Autumn Leaf Fall Accents the Soil

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Picture hundreds of painted clowns, performing on trapezes in a big-top tent, suddenly leaping down in unison to the floor to acknowledge the crowd’s applause. What a circus act that would be!

A maple tree is likely to do the equivalent each autumn in eastern USA, adjacent areas of Canada, and mountain areas of Japan and southern China. Try to visualize a tree in full splendor of orange and red leaf color at sunset. Then imagine the same tree the next morning, standing stripped, with a blanket of as many as 100,000 golden leaves on the ground beneath. No wonder the sugar maple *(Acer saccharum* Marshall) is the official state tree of New York, Vermont, West Virginia, and Wisconsin. The state government of Wisconsin issues biennially an impressive Blue Book of reports, with color pictures of the state symbols. The sugar maple in autumn yellow and orange foliage is included.

The tree leaves contain colorful compounds, once masked by the green pigment chlorophyll, that are manufactured all summer. Among these compounds are two stable pigments, orange and red carotene and clear yellow xanthophyll. Other pigments that are formed when autumn comes are water-soluble dyes called *anthocyanins*. These are unstable and also changeable in color, from red in acid cell sap to purple or even blue as acidity lessens. *Anthocyanins* form in sun-illuminated leaves by interaction between sugars and certain cyclic compounds (*anthocyanidins*). With the autumnal “degreening” (Culberson, 1991) of the leaves, their reserves of protein and carbohydrates are moved down tubes to storage sites in the trunk and roots, to be used at the time of spring regreening. All of these changes in the leaves are signs of their decline, leading to abscission and death. This process is said to have evolved during the Cretaceous period (136–65 million yr ago) in response to the development of a strongly seasonal climate (Addicott, 1982). The bright pigments become visible with the disintegration of the chlorophyll. With shorter day length and sunny warm days followed by cool nights, spectacular colors develop in the foliage of species that are genetically capable of producing bright pigments. Among these plants are: maples *(A. saccharum* Marshall, *A. rubrum* L.), sassafras *(Sassafras albidum)*, staghorn and poison sumacs *(Rhus typhina* L. and *R. vernix)*, poison-ivy *(Toxicodendron radicans* L.) *kuntze*, white oat *(Quercus alba* L.) and shadbush *(Amelanchier* spp.). Tannins give a yellow-brown color to leaves of beech *(Fagus* spp.) and oak. Hereditary potential of trees and environmental control of autumn weather combine to create the dramatic coloration. Colors of autumn leaves are represented on nearly every page of the scientific soil color chart that is used internationally. Most published soil profile

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