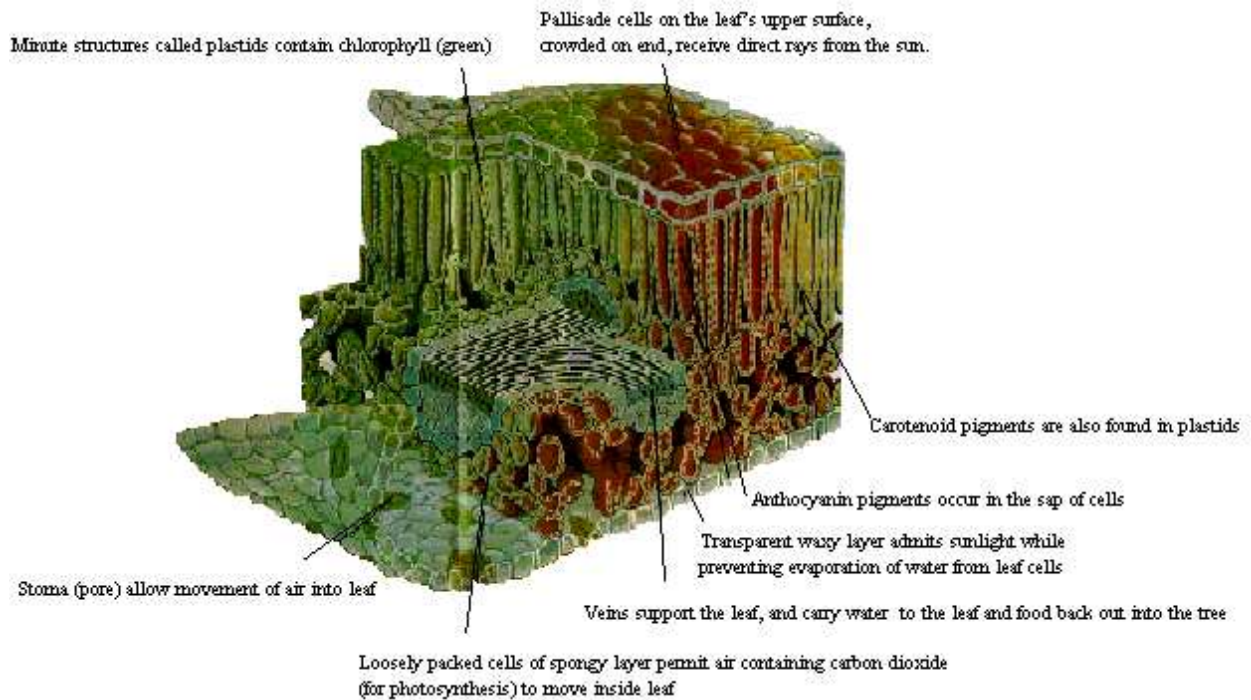




## CHANGING COLOR

Every year at this time we revel in the beauty of the trees, knowing well that it is only a fleeting pleasure. Before long the leaves will flutter away from their summer home and become a part of the rich carpet that covers the forest floor. Many people suppose that Jack Frost is responsible for the color change, but we now know that change in coloring is the result of chemical processes which take place in the tree as the season changes from summer to winter.

All during spring and summer the leaves have served as factories where most of the foods necessary for the trees' growth are manufactured. This food-making process takes place in the leaf (Figure 1) in numerous cells containing the pigment chlorophyll, which gives the leaf its green color. Along with the green pigment leaves also contain yellow or orange carotenoids which, for example, give the carrot its familiar color. Most of the year these yellowish colors are masked by the greater amount of green coloring. But in the fall, partly because of changes in the period of daylight and changes in temperature, the leaves stop their food-making process. The chlorophyll breaks down, the green color disappears, and the yellowish colors become visible and give the leaves part of their fall splendor.



At the same time other chemical changes may occur and cause the formation of additional pigments that vary from yellow to red to blue. Some of them give rise to the reddish and purplish fall colors of leaves of trees such as dogwoods and sumacs. Others give the sugar maple its brilliant orange or fiery red and yellow. The autumn foliage of some trees, such as quaking aspen, birch, and hickory, shows only yellow colors. Many oaks and others are mostly brownish, while beech turns golden bronze. These colors are due to the mixing of varying amounts of the chlorophyll and other pigments in the leaf during the fall season.

Fall weather conditions favoring formation of brilliant red autumn color are warm sunny days followed by cool, nights with temperatures below 45<sup>o</sup> F. Much sugar is made in the leaves during the daytime, but cool nights prevent movement of, sugar from the leaves. From the sugars trapped in the leaves the red pigment called anthocyanin is formed.

The degree of color may vary from tree to tree. For example, leaves directly exposed to the sun may turn red, while those on the shady side of the same tree or on other trees in the shade may be yellow. The foliage of some tree species just turns dull brown from death and decay and never shows bright colors.

Also, the colors on the same tree may vary from year to year, depending upon the combination of weather conditions. The most vivid colors appear after a warm dry summer and early autumn rains which prevent early leaf fall. Long periods of wet weather in late fall produces a rather drab coloration. Droughts favor anthocyanin formation principally due to the indirect effects of soil water deficiency upon the metabolism of the plants. Drought conditions also favor red pigment formation due to the reduction of nitrate absorption.

As the fall colors appear, other changes are taking place. At the base of the leafstalk where it is attached to the twig, a special layer of cells develops and gradually severs the tissues that support, the leaf. At the same time Nature heals the break, so that after the leaf is finally blown off by the wind or has fallen from its own weight, the place where it grew on the twig is marked by a leaf scar.

Through fallen leaves, Nature has provided for a fertile forest floor. Fallen leaves contain relatively large amounts of valuable elements, particularly calcium and potassium, which were originally a part of the soil. Decomposition of the leaves enriches the top layers of the soil by returning part of the elements borrowed by the tree and at the same time provides for more water-absorbing humus.

Some of the most startling color combinations are to be found in the leaves of red and sugar maples, sassafras, sumac, blackgum, sweetgum, Northern red oak, scarlet oak, sour-wood, and dogwood. Ginkgo, hickory, and yellow poplar produce few if any anthocyanins and usually just display a golden yellow.

North Carolina leads the parade for leaf lookers, and depending upon the season, the species of trees involved, and the relative proportion of the three pigments, just about every imaginable color combination may be seen.

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