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Changing Colors

Dr Reese Halter is a public speaker and conservation biologist. His latest book is The Incomparable Honeybee and the Economics of Pollination. Contact him through www.DrReese.com.

We first met Dr. Reese in Aspen, Colorado at a conference staged by John Denver's Windstar Foundation. Lyle and I were very taken with this tree scientist and have been corresponding ever since. Reese is on the west coast and you'll enjoy his insights and information on fall colors:

The most colorful time of year is autumn. It's brief and should be celebrated outdoors, before the colors fade and the trees drop their leaves. Become a "leaf-peeper" and open your eyes to nature's glorious hues of scarlet, gold and wine. In order to understand autumn colors we must examine the leaf. Leaves have spent the winter tightly wrapped in a cover of weather-resistant scales, and emerge in spring from buds formed the previous summer. Bursting buds result from absorbing the sun's energy.

Young leaves expand and endeavor to survive the onslaught of insects, strong winds and hot, sometimes scalding, sun. Leaves are filled with cell sap made up of millions of green chlorophyll molecules. They take energy from the sun, water from the ground and atmospheric carbon dioxide and, in return, give back oxygen to the air. They also make sugars for all parts of the tree to grow.

Chlorophyll is an unstable molecule because of a magnesium atom at its center. If it's artificially replaced by a copper atom then the green color becomes permanent. That's exactly what we find in the store when buying green toothpaste, shampoo and many food products. Not all cells in leaves are chlorophyll (green). Some cells, called chromoplasts, contain non-light making pigments, like carotenes (oranges of carrots) and xanthophylls (yellows of corn). They give a leaf the yellow color when it looses chlorophyll. Some oak leaves have tannins – bitter to taste and used as a plant defense against insects – that cause a brownish leaf color in autumn.

There's a third class of pigments in tree leaves called anthocyanins that produces brilliant reds and purples of apples, grapes and most maples. They are not found in the chromoplast cells that make carotenes. They form in leaf cell sap because of a chemical reaction between accumulating sugars and organic compounds. The more acidic the cell sap the more dazzling the red. Purples and blues, on the other hand, occur when the cell sap is less acidic. Substances other than pigments also occur in leaves. Resins help repel sap sucking or leaf munching bugs. Leaf hormones govern growth, protect against water-stress and cold temperatures. As August progresses the day length shortens. Soon layers of waterproof cork cells form between the leaf stalk and the twig. The leaf is now sealed off from its tree – incapable of receiving water from the sap stream and unable to export leaf sugars to the tree. The leaf cell sap begins to accumulate. The greens of the chlorophylls are destroyed and yellows are unmasked. The cool fires of fall have been ignited!

Alder leaves don't display much if any autumn color. Cottonwood, aspens, birches and larches are rich in carotenes but not anthocyanins, they paint the landscape with yellows and golds.
Maples and sweetgum are heavy with anythocyanins and produce deep wines and reds. And some trees have a lovely mix of both reds and yellows.
Sunny days and crisp cool nights are just the right combination for majestic fall colors. I recommend hiking

in the eastern Pasayten Wilderness to the Upper Cathedral Lakes, Washington to the sublime sub-alpine larches; they display (for about a week) an awesome autumn golden-yellow before they too shed their needles.

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