Why Leaves Turn Color in the Fall

DIANE ACKERMAN

The stealth of autumn catches one unaware. Was that a goldfinch perching in the early September woods, or just the first turning leaf? A red-winged blackbird or a sugar maple closing up shop for the winter? Keen-eyed as leopards, we stand still and squint hard, looking for signs of movement. Early-morning frost sits heavily on the grass, and turns barbed wire into a string of stars. On a distant hill, a small square of yellow appears to be a lighted stage. At last the truth dawns on us: Fall is staggering in, right on schedule, with its baggage of chilly nights, macabre holidays, and spectacular, heart-stoppingly beautiful leaves. Soon the leaves will start cringing on the trees, and roll up in clenched fists before they actually fall off. Dry seedpods will rattle like tiny gourds. But first there will be weeks of gushing color so bright, so pastel, so confettilike, that people will travel up and down the East Coast just to stare at it —a whole season of leaves.

macabre (mə käb´ rə) *adj.* gruesome; grim and horrible

Where do the colors come from? Sunlight rules most living things with its golden edicts.[1] When the days begin to shorten, soon after the summer solstice on June 21, a tree reconsiders its leaves. All summer it feeds them so they can process sunlight, but in the dog days of summer the tree begins pulling nutrients back into its trunk

Reading Check

What question will the writer answer?

1. **edicts** (ē´ dikts´) *n.* authority; order.

and roots, pares down, and gradually chokes off its leaves. A corky layer of cells forms at the leaves' slender petioles,[2] then scars over. Undernourished, the leaves stop producing the pigment chlorophyll,[3] and photosynthesis[4] ceases. Animals can migrate, hibernate, or store food to prepare for winter. But where can a tree go? It survives by dropping its leaves, and by the end of autumn only a few fragile threads of fluid-carrying xylem[5] hold leaves to their stems.

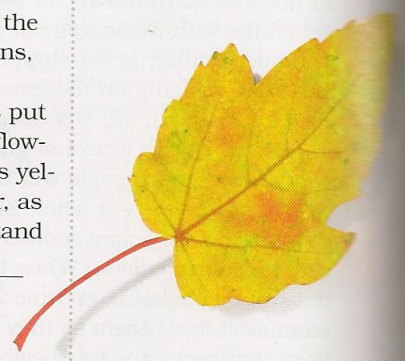
A turning leaf stays partly green at first, then reveals splotches of yellow and red as the chlorophyll gradually breaks down. Dark green seems to stay longest in the veins, outlining and defining them. During the summer, chlorophyll dissolves in the heat and light, but it is also being steadily replaced. In the fall, on the other hand, no new pigment is produced, and so we notice the other colors that were always there, right in the leaf, although chlorophyll's shocking green hid them from view. With their camouflage gone, we see these colors for the first time all year, and marvel, but they were always there, hidden like a vivid secret beneath the hot glowing greens of summer.

The most spectacular range of fall foliage occurs in the northeastern United States and in eastern China, where the leaves are robustly colored thanks in part to a rich climate. European maples don't achieve the same flaming reds as their American relatives, which thrive on cold nights and sunny days. In Europe, the warm, humid weather turns the leaves brown or mildly yellow. Anthocyanin, the pigment that gives apples their red and turns leaves red or red-violet, is produced by sugars that remain in the leaf after the supply of nutrients dwindles. Unlike the carotenoids, which color carrots, squash, and corn, and turn leaves orange and yellow, anthocyanin varies from year to year, depending on the temperature and amount of sunlight. The fiercest colors occur in years when the fall sunlight is strongest and the nights are cool and dry (a state of grace scientists find vexing to forecast). This is also why leaves appear dizzyingly bright and clear on a sunny fall day: The anthocyanin flashes like a marquee.

Not all leaves turn the same color. Elms, weeping willows, and the ancient ginkgo all grow radiant yellow, along with hickories, aspens, bottlebrush buckeyes, cottonweeds, 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. Though some oaks yellow, most turn a pinkish brown. The farmlands also change color, as tepees of cornstalks and bales of shredded-wheat-textured hay stand

camouflage (kam´ ə fläzh´) *n.* disguise or concealment

Literary Analysis
Author's Style In this passage about fall foliage ranges, would you call Ackerman's vocabulary mostly *scientific,* mostly *descriptive,* or mostly *bland?* Why?



2. **petioles** (pet´ ē ōls´) *n.* stalks of leaves.
3. **chlorophyll** (klôr´ ə fil´) *n.* green pigment found in plant cells. It is essential for the photosynthetic process.
4. **photosynthesis** (fōt´ ō sin´ thə sis) *n.* the production of organic substances; the transformation of radiant or light energy into chemical form.
5. **xylem** (zī´ ləm) *n.* woody tissue of a plant that carries water and minerals in the stems, roots, and leaves, giving support to softer tissues.

drying in the fields. 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.

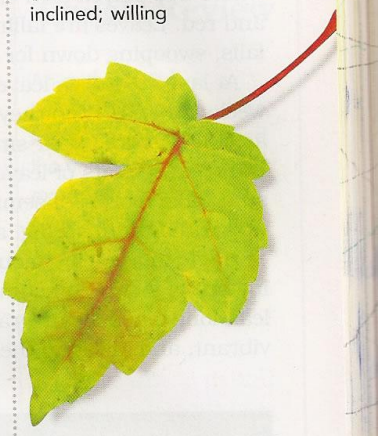
An odd feature of the colors is that they don't seem to have any special purpose. We are predisposed to respond to their beauty, of course. They shimmer with the colors of sunset, spring flowers, the tawny[6] buff of a colt's pretty rump, the shuddering pink of a blush. Animals and flowers color for a reason—adaptation to their environment—but there is no adaptive reason for leaves to color so beautifully in the fall any more than there is for the sky or ocean to be blue. It's just one of the haphazard marvels the planet bestows every year. We find the sizzling colors thrilling, and in a sense they dupe us. Colored like living things, they signal death and disintegration. In time, they will become fragile and, like the body, return to dust. They are as we hope our own fate will be when we die; not to vanish, just to sublime from one beautiful state into another. Though leaves lose their green life, they bloom with urgent colors, as the woods grow mummified day by day, and Nature becomes more carnal, mute, and radiant.

We call the season "fall," from the Old English *feallan*, to fall, which leads back through time to the Indo-European *phol*, which also means to fall. So the word and the idea are both extremely ancient, and haven't really changed since the first of our kind needed a name for fall's leafy abundance. As we say the word, we're reminded of that other Fall, in the Garden of Eden, when fig leaves never withered and scales fell from our eyes. Fall is the time when leaves fall from the trees, just as spring is when flowers spring up, summer is when we simmer, and winter is when we whine from the cold.

Children love to play in piles of leaves, hurling them into the air like confetti, leaping into soft unruly mattresses of them. For children, leaf fall is just one of the odder figments of Nature, like hailstones or snowflakes. Walk down a lane overhung with trees in the never-never land of autumn, and you will forget about time and death, lost in the sheer delicious spill of color. . . .

But how do the colored leaves fall? As a leaf ages, the growth hormone, auxin, fades, and cells at the base of the petiole divide. Two or three rows of small cells, lying at right angles to the axis of the petiole, react with water, then come apart, leaving the petioles hanging on by only a few threads of xylem. A light breeze, and the leaves are airborne. They glide and swoop, rocking in invisible cradles. They are all wing and may flutter from yard to yard on small whirlwinds or updrafts, swiveling as they go. Firmly tethered to earth, we love to see things rise up and fly—soap bubbles, balloons, birds, fall leaves. They remind us that the end of a season is capricious, as is the end of life. We especially like the way leaves rock, careen, and swoop as they fall.

predisposed (prē´ dis pōzd´) *adj.* inclined; willing



Reading Strategy
Recognizing the Author's Purpose What does this passage about children and leaves suggest that the author's purpose for writing might be?

capricious (kə prē´ shəs) *adj.* tending to change abruptly and without apparent reason

Reading Check
What causes the reds and yellows in autumn leaves?

6. **tawny** (tô´ nē) *adj.* brownish-yellow; tan.

Everyone knows the motion. Pilots sometimes do a maneuver called a "falling leaf," in which the plane loses altitude quickly and on purpose, by slipping first to the right, then to the left. The machine weighs a ton or more, but in one pilot's mind it is a weightless thing, a falling leaf. She has seen the motion before, in the Vermont woods where she played as a child. Below her the trees radiate gold, copper, and red. Leaves are falling, although she can't see them fall, as she falls, swooping down for a closer view.

At last the leaves leave. But first they turn color and thrill us for weeks on end. Then they crunch and crackle underfoot. They *shush,* as children drag their small feet through leaves heaped along the curb. Dark, slimy mats of leaves cling to one's heels after a rain. A damp, stuccolike mortar of semidecayed leaves protects the tender shoots with a roof until spring, and makes a rich humus. An occasional bulge or ripple in the leafy mounds signals a shrew or a field mouse tunneling out of sight. Sometimes one finds in fossil stones the imprint of a leaf, long since disintegrated, whose outlines remind us how detailed, vibrant, and alive are the things of this earth that perish.

Review and Assess

Thinking About the Selection

1. **Respond:** Which interested you more—the scientific details or the author's descriptions and language?
2. **(a) Recall:** Name two facts about leaves that Ackerman states in the selection. **(b) Speculate:** Do you think Ackerman's scientific knowledge about leaves comes from observation or research? Explain.
3. **(a) Recall:** Why do leaves fall off trees? **(b) Apply:** In what way does Ackerman apply this specific event to life in general?
4. **(a) Recall:** According to the author, in what two places are the changing colors of the leaves most spectacular? **(b) Compare and Contrast:** What weather conditions do these two places probably share? **(c) Question:** What questions might a reader who does not live in a place where leaves change color have?
5. **(a) Summarize:** In your own words, summarize Ackerman's explanation of why leaves change color. **(b) Evaluate:** Does a scientific explanation make the changing color of leaves more or less interesting or impressive? Explain.
6. **(a) Identify:** What are three things people do with fall leaves? **(b) Interpret:** What does Ackerman say is the reason people are attracted to falling leaves? **(c) Assess:** Do you agree with her or not? Explain.

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(b. 1948)

A native of Waukegan, Illinois, nature writer Diane Ackerman studied psychology, physiology, and English in college, eventually earning two master's degrees and a Ph.D. at Cornell University. She has published eight books of poems and more than ten books of nonfiction, including *A Natural History of the Senses*. Her literary skills and scientific training enable her to describe the natural world in a captivating way.