



Dear Educator:

Welcome to a new year and a new, expanded, online-only Teacher's Guide! Each lesson provides in-depth instructional support to engage your students and help them become active, proficient readers. New features will help you use the magazine to access science content and assess students' understanding of key concepts. You'll also find ideas for English language learners and collaborative learning groups as well as suggested reteaching activities. For a link to interactive whiteboard content, please go to the Teachers tab on our website.

One thing that hasn't changed is our commitment to compelling storytelling. This issue of EXTREME EXPLORER is action-packed. A champion skier rockets down a jump and soars through the air. Plants use wily tricks to survive under the harshest conditions. African-American explorer Matthew Henson braves racism and freezing temperatures to reach the North Pole. Even portions of planet Earth shake, rattle, and drift apart.

"The Winning Edge" explores the science behind extreme skiing. Readers follow Olympic athlete Billy Demong as he powers through a day of training, eating, and balancing calories and exercise. Demong also relies on Newton's three laws of motion to help him get going, gain speed, and stay airborne. The activity on p. T7 will support students in making inferences to get the most out of the text.

Unlike animals, plants can't run from danger or go off in search of food. "The Secret Life of Plants" introduces readers to some of the amazing ways plants get what they need to survive. Readers will meet carnivorous plants, water thieves, imposters, and quick-change artists. You can use the activity on p. T16 to help students monitor their comprehension as they read.

In "Arctic Adventurer," readers go back in time to meet an explorer who did what no one else had done before. The story traces Matthew Henson's dramatic and ground-breaking journey to the North Pole. Students will read about the challenges and setbacks Henson endured and find out how he contributed to the expedition's ultimate success. The activity on p. T25 guides readers in adding up supporting details to infer the story's main ideas.

Finally, "Active Earth" provides a graphic tour of Earth's layers. From the planet's sizzling core to the crust we call home, students will learn about tectonic plates and how they create earthquakes, volcanic eruptions, and mountain ranges. The chart and sentence frames on p. T34 will help them apply the visualize strategy to access science content.

As always, our goal is to help you build scientific and content literacy in all learners. We welcome your comments and suggestions to help us meet this important goal.

Wishing you a Happy 2010!

A handwritten signature in black ink that reads "Jacalyn Mahler".

Jacalyn Mahler
Editor in Chief



THE WINNING EDGE

Teacher's Guide

Jan.-Feb. 2010

Curriculum Connections:

- Language Arts
- Physical Science
- Health/Nutrition

Standards Correlations:

- Language Arts: Determine essential information by inferring
- Physical Science: Properties of matter; Forms of energy; Role of laws in scientific knowledge
- Health: Human anatomy; Nutrition

Literacy Skills:

- Reading Strategy: Make Inferences
- Vocabulary: Action Words
- Writing: Critical Thinking

Activity Masters

Make Inferences, T7

Make Inferences, Answer Key, T8

Comprehension Check, T9

Comprehension Check, Answer Key, T10

THE *WINNING* EDGE

About the Story

Billy Demong has his sights on a gold medal in the Nordic Combined event in the 2010 Winter Olympics. In this story, readers discover how he uses skill, endurance training, and knowing the physics of objects in motion to achieve the winning edge. Students learn about Newton's Laws of Motion as they follow Demong in ski jumping and cross-country skiing events.

Fast Facts

- The XXI Olympic Winter Games will be held in Vancouver, BC, Canada, from February 12-28, 2010. Over 80 nations and 5,500 athletes will participate in 86 events.
- Every Olympic Games selects different mascots that are representative of the city or country where the games are held. The mascots for the 2010 Winter Olympics are: *Miga*, a mythical sea bear that's part orca and part Kermode bear; *Quatch*, a sasquatch; and *Mukmuk*, a Vancouver Island marmot.
- Sir Isaac Newton (1642-1727) was born in England. He is best known for his study of physics and describing three basic laws of nature known as Newton's Laws of Motion.

Vocabulary

Action Words Display the sentence *Watch him go down the hill*. Circle or highlight the word *go*, and ask a volunteer to tell what it means (to move). Point out that English has many other action words that tell how someone or something moves. These words are often a better choice than *go* because they give a clearer idea of how the person or thing is moving. Model this by repeating the sentence, substituting the word *race* for *go*. Ask students to think of other action words that could replace *go* in the sentence. You may want to have English Language Learners brainstorm with a more fluent partner. As students share ideas, display their responses.

Next, have a volunteer read aloud the first paragraph on p. 3. Ask students to jot down action words they hear. (*rocket down, glide, fly*) Have students think of a favorite game or sport. Ask them to write three sentences with vivid action words that describe how the players or athletes move. After sharing their best sentence, urge them to keep a log of vivid verbs for future writing assignments.

Preview and Make Predictions

Topic-Related Vocabulary Display each of the following words in random order inside an oval: *energy, strength, gravity, muscles, jumping, ski, pushes, force*. Create a backwards web by drawing a line from each word back to an empty square in the middle. Ask students to look at the words from the story and predict what it is about. Say: *What topic links all these words? What do you think you will be reading about?* To help focus their thinking, direct attention to pp. 2-3 of the story. Have them consider the photo as they make their predictions about the topic. Summarize student predictions and write a class response in the middle of the web. Tell students they will review the prediction after reading the story to see if it was correct.

THE **WINNING** EDGE

(continued)

Access Science Content

Demonstrate Law #1 Use a model to introduce students to the concepts of **force** and **gravity**. First, set a ball on the floor. Ask: *What do you observe? Why do you think the ball isn't moving?* After students respond, explain that in order for an object at rest to start moving, it has to be acted upon by a force such as a push or pull. This force can come from different sources, including a source from nature such as wind, a human action such as a kick (demonstrate with the ball), or an object such as a magnet. Lead students to understand that when you kicked, your bones and muscles supplied the strength and energy to move the ball. Explain that when they read the story, they will discover how an athlete manages to get off to a good start in an Olympic competition.

Next, have a volunteer hold the ball above his or her head. Poll the class to predict what will happen when the student lets the ball go. Then prompt the volunteer to drop the ball. Explain that the ball falls to the ground due to gravity, which is a force that acts on objects and people. Gravity pulls things toward the center of Earth.

Introduce Law #2 Use an imagined game to introduce students to the concepts of **mass** and **acceleration**. Display photos of a tennis ball and a bowling ball. Have students imagine what it would be like to roll these balls across pavement (such as an outdoor basketball court). Ask: *Which ball would require more force to keep rolling on the ground? Why?* Explain that students would have to push harder to keep the bowling ball moving because it has more mass than the tennis ball. The lower an object's mass, the less force it needs to keep going or go faster.

Demonstrate Law #3 Use a model to introduce the concept of **air resistance**. Hold a small piece of light fabric or toy parachute above your head and demonstrate how slowly the object floats to the ground. Explain that although gravity is acting on it, when the falling object pushes air downward, some of the air pushes back upward. This slows the object's fall to Earth.

As students read the story, encourage them to think about how the athlete's body is like a moving ball or falling object.

THE **WINNING** EDGE

(continued)

Sum Up

Ask for a show of hands for those students who accurately predicted the story topic based on the vocabulary. Then distribute the Inference Chart on p. T7. Remind students that by combining ideas in the text with what they know, readers can figure out what a writer doesn't say directly. Model how to **make inferences** to complete the first item. Say: *The writer says that to win, Demong has to jump the farthest and ski the fastest. When I came across these sentences in the story, I used what I know about Olympic athletes to read between the lines. I know Olympic athletes are some of the best and strongest athletes in the world. So I figured out that Demong will have to be in great physical shape in order to win.* Model filling in the first row of the chart based on your think-aloud.

Next, have students work in pairs to complete the chart. Invite volunteers to share the writer's words, what they added from prior knowledge, and the inference they drew. Compare student responses, emphasizing that each person brings different background experiences to the story, which may affect the inferences drawn from the text.

Assess and Reteach

Materials: Comprehension Check, pp. T9 and T10; "The Winning Edge" story

Assign the Comprehension Check for "The Winning Edge" on p. T9. Use the Answer Key to score the assessment. Based on the results, you may want to reteach key science concepts. For example, students may not understand how Demong's diet and training enhance his athletic performance (rules of biology) or how the **laws of motion** affect how fast he skis or how far he jumps (rules of physics).

Display the words *energy*, *endurance*, and *strength*. Have volunteers take turns reading the section "Powering the Machine." Pause at the end of each paragraph and ask students to turn to a partner to sum up the main idea. As students share their responses, help them relate the information to the key words displayed. Reinforce that Demong is aware of the food he eats and tries to calculate the energy he will get from the **calories** he consumes. This is the important foundation he needs to do his daily training, which will allow him to compete in the grueling Olympic events. Read aloud the last two sentences on p. 3 that sum up the ideas in this section: "His breakfast turns into energy. It's just what he needs to build his muscles and fuel his workout."

Repeat this process on pp. 4-5 to reteach the laws of motion. Then work with students to state each law of motion in their own words. Sample responses:

Newton's Laws of Motion

1. To start moving, an object needs a force, like a push or a pull.
2. The amount of force a moving object needs to change speed depends on its mass.
3. When an object pushes against something, even something like air, the thing pushes back.

THE WINNING EDGE

(continued)

Extend the Learning

Plot the Data Encourage students to find out how Billy Demong fares in the Nordic Combined events in February. Suggest that they use print and online resources to find out his time in the cross-country skiing event and the distance he flies in the ski jump competition. Students can make a bar or a line graph to compare his performance to that of other racers.

Role-Play an Interview Students can extend the preceding activity by role-playing an interview between Demong and a sports journalist. Encourage the interviewer to prepare at least ten questions, including several that go beyond a simple “yes” or “no” answer. Model the kinds of questions the “interviewer” might ask, such as: *How did you change your diet in order to train for the Olympics?* Have students practice rehearsing the questions and answers before they perform for the class.

Challenge Divide students into three groups by having them number off by 1s, 2s, and 3s (corresponding to Newton’s three laws of motion). Explain that their assignment is to design a class demonstration that explains one of Newton’s Laws of Motion. Their demonstration could take the form of a hands-on experiment, short skit, multimedia presentation, or poster. After groups present to the class, take a vote to choose the groups that were the “Best Teachers” and “Most Creative Scientists.”

Food Choice Log Explain to students that it’s important for everyone to be aware of our food and calorie intake, even when we’re not competitive athletes. Encourage them to keep a log of everything they eat and drink for one school week, with the estimated number of calories listed next to each item. Explain that preteens and teenagers with an average activity level need about 2,300 to 2,700 calories a day to maintain their weight (about 2,300 for girls and about 2,700 for boys, according to the American Academy of Pediatrics). If they eat more calories, they may gain weight. You may want to invite a professional nutritionist or nurse to speak to the class and help students review their food logs and discuss healthy food choices they could make.

THE WINNING EDGE

Read the sentences from “The Winning Edge” in the chart below. In the second column, write what you know from your own experience. In the third column, write the full meaning that the writer leaves unsaid.

I Read	I Know	And So...
1. To win, he must jump the farthest down a hill. He also must ski the fastest across the hills.		
2. He knows that each food has a certain number of calories. Will this mega breakfast give him enough energy?		
3. He'll need more than endurance to win gold. So Demong heads to the weight room.		
4. The extra calories he eats nearly equal the calories he burns for energy.		

THE WINNING EDGE

Read the sentences from “The Winning Edge” in the chart below. In the second column, write what you know from your own experience. In the third column, write the full meaning that the writer leaves unsaid.

I Read	I Know	And So...
1. To win, he must jump the farthest down a hill. He also must ski the fastest across the hills.	Olympic athletes are some of the strongest and fastest athletes in the world.	Demong must be in great physical shape to win.
2. He knows that each food has a certain number of calories. Will this mega breakfast give him enough energy?	Food gives people energy.	Demong wants to make sure that he eats enough food.
3. He'll need more than endurance to win gold. So Demong heads to the weight room.	Olympic athletes need to be strong.	Demong probably lifts weights to make his muscles stronger.
4. The extra calories he eats nearly equal the calories he burns for energy.	If you eat food with too many calories, or don't exercise enough, you can gain weight.	It must be important for Demong to not gain or lose too much weight.

COMPREHENSION CHECK

Answer these questions about “The Winning Edge.” For items 1–4, fill in the circle by the correct answer. Write your answer to item 5.

1. For skier Billy Demong, what “powers the machine”?
☐ (A) ski jumps
☐ (B) push-ups
☐ (C) food energy
☐ (D) gravity
2. In this story, what is the meaning of *mass*?
☐ (A) the weight and size of an object
☐ (B) the speed of an object
☐ (C) the look and feel of an object
☐ (D) the distance an object travels
3. What keeps ski jumpers from floating away into space?
☐ (A) mass
☐ (B) metabolism
☐ (C) endurance
☐ (D) gravity
4. Why does Demong hold his body in a V-shape when he competes in the ski jump?
☐ (A) to stay up in the air longer
☐ (B) to land on the ground softly
☐ (C) to burn more calories
☐ (D) to build the muscles in his legs
5. Think about Sir Isaac Newton’s three laws of motion. Explain how Billy Demong uses one of these laws to get going, gain speed, or fly far.

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Sample top-scoring response (accept any one of the following responses): 1. One law says that something cannot start moving without a force such as a push. Demong uses a push to get himself moving down a ski jump. 2. One law says that the amount of force something needs to keep moving depends on its mass. By pushing hard, Demong passes other skiers in a cross-country race. 3. One law says that when an object pushes on something, the thing pushes back. Demong uses this law when he makes a V-shape with his body in the air. It slows his fall back to the ground so he can stay up in the air longer.

The Secret Life of Plants

Teacher's Guide

Jan.-Feb. 2010

Curriculum Connections

- Language Arts
- Life Science

Standards Correlations

- Language Arts: Set a purpose for reading; Make inferences
- Life Science: Characteristics of plants; Adaptation

Literacy Skills

- Reading Strategy: Plan and Monitor
- Vocabulary: Multiple-Meaning Words; Cognates; Alliteration
- Writing: Scientist's Journal; Creative Writing; Poetry

Activity Masters

Access Science Content, T16

Access Science Content, Answer Key, T17

Comprehension Check, T18

Comprehension Check, Answer Key, T19

The Secret Life of Plants

About the Story

This story introduces students to the unusual ways some plants have adapted to get what they need to survive. Students will read about bug eaters, water thieves, mimics, and quick-change artists that use color and odors to attract pollinators.

Fast Facts

- The Venus flytrap is one of 600 species of carnivorous plants. These plants have developed adaptations that allow them to eat meat to get the nutrients they need to survive. In the wild, the Venus flytrap feasts on flies, frogs, and even lizards. It has hinged leaves fringed with spiky hairs. When an animal touches two or more hairs on its leaves, the leaves fold shut, trapping the animal. The leaves secrete digestive juices. These juices dissolve the animal's body tissues in eight to ten days. Other carnivorous plants have different ways to catch animals. The poster "Tricky Trappers" explores how the Venus flytrap and other carnivorous plants have adapted in order to survive.
- Most plants are autotrophs, or producers: They make their own food through the process of photosynthesis. Chlorophyll inside their leaves traps energy from sunlight. The energy reacts with carbon dioxide from the air and water from the plant's roots. The reaction creates sugar and oxygen. This sugar is the food that helps a plant live and grow. The extra oxygen is released into the air.

Vocabulary

Multiple-Meaning Words: Remind students that sometimes writers give word clues to help readers visualize what the writer is describing. Display the word *fangs* and ask students what they think it means (possible response: *sharp teeth of an animal such as a snake*). Ask a volunteer to read aloud the second paragraph in the section "Bug Soup" on p. 8. Then say: *What do you think a cobra lily's fangs are? Why is the word in quotation marks?* Explain that we associate "fangs" with fierce, attacking animals, yet in this story, the word *fangs* refers to the flaps of a plant that make nectar to attract insects.

Model making inferences to figure out the meaning of the word in this context. Say: *Since I know how animals use fangs, I can use that understanding to figure out that "fangs" in quotation marks must mean parts of the plant that work like animal fangs to catch bugs.* Point out that sometimes it's not so obvious how a word with multiple meanings is being used. For example, the word *mouse* might mean something very different in a science textbook than in a computer manual. Alert students to these other multiple-meaning words in the story: *hood*, *slipper*. Suggest they use what they know and clues in the text to figure out what the words mean in this context.

The Secret Life of Plants

(continued)

Vocabulary (continued)

English Language Learners Display the word *carnivorous* and ask students if it looks like any words they might be familiar with in their home language. Then display *carnívoros* and *carnívoros*, and explain that they are Spanish and French words that mean the same thing as *carnivorous*. Explain that many words commonly used in science, social studies, and math come from Latin and Greek roots, and therefore look similar in many languages. These words are called **cognates**. English language learners can use cognates to figure out the meaning of new words in English and expand their understanding of what they are reading.

Model this strategy for students. Say: *The story says, “The swampy soil lacks nutrients.” The word soil is similar to the Spanish word suelo, and the word nutrients looks like the Spanish word nutrientes. So maybe they mean the same thing.* Encourage students to try out those meanings and see if they make sense within the context of the story.

Pair students and ask them to look for other cognates in the story. Examples include: *nectar, gland, bacteria, adaptation*. Tell students to make a T-chart with the English word on one side, and their home language cognate on the other side. Ask volunteers to share a cognate they found and explain how it helped them understand the text.

Activate Prior Knowledge

Students are better equipped to understand a new text if they have a foundation of knowledge to build upon. Before reading “The Secret Life of Plants,” pair students and ask them to brainstorm what they already know about plants. Display all reasonable responses. Then ask the pairs to page through the story and preview the photos, captions, and subheads. As they process and evaluate the information, ask them to add to their list of plant facts. Add new responses to the group list.

Access Science Content

Use the following questions to prompt a group discussion:

1. What do plants need to survive?
2. What do plants do if they can’t get what they need where they grow?
3. How do plants defend themselves against predators if they can’t move?

After the discussion, ask the pairs of students to organize their shared list of plant facts into three categories: **survival needs, adaptations, defense**. Tell them that some traits may fall into more than one category.

Based on students’ preview, have them set a purpose for reading. (Sample response: *How do plants survive in extreme environments?*) Distribute the activity on p. T16. As students read, suggest they use the chart to list each plant mentioned, the problem it faces, and how it manages to survive. Remind students that good readers frequently check in with themselves. Encourage them to do so as they read the story and complete the chart.

The Secret Life of Plants

(continued)

Sum Up

After students read the story, invite volunteers to use their completed charts to share what they learned about plants. Encourage students to explain how **monitoring** their understanding helped them get the most out of the text.

You may want to use the “Tricky Trappers” poster to build on the concept of adaptation. Remind students that some plants are meat-eaters. Display the poster and direct attention to the key “Trap Types.” Have volunteers read the name of each trap type and its definition. Then, in a timed challenge, see how quickly pairs of students can correctly match the pictured plants with their trap type. (Answers: *butterwort-flypaper trap*; *bladderwort-suction trap*; *Venus flytrap-snap trap*; *pitcher plant-pitfall trap*; *sundew-flypaper trap*)

Assess and Reteach

Materials: Comprehension Review, pp. T18 and T19; “The Secret Life of Plants” story

Assign the Comprehension Review for “The Secret Life of Plants” on p. T18. Use the Answer Key to score the assessment. Based on the results, you may want to reteach key science concepts such as **survival needs** and **adaptation**.

If so, draw students’ attention to the opener on pp. 6-7. Read aloud the deck: *From the smallest flower to the largest tree, plants have a major problem. They are stuck—rooted in the ground. They can’t run away from enemies. They can’t go off in search of food, water, or mates. So how do they survive?* Then say: *Early in the story, we learn that some plants have adapted, or changed, in order to survive in places other plants cannot.*

Explain that asking questions while reading can help readers understand the text. Model this strategy by walking students through the section “Bug Soup” on p. 8. Say: *The first thing I need to figure out is, what does this plant need? The first paragraph says the cobra lily grows in “swampy soil that lacks nutrients. The lily’s roots can’t absorb enough food to stay healthy.” This part of the story is telling me that the thing the cobra lily needs is food. My second question is, how does the cobra lily get what it needs? If I read on, the writer describes how the plant lures bugs with nectar and then the bugs fall into a pool of liquid inside the plant. I think that means the plant traps bugs. The next sentence confirms it. It says, “It’s a trap!” So the cobra lily needs food and it gets it by trapping insects.*

Next, display the two questions you asked yourself in the think-aloud:

1. What does the plant need?
2. How does the plant get what it needs?

Divide students into six expert groups and assign each group a section of the story. Tell each expert group to answer the two questions for their section, and to use details in the text to support the answers. Then regroup students so each new group has at least one member from each expert group. Ask the experts to report their findings to their new group.

The Secret Life of Plants

(continued)

Extend the Learning

Scientist's Journal Explain that one scientific method of study used by scientists is called **observation**, and that students used observation to view and categorize the carnivorous plants on the “Tricky Trappers” poster. Ask students to choose a plant that is growing at school, in their backyard, or near their home. Tell them to imagine they are scientists who are monitoring how the plant survives in its environment. Their assignment is to create a detailed journal entry describing the plant. The entry might include drawings, leaf rubbings, diagrams, and even a question-and-answer section. Provide the following question prompts to guide their observations:

- What does the plant look like? Does it have a trunk or a stem?
- Does the plant have leaves or needles? What shape are they?
- Where does the plant grow? Does it survive under harsh conditions such as pollution, limited sunlight, or extreme temperatures?
- What kind of challenges does it face to get nutrients or water?
- How does the plant reproduce? Does it need pollinators?

Suggest that students use the Internet or plant books to identify their plant and research extra information to help support their observations, or even lead them to new observations.

Creative Writing Tell students to imagine they are a National Geographic explorer and have just discovered a new plant that lives only on icy glaciers. In an explorer's log, have them describe the plant, its survival needs, its adaptations, its defenses, and any unique ways it may have developed to attract pollinators.

Language Arts Point out to students that, in the story, the writer uses language in a way that makes the text lively. For instance, the writer describes adaptations as *wily ways*, and a plant that uses camouflage is a *fabulous faker*. Explain that these are examples of *alliteration*, when two or more words in a phrase start with the same letter or sound. Other examples in the story include *perfect plot*, *powdery pollen*, and *(this) faker fools flies*.

Have students pick a plant featured in the story and make a list of alliterative descriptions that tell how the plant looks or what it does. Students can then use those alliterations to write a poem about the plant. Invite volunteers to read their poems aloud.

The Secret Life of Plants

As you read "The Secret Life of Plants" in EXTREME EXPLORER, use this chart to record the name of each plant, the problem it faces, and how it solves this problem.

Plant Name	Problem	Solution
Cobra lily	Grows in bad soil; doesn't have enough to eat	Catches and eats insects

The Secret Life of Plants

As you read "The Secret Life of Plants" in EXTREME EXPLORER, use this chart to record the name of each plant, the problem it faces, and how it solves this problem.

Plant Name	Problem	Solution
Cobra lily	Grows in bad soil; doesn't have enough to eat	Catches and eats insects
Australian Christmas tree	Blooms during the dry season; needs water	Grows shoots underground to steal water from other plants
Stone plant	Thirsty animals eat its water-filled leaves	Uses camouflage to look like a rock; only blooms in the wet season when animals can find water in other places
Corn	Caterpillars eat it	Releases a chemical to attract wasps that kill caterpillars
Skunk cabbage	Blooms in late winter when there are few pollinators	Has a stinky smell that attracts pollinators; is warm inside its hood
Slipper orchid	Needs to attract pollinators	Has dots on its leaves that look like aphid eggs and attract flies
Amazon lily	Needs to attract pollinators	Blooms bright white at night to attract beetles

COMPREHENSION CHECK

Answer these questions about "Secret Life of Plants." For items 1–4, fill in the circle by the correct answer. Write your answer to item 5.

1. According to "The Secret Life of Plants," what is the biggest challenge to plants' survival?
☐ (A) Other plants steal their water.
☐ (B) Their colors attract birds.
☐ (C) They can't reproduce.
☐ (D) They are stuck in one place.
2. What problem does a cobra lily solve by trapping insects?
☐ (A) poor nutrients in swampy soil
☐ (B) lack of water in the soil
☐ (C) sending pollen to other lilies
☐ (D) being hard to see at night
3. What is one way plants use odor to help them survive?
☐ (A) to attract insects
☐ (B) to fool people into eating them
☐ (C) to camouflage themselves
☐ (D) to find water
4. What do the spots on a slipper orchid do?
☐ (A) poison hungry predators
☐ (B) provide food for the plant
☐ (C) mimic aphid eggs
☐ (D) attract beetles
5. Write a paragraph with details that support this main idea:
Many plants have adapted unique ways to survive.

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5. Write a paragraph with details that support this main idea:
Many plants have adapted unique ways to survive.

Sample top-scoring response: Plants face a big problem. They are rooted in place, so some plants

have tricky ways to get what they need to survive. For example, the Australian Christmas tree grows

in a hot, dry place. It needs water, so it grows long shoots and steals water from many other plants.

Another example is the cobra lily. It grows in swamps and can’t get enough nutrients from the soil. So

it catches and eats bugs to get the food it needs. A third example is the stone plant. It really looks

like a stone. Lots of animals eat plants, but they skip the stone plant because it doesn’t look tasty.

Arctic Adventurer

Teacher's Guide

Jan.-Feb. 2010

Curriculum Connections:

- Language Arts
- Social Studies
- Geography

Standards Correlations:

- Language Arts: Main idea and supporting details
- Social Studies: Exploration; Race relations
- Geography: Use of maps

Literacy Skills:

- Reading Strategy: Determine Importance
- Vocabulary: Jargon
- Comprehension: Sequence Chain; Timeline

Activity Masters

Determine Importance, T25

Determine Importance, Answer Key, T26

Comprehension Check, T27

Comprehension Check, Answer Key, T28

Arctic Adventurer

About the Story

“Arctic Adventurer” tells the story of African-American explorer Matthew Henson’s quest to reach the North Pole. It also traces America’s changing attitudes toward minorities. A century ago, Henson was the right-hand man of celebrated explorer Robert Peary. After the pair’s 1909 Arctic expedition, Peary was hailed as the first person to reach the North Pole. Henson’s vital role in the expedition was overlooked for decades. Students will read about the dangers Henson faced, the survival skills he learned from the Inuit, and how he overcame racism to reach the North Pole.

Fast Facts

- Students can read more about Matthew Henson in National Geographic’s book *Onward: A Photobiography of African-America Polar Explorer Matthew Henson*.
- Throughout the 1909 expedition to the North Pole, Henson kept a journal of events, mostly during lulls in the journey such as during the voyage onboard *The Roosevelt*, while the explorers waited for ice to refreeze, and during the 33 hours spent at the North Pole. Henson also recorded temperatures, estimates of distance traveled, and solar observations. He used his notes to write his autobiography, *A Negro Explorer at the North Pole*. The book, which has a forward written by Peary, was published in 1912.

Vocabulary

Jargon Display the phrase *Arctic Adventurer* and ask students what they think these two words mean. If students are unsure, explain that the Arctic is the frozen region surrounding the North Pole and an adventurer is like an explorer—someone who goes to and investigates unknown or little known places.

Next, tell students that adventurers often use very specific words, or jargon, to describe what they do and the environment they’re exploring. If you’re not part of the group, these technical words may be confusing or hard to understand. As you read aloud the first two paragraphs on p. 14 of the story, ask students to follow along and record words that they think might be jargon (*pressure ridge, crevasses, leads*).

Model using context to determine word meaning and testing the predicted meaning in the sentence. Say: *The story says pressure ridges rose as high as six-story buildings. The phrase “pressure ridges” is unfamiliar to me. I think that it might be jargon related to exploring the Arctic. I know that ridges are like hills. And the story says they are as high as a six-story building and part of a “maze of dangers.” So maybe a pressure ridge is a giant, dangerous, icy hill that Henson had to climb.* Point out that if students don’t have enough information, they can look up jargon in a dictionary or ask someone. After reading the story, have students share how they figured out the meanings of *expedition, sledge, broke trails, and igloo*.

Arctic Adventurer

(continued)

Build Background

Geography Have volunteers locate the Arctic Circle and the North Pole on a world map or globe. Work with students to examine which parts of the Arctic Circle are land and which parts are water. Then ask if the North Pole is located on land or water. (Answer: Water—it's in the middle of the Arctic Ocean.) Explain that temperatures in the Arctic Circle are often below freezing (typically about -40°C (-40°F) during winter near the North Pole). Based on this information, lead students in making an inference about how Henson could travel by dogsled to the North Pole. (Answer: It's so cold, the ocean froze. Henson traveled on ice.) Finally, have students brainstorm what the Arctic environment might be like and what obstacles explorers would face on an expedition there. They can preview the photographs in the story in order to spark ideas.

Social Studies Explain that Henson's story also provides a window into racial attitudes in the U.S. a century ago. While the Civil War abolished slavery, it did not create equality. African Americans often were discriminated against and segregated: They could not go to the same schools, be treated at the same hospitals, eat at the same restaurants, or drink from the same water fountains as white people. They generally had fewer opportunities to get a good education, work in a skilled job, or earn enough money to pull themselves out of poverty. Encourage students to consider what life may have been like for African Americans around the time of Henson's expeditions (1891-1909). Ask them to consider this as they read what the writer says about people being slow to accept Henson as a famous explorer.

Practice: Infer Main Ideas

Invite a volunteer to read aloud the introductory paragraphs on p. 13. Ask students to restate information that caught their attention. Then explain that good readers do more than simply absorb details. They put the details together to identify the main ideas of the text. Those are the most important ideas the writer wants readers to know.

Model inferring the main idea. Say: *One detail that jumps out at me when I read this introduction is that, in 1909, no one had ever reached the North Pole before. So I think one of the main ideas is that it is hard to reach the North Pole. As I read on, I'm going to see if other details in the story support this main idea.* Ask students to identify other main ideas in the introduction. (Possible answers: Henson was tough; he'd spent much of his life trying to reach the North Pole; the North Pole is a long way away.) As they read the story, encourage students to use the details in the story to come up with the big ideas the writer wants readers to take away.

Sum Up

After students read the story, distribute the Determine Importance activity on p. T25. Pair students and ask them to work together to add up the details and sum up the story's main ideas. Note that different readers may sum up the main ideas in different ways. Encourage pairs to share their responses.

Arctic Adventurer

(continued)

Assess and Reteach

Materials Comprehension Review, pp. T27 and T28; “Arctic Adventurer” story

Assign the Comprehension Review for “Arctic Adventurer” on p. T27. Use the Answer Key to score the assessment. Based on the results, you may want to reteach key concepts. For example, students may be unclear about the sequence of events in the story.

Tell students that the story uses a literary device called a **flashback**. In a flashback, the writer is in the middle of describing a scene, then suddenly takes the reader back to an earlier time. Then the writer returns to the scene and continues the story. A flashback often fills in important details and gives readers context for what they are reading.

Model by directing students’ attention to the first two paragraphs of the story on p. 13. Invite a volunteer to read aloud the first paragraph, then ask: *Is this happening right now in the story?* (Yes) Ask a volunteer to read the second paragraph and again ask: *Is this happening now in the story?* (No) Challenge students to see if they can find any signals in the writing that alert them to the flashback. If needed, give them a hint to look at the verbs. The writer shifts from the simple past tense (*Henson charged*) to the past perfect (*Henson had sailed*). Phrases such as *in the past* or *[he] remembered when...* also can signal a flashback.

Sequence Chain Use a sequence chain to help students understand flashback. Ask students to use index cards to list the events in the story. They should number the events in the order in which they are described in the story. Then ask students to reorganize the cards in time sequence. Using the first two paragraphs as a model, the new order will show event No. 2 (the trip to the Arctic was hard) comes before event No. 1 (Henson raced across the ice to the North Pole.) The mixed-up numerical order indicates a flashback.

Arctic Adventurer

(continued)

Extend the Learning

Make Connections Ask students to compare Henson's experience to the ground-breaking achievements of minorities today, such as U.S. President Barack Obama, Supreme Court Justice Sonia Sotomayor, astronaut Mae Jemison, or former U.S. Secretary of State Colin Powell. Lead them in comparing education and career opportunities as well as changes in people's attitudes.

Critical Thinking Display the following question: *Is it important to explore extreme places?* Divide students into three teams. One will argue that it is important; the other will argue that it is not important. The third will be the audience to be convinced. Remind the first two teams that they need to come up with persuasive arguments to support their point of view. You may want to provide prompts to get students thinking, such as the cost of such expeditions, the dangers of such expeditions, the potential discoveries, and the inspiration.

Interpret a Map Ask students what information they can get from looking at a map. List reasonable responses. Then direct students' attention to the map, "Henson's 1908-1909 Expedition," on p. 15 of the story. Point out its features, including the compass rose, labels for landforms and bodies of water, and Henson's route. Have students examine the map, as well as the headline and caption, to answer the following questions:

1. Where did Henson's expedition begin? (*New York*)
2. In what country is the starting point located? (*United States*)
3. Through which oceans did Henson travel? (*Atlantic and Arctic*)
4. In what direction did Henson travel? (*north*)
5. What was his destination? (*The North Pole*)
6. When did this expedition occur? (*1908-1909*)

Challenge: Create a Map Ask students to choose a route they often take or are familiar with such as how they get to school, to a friend's house, or to a relative's house. Ask them to create a map that shows the route they take. Encourage them to be as detailed as possible, whether they are drawing their map freehand or using other resources, such as National Geographic's online atlas at <http://maps.nationalgeographic.com/>. Make sure they include an accurate compass rose and, if desired, a distance scale. Then ask students to write down three questions that can be answered by looking at their maps.

Critical Thinking Point out that people throughout time have used things from nature for survival. Henson made houses out of ice and hunted caribou to eat. Have students brainstorm ten things we use today from our natural world. (Examples: solar and wind for energy, cotton for clothing, wood for building houses.)

Arctic Adventurer

Read "Arctic Adventurer" in NATIONAL GEOGRAPHIC EXTREME EXPLORER. Then look at the lists of details below. Add up the details in each list to come up with a main idea.

<p>Details</p> <p>Matthew Henson nearly died when his sledge plunged into the Arctic Ocean.</p> <p>+</p> <p>Pressure ridges rose as high as six-story buildings.</p> <p>+</p> <p>Temperatures dropped far below freezing.</p> <p>+</p> <p>Ice sometimes had holes and cracks in it.</p>	<p>Details</p> <p>Matthew Henson hoped that his reaching the North Pole would help make all African Americans feel proud.</p> <p>+</p> <p>In Henson's time, most black people in America worked unskilled jobs.</p> <p>+</p> <p>Many people refused to believe that a black man had reached the North Pole.</p>	<p>Details</p> <p>Near the end of his life, Matthew Henson won a medal from Congress.</p> <p>+</p> <p>Henson was a guest at the White House.</p> <p>+</p> <p>Henson was invited to join the famous Explorers Club.</p>
<p>Main Idea 1</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p>Main Idea 2</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p>Main Idea 3</p> <p>_____</p> <p>_____</p> <p>_____</p>

Arctic Adventurer

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<div>Details</div> <div>Matthew Henson nearly died when his sledge plunged into the Arctic Ocean. + Pressure ridges rose as high as six-story buildings. + Temperatures dropped far below freezing. + Ice sometimes had holes and cracks in it.</div>	<div>Details</div> <div>Matthew Henson hoped that his reaching the North Pole would help make all African Americans feel proud. + In Henson's time, most black people in America worked unskilled jobs. + Many people refused to believe that a black man had reached the North Pole.</div>	<div>Details</div> <div>Near the end of his life, Matthew Henson won a medal from Congress. + Henson was a guest at the White House. + Henson was invited to join the famous Explorers Club.</div>
<div>Main Idea 1</div> <div>Matthew Henson was very brave. Reaching the North Pole was a huge achievement.</div>	<div>Main Idea 2</div> <div>One big challenge Henson faced was racism.</div>	<div>Main Idea 3</div> <div>It took a long time, but Henson was finally recognized for contributing to the success of the expedition.</div>

COMPREHENSION CHECK

Answer these questions about "Arctic Adventurer." For items 1–4, fill in the circle by the correct answer. Write your answer to item 5.

1. Based on Matthew Henson's experiences with the Inuit, you can tell he was—
 - (A) strong and funny
 - (B) famous and wealthy
 - (C) young and curious
 - (D) smart and skillful
2. Which of these was the biggest danger for the 1909 expedition?
 - (A) melting ice
 - (B) hungry dogs
 - (C) lack of supplies
 - (D) broken equipment
3. Why didn't people believe that Henson had reached the North Pole?
 - (A) They didn't think Peary had led an expedition to the North Pole.
 - (B) They didn't believe an African American could accomplish that goal.
 - (C) Cook had reached the North Pole a year earlier.
 - (D) Henson was injured during the last part of the expedition.
4. Which is an example of *navigation*?
 - (A) using a compass to go north
 - (B) loading supplies on a dogsled
 - (C) building an igloo made of ice
 - (D) making clothing for an expedition
5. Write a paragraph that tells what challenges Matthew Henson faced before, during, and after his 1908–1909 expedition to the North Pole.

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5. Write a paragraph that tells what challenges Matthew Henson faced before, during, and after his 1908-1909 expedition to the North Pole.

Sample top-scoring response: Before the expedition, Henson had to convince Robert Peary that he could survive in the cold climate of the Arctic. When he got to the Arctic with Peary, he faced a "brutal maze of dangers," including freezing temperatures, pressure ridges as high as a six-story building, holes in the ice, and melting ice. After the expedition, many people did not believe that an African American had reached the North Pole. Some people laughed at him. So the final challenge Henson faced was widespread racism.

ACTIVE EARTH

Teacher's Guide

Jan.-Feb. 2010

Curriculum Connections:

- Language Arts
- Earth Science
- Geography

Standards Correlations:

- Language Arts: Vocabulary development
- Earth Science: Earth structures; Forms of energy; Role of models in practice of science
- Geography: Maps; Spatial organization

Literacy Skills:

- Reading Strategy: Visualize
- Vocabulary: Sensory Details
- Writing: Research

Activity Masters

Access Science Content, T34

Access Science Content, Answer Key, T35

Comprehension Check, T36

Comprehension Check, Answer Key, T37

ACTIVE EARTH

About the Story

Earth is an active, dynamic planet. It shakes and rattles, sizzles and oozes. In this story, students will learn about geological processes that occur above and below Earth's surface. Readers will explore Earth's layers and discover how ever-shifting tectonic plates create earthquakes, volcanoes, and mountain ranges.

Fast Facts

- *The JR* is a ship run by several research organizations and universities. Its initials stand for *JOIDES Resolution*. The ship has been in operation since 1985 and is a floating scientific research center with the sole purpose of drilling into Earth's crust to bring up samples for examination. This research will help scientists understand more about Earth's layers and constant movement. As of fall 2009, the deepest hole they had drilled reached over 2 kilometers (1.3 miles) into Earth's crust.
- The Richter Scale was invented by Charles Richter in 1935 to measure the amount of seismic energy released by an earthquake. On May 22, 1960, an earthquake struck Valdivia, Chile, that measured a magnitude of 9.5 on the Richter scale. This was the strongest earthquake ever recorded.

Vocabulary

Sensory Details Have students close their eyes and imagine the scene as you read aloud these phrases from the story: *volcanoes sizzle*, *molten rock oozes*, *earthquakes rattle*, *magma rises*, *plates collide head-on*. Then ask students to open their eyes and describe what they pictured.

Display labels for the five senses: *sight*, *hearing*, *touch*, *smell*, *taste*. Model using sensory details to understand the writer's ideas, connecting the descriptions to the five senses. For example, say: *When I read the words volcanoes sizzle, I imagined smelling smoke coming out of a big, hulking mountain. I could hear the mountain making loud rumbling sounds. I felt hot air filled with smoke and ash.* Continue with the other phrases, leading students to explain how the sensory details help them understand and remember what the writer is describing.

Suggest that as they read the story, students use self-stick notes to write down phrases that appeal to one or more of the senses and to use the writer's words to imagine what the different layers of Earth are like.

ACTIVE EARTH

(continued)

Preview and Set a Purpose

When students set a purpose for reading they become engaged readers. Lead students in previewing the story and setting a purpose. Direct attention to the headline and deck on p. 19. Ask students to think about what they already know about our active Earth. Model tapping into prior knowledge. For example, say: *I know Earth has three main layers. I also know the layer we live on is called the crust and it is always changing.* Have students turn and talk with a partner, sharing what they know about Earth's layers and how its surface changes.

Next, model for students how to set a purpose for reading by combining what they know with what they learned from their preview. Say: *I know a bit about Earth's layers. By skimming the photos and captions, I was reminded about Earth's tectonic plates. I need to read more to find out what Earth's layers are like and why plates move around. My purpose for reading this story will be to find out what makes the plates move and how the moving plates create volcanoes and earthquakes.* Distribute p. T34 and have students write their purpose for reading the story at the top of the page.

Access Science Content

Remind students that as they're reading, good readers **visualize**, or use the writer's words to create pictures in their minds. When they combine these images with things they know from their own lives, it becomes easier to understand the writer's ideas. In "Active Earth," the writer uses sensory details and comparisons to help readers create a kind of mental photo album of Earth.

Display the following sentence from the story: *To picture [Earth's layers], think of a hard-boiled egg.* Explain that students can use what they know from observing an egg to understand something in nature they can't see. Say: *This sentence about a hard-boiled egg helps me get a better picture of Earth's layers. The writer is giving me a great model. A **model** is an object that stands for something else. In this case, it's a hard-boiled egg. The egg has a thin shell like Earth's lithosphere, that is, Earth's crust and upper mantle. Underneath is the thick white part of the egg, which is like Earth's mantle. In the center is the yolk, which is like Earth's core. Now I have a good picture of Earth's layers in my mind.* Direct students' attention to the diagram of Earth's **geosphere** on p. 20. Guide them in connecting each layer to the corresponding part of the egg.

Before students begin reading, suggest they check the purpose for reading they recorded on p. T34. As they read the story, have them use the chart on that page to record what they imagine each layer is like.

English Language Learners You may want to pair ELL students with fluent English readers. Have partners read aloud to each other, alternating sentences or paragraphs. At the end of each paragraph, students can use words or drawings to take turns summing up what they learned.

ACTIVE EARTH

(continued)

Sum Up

After students read the story, invite volunteers to use their completed charts to share what they learned about Earth's layers and how **visualizing** helped them better understand what they read. Ask them to support their responses with words and phrases from the text. To demonstrate understanding of the key science concepts, have students complete the numbered sentence frames on p. T34. Encourage them to read their work aloud to a partner and show thumbs-up when they are ready to share it with the class.

Assess and Reteach

Materials: Comprehension Check, pp. T36 and T37; "Active Earth" story; "Earth in Motion" poster

Assign the Comprehension Check for "Active Earth" on p. T36. Use the Answer Key to score the assessment. Based on the results, you may want to reteach key science concepts. For example, students may be unclear about **tectonic plates** and their role in creating earthquakes and volcanoes. To help students better understand the phenomena, display the "Earth in Motion" poster found in the Teacher's Edition.

First, have students view the world map. Using the map key, ask a volunteer to trace all the plates and boundary lines. Direct students to the boldface words *tectonic plates* on p. 21. Remind them that scientists believe Earth's core heats the mantle. Heated rock in the mantle rises up, then sinks as it cools. This rising and sinking creates **convection currents** that push and pull on the plates that float above.

Explain that this movement of the plates is what causes most earthquakes and volcanoes. Point out the diagrams on the right side of the poster and ask a student to read aloud the boundary definitions: **transform**, **divergent**, and **convergent**. Ask students to match the photos at the bottom of the poster with the type of boundary they represent.

Finally, set up a Four Corners cooperative learning group. Have students form four groups and gather in a corner of the classroom. Assign one of the following questions to each group. Students should think and write about each question individually before participating in a brief group discussion. Then one or two volunteers from each group can report back to the class with the group's response.

1. What can we learn from examining where the deadliest earthquakes have occurred in the last 100 years?
2. What happens at a convergent boundary?
3. What happens at a divergent boundary?
4. What happens at a transform fault?

ACTIVE EARTH

(continued)

Extend the Learning

Think Like a Scientist Tell students that *The JR* has a website where students can post questions for the people working on the ship. (<http://joidesresolution.org/node/41>) Invite students to think of questions they would like to ask someone working aboard *The JR*. Remind them there are different kinds of scientists onboard such as chemists, geologists, and marine biologists. There also are laboratory technicians, engineers, and the crew that operates the ship. After thinking of a question, students should decide who might be the best person aboard the ship to ask. (Example: A question about how they do the drilling should go to the engineer, but a question about how they test the core samples could go to a chemist or laboratory technician.) As a class, choose five questions to submit.

Research U.S. Volcanoes The United States is home to many volcanoes. Some have been active in recent history; others lay dormant, or inactive. Have students work in small groups to research a volcano in the United States. Groups can write a one-page data-based report with the information they find. Reports should include: location, size, type of volcano, date of last eruption, what occurred, probability of eruption in the future, potential effect of an eruption on nearby cities or towns, etc. Possible volcanoes to research are: Mount Shasta, Mount Hood, Mount St. Helens, Mount Rainier, Kilauea, and Haleakala. Have students share their findings in an oral presentation to the class. Encourage students to use visual props, such as photographs, drawings, maps, or diagrams they find or create.

Challenge Invite students to find out everything they can about the Richter Scale. You may want to display the following questions to guide their research:

- How does it work?
- Where are the scales located?
- How is the data collected and recorded?
- What are some of the largest earthquakes measured by the Richter Scale?
- Where and when did they occur?
- Can the Richter Scale help scientists predict future earthquakes?

As they research, students can refer to this U.S. Geological Survey website to find data about recent seismic events: <http://earthquake.usgs.gov/eqcenter/recenteqsww/>. Invite students to share what they learn. As an ongoing follow-up, students can keep a log of earthquakes that occur around the world during the school year and create a bar or line graph showing each quake's magnitude on the Richter Scale.

ACTIVE EARTH

Before you read “Active Earth” in NATIONAL GEOGRAPHIC EXTREME EXPLORER, preview the story. Decide what you want to learn and complete the sentence.

1. I want to read the story to _____

As you read the story, record what the writer says about each of Earth’s layers. Then write what you imagine.

Layer	Writer’s Words	What I Imagine
2.		
3.		
4.		

Complete each sentence to show what you learned.

5. The _____ is Earth’s deepest layer.
6. Everything we see around us is part of Earth’s _____.
7. Earth’s core is 6,650°C and made of _____.
8. Earth’s lithosphere is broken into _____.
9. Volcanoes occur where _____.
10. Earthquakes are caused when _____.

ACTIVE EARTH

Before you read "Active Earth" in NATIONAL GEOGRAPHIC EXTREME EXPLORER, preview the story. Decide what you want to learn and complete the sentence.

1. I want to read the story to Sample response: learn what Earth's layers are like.

As you read the story, record what the writer says about each of Earth's layers. Then write what you imagine.

Layer	Writer's Words	What I Imagine
2. core	<ul style="list-style-type: none"> • thousands of miles below your feet • hot! • Earth's "yolk" 	Answers will vary.
3. mantle	<ul style="list-style-type: none"> • like an egg white • made of partially melted rock 	Answers will vary.
4. crust	<ul style="list-style-type: none"> • eggshell • all you see is part of it 	Answers will vary.

Complete each sentence to show what you learned.

5. The core is Earth's deepest layer.
6. Everything we see around us is part of Earth's crust.
7. Earth's core is 6,650°C and made of liquid metals.
8. Earth's lithosphere is broken into tectonic plates.
9. Volcanoes occur where plates pull apart.
10. Earthquakes are caused when plates slide past each other.

COMPREHENSION CHECK

Answer these questions about "Active Earth." For items 1–4, fill in the circle by the correct answer. Write your answer to item 5.

1. Which part of Earth does the author compare to an egg yolk?
☐ (A) the mantle
☐ (B) the crust
☐ (C) the core
☐ (D) the plates
2. If you could stand in Earth's core, what would you say?
☐ (A) "I'm cold."
☐ (B) "I'm drifting!"
☐ (C) "It's hot down here!"
☐ (D) "Hello, I'm Pangaea."
3. Which phrase best describes Earth's crust?
☐ (A) huge, slow-moving pieces
☐ (B) connected continents
☐ (C) far below Earth's surface
☐ (D) solid and unchanging
4. What caused the Himalaya to form?
☐ (A) tectonic plates sliding past each other
☐ (B) tectonic plates colliding
☐ (C) tectonic plates separating
☐ (D) a volcanic eruption
5. Think about how Earth's continents have changed over time. Explain why the east coast of South America and the west coast of Africa would fit together like two puzzle pieces.

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☐ (C) tectonic plates separating
☐ (D) a volcanic eruption
5. Think about how Earth's continents have changed over time. Explain why the east coast of South America and the west coast of Africa could almost fit together like puzzle pieces.

Sample top-scoring response: Long ago there was just one land mass on Earth. It was called

Pangaea. It floated on top of Earth's mantle, which is a layer of warm rock that constantly moves. The

land mass slowly broke apart into different pieces as the heat rose from Earth's core and made cracks

in the land mass. Over time, the pieces drifted further and further apart. But because they were once

joined together, they could still almost fit together like puzzle pieces of you moved them

back to their original positions.