The Science Behind the Spectacle: Why Do Leaves Change Color?

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Photo Credit: Santa Andujar

A perennial question posed to foresters this time of year is, “why do the leaves change colors?” Those reds, oranges, yellows and browns are influenced by three main factors: day length, weather, and leaf pigments. The timing of color change is primarily regulated by day length, or rather night length at this time of year. As the days get shorter, the amount of sunlight the leaves receive is reduced. With less exposure to the sun, the process of photosynthesis (by which green plants use sunlight to synthesize foods from CO2 and water) begins to slow. Weather conditions such as temperature and amount of rainfall also play a role, but it is primarily the result of nights getting longer and cooler that initiates the biochemical process in the leaf that causes its colors to begin to change.

During the growing season, chlorophyll is continually being produced through photosynthesis. This leaf pigment reflects and transmits green light, causing leaves to appear green. As night length increases, chlorophyll production slows down and then stops. This allows other pigments in the leaf to take over. Carotenoids (also responsible for giving carrots and pumpkins their orange glow) are always present in the leaf, but during the summer months they are masked by green chlorophyll. When visible, they produce yellow, orange and brown colors. Another compound, called anthocyanins, are also produced in the autumn, in response to bright light and excess plant sugars within leaf cells. When allowed to shine, they give us the red and purple hues that are so popular with photographers and leaf peppers.

You could say that the leaves change color because of what is not happening (photosynthesis), as much as by what is. Whatever way you look at it; the annual display of fall foliage is a sight to behold.