

# Why Leaves Turn Color in the Fall

Essay by Diane Ackerman

VIDEO TRAILER



KEYWORD: HML10-538

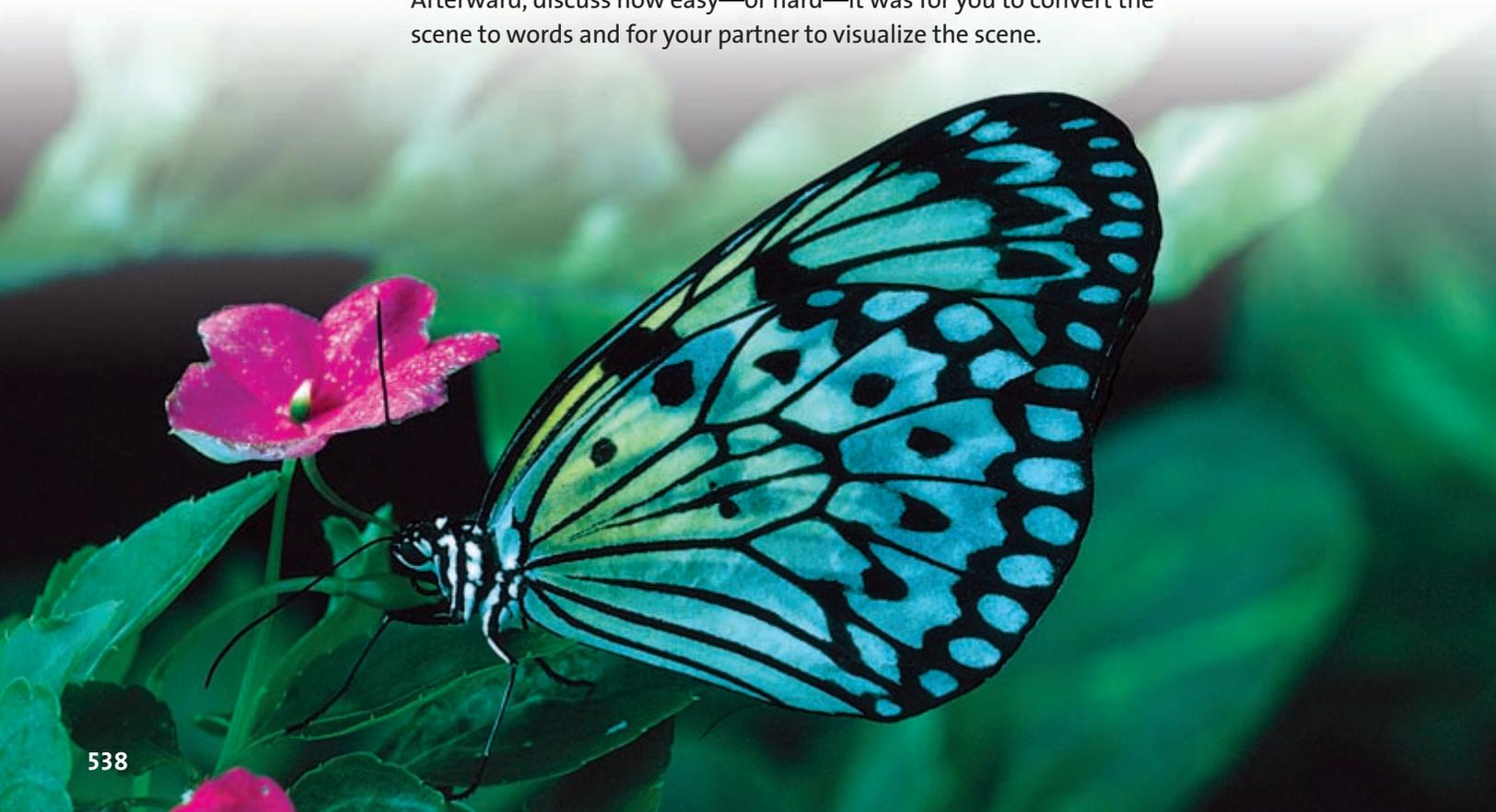
## Can **BEAUTY** be captured in words?

### COMMON CORE

**RI 4** Determine the meaning of words and phrases as they are used in a text. **RI 5** Analyze in detail how an author's ideas or claims are developed by sentences, paragraphs, or larger portions of text. **RI 6** Determine an author's point of view or purpose in a text.

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.

*Tree pulls nutrients back into trunk and roots.*



### ▲ 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

## Diane Ackerman

born 1948

### Done It All

Diane Ackerman considers herself a nature writer “if what we mean by Nature is . . . the full sum of Creation.” She has worked as a sports journalist and a crisis counselor as well as a writer-in-residence. She has dared to fly planes, scuba dive, swim with a whale, and sit on an alligator with its mouth taped shut. Naturally, she has written about all of these experiences. She often finds herself “in a state of complete rapture about a discipline or field,” which helps explain why science and natural history are so often incorporated into her work.

### Science and Poetry

Ackerman's interest in science began in childhood when she raised turtles and observed that plums hanging from a tree looked like bats. She lives in upstate New York on two acres of wooded land that includes a portion set aside for deer. She is an accomplished poet as well as a nature writer. One of her works is a verse play about Sor Juana Inés de la Cruz, a 17th-century Mexican nun who was a poet and a scientist.



Complete the activities in your **Reader/Writer Notebook**.

Authors Online



Go to [thinkcentral.com](http://thinkcentral.com). KEYWORD: HML10-539

# 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  
10 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. **A**

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  
20 its leaves. A corky layer of cells forms at the leaves' slender petioles,<sup>1</sup> then scars over. Undernourished, the leaves stop producing the pigment chlorophyll, and photosynthesis<sup>2</sup> ceases. Animals can migrate, hibernate, or store food to prepare for winter. But where can a tree go? It survives by dropping its leaves,

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.

**stealth** (stēlth) *n.*  
a concealed manner  
of acting

COMMON CORE RI.4

## Language Coach

**Denotations/Connotations** The feelings and ideas associated with a word are its **connotations**. *Staggering* and *toddling* both mean “moving unsteadily.” *Toddling* suggests youth; what does *staggering* (line 7) suggest?

**A AUTHOR'S PURPOSE**  
What seems to be Ackerman's purpose in the first paragraph? Support your answer with specific details.

**edict** (ē'dīkt') *n.*  
a command issued by  
an authority





and by the end of autumn only a few fragile threads of fluid-carrying xylem<sup>3</sup> hold leaves to their stems. **B**

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  
30 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. **C**

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  
40 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

**B PATTERNS OF ORGANIZATION**

In lines 14–24, the pattern of organization switches from main idea and supporting details to cause and effect. Fill out a cause-and-effect chain to show why leaves fall.

**C PATTERNS OF ORGANIZATION**

Use lines 25–33 to fill out a cause-and-effect chain showing the process of leaves changing color.

**robustly** (rō-bŭst'lē)  
*adv.* in a strong, powerful way

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3. **xylem**: plant tissue through which water and nutrients are conducted.

appear dizzily bright and clear on a sunny fall day: The anthocyanin flashes like a marquee.<sup>4</sup> **D**

Not all leaves turn the same colors. Elms, weeping willows, and the ancient ginkgo all grow radiant yellow, along with hickories, aspens, bottlebrush  
50 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  
60 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 sublime<sup>5</sup> from one beautiful state into another. Though leaves lose their green life, they bloom  
70 with urgent colors, as the woods grow mummified day by day, and Nature becomes more carnal, mute, and radiant. **E**

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.

80 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. **F**

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

**D AUTHOR'S PURPOSE**

Using scientific **diction**—the terms *anthocyanin* and *carotenoids*—helps Ackerman explain the difference between the pigments found in leaves. How do they differ?

**predisposed**

(prē'dī-spōzd') *v.*  
inclined to something in advance

**adaptation**

(ăd'ăp-tā'shən) *n.*  
the process of adjusting to suit one's surroundings

**E AUTHOR'S PURPOSE**

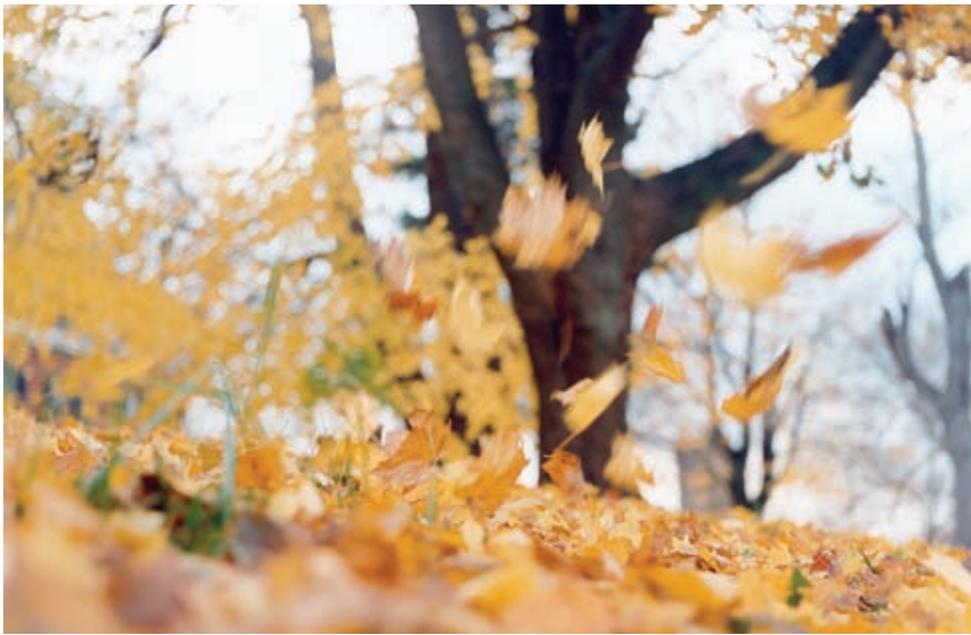
Reread lines 65–71. Here Ackerman reflects on the deaths of living things, including human beings. What does she say we hope for ourselves?

**F AUTHOR'S PURPOSE**

Reread lines 72–86. What seems to be Ackerman's purpose in each paragraph? Cite specific words and phrases to support your answers.

4. **marquee**: a lighted billboard, such as those used at movie theaters.

5. **sublime**: to transform directly into another state.



## ◀ Analyze Visuals

Study the photographs on this page and on pages 541 and 542. What qualities of autumn leaves are brought out in each photo? How do the photos add to the visual appeal of the selection?

small cells, lying at right angles to the axis of the petiole, react with water, then  
 90 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<sup>6</sup> to earth, we **G**  
 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  
 100 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 mortar<sup>7</sup> of  
 semidecayed leaves protects the tender shoots with a roof until spring, and  
 makes a rich humus.<sup>8</sup> An occasional bulge or ripple in the leafy mounds signals  
 110 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. **H**

### **G** GRAMMAR AND STYLE

Reread lines 91–93. Ackerman effectively uses the **participial phrases** “rocking in invisible cradles” and “swiveling as they go” to vividly describe the falling leaves.

**capricious**  
 (kə-prīsh’əs)  
*adj.* impulsive, unpredictable

### **H** AUTHOR’S PURPOSE

Think about Ackerman’s purpose in the last paragraph. How is her purpose supported by her **diction** and use of **imagery**?

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?

### COMMON CORE

**RI 5** Analyze in detail how an author’s ideas or claims are developed by sentences, paragraphs, or larger portions of text. **RI 6** Determine an author’s point of view or purpose in a text.

## 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.

### Sensory Imagery

- “Early-morning frost sits heavily . . .” (lines 4–5)
- 
- 

## 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.

### WORD LIST

adaptation  
capricious  
edict  
predisposed  
robustly  
stealth

## 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.

compost deciduous organic solstice hydrocarbon

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

### COMMON CORE

L6 Acquire and use accurately domain-specific words and phrases.

Interactive Vocabulary **THINK** central

Go to [thinkcentral.com](http://thinkcentral.com).  
KEYWORD: HML10-546

## 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**

Like leaves during <sup>growing</sup> a season, people change as they age. <sup>Moving from junior high to high school,</sup> We do not always like the same clothes, music, or activities that we used to. <sup>Losing their leaves</sup> ~~When~~ ~~they lose their leaves,~~ trees do not die, they just become something <sup>exciting and challenging</sup> 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?

### COMMON CORE

**L 1b** Use various types of phrases to convey meanings and add variety and interest to writing.

Interactive Revision **THINK** central  
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KEYWORD: HML10-547