



## View from the Home Ranch: Falling Leaves

by Carlas Hill, UC Master Gardener

With great relief, those of us here in the Central Valley have finally found fall stealing into our parched, dry land. We welcome the early morning dew returning to our fields, nurturing the tender blades of grass between rains. Landscape trees have suffered through a hot summer on top of prolonged drought, and as the season turns, they may not be equipped to provide their usual dazzling display of jewel-like color change. Why and how do those spectacular colors form?

During summer, the tree sends nourishment to its leaves, which fulfill their primary function of processing sunlight by photosynthesis, turning the sun's energy into chemical energy that the tree can use. Animals can hibernate or migrate to prepare for winter; trees have fewer options. Deciduous trees "hibernate" by dropping their leaves. Soon after the summer solstice -- generally June 20 or 21 -- as days begin to shorten, the tree will gradually choke off its leaves, pulling nutrients out of the branches and into the trunk and roots, storing the food energy there for use in winter.

On each leaf, at the petiole, or leafstalk -- the part of a plant attaching the leaf to the stem -- special spongy cells form and then scar over, blocking normal nutrient exchange. These are called abscission cells, from the Latin roots *ab*, "off" or "away", and *scindere*, "to cut". They begin the drawn-out process of physically separating the leaf from the tree. With very little nourishment coming in, the leaf can't manufacture chlorophyll, and without chlorophyll, photosynthesis stops. As a result the leaves' "green screens" begin to dissolve and new colors leap into view.

Still partly green at first, the changing leaves reveal splotches of yellow and red as the last remaining chlorophyll breaks down. Yellows, reds and oranges seem to arrive out of nowhere, though in fact they have been present the whole time, radiant secrets hidden beneath the green plasma of spring and summer energy production.

Maple trees in the eastern United States achieve flaming fall reds because they thrive on cold nights and sunny days, a weather combination that contributes to the chemical changes conducive to that color bloom; warm or humid weather tends to turn leaves brown or yellowish. The Chinese Pistache tree (*Pistacia chinensis*) will turn scarlet even in the desert, with the female trees boasting the addition of a cluster of small parchment-like seed pods that rattle in the wind like Indian rain sticks.



The brightest colors appear during years when fall sunlight is fierce and nights are cool and dry. In her essay "Why Leaves Turn Color in the Fall", American poet and naturalist Diane Ackerman provides "color commentary" on this phenomenon in the truest sense of the phrase. She writes: "Not all leaves turn the same color. Elms, weeping willows, and the ancient ginkgo all grow radiant yellow, along with hickories, aspens, bottlebrush, buckeyes, cottonwoods, and tall, keening poplars. Basswood turns bronze, birches bright gold. Water-loving maples put on a symphonic display of scarlets. Sumacs turn red, too, as do flowering dogwoods, black gums, and sweet gums." In some spots, one slope of a hill may be green and the other already in bright color, because the hillside facing south gets more sun and heat than the northern one." Given the great variation in elevation among the Sierra foothills, we can experience a vast amount of fall color within a short drive.

The leaf has reached the end of its useful life; the tree is busy shedding its deciduous burden and "battening down" against the approaching winter. But just what is it that brings the countdown clock to zero and causes the leaf to take its final leap? With the cessation of the spring and summer's energy production and nutrient exchange, and the onset of the fall season's further chemical changes, the level of plant growth hormone auxin drops, and the abscission cells at the base of the petiole again divide, pushing each leaf further away from tree. The few fibers still attaching leaf to tree grow fewer and become fragile, until the merest breath of wind is enough to break that last tenuous bond and send the leaf gliding earthward. Truly, autumn's breezes merely finish the job the tree itself started.

It seems we've always called this season "fall": the word derives from the Old English *feallan*, "to fall"; that early word traces its origins back even further, to numerous ancient Indo-European roots all having the same basic meaning ... surely a most appropriate term to associate with this annual metamorphosis and harbinger of seasonal change.

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