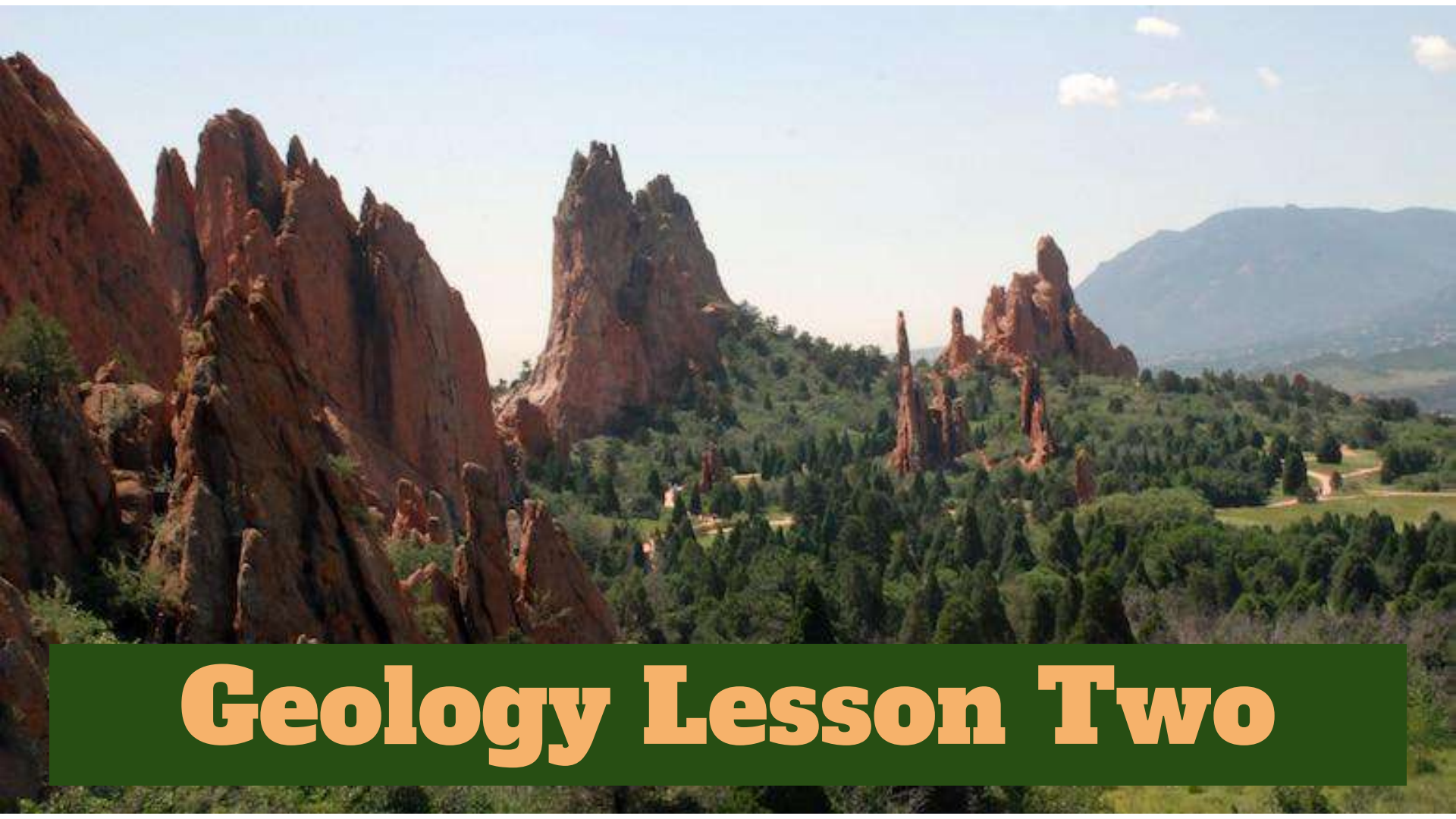


Geology Lesson Two

Objectives:

Reading: I will identify and describe Earth's layers, describe the movement of tectonic plates, and identify evidence of how Earth's layers and tectonic plates interact to change the Earth's surface.

Grammar: I will identify the correct location of commas in dates, addresses, city and state, and items in a series.

Morphology: I will distinguish between root words and the suffix -ly and use those words correctly in sentences.

Writing: I will explain similes related to geology concepts.

Chapter 2 is titled “Earth’s Layers and Moving Plates.”

Turn to the table of contents and locate the chapter, and then turn to the first page of the chapter.

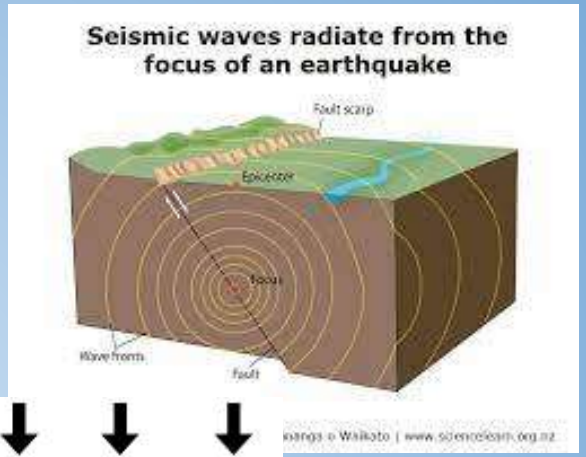
One of the first vocabulary words we will encounter in this chapter is a seismic wave. Turn to the glossary at the back of the book and find the definition of a seismic wave. Who wants to read the definition to us?

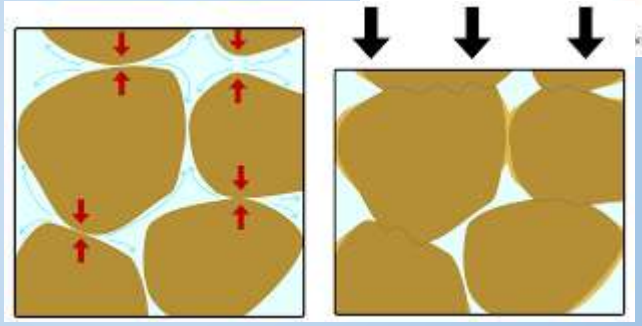
Let’s now go over the rest of the vocabulary words that we will encounter in chapter 2.

Seismic wave, n. A surge of energy traveling out from an earthquake's source through the earth.

Pressure, n. The weight or force produced when something presses or pushes against something else.

Basalt, n. Heavy, dense rock formed from cooled, hardened lava.



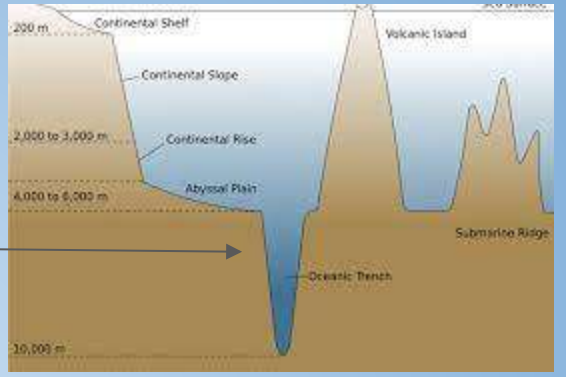


Magma, n. Melted rock in Earth's mantle

Lava, n. Red-hot melted rock that has erupted above Earth's crust from deep underground.

Basin, n. A large area in the earth that is lower than the area around it.

Ocean trench, n. A narrow, extremely deep valley formed when the seafloor dips down as one tectonic plate slides under another.



Theory, n. An explanation for why something happens based on evidence.

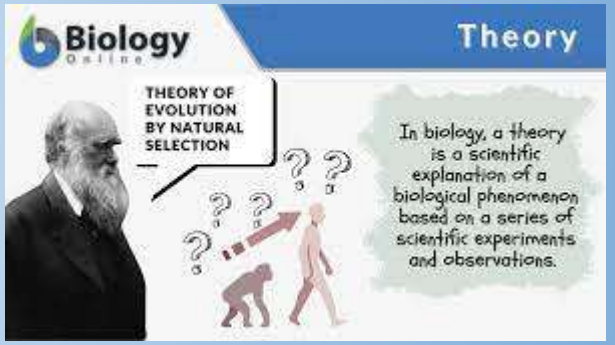
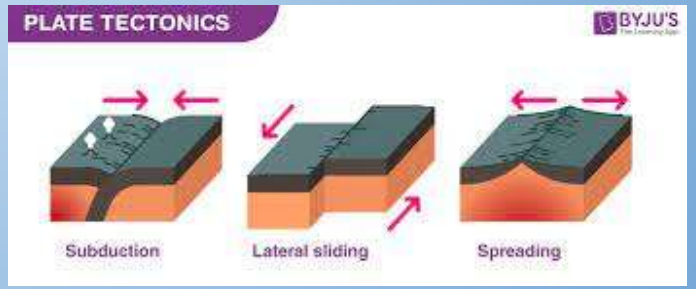
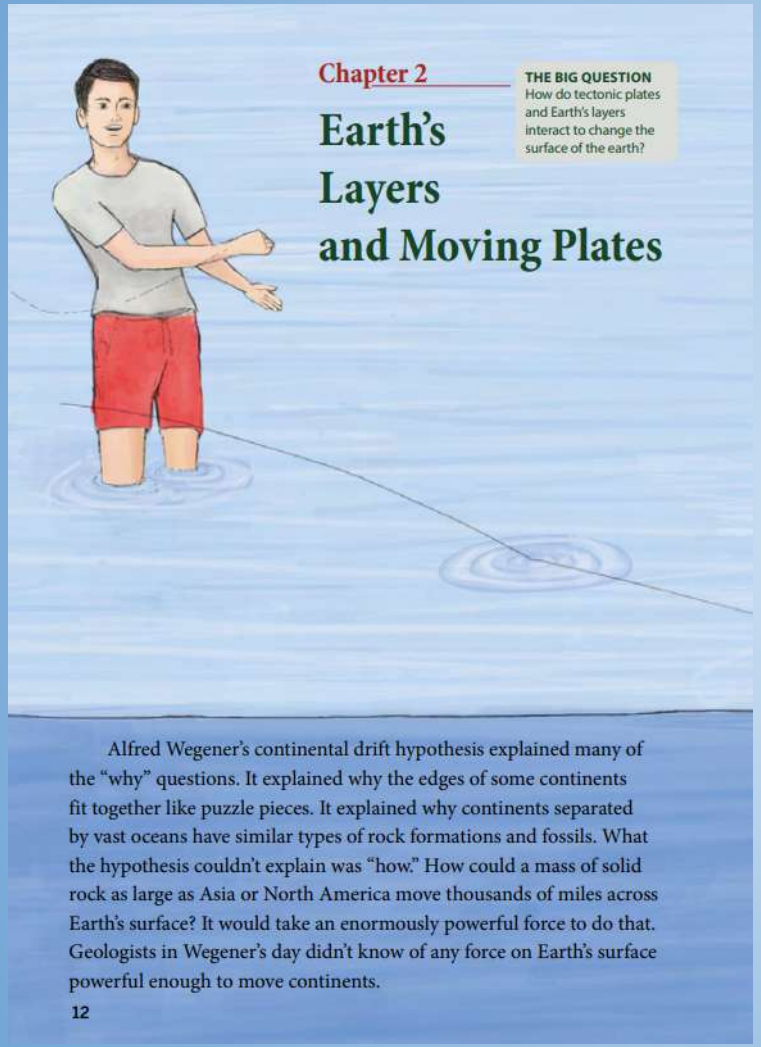


Plate tectonics, n. A theory that Earth's crust and the solid top part of the mantle are broken up into sections that fit together but move against each other.



Exert, v. to cause a force to be felt or have an effect.



Chapter 2

Earth's Layers and Moving Plates

THE BIG QUESTION
How do tectonic plates and Earth's layers interact to change the surface of the earth?

Alfred Wegener's continental drift hypothesis explained many of the "why" questions. It explained why the edges of some continents fit together like puzzle pieces. It explained why continents separated by vast oceans have similar types of rock formations and fossils. What the hypothesis couldn't explain was "how." How could a mass of solid rock as large as Asia or North America move thousands of miles across Earth's surface? It would take an enormously powerful force to do that. Geologists in Wegener's day didn't know of any force on Earth's surface powerful enough to move continents.

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Who can read the Big Question for Chapter 2 for us?

"How do tectonic plates and Earth's layers interact to change the surface of the earth?"

Read pages 12 and 13 silently to yourself.

How is a small rock thrown into water like seismic waves?

Seismic waves travel out through the earth from the source of an earthquake. A small rock thrown into water makes waves that travel out from the spot where the rock hit the water. Both seismic waves and waves created when a small rock hits water travel out from a source.

Read pages 14 and 15 silently to yourself.

What did scientists learn from studying seismic waves?

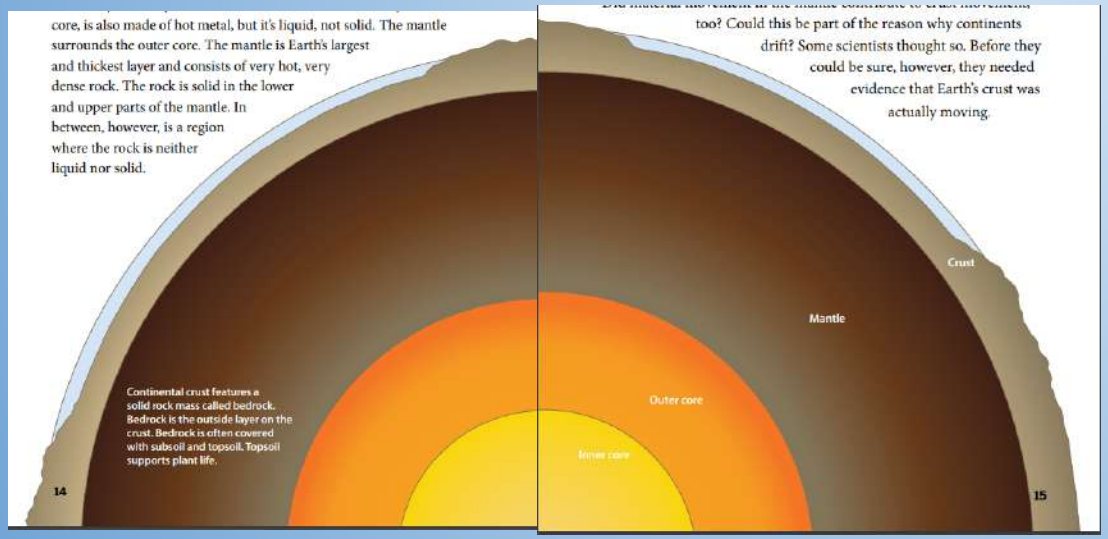
By studying seismic waves, scientists were able to identify Earth's four main layers: the inner core, the outer core, the mantle, and the crust.

Suppose seismic waves enter a 100-mile long lake and a 100-mile long mountain made of rocks at the same moment. What would happen?

The waves would go through the rock more quickly than through the lake.

Name and describe characteristics of each layer, while referring to the image that spans pages 14 and 15.

The inner core is solid and made of very hot metal; the outer core is made of hot liquid metal; the mantle is the earth's largest and thickest layer; made of very hot, very dense rock; the top and bottom parts of the mantle are solid, but the region in the middle is neither liquid nor solid; this material does slowly move; the crust is the thin, rocky outer layer of the earth; there are two types of crust: oceanic crust and continental crust; the oceanic crust is covered by ocean water; most of the continental crust is dry land, but some of the crust around the edges is covered by water; oceanic crust is thinner but heavier than continental crust.



Why was this new knowledge about Earth's layers important for scientists?

Learning about Earth's layers and their characteristics led scientists to new questions; they thought the new information about the mantle and the crust might hold answers to the mystery of continental drift; they were inspired to learn more about how the mantle and the crust interacted with each other; and they were inspired to look for evidence that the earth's crust was actually moving.

Read pages 16 an 17 silently.

Why did scientists suspect that ocean trenches were part of the answers to the puzzle of continental drift?

Scientists knew the earth wasn't getting any bigger; they guessed that if new crust was being created along mid-ocean ridges, then old crust must be destroyed somewhere else; new maps of the seafloor revealed incredibly deep valleys along the edges of several ocean basins; scientists guessed that deep ocean trenches are places where crust is sinking down into the mantle.

Read pages 18 and 19 silently.

How does the theory of plate tectonics provide an explanation for how continents can move?

According to the theory of plate tectonics, the earth's crust and the solid top part of the mantle are broken up into huge rocky slabs called tectonic plates that fit tightly together. As the material in the mantle beneath the tectonic plates slowly moves due to heat and pressure, it exerts enormous pressure on the plates above. The pressure is great enough to cause the plates, which includes continents, to move very, very slowly.

Find South America on the map. Who can identify the plate that lies directly to the west of most of the continent?

The Nazca Plate

What evidence did scientists use to figure out the theory of plate tectonics? Why did scientists have to rely on this evidence?

Some of the evidence scientists studied that could provide clues about changes to the earth was left a very long time ago. For example, the older rock farther away from mid-ocean ridges was deposited a long time ago, and scientists would have to use some kind of tool or test to figure out how old the rock was. Mountains existed and scientists had to examine them as they were to look for clues about changes to the earth. Some of the evidence scientists studied that could provide clues about changes to the earth came from inside the earth or deep beneath the ocean. For example, scientists analyzed seismic waves to learn about the layers and materials inside the earth.

Turn to Activity Pages 1.3 and 1.4 and refer to the Evidence Collector's Chart.

(As a reminder, this chart is being used throughout the unit to collect evidence of changes to the earth related to specific causes of geologic change. The evidence represents what geologists examine to determine how powerful forces above and below Earth's surface work to change the earth.)

Who can read the information under "What is the cause?" in the second row?

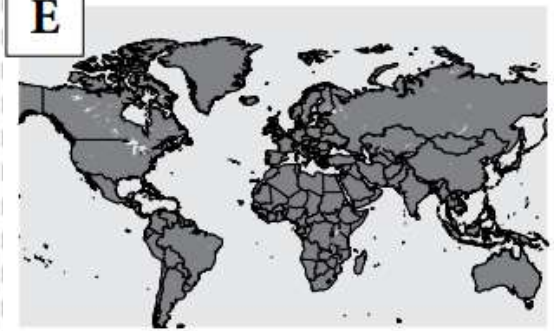
Evidence Collector's Chart

Chapter #	What is the cause?	What evidence is there?	Letter
	At some point, Pangaea broke apart and the pieces slowly moved apart over a long period of time.		
	Tectonic plates move very slowly due to the heat and pressure in Earth's mantle.		

Which pages in the text provide evidence about why tectonic plates move very slowly?

Pages 18 and 19

Let's complete this together.

2	Tectonic plates move very slowly due to the heat and pressure in Earth's mantle.	E 	Map of continents as they look today; continents rearranged over time.	E

Chapter Two Big Question:

How do tectonic plates and Earth's layers interact to change the surface of the Earth?

When tectonic plates push together or pull apart, that pushing and pulling can cause the layers of the land to move, or it can cause new pieces of land (or mountains) to form.