Before Reading

Why Leaves Turn Color in the Fall
Essay by Diane Ackerman

Can BEAUTY be captured in words?

How would you describe a beautiful sunset to someone who had not seen it? How would you explain this same sunset to a child who wondered why it occurred? Would explaining the sunset make it seem more beautiful, or less? In the following essay, Diane Ackerman captures the beauty of autumn leaves while explaining the scientific concepts behind their occurrence.

DISCUSS Describe to a partner, in as much detail as you can, a beautiful scene from nature. This might be a sunset (as mentioned before), a flock of birds taking wing, or any other natural phenomenon. Afterward, discuss how easy—or hard—it was for you to convert the scene to words and for your partner to visualize the scene.
**TEXT ANALYSIS: AUTHOR’S PURPOSE**

Author’s purpose is the reason why a writer writes. An author may write to explain a process, to describe a scene, to reflect on an idea, or, in the case of Diane Ackerman, to do all three. Her overall purpose in this essay is to explain why leaves turn color and fall from trees. To that end, she uses scientific terms.

A corky layer of cells forms at the leaves’ slender petioles, then scars over. Undernourished, the leaves stop producing the pigment chlorophyll, and photosynthesis ceases.

Ackerman also wants to describe the beauty of autumn leaves, and to that end she uses poetic diction and imagery, words and phrases that re-create sensory experiences.

*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.*

As you read, determine the main purpose of each paragraph—to explain, to describe, or to reflect.

**READING SKILL: PATTERNS OF ORGANIZATION**

Ackerman uses at least three patterns of organization:

- **cause and effect**, to explain a process
- **comparison and contrast**, to show likeness and difference
- **main idea and supporting details**, to present insights

As you read, look for cause-and-effect organization. Fill out two cause-and-effect chains—one to show why leaves turn color and another to show why they fall.

**VOCABULARY IN CONTEXT**

Diane Ackerman conveys the richness of her subject by using the following boldfaced words. Define each word.

1. **stealth** in her smooth, silent movement
2. a judge issuing an **edict** in the courtroom
3. an athlete, tall and **robustly** built
4. a painter’s son, **predisposed** to the arts
5. **adaptation** of an animal to its environment
6. the monkey’s **capricious**, unpredictable nature

Complete the activities in your Reader/Writer Notebook.
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.

Where do the colors come from? Sunlight rules most living things with its golden **edicts**. 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 and roots, pares down, and gradually chokes off its leaves. A corky layer of cells forms at the leaves’ slender petioles, then scars over. Undernourished, the leaves stop producing the pigment chlorophyll, and photosynthesis ceases. Animals can migrate, hibernate, or store food to prepare for winter. But where can a tree go? It survives by dropping its leaves,

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1. **petioles**: the stalks of leaves.
2. **chlorophyll** ... **photosynthesis**: Chlorophyll is the green pigment in plants that is necessary for photosynthesis, the process by which plants use sunlight, water, and carbon dioxide to produce food.
and by the end of autumn only a few fragile threads of fluid-carrying xylem
hold leaves to their stems.  
A turning leaf stays partly green at first, then reveals splodges 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

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3. **xylem**: plant tissue through which water and nutrients are conducted.
appear dizzyingly bright and clear on a sunny fall day: The anthocyanin flashes like a marquee.4

Not all leaves turn the same colors. Elms, weeping willows, and the ancient gingko 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 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 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 sublime5 from one beautiful state into another. Though leaves lose their green life, they bloom with urgent colors, as the woods grow mumified 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. Adam and Eve concealed their nakedness with leaves, remember? Leaves have always hidden our awkward secrets.

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

4. marquee: a lighted billboard, such as those used at movie theaters.
5. sublime: to transform directly into another state.
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 tethered6 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. 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 under foot. They shush, as children
drag their small feet through the leaves heaped along the curb. Dark, slimy
mats of leaves cling to one’s heels after a rain. A damp, stuccolike mortar7 of
semidecayed leaves protects the tender shoots with a roof until spring, and
makes a rich humus.8 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.  

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6. tethered: fastened, as if with a rope.
7. stuccolike mortar: a bonding material that is like a soft, sticky plaster.
8. humus: decomposed organic matter that provides nutrients for plants.
Comprehension

1. **Recall**  How does dropping its leaves in autumn help a tree to survive?
2. **Paraphrase**  What does Ackerman mean by autumn’s “stealth”?
3. **Paraphrase**  In what ways do the bright colors of autumn “dupe” us?

Text Analysis

4. **Identify Author’s Purpose**  In which parts of her essay is Ackerman’s purpose to explain? to describe? to reflect? Are these purposes compatible? Explain your answer.
5. **Analyze Patterns of Organization**  Use the cause-and-effect chains you created to explain why leaves turn color and why they fall. Be specific.
6. **Recognize Contrasts**  What contrasts are pointed out in the essay? Cite examples.
7. **Analyze Language**  Ackerman’s language can be very poetic, filled with sensory **imagery**. Skim the essay and record notable examples. Which examples best describe the beauty of fall? Explain your answer.
8. **Interpret Author’s Message**  Explain the connection Ackerman sees between fall leaves and human beings. How close does the connection seem to you?
9. **Evaluate Interpretations**  One critic has said that Ackerman’s nonfiction is “a creative blend of journalism, science, and poetry; it is her poetic vision that makes her nonfiction so successful.” Would you say that this is true of her essay? Cite strong text evidence to support your answer.

**Can BEAUTY be captured in words?**

How do you define beauty?
Vocabulary in Context

**VOCABULARY PRACTICE**

Choose the word that best completes each sentence.

1. With great ________, the lioness tracked her prey.
2. Try not to be ________; think before you act!
3. Our teacher’s ________ was that tardy students would be locked out.
4. ________ to a new environment ensures the survival of a species.
5. He shook my hand ________, showing great enthusiasm.
6. As an animal lover, I am ________ to veterinary school.

**ACADEMIC VOCABULARY IN WRITING**

- author  
- document  
- goal  
- issue  
- vision

What is your favorite season of the year? **Document** your response by writing a paragraph describing that season. Share your **vision** by creating strong images of the season. Use at least one Academic Vocabulary word in your response.

**VOCABULARY STRATEGY: SPECIALIZED VOCABULARY**

Biologists and other scientists have their own **specialized vocabulary**—terms specifically suited to their particular fields of study. This vocabulary includes words such as **chlorophyll**, which names the pigment necessary for **photosynthesis**, the name of the process by which plants use sunlight to convert water and carbon dioxide into food. It is often possible to figure out the meaning of a specialized vocabulary term from context. Other times, you will need to look up the terms.

**PRACTICE** Match each definition below with the appropriate term from the selection. If you need to, check a dictionary or glossary.

<table>
<thead>
<tr>
<th>compost</th>
<th>deciduous</th>
<th>organic</th>
<th>solstice</th>
<th>hydrocarbon</th>
</tr>
</thead>
</table>

1. having properties characteristic of living organisms
2. a mixture of decaying matter
3. a compound consisting of hydrogen and carbon
4. the time of year when the sun is farthest from the equator
5. losing foliage at the end of the growing season
Language

◆ GRAMMAR AND STYLE: Add Descriptive Details

Review the Grammar and Style note on page 544. Note how Ackerman uses participial phrases to create images of falling leaves.

A participle is a verb form (verbal) that acts as an adjective. It modifies a noun or a pronoun. A participial phrase consists of a participle plus its modifiers and complements. Here are some examples of how Ackerman uses participles and participial phrases to enrich her writing with imaginative details.

...they were always there, hidden like a vivid secret beneath the hot glowing greens of summer. (lines 32–33)

Children love to play in piles of leaves, hurling them into the air like confetti, leaping into soft unruly mattresses of them. (lines 80–81)

Notice how the revisions in blue enliven this first draft by incorporating participles and participial phrases. Try making similar changes when revising your own writing.

STUDENT MODEL

Growing
Moving from junior high to high school, like leaves during a season, people change as they age. We do not always like the same clothes, music, or activities that we used to. When they lose their leaves, trees do not die, they just become something different. Our old selves do not die as we go through changes, either.

READING-WRITING CONNECTION

Expand your understanding of “Why Leaves Turn Color in the Fall” by responding to this prompt. Then use the revising tip to improve your writing.

WRITING PROMPT

Extended Constructed Response: Reflection
What do autumn leaves tell humans about themselves? What does their beauty mean? Respond in three to five paragraphs, drawing on Ackerman’s ideas or your own original ideas.

REVISING TIP

Review your response. Have you used participial phrases to add descriptive details?