbing water. Plant cells are the only cells that contain chloroplasts. These organelles carry out the processes of photosynthesis, converting light energy into chemical energy and storing it as sugar.

Plants probably evolved from multicellular green algae called charophytes and were the first multicellular organisms to colonize land. In order to do this, plants had to evolve several new characteristics in the form of distinct, specialized organs, which protists and algae lack. First of all, plants need to have a form of anchorage in the ground and rigid stem tissue for support. Cellulose-containing cell walls developed in plant cells to maintain a form of rigidity in the part of the plant above ground. These account for the stiffness of plant stems and from the hardness of wood. Also, to prevent water loss in a terrestrial environment, plants evolved a waxy cuticle, which covers stem and leaf surfaces. Gases for photosynthesis cannot diffuse across this cuticle, so tiny pores called stomata are present in the cuticle.

Because plants have organs that serve different functions, they must have systems to distribute necessary substances throughout the plant. Sugars, produced in photosynthesis, must be distributed to the body and roots of the plant that do not photosynthesize. Water and nutrients from the soil, taken up by the roots, must also make their way into the plant body and leaves. To perform these essential functions, plants contain a vascular tissue network, consisting of small tubes running throughout the plant. There are two types of vascular tissue: xylem, which are dead cells that transport water and minerals up from the roots, and phloem, which are living cells that distribute sugars produced in photosynthesis. Also characteristic of plants, as well as some algae, are gametangia that protect gametes. These are pockets of cells that protect the egg cell, and where the egg is fertilized.

The predominant plant divisions include the bryophytes ([Division Bryophyta](http://classic.sidwell.edu/us/science/vlb5/Labs/Classification_Lab/Eukarya/Plantae/Eukarya/Plantae/Bryophyta/)), the ferns ([Division Filicophyta](http://classic.sidwell.edu/us/science/vlb5/Labs/Classification_Lab/Eukarya/Plantae/Eukarya/Plantae/Filicophyta/)), the horsetails ([Division Sphenophyta](http://classic.sidwell.edu/us/science/vlb5/Labs/Classification_Lab/Eukarya/Plantae/Eukarya/Plantae/Sphenophyta/)), the gymnosperms ([Division Coniferophyta](http://classic.sidwell.edu/us/science/vlb5/Labs/Classification_Lab/Eukarya/Plantae/Eukarya/Plantae/Coniferophyta/)), and the angiosperms ([Division Anthophyta](http://classic.sidwell.edu/us/science/vlb5/Labs/Classification_Lab/Eukarya/Plantae/Eukarya/Plantae/Anthophyta/)), as well as the ginkgoes ([Division Ginkgophyta](http://classic.sidwell.edu/us/science/vlb5/Labs/Classification_Lab/Eukarya/Plantae/Eukarya/Plantae/Ginkgophyta/)). Bryophytes, the mosses, are the only among these to have a dominant gametophyte generation. The seedless vascular plants, which include such organisms as the fern and the horsetail, have small gametophytes that grow on the bottom of the sporophytes. In these plants, as in mosses, the unprotected sperm require moisture to travel to the egg, where fertilization occurs. This is somewhat of a limiting factor and the reason why these plants are usually found in areas near water or with excessive rain. The gymnosperms, consists of conifers and such plants that have sperm made by pollen grains. Angiosperms, the most recent evolutionary branch of the plant kingdom, are the flowering plants that now dominate the plant world (80% of all plant are angiosperms). The success of the angiosperms lies centrally in the flower, the key part of the reproductive cycle. The flower contains the gametophytes, and controls production of sperm and eggs. Embryos, which are created in the flower, become encased in seeds, which protect the embryos. Seeds are in turn contained by fruits, which facilitate seed distribution, either by wind or animal consumption.

The plant kingdom, one of Linnaeus’s original two, occupies a fairly solid place in modern taxonomy. The only major debate, right now, is on whether the charophytes, the algal ancestors of plants, should be classified in the plant kingdom. They share many similar features, but all algae are currently recognized in the Kingdom Protista. Hence, the Kingdom Plantae has immense diversity, and its organisms are the foundation of the cycles of energy on Earth as well as the fixation of organic carbon, the basis for all life.