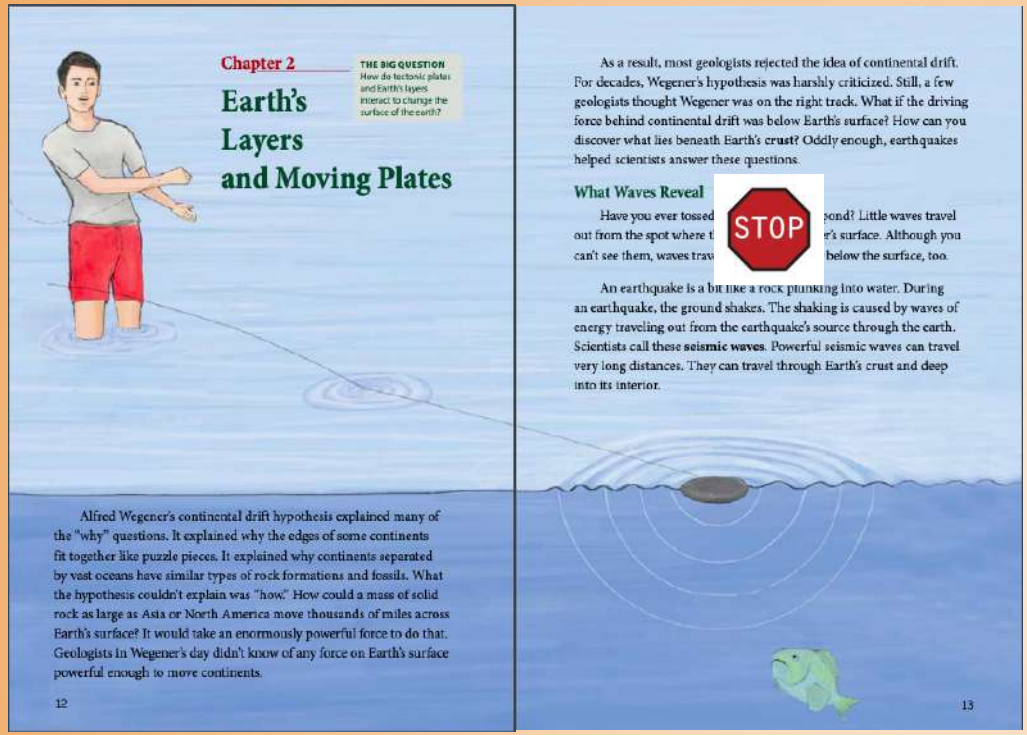
Let's do a little review...do you have your reader out?

What are tectonic plates?

Describe the different ways tectonic plates can move.

Now on to today's lesson...

We will be rereading chapter 2 in a bit more depth.



Chapter 2

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

Earth's Layers and Moving Plates

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.

12

As a result, most geologists rejected the idea of continental drift. For decades, Wegener's hypothesis was harshly criticized. Still, a few geologists thought Wegener was on the right track. What if the driving force behind continental drift was below Earth's surface? How can you discover what lies beneath Earth's crust? Oddly enough, earthquakes helped scientists answer these questions.

What Waves Reveal

Have you ever tossed [STOP] ond? Little waves travel out from the spot where t [STOP] r's surface. Although you can't see them, waves trav [STOP] below the surface, too.

An earthquake is a bit like a rock plunking into water. During an earthquake, the ground shakes. The shaking is caused by waves of energy traveling out from the earthquake's source through the earth. Scientists call these **seismic waves**. Powerful seismic waves can travel very long distances. They can travel through Earth's crust and deep into its interior.

13

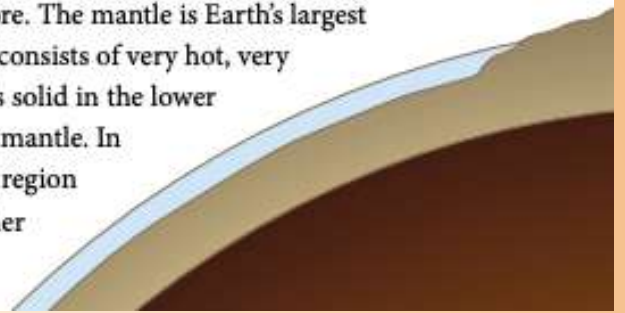
Reread the first section of chapter 2.

How does the author's word choice help explain that many geologists did not agree with Wegener's hypothesis?

You have learned that an idiom is a phrase that does not make sense using the meanings of the individual words, but that the phrase has its own meaning. The author uses the idiom "on the right track", in the last paragraph. What does the author mean when using this idiom?

Please turn to page 14 and read the second paragraph to yourself.

Earth's deepest layer is a solid **inner core** of very hot metal. This metal may be nearly as hot as the sun's surface. The next layer, the **outer core**, is also made of hot metal, but it's liquid, not solid. The **mantle** surrounds the outer core. The mantle is Earth's largest and thickest layer and consists of very hot, very dense rock. The rock is solid in the lower and upper parts of the mantle. In between, however, is a region where the rock is neither liquid nor solid.



Which parts of Earth 's layers are described as solid and which parts are described as liquid?

Turn to your Speed Dial 2 partner and explain how the inner and outer core are different.

Clues from the Seafloor

During the 1940s and 1950s, new technology enabled scientists to make detailed maps of the seafloor. The maps revealed long chains of underwater mountains, called mid-ocean ridges, in all of Earth's oceans. There was a split, or rift, that ran down the center of these ridges. The rift was like a seam in a pants leg, where two pieces of fabric come together.

Scientists dredged up rock samples from mid-ocean ridges. All the rocks were **basalt**. Mid-ocean ridges seemed to be like long, skinny strings of volcanoes running along the seafloor.

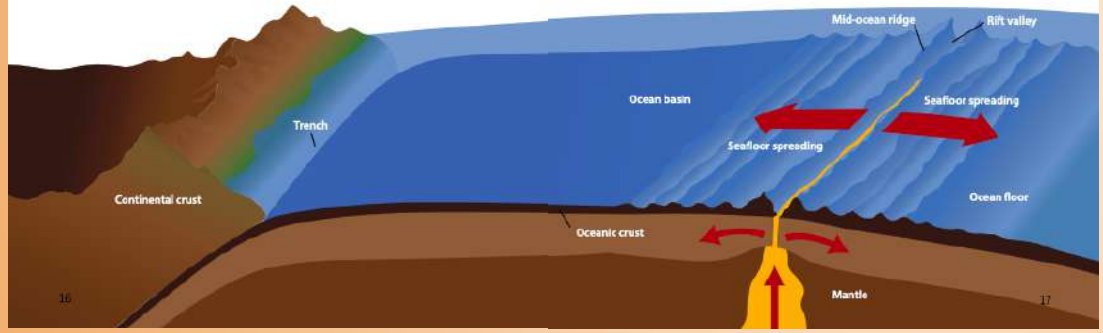
Scientists collected rocks at various distances from the rift along a mid-ocean ridge. They discovered that rocks from the edge of the rift had formed very recently. Rocks farther away from the rift were older. The farther scientists got from the rift, on either side, the older the rocks were.

The scientists concluded that mid-ocean ridges form along huge cracks in Earth's crust. **Magma** beneath the crust erupts through these cracks as **lava**. The lava cools into basalt, creating new oceanic crust on either side of the rift.

As new crust is added, older crust gets pushed outward, away from the rift. Inch by inch, year after year, oceanic crust spreads outward into ocean **basins** on either side of mid-ocean ridges. Scientists called this process seafloor spreading. They theorized that as the seafloor slowly spreads, continents bordering the ocean slowly move apart. Here was one explanation of how continents could drift!

Scientists knew the earth wasn't getting bigger. If new crust forms along mid-ocean ridges, then old crust must be destroyed somewhere else. Scientists guessed that deep **ocean trenches** are places where crust is sinking down into the mantle.

In the 1960s, scientists formed a new **theory** about how Earth's surface changes. They called the theory **plate tectonics**.



Reread page 16 and the first paragraph on page 17 with your speed dial 1 partner.

Revealed?

The word revealed means made known or brought something into view. Why do you think the author chose this word when stating maps revealed long chains of underwater mountains?

What did scientists conclude about mid-ocean ridges?

pressure keeps building. Eventually the pressure gets too great. The stuck edges break free, causing the plates to jerk past each other.

Providing the Answers

The theory of plate tectonics answered many questions in geology. It explained how Wegener's Pangaea broke apart. It explained how the continents have been slowly rearranged over millions of years. The movement of the plates also explained mid-ocean ridges, deep ocean trenches, patterns in the locations of mountains, and many other features on Earth's surface. The theory has become the cornerstone of modern geology.

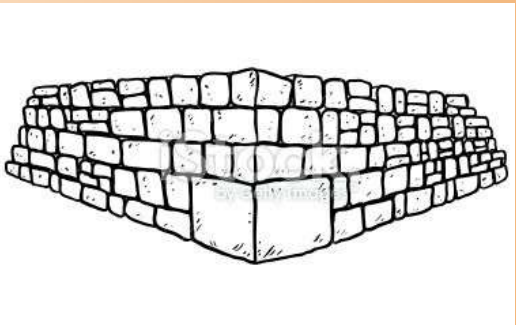
As plates move, interesting things happen. Most of the time, they happen incredibly slowly. Sometimes, though, the effects of plate movements are sudden and dramatic. Think earthquakes and volcanoes!

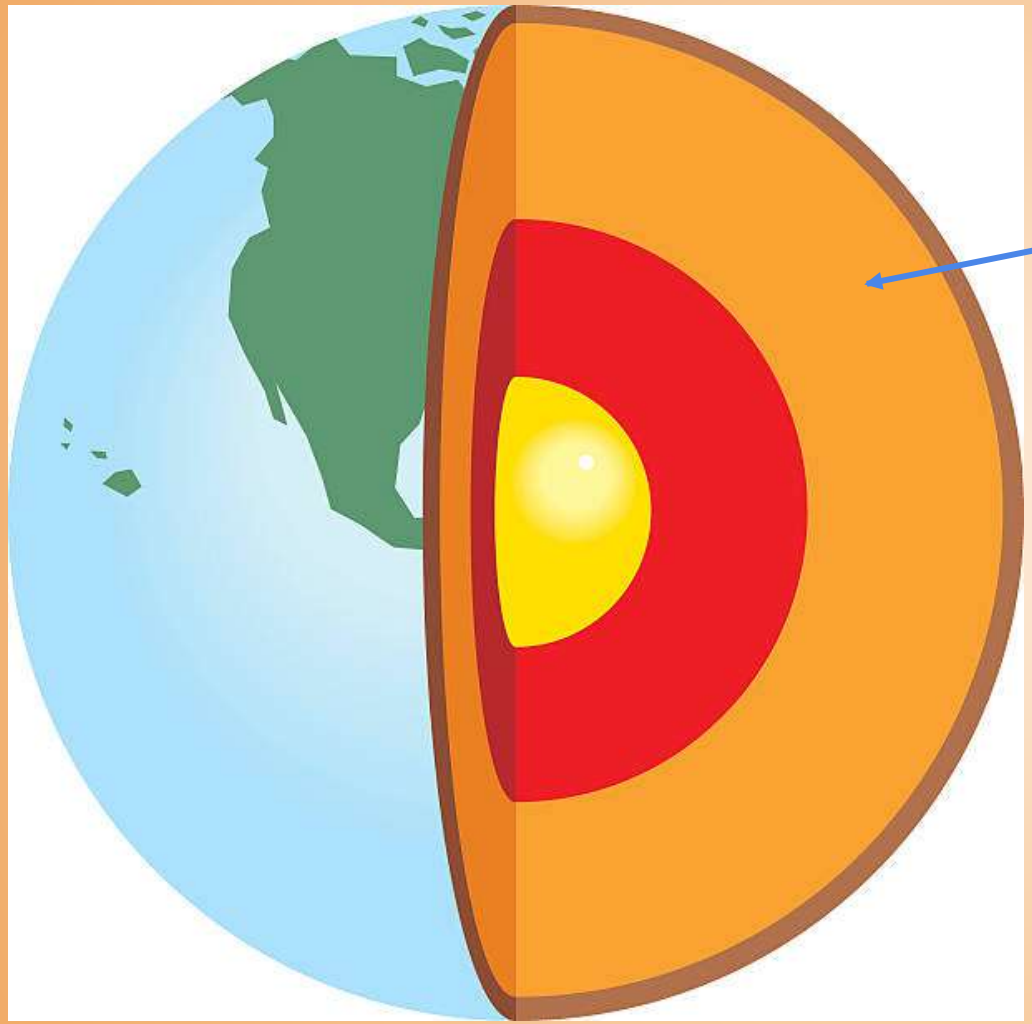
Core Conclusions

You may never have heard of the Danish scientist Inge Lehmann. Among seismologists, however, she is famous. Around 1900, scientists thought the earth had just three layers: an outer crust, a solid mantle, and a liquid core. Lehmann studied seismograph records of earthquakes. She analyzed how seismic waves changed as they traveled through Earth's interior. Lehmann collected thousands of records organized in boxes—there were no computers back then! She saw patterns in how seismic waves behaved as they moved through Earth. Lehmann concluded that Earth's core has two parts: a liquid outer core and a solid inner core. In 1936, she announced her findings and changed our view of Earth!

Please read this paragraph to yourself.

Cornerstone means foundation or basis for other ideas to be built. What does the author mean by the statement, "The theory has become the cornerstone of modern geology"?





Based on everything you have learned, why might the earth's mantle be the most important layer for scientists to study for understanding changes on the earth's surface?

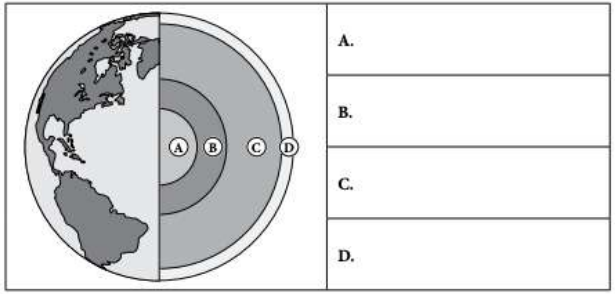
NAME: _____ **3.1** TAKE-HOME

DATE: _____

Excerpt from "Earth's Layers and Moving Plates"

Read the following excerpt and use it to label Earth's layers in the diagram that follows.

Earth's deepest layer is a solid inner core of very hot metal. This metal may be nearly as hot as the sun's surface. The outer core is also made of hot metal, but it's liquid, not solid. The mantle surrounds the outer core. The mantle is Earth's largest and thickest layer and consists of very hot, very dense rock. The rock is solid in the lower and upper parts of the mantle. In between, however, is a region where the rock is neither liquid nor solid. The slow movement and behavior of this material, caused by heat and pressure, have an impact on Earth's surface. Above the mantle is Earth's outermost layer, the thin, rocky crust. There are two types of crust: oceanic crust and continental crust. 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.



A.

B.

C.

D.

Let's take a look at your homework!

1. Read the words in the word bank on p. 34
2. Go back to p. 29 and start circling or highlighting the words from your word bank in the text.
3. Tear out pages 29 – 34
4. Staple them together
5. Put them in your red folder.

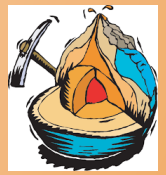
Word Work: exert

Text Example:
"As the material in the mantle slowly moves, it exerts enormous pressure on the overlying plates."

Meaning:
to cause a force to be felt or have an effect

My Example:
The girl had to exert a lot of force to pick up her full backpack.

Can you think of a sentence using exert?



We will finish our day with a little bit of writing. I will model it for you first!

NAME: _____ **2.4** ACTIVITY PAGE

DATE: _____

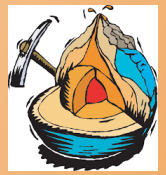
Similes about Earth's Changes

Reread the text on the page noted for each simile. Then, fill in the chart to explain what the simile is comparing and what it means.

Page	Simile from Text	What is the simile comparing?	What does the simile mean?
9	*What if continents were like enormous pieces of ice?*		
13	*An earthquake is a bit like a rock plunking into water.*		
16	*The rift was like a seam in a pants leg, where two pieces of fabric come together.*		

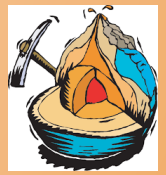
We are going to be writing a detailed explanation of a simile used in this chapter.

First, turn back to Activity Page 2.4 (workbook page 27) and reread row 3.



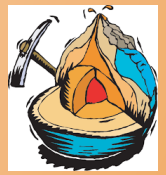
I begin my explanation by stating what the Reader says, so I need to look back at page 16 to find the simile in the text and then use that direct quote in my explanation.

In the Reader, the author says, "The rift was like a seam in a pants leg, where two pieces of fabric come together."



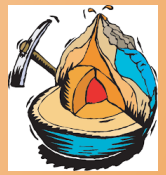
The next sentence should tell what two things the simile compares. This can be found on Activity Page 2.4.

In the Reader, the author says, "The rift was like a seam in a pants leg, where two pieces of fabric come together." This simile is comparing the rift in mid–ocean ridges to the seam in a pants leg.



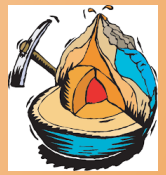
The 3rd sentence should provide information about the familiar idea or item that the geology concept is being compared to.

In the Reader, the author says, "The rift was like a seam in a pants leg, where two pieces of fabric come together." This simile is comparing the rift in mid–ocean ridges to the seam in a pants leg. We can see that the seam in a pants leg dips down where the two pieces of fabric come together, so the seam lies a little lower than the fabric on either side.



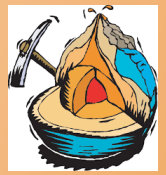
The next part of your explanation should tell how this familiar item or idea helped you understand the geology concept.

In the Reader, the author says, "The rift was like a seam in a pants leg, where two pieces of fabric come together." This simile is comparing the rift in mid–ocean ridges to the seam in a pants leg. We can see that the seam in a pants leg dips down where the two pieces of fabric come together, so the seam lies a little lower than the fabric on either side. Thinking of a seam helped me to visualize the dip that is the rift between the mid–ocean ridges. The ridges on either side are a little higher than the rift just like the fabric is a little higher than the seam.



The last sentence of your explanation should explain what we now know about the concept in the Reader.

In the Reader, the author says, "The rift was like a seam in a pants leg, where two pieces of fabric come together." This simile is comparing the rift in mid–ocean ridges to the seam in a pants leg. We can see that the seam in a pants leg dips down where the two pieces of fabric come together, so the seam lies a little lower than the fabric on either side. Thinking of a seam helped me to visualize the dip that is the rift between the mid–ocean ridges. The ridges on either side are a little higher than the rift just like the fabric is a little higher than the seam. We now know that as plates pull apart a rift is formed between the mid–ocean ridges and causes seafloor spreading.



Remember to read the excerpt from "Earth's Layers and Moving Plates" with someone tonight, and complete the activities on pages 29 and 34! Needs to be ready to turn in tomorrow!