

**Red Edition**  
Grade 3–4  
reading level

**Purple Edition**  
Grade 4–5  
reading level

## Objectives

- Compare Earth's layers.
- Explore Earth's surface.
- Understand Earth's moving plates and the changes they cause.
- Describe ways that mountains can form.
- Explain ways that scientists use rocks and fossils to understand Earth's history.
- Describe what occurs when a volcano erupts.
- Compare three main types of volcanoes.
- Understand the causes of earthquakes.
- Discuss how earthquakes are measured.

## Reading Comprehension Skills

Preview the Book ♦ How to Read Diagrams  
Cause and Effect

**Skillbuilders are available for this title.**

## Supporting English Learners

**Teach Academic English** Make school language comprehensible to English Learners. Carefully select words that have to do with academic tasks, such as *preview*, *diagram*, *map*, and *chart*, and teach them in meaningful contexts. Provide daily, explicit instruction to teach both science vocabulary and school language in depth.

## Summary

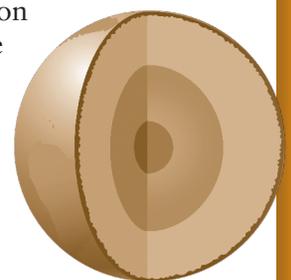
What is inside Earth? The Delta Science Content Reader *Inside Earth* begins by introducing students to the layers our planet is composed of and the landforms that cover its surface. The book explains how movements of vast sections of Earth called plates cause changes to the land. Students also discover some methods geologists use to study Earth's history. The book concludes with an exploration of the processes within Earth that result in volcanic eruptions and earthquakes.

## Science Background

Earth is a solid, spherical mass divided into layers, each of which has a distinct composition. The rocky outer layer that covers Earth's surface is the crust. There are two types of crust. Continental crust contains the huge land masses called continents. Continents contain landforms such as mountains and valleys. Oceanic crust lies beneath the oceans and also contains a variety of landforms, such as seamounts and trenches. Beneath the crust is a hot, semiliquid layer called the mantle. At the center of Earth is the superhot core, which is composed mainly of the metals iron and nickel. The core has two main regions: the outer core, which is liquid, and the inner core, which is solid.

The theory of plate tectonics maintains that the continents are embedded in pieces of crust and upper mantle called plates. These plates have split and drifted apart and then drifted back together, collided, and joined together in new mosaics in a gradual process that continues to this day. The main force driving the movement of Earth's plates—and the continents that are embedded in them—is thought to be extremely slow currents in the rock of the mantle.

The movement of plates is considered to account for all major geological activity taking place on Earth. The collision of plates causes the formation of mountains. The separation of plates over long periods of time causes the formation of new oceans and continents. The pressure from upwelling magma causes volcanic activity and earthquakes, whether plates are coming together or moving apart.



# What Is Earth Made Of?

(pages 2–7)

## Before Reading

### Discuss the Cover

**Cover Image** Discuss the photograph on the cover of *Inside Earth*. Use the information on the inside front cover to support the discussion.

**Science Statement** Discuss the science statement. Ask: *What do you think is under Earth’s surface?* (Possible answers: rocks, lava)

### Build Reading Skills (page 2)

**Preview the Book** Use Build Reading Skills on page 2 to review how to preview the book. Discuss the steps. Then model previewing pictures.

**Think Aloud** *Several of the pictures in this book show mountains. This book is called Inside Earth, but mountains are on Earth’s surface, not inside it. What do mountains have to do with the inside of Earth? Does something inside Earth make mountains form? I will look for answers to these questions as I read.*

Guide students as they finish previewing *Inside Earth*. Focus on nonfiction text features.

- Prompt them to look at the headings, photographs, captions, and diagrams. Ask questions such as *Why do you think that feature is there? How will it help you understand what you read?*
- Prompt them to look at the bold Vocabulary words. Guide the class in looking up a Vocabulary word in the Glossary.

Students can apply the skill in the Reflect on Reading activity on page 7.

**K-W-L Chart** Have students begin a K-W-L chart. They should add to it after each section.

What I <b>K</b> now	What I <b>W</b> ant to Learn	What I <b>L</b> earned
Lava comes out of volcanoes.	What makes lava?	

### Make a Connection (page 3)

**Make a Connection** Discuss the Make a Connection questions. Use this discussion to build background and activate prior knowledge about what Earth is made of. (Possible answers: Yes. The bottom of the ocean is also part of Earth’s surface, so it seems that it should have features like the land’s.)

**Find Out About** Read each statement to help students set a reading purpose. Explain that these are the important topics that they will learn about in this section.

**Vocabulary** Read the Vocabulary words aloud. Explain to students that they will see these words in bold in this section. Start a T-chart on the board with the headings *Landforms on the Land* and *Landforms on the Ocean Floor*. Have students suggest examples as they read.

## During Reading

### Earth’s Layers (page 4)

- Ask: *What is a continent?* (large area of the crust that can be seen above the ocean)
- The rock of the upper mantle is solid and rigid. The rock of the lower mantle is, for the most part, solid, yet it is hot enough to bend and change shape like stiff putty. This condition is what allows the rock to flow.
- Discuss the picture of Earth’s layers on page 4. Ask: *How many layers does Earth have?* (three) *If Earth has three layers, why are four parts of the inside of Earth labeled?* (The core has two parts: the inner core and the outer core.)

✓ **Checkpoint** (page 5) (Possible answer: Crust: Earth’s outer layer, thinnest, made of solid rock; Mantle: layer of rock under crust, second thickest, very hot and rock is under great pressure—this makes some of the rock flow very slowly; Core: at center of Earth, made mostly of metals, outer core is liquid, inner core is solid, hottest part of Earth)

### Earth’s Surface (page 5)

- Ask: *Which of Earth’s layers is where landforms are found?* (the crust)
- Ask: *What landforms are found at the edge of a continent?* (continental shelf, continental slope, continental rise)

- Point out the phrase “not to scale” at the bottom of the picture of the ocean floor on pages 6–7. Explain that this means that the sizes of the landforms and the distances between them are not the same as on the real ocean floor.
  - Ask: *How is an abyssal plain like a plain on Earth’s land?* (both are wide and flat)
- ✔ **Checkpoint** (page 7) (A landform is a natural shape, or feature, on Earth’s surface. Possible answers: mountain, valley, plain, plateau, continental shelf, continental slope, continental rise, abyssal plain, mid-ocean ridge, seamount, trench)

## After Reading

**Reflect on Reading** (page 7) (Possible answer: The picture of the ocean floor on pages 6–7 helped me understand what landforms on the ocean floor are like.)

**Apply Science Concepts** (page 7) This activity applies a concept from Find Out About on page 3. Assist students in finding pictures of landforms, as needed. Though students may attempt to find pictures of ocean floor landforms, most of these are maps or satellite images and not actual photographs. Encourage students to help one another label the pictures on the poster with the landforms’ names, kinds, and locations.

# How Does Earth Change? (pages 8–15)

## Before Reading

**Build Reading Skills** (page 8)

**How to Read Diagrams** Use Build Reading Skills on page 8 to review how to read diagrams. Discuss the tips. Discuss with students that arrows, numbers, keys, legends, symbols, and color coding can be important features of diagrams. Then model how to read the maps on page 15.

**Think Aloud** *First, I read the title, “Earth’s Moving Continents.” Then, I read the labels, “225 million years ago,” “135 million years ago,” and “present day.” These maps must show what Earth’s continents looked like at different points in Earth’s history. I will look for information about how the continents moved as I read.*

Students can apply the skill in the Reflect on Reading activity on page 15.

## Make a Connection (page 9)

**Make a Connection** Discuss the Make a Connection question. Use this discussion to build background and activate prior knowledge about how Earth changes. (Possible answer: Maybe something from inside Earth pushed up on the crust to form these mountains.) Mount Everest rises to a height of 8,848 meters (29,029 feet) above sea level, making it the highest mountain on Earth and the highest point on Earth’s surface.

**Find Out About** Read each statement to help students set a reading purpose. Explain that these are the important topics that they will learn about in this section.

**Vocabulary** Read the Vocabulary words aloud. Explain to students that they will see these words in bold in this section. Start a word web on the board with *Plate* in the center. Have students add words and information to the web as they read.

## During Reading

### Earth’s Plates (page 10)

- Remind students that there are two types of crust: continental crust and oceanic crust. Many plates include both types of crust.
  - Rock in the mantle flows mainly due to convection currents. Convection currents occur when a material that can flow is heated unevenly. As material in the lower mantle is heated by the core, the material expands, becomes less dense, and is pushed upward by the cooler, denser material around it. As the material rises, it cools and becomes more dense, causing it to sink back down. Then it is heated again and the cycle repeats.
  - Use a ruler to help students visualize how far Earth’s plates move in a year.
  - Ask: *What is the name for the places where plates meet?* (plate boundaries)
- ✔ **Checkpoint** (page 11) (A plate is a thick piece of crust and part of the upper mantle. Possible answer: Plates slowly move toward each other. One plate sinks down under the other. The crust of the sinking plate melts and is destroyed. A trench and volcanic mountains form.)

## How Mountains Form (page 12)

- Remind students that they read about the Himalayas in the Make a Connection on page 9. Ask: *What kind of mountains are the Himalayas?* (folded mountains) *How did they form?* (Plates moved toward each other and slowly crashed. The crust crumpled and folded.)
- Ask: *What is a fault?* (a break in the crust) *Where are faults found?* (Many faults are at or near plate boundaries. But faults can be on other parts of a plate, too.)
- ✓ **Checkpoint** (page 13) (Possible answers: Folded mountains form where plates move toward each other and slowly crash. The crust crumples and folds. Volcanic mountains can form where plates are moving toward each other and one plate sinks under the other plate. Or they can form where plates are moving apart. Melted rock comes to Earth's surface, cools, and hardens. The rock builds up over time. Fault-block mountains form where large blocks of crust move up or down along a fault.)

## Studying Earth (page 14)

- Discuss the photograph of rock layers on page 14. Ask: *Which rock layers are probably the newest?* (the ones on top)
- Ask: *Why can't scientists always look at rock layers to tell the age of one rock compared with another?* (Plate movements and faults can fold, break, lift, and overturn rock. So the newest rock is not always found on top.)
- Ask: *What clues led scientists to discover that the continents are moving and that they were once joined together?* (The shapes of South America and Africa seem to fit together like puzzle pieces. The kinds of rocks found in South America match the rocks in Africa. The same kinds of fossils have been found on both continents.)
- Students may have trouble believing that the continents could have moved so far when plates move so slowly. Emphasize that these movements happened over millions of years. A plate moving at 2.5 centimeters a year for 225 million years could have moved over 5,000 kilometers (over 3,000 miles)!

- The United States Geological Survey (USGS) education Web site is a valuable source of information about plate movements and other geological activity.

- ✓ **Checkpoint** (page 15) (Plate movements cause the continents to move. Earth's plates include the crust of the continents. So, as the plates move, the continents move.)

## After Reading

**Reflect on Reading** (page 15) Students' drawings should accurately reproduce the positions of the plates, the arrows showing direction of movement, and any landforms produced by this movement. Encourage students to use their own words to explain their drawings to their partners.

**Apply Science Concepts** (page 15) This activity applies a concept from Find Out About on page 9. Assist students in conducting their research, as needed. They may choose to research an individual mountain or a mountain range. Remind them to write the mountain or range's name, where it is on Earth, and one interesting fact about it, such as how and when it began to form or what plants and animals live there.

## What Are Volcanoes and Earthquakes?

(pages 16–23)

## Before Reading

### Build Reading Skills (page 16)

**Cause and Effect** Use Build Reading Skills on page 16 to review cause and effect. Discuss the tips. Then read aloud the first paragraph on page 21 and model identifying cause and effect.

**Think Aloud** *I read that an earthquake is a shaking, or vibration, of the ground. It happens when underground rock that is under pressure suddenly moves. What is the cause? Stored energy is given off when underground rock moves. What is the effect? The ground shakes.*

Students can apply the skill in the Reflect on Reading activity on page 23.

## Make a Connection (page 17)

**Make a Connection** Discuss the Make a Connection question. Use this discussion to build background and activate prior knowledge about volcanoes and earthquakes. (Possible answers: I think lava can flow over the land and cover up the soil and everything else on the ground. It can burn up anything in its path, such as plants or buildings. After it cools and hardens, it can make new rock.)

**Find Out About** Read each statement to help students set a reading purpose. Explain that these are the important topics that they will learn about in this section.

**Vocabulary** Read the Vocabulary words aloud. Explain to students that they will see these words in bold in this section. Start a word web on the board with *Earthquake* in the center. Have students add words and information to the web as they read.

## During Reading

### Volcanoes (page 18)

- Ask: *What is the difference between magma and lava?* (Magma is melted rock that is under Earth's surface. Lava is magma that has reached Earth's surface.)
  - Ask: *What materials erupt from volcanoes?* (lava, gases, ash, cinders)
  - Discuss the volcano diagram on page 18. Ask: *Which kind of volcano do you think is shown in the diagram? Explain.* (Possible answer: I think it is a composite volcano. Composite volcanoes are usually tall and wide, have steeply sloped sides, and are made of different layers, just like the one in the diagram.)
  - Note the photograph of the cinder cone volcano Wizard Island on page 19. Wizard Island and the surrounding Crater Lake lie in the remains of Mount Mazama. Mount Mazama was a composite volcano that was destroyed by a catastrophic eruption around 7,000 years ago.
  - Ask: *What is the Ring of Fire?* (the plate boundaries around the edges of the Pacific Ocean where many volcanoes are found)
- ✔ **Checkpoint** (page 20) (A volcano is a vent. It is also the mountain that often forms from materials that erupt through the vent. Many volcanoes are located near plate boundaries.)

## Earthquakes (page 21)

- Help students understand the concept of energy. Explain that energy is what makes things go or grow. Stored energy is energy an object, such as a stretched rubber band, has because of its condition or position. Stored energy can change to the energy of motion, such as when a rubber band that was stretched flies through the air after being let go.
  - Discuss the diagram on page 21. Ask: *What is the difference between a focus and an epicenter?* (A focus is the point inside Earth where an earthquake starts. An epicenter is the point on Earth's surface above the focus.) *What do the circles going through the land show?* (They show energy moving out from the focus.)
  - Ask: *If thousands of earthquakes happen every day, then why don't we hear about them all the time?* (Most are too weak for people to feel.)
  - Ask: *What kinds of damage can an earthquake cause?* (Possible answers: The ground can crack. Buildings may be destroyed. Power, gas, or water lines may break. Places where animals and plants live may be changed or ruined.)
- ✔ **Checkpoint** (page 23) (Underground rock that is under pressure suddenly moves. When the rock moves, stored energy is given off. The energy makes the ground shake.)

## After Reading

**Reflect on Reading** (page 23) (Possible answers: Effects: Materials sent out can get into the air and cover the ground. Living things may be destroyed as a result. Gas, dust, and ash from a large eruption can affect weather.)

**Apply Science Concepts** (page 23) This activity applies concepts from Find Out About on page 17. (Possible answer: I do not think scientists can predict when an earthquake will happen. Thousands of earthquakes happen every day. If scientists could figure out which of those earthquakes we had to worry about, they would tell people to leave before they happened, as they do with hurricanes. Since they do not do this, they must not be able to predict them.)

➔ **Continued on last page**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

# Test: Inside Earth

## Part A: Vocabulary

core	crust	earthquake	landform
magma	mantle	plate	volcano

Choose the correct vocabulary word for each sentence. Write the word on the line.

1. We live on the solid outer layer of Earth called the \_\_\_\_\_.
2. Some of the rock in Earth's \_\_\_\_\_ flows very slowly.
3. The \_\_\_\_\_ is at the center of Earth.
4. A valley is one kind of natural feature, or \_\_\_\_\_, on Earth's surface.
5. A continent moves as the \_\_\_\_\_ that it is part of moves.
6. Melted rock that is under Earth's surface is called \_\_\_\_\_.
7. The gas, dust, and ash that came out of the \_\_\_\_\_ affected the weather.
8. A shaking of the ground, or \_\_\_\_\_, happens when underground rock suddenly moves.

## Part B: Science Concepts

Mark the best answer to each question.

9. The \_\_\_\_\_ is the gently sloping underwater edge of a continent.  

(A) abyssal plain	(C) continental shelf
(B) continental rise	(D) seamount
10. Which kind of mountain can form when plates move toward each other and slowly crash?  

(A) fault-block	(C) folded
(B) dome	(D) volcanic

## Test: Inside Earth (continued)

11. Which of these builds up the thin layers of a shield volcano?

- (A) ash
- (B) cinders
- (C) fossils
- (D) lava

12. A seismograph helps scientists learn the \_\_\_\_\_ of an earthquake.

- (A) vent
- (B) magnitude
- (C) tsunami
- (D) plateau

Write the answer.

13. Tell what fossils are. Describe how geologists use fossils to find the age of some rocks.

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14. Explain why many volcanoes are located near plate boundaries.

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15. Describe what the picture shows. Use the word *fault* in your answer.

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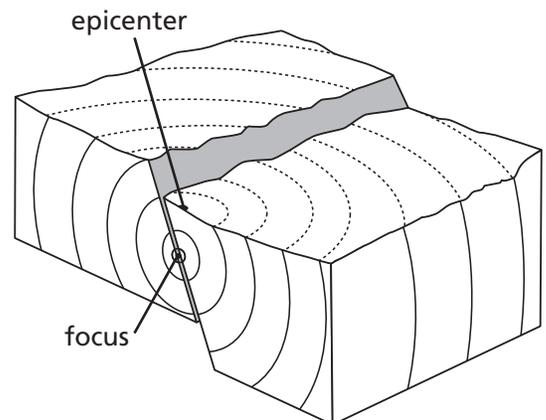
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# Let's Review

## (inside back cover)

Have students complete their K-W-L charts before answering these questions. Possible answers are shown.

- 1. Cover Connection** (The crust is Earth's outer layer, and the mantle is the layer under the crust. A plate is a thick piece of crust and part of the upper mantle. Some of the rock in the mantle flows very slowly. This causes the plates above to move slowly. Plate movements cause some mountains to form and cause the continents to move.)
- 2.** (An abyssal plain is a very wide, flat area of the deep-ocean floor. A trench is a very deep valley on the ocean floor.)
- 3.** (Geologists use fossils to find the age of some rocks. They also can do laboratory tests to find the age of a rock.)
- 4.** (An earthquake's magnitude is the amount of energy given off by it. A seismograph is used to learn the magnitude of an earthquake.)
- 5. How to Read Diagrams** (The diagram shows Earth's layers. The colors help me compare the layers' thicknesses and temperatures.)
- 6. Write** (Stories will vary but should include realistic details about volcanoes. Information about the volcano's location might include that it is near a plate boundary or above a hot spot and may reference the Ring of Fire. The explorer should know it is a volcano because it has a vent.)

**Try It!** Modeling clay works best for this activity. Partners should recognize that their models show how

Earth's crust—represented by the clay “rock” layers—crumples and folds when plates slowly move toward each other and crash, forming mountains. Partners may also observe that some lower layers are now on top of upper layers, similar to how plate movements can fold, break, lift, and overturn rock.

**Science at Home** Have students do this activity at home with a family member. Students should be able to explain to their families that the shell represents Earth's crust, the white represents the mantle, and the yolk represents the core. They should note that the egg is different from Earth in a number of ways, including that it is much smaller and has no plates or landforms on its surface.

## Answers to Test

### (Teacher's Guide pages 6–7)

**1.** crust **2.** mantle **3.** core **4.** landform **5.** plate **6.** magma **7.** volcano **8.** earthquake **9.** C **10.** C **11.** D **12.** B **13.** Fossils are the remains or traces of living things from long ago. Sometimes a rock has a fossil in it. Scientists may know when that kind of living thing was alive. So they know the rock likely formed during that same time. **14.** Volcanoes can form where plates move apart. Hot magma comes up between the plates. Volcanoes also form where plates move toward each other and one plate sinks down under the other. Parts of the sinking plate melt. This makes magma. That magma often comes to the surface nearby, forming volcanoes. **15.** The picture shows an earthquake happening at a fault, or break in Earth's crust. There is a point inside Earth where an earthquake starts called the focus. Energy moves out from the focus in all directions. The energy makes the ground shake.

**ADDITIONAL ASSESSMENT OPPORTUNITIES** Use the Checkpoints, Reflect on Reading, and Apply Science Concepts features and Let's Review questions as additional assessment opportunities.

*Delta Science Content Readers* are 24-page nonfiction student books with informative, engaging text and full-color photos and illustrations. The readers present key science content and vocabulary found on state tests, present key reading skills and strategies useful for reading informational text, support and extend the experiences and content of hands-on activities, promote scientific inquiry, and serve as a home-school link. They are available in two editions: Red Edition for Grades 3–4 and Purple Edition for Grades 4–5.

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