8th grade: modified

Ms. Hanrahan's Days 11-20 Science NTI Assignments, 8 Gold

We will be learning about plate tectonics. Plate tectonics includes topics such as Pangea, convergent, divergent, and transform plate boundaries, continental drift, and seafloor spreading. You will see that the fossils we just learned about are a key piece of evidence supporting the theory of continental drift. You learned about plate tectonics in 6th grade, but we review it in 8th grade before you go to high school.

Days 11 and 12

1. Read "Section 3 Plate Tectonics"
2. Answer questions 1-3 in the "section 3 review"
3. Complete the "plate tectonics section 3 theory of plate tectonics" practice (actual document pages 76-78)

Day 13

1. Complete "Going Deep with Plate Tectonics" passage and questions

Day 14

1. Complete "Plate Boundary Homework"

Day 15 and 16

1. Read "Section 1 Continental Drift"
2. Answer questions 1-4 in the "section 1 review"
3. Complete the "plate tectonics section 1 continental drift" practice (actual document 70-72)

Day 17

1. Complete "Continental Drift CER"
2. Complete "Pangea Exists" newspaper article

Day 18 and 19

1. Read "Section 2 Seafloor Spreading"
2. Answer questions 1-5 in the "section 2 review"
3. Complete the "plate tectonics section 2 seafloor spreading" practice (actual document 73-75)

Day 20

1. Complete "Chapter 7 Review" questions 7-14
2. Complete "Chapter 7 Standardized Test Practice" questions 1-7 and 13-15

Additional Video Resources you can use to help you learn:

1. Go to YouTube: search "Plate tectonics" and watch the first video. It is published by BrainPop and is a little over 7 minutes long. We would have watched this in class at the beginning of the

section 3

Theory of Plate Tectonics

as you read

What You'll Learn

- **Compare and contrast** different types of plate boundaries.
- **Explain** how heat inside Earth causes plate tectonics.
- **Recognize** features caused by plate tectonics.

Why It's Important p. 77 18

Plate tectonics explains how many of Earth's features form.

Review Vocabulary
converge: to come together
diverge: to move apart
transform: to convert or change

New Vocabulary
- plate tectonics
- plate
- lithosphere
- asthenosphere
- convection current

Plate Tectonics

The idea of seafloor spreading showed that more than continents were moving, as Wegener had thought. It was clear to scientists that sections of the seafloor and continents move in relation to one another.

Plate Movements In the 1960s, scientists developed a theory that combined continental drift and seafloor spreading. According to the theory of **plate tectonics**, Earth's crust and of the upper mantle are broken into sections. These sections called **plates**, move on a plasticlike layer of the mantle. The plates can be thought of as rafts that float and move on the layer.

Composition of Earth's Plates Plates are made of the crust and a part of the upper mantle, as shown in **Figure 8**. These two parts combined are the **lithosphere** (LIH thuh sfihr). This rigid layer is about 100 km thick and generally is less dense than material underneath. The plasticlike layer below the lithosphere is called the **asthenosphere** (as THE nuh sfihr). The rigid plates of the lithosphere float and move around on the asthenosphere.

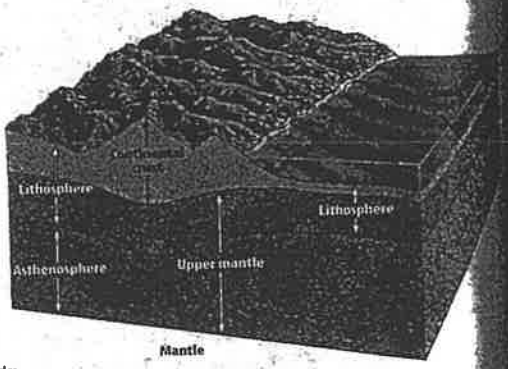


Figure 8 Plates of the lithosphere are composed of oceanic crust, continental crust, and rigid upper mantle.

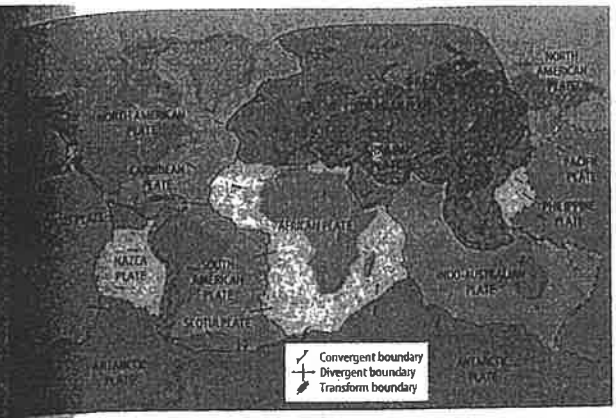


Plate Boundaries

When plates move, they can interact in several ways. They can move toward each other and converge, or collide. They also can pull apart or slide alongside one another. When the plates interact, the result of their movement is seen at the plate boundaries, as in **Figure 9**.

Reading Check *What are the general ways that plates interact?*

Movement along any plate boundary means that changes happen at other boundaries. What is happening to the Ocean floor between the North American and African Compare this with what is happening along the western of South America.

Moving Apart The boundary between two plates that moving apart is called a divergent boundary. You learned divergent boundaries when you read about seafloor ing. In the Atlantic Ocean, the North American Plate is away from the Eurasian and the African Plates, as shown **9.** That divergent boundary is called the Mid-Atlantic the Great Rift Valley in eastern Africa might become a plate boundary. There, a valley has formed where a tal plate is being pulled apart. **Figure 10** shows a side what a rift valley might look like and illustrates how the erial rises up where plates separate.

Diverge

Figure 9 This diagram shows major plates of the lithosphere, direction of movement, and th type of boundary between them **Analyze and Conclude** *Base what is shown in this figure, wh happening where the Nazca Pla meets the Pacific Plate?*

pg 190

pg 191

Where Plates Collide A subduction zone also can [form] where two oceanic plates converge. In this case, the colder, [older] denser oceanic plate bends and sinks down into the mantle. [The] Mariana Islands in the western Pacific are a chain of volc[anic] islands formed where two oceanic plates collide.

Usually, no subduction occurs when two continental [plates] collide, as shown in **Figure 10.** Because both of these plates [are] less dense than the material in the asthenosphere, the two [plates] collide and crumple up, forming mountain ranges. Earthqu[akes] are common at these convergent boundaries. However, [vol]noes do not form because there is no, or little, subduction. [The] Himalaya in Asia are forming where the Indo-Australian [plate] collides with the Eurasian Plate.

Where Plates Slide Past Each Other The third type [of] plate boundary is called a transform boundary. Transform boundaries occur where two plates slide past one another. They move in opposite directions or in the same direction at differ[ent] rates. When one plate slips past another suddenly, earthquakes occur. The Pacific Plate is sliding past the North American Plate, forming the famous San Andreas Fault in California, as seen in **Figure 11.** The San Andreas Fault is part of a transform plate boundary. It has been the site of many earthquakes.

Figure 11 The San Andreas Fault in California occurs along the transform plate boundary where the Pacific Plate is sliding past the North American Plate.

Overall, the two plates are moving in roughly the same direction. **Explain** *Why, then, do the red arrows show movement in opposite directions?*

This photograph shows an aerial view of the San Andreas Fault.

Causes of Plate Tectonics

Many new discoveries have been made about Earth's crust since Wegener's day, but one question still remains. What causes the plates to move? Scientists now think they have a good idea. They think that plates move by the same basic process that occurs when you heat soup.

Convection Inside Earth Soup that is cooking in a pan on the stove contains currents caused by an unequal distribution of heat in the pan. Hot, less dense soup is forced upward by the surrounding cooler, denser soup. As the hot soup reaches the surface, it cools and sinks back down into the pan. This entire cycle of heating, cooling, and sinking is called a convection current. A convection current of this same process, occurring in the mantle, is thought to be the force behind plate tectonics. Scientists suggest that differences in density cause hot, plasticlike rock to be forced toward the surface.

Moving Mantle Material Wegener wasn't able to come up with an explanation for why plates move. Today, researchers who study the movement of heat in Earth's interior have proposed several possible explanations. All of the hypotheses use convection in one way or another. It is, therefore, the transfer of heat inside Earth that provides the energy to move plates and change many of Earth's surface features. One hypothesis is shown in **Figure 12.** It relates plate motion directly to the movement of convection currents. According to this hypothesis, convection currents cause the movements of plates.

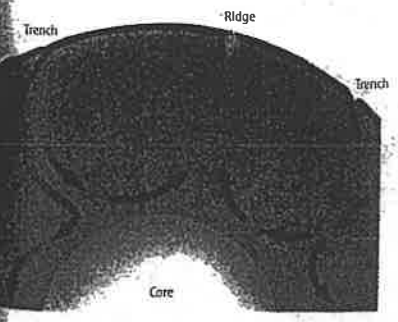


Figure 12 In one hypothesis, convection currents occur throughout the mantle. Such convection currents (see arrows) are the driving force of plate tectonics.

Mini LAB

Modeling Convection Currents

Procedure

1. Pour water into a clear colorless casserole dish until it is 5 cm from the
2. Center the dish on a hot plate and heat it. WARNING: *Wear thermal mitts to protect your hands.*
3. Add a few drops of food coloring to the water above the center of the hot plate.
4. Looking from the side of the dish, observe what happens in the water.
5. Illustrate your observations in your Science Journal.

Analysis

1. Determine whether any currents form in the water.
2. Infer what causes the currents to form.

Pg 194

Pg 195

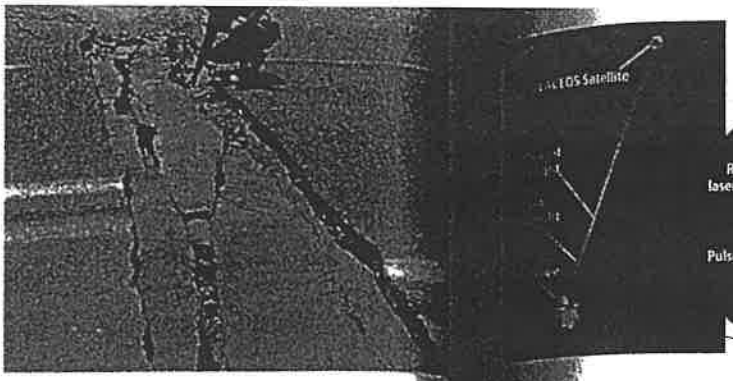


Figure 15 Most of the movement along a strike-slip fault is parallel to Earth's surface. When movement occurs, human-built structures along a strike-slip fault are offset, as shown here in this road.

Figure 16 When using the Satellite Laser Ranging System, scient on the ground aim laser pulses at a satellite. The pulses reflect off th satellite and are used to determine a precise location on the ground

Current Data Satellite I Ranging System data show Hawaii is moving toward J at a rate of about 8.3 cm year. Maryland is moving from England at a rate of 1. per year. Using such meth scientists have observed the plates move at rates rar from about 1 cm to 12 cn year.

Strike-Slip Faults At transform boundaries, two pl slide past one another without converging or diverging. plates stick and then slide, mostly in a horizontal direct along large strike-slip faults. In a strike-slip fault, rock opposite sides of the fault move in opposite directions, the same direction at different rates. This type of fault m ment is shown in **Figure 15.** One such example i San Andreas Fault. When plates move suddenly, vibration generated inside Earth that are felt as an earthquake.

Earthquakes, volcanoes, and mountain ranges are evid of plate motion. Plate tectonics explains how activity in Earth can affect Earth's crust differently in different locati You've seen how plates have moved since Pangaea separa Is it possible to measure how far plates move each year?

Testing for Plate Tectonics

Until recently, the only tests scientists could use to chec plate movement were indirect. They could study the magn characteristics of rocks on the seafloor. They could study vo noes and earthquakes. These methods supported the theory the plates have moved and still are moving. However, the not provide proof—only support—of the idea.

New methods had to be discovered to be able to mea the small amounts of movement of Earth's plates. O method, shown in **Figure 16,** uses lasers and a satellite. scientists can measure exact movements of Earth's plates little as 1 cm per year.

INTEGRATE Physics

Direction of Forces In which directions do forces act at convergent, divergent, and transform boundaries? Demonstrate these forces using wooden blocks or your hands.

section 3 review

Summary

Plate Tectonics
The theory of plate tectonics states that ...s of the seafloor and continents ...t plates on a plasticlike layer of ...mantle.

Plate Boundaries
...boundary between two plates moving ... called a divergent boundary.
...move together at a convergent boundary.
...form boundaries occur where two plates ... past one another.

Causes of Plate Tectonics
...convection currents are thought to cause the ...ement of Earth's plates.

Features Caused by Plate Tectonics
...ing forces cause normal faults, rift valleys, ...-ocean ridges at divergent boundaries.
...convergent boundaries, compression forces ...folding, reverse faults, and mountains.
...form boundaries, two plates slide past ...another along strike-slip faults.

Self Check

1. **Describe** what occurs at plate boundaries that are associated with seafloor spreading.
2. **Describe** three types of plate boundaries where volcanic eruptions can occur.
3. **Explain** how convection currents are related to plate tectonics.
4. **Think Critically** Using Figure 9 and a world map, determine what natural disasters might occur in Iceland. Also determine what disasters might occur i Tibet. Explain why some Icelandic disasters are not expected to occur in Tibet.

Applying Skills

5. **Predict** Plate tectonic activity causes many events that can be dangerous to humans. One of these events is a seismic sea wave, or tsunami. Learn how scientists predict the arrival time of a tsunami in a coastal area.
6. **Use a Word Processor** Write three separate descriptions of the three basic types of plate boundaries—divergent boundaries, convergent boundaries, and transform boundaries. Then draw a sketch of an example of each boundary next to your description.

...nline **blue.msscience.com/self_check_quiz**

Name _____ Date _____

Plate Tectonics

Section 3 Theory of Plate Tectonics

Scan *the headings and illustrations in Section 3. List four features caused by plate tectonics.*

pg 197

1. _____ 3. _____

2. _____ 4. _____

Review Vocabulary

Define *the review terms to show their scientific meanings.*

converge _____ pg 192

diverge _____ pg. 196

transform _____ pg. 194

New Vocabulary

Use your book to define the following terms.

plate _____ pg 190

_____

plate tectonics _____ pg 190

_____

lithosphere _____ pg 190

_____

asthenosphere _____ pg 190

_____

convection current _____ pg 194

_____

Academic Vocabulary

Use a dictionary to define rigid.

rigid _____

_____

Name _____ Date _____

Section 3 Theory of Plate Tectonics (continued)

Main Idea

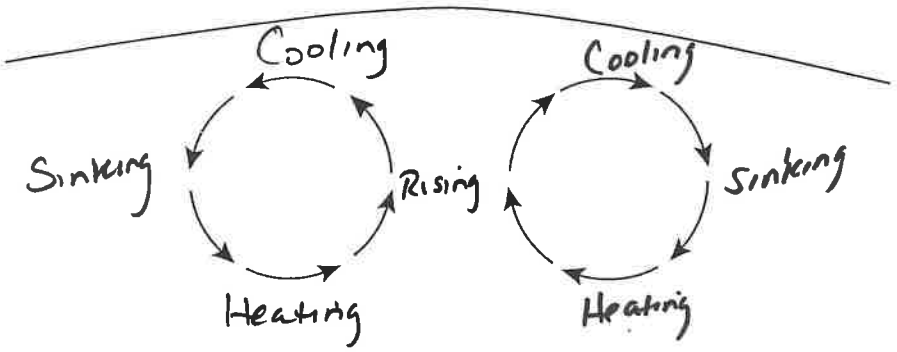
Details

Causes of Plate Tectonics

I found this information on page _____.

SE 195
RE p. 96

Label *the* convection currents *depicted below with heating, rising, cooling, and sinking.*



Features Caused by Plate Tectonics

I found this information on page _____.

SE pp. 196-197

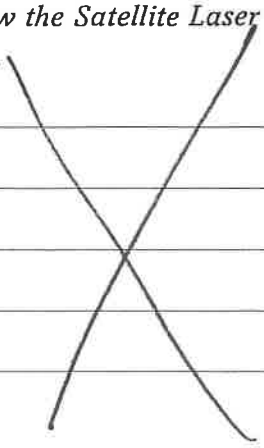
Organize *information to describe features caused by plate tectonics. Fill in the chart below.*

	Feature	Description
1	Rift valley	Being stretched or _____ p. 196
2	Folded and faulted mountains p. 197	High mountains that form where plates _____
3	Strike-slip faults p198	Faults that form at transform boundaries where plates _____.

Testing for Plate Tectonics

I found this information on page _____.

Summarize *how the Satellite Laser Ranging System measures plate movement.*



NAME _____

Going DEEP with PLATE TECTONICS

Study Guide and Practice

How do mountains form? Why do earthquakes happen? What is a volcano and why does it erupt? Throughout recorded human history, there were always questions like these trying to understand how or why these events happened. Questions such as these led to plenty of research from hundreds of scientists over the past century to find the answers. These answers were found! From the collected facts and evidence, there was a theory to explain it all... The *Theory of Plate Tectonics*!

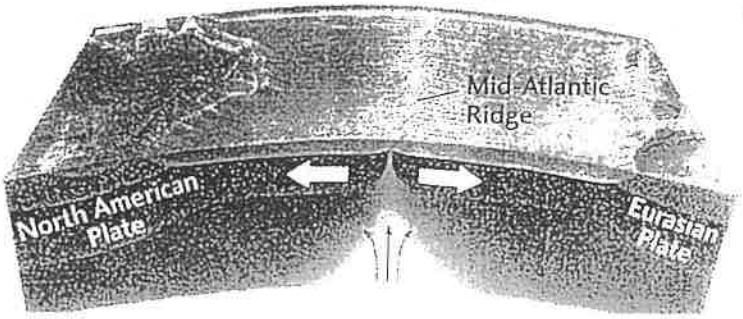
We live on a restless Earth, in which 7 major and 8 minor tectonic plates move about on top of the asthenosphere. Whether they are colliding, dividing, or sliding, these plates are always in motion. Where these plates meet, called 'plate boundaries', is where most of the earthquakes and volcanoes on Earth happen.

The Theory of Plate Tectonics underlines that the Earth forms new crust at the mid-ocean ridges. This crust begins to move outward to either side of the ridge. As it moves, it is forced below another plate where it is melted back into magma. Far into the geological future, this recycled crust emerges again at a mid-ocean ridge.

What causes the plates to move about? It's very simple really! It's called *CONVECTION CURRENTS*! Think of how boiling water in a pot moves... the hotter water rises up. Then, as the water moves to the pot's edge, it is forced back down to be heated back up again. Inside the Earth, instead of convecting water, it is convecting magma.

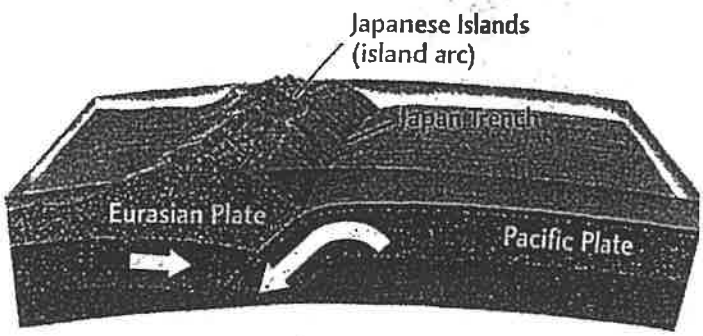
There are THREE types of plate boundaries: *DIVERGENT*, *CONVERGENT*, and *TRANSFORM*! Each of these give rise to new landforms and can cause many natural disasters.

Divergent Plate Boundaries are where plates are moving away from each other. This movement is found along mid-ocean ridges where new crust material is being formed.

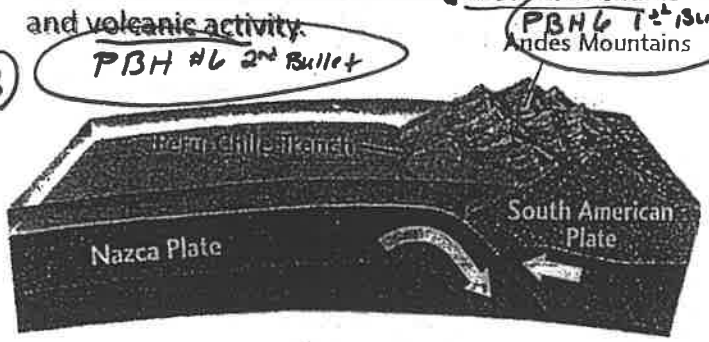


Convergent Plate Boundaries are where one plate subducts under crust that is less dense to be recycled back into the asthenosphere. There are three type o convergent plate boundaries:

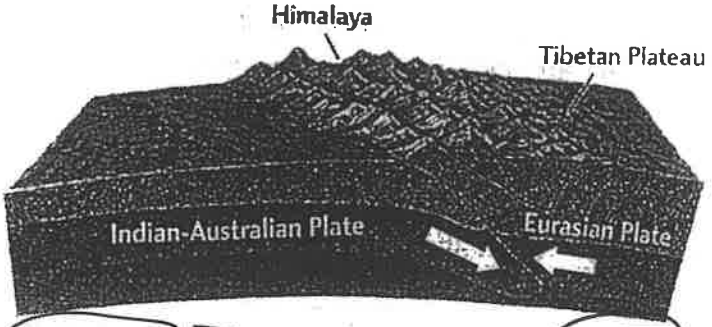
- ***Ocean to Ocean*: when the crust of two oceanic plates meet, usually forming island arcs.**



- ***Ocean to Continental*: when ocean crust subducts under continental crust forming mountain chains and volcanic activity.**



- ***Continental to Continental*: when two continental plates meet and buckle up forming large mountains**



Transform Plate Boundaries are when plates move side by side with each other resulting in frequent earthquakes.

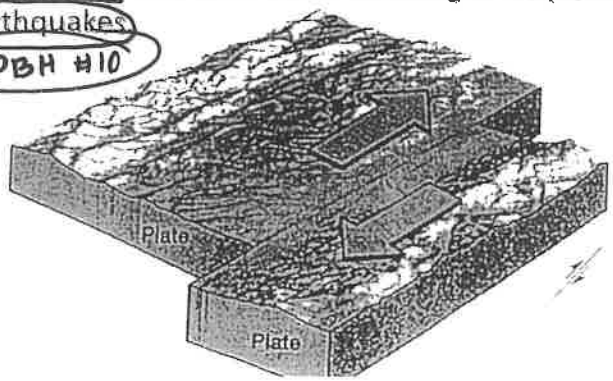
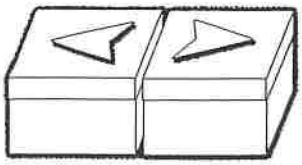


Plate Boundary Homework Name _____

Some Answer hints on "Going Deep with Plate Tectonics" article.

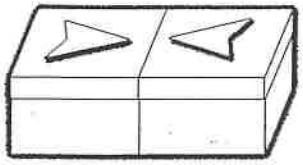
Hints will be: PBH1 (Ex)

A



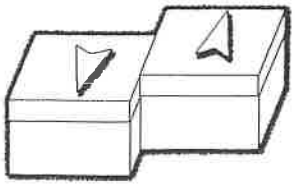
1. What is the name of this type of boundary in Figure A?
   _____
2. What type of features are found at this boundary?
   - In the ocean _____
   - On the continent rift valley
3. How are these plates moving? _____
4. Is this an example of a subduction zone? Yes or (No)

B



5. What is the name of this type of boundary in Figure B?
   _____
6. What type of features are found at this boundary?
   - Continental/Continental _____
   - Continental/Oceanic _____
   - Oceanic/Oceanic underwater volcanoes
7. How are these plates moving? together or apart (choose one.)
8. Put a check by the ones that are subduction zones.

C



9. What is the name of this type of boundary in figure C?
   _____
10. What type of features are found at this boundary?
    _____
11. How are these plates moving? _____
12. Is this an example of a subduction zone? Yes or (No)

Bonus: Name a place on Earth where you would find these boundaries: Your choice

A _____

B _____

C _____

section 1

Continental Drift

as you read

What You'll Learn

- **Describe** the hypothesis of continental drift.
- **Identify** evidence supporting continental drift.

Why It's Important

The hypothesis of continental drift led to plate tectonics—a theory that explains many processes in Earth.

Review Vocabulary

continent: one of the six or seven great divisions of land on the globe

New Vocabulary

- continental drift
- Pangaea

Evidence for Continental Drift

If you look at a map of Earth's surface, you can see that the edges of some continents look as though they could fit together like a puzzle. Other people also have noticed this fact. For example, Dutch mapmaker Abraham Ortelius noted the fit between the coastlines of South America and Africa more than 400 years ago.

Pangaea German meteorologist Alfred Wegener (VEG nur) thought that the fit of the continents wasn't just a coincidence. He suggested that all the continents were joined together at some time in the past. In a 1912 lecture, he proposed the hypothesis of continental drift. According to the hypothesis of **continental drift**, continents have moved slowly to their current locations. Wegener suggested that all continents once were connected as one large landmass, shown in **Figure 1**, that broke apart about 200 million years ago. He called this large landmass **Pangaea** (pan JEE uh), which means "all land."

Reading Check *Who proposed continental drift?*

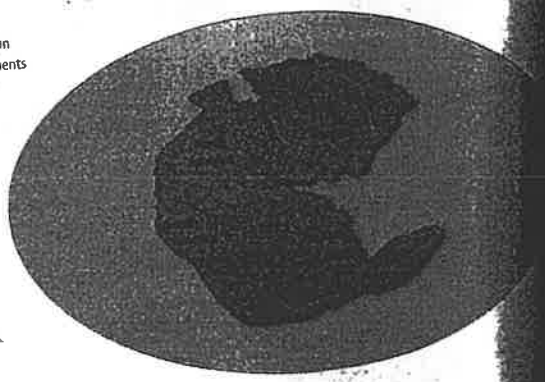


Figure 1 This illustration represents how the continents once were joined to form Pangaea. This fitting together of continents according to shape is not the only evidence supporting the past existence of Pangaea.

A Controversial Idea Wegener's ideas about continental drift were controversial. It wasn't until long after Wegener's death in 1930 that his basic hypothesis was accepted. The evidence Wegener presented hadn't been enough to convince many people during his lifetime. He was unable to explain exactly how the continents drifted apart. He proposed that the continents plowed through the ocean floor, driven by the spin of Earth. Physicists and geologists of the time strongly disagreed with Wegener's explanation. They pointed out that continental drift would not be necessary to explain many of Wegener's observations. Other important observations that came later eventually supported Wegener's earlier evidence.

Fossil Clues Besides the puzzlelike fit of the continents, fossils provided support for continental drift. Fossils of the reptile *Mesosaurus* have been found in South America and Africa, as shown in **Figure 2.** This swimming reptile lived in freshwater and on land. How could fossils of *Mesosaurus* be found on land areas separated by a large ocean of salt water? It probably couldn't swim between the continents. Wegener hypothesized that this reptile lived on both continents when they were joined.

Reading Check *How do* Mesosaurus *fossils support the past existence of Pangaea?*

Science Online

Topic: Continental Drift

Visit blue.msscience.com for Web links to information about the continental drift hypothesis.

Activity Research and write a brief report about the initial reactions, from the public and scientific communities, toward Wegener's continental drift hypothesis.

Figure 2 Fossil remains of plants and animals that lived in Pangaea have been found on more than one continent. **Evaluate** *How do the locations of* Glossopteris, Mesosaurus, Kannemeyerid, Labyrinthodont, *and other fossils support Wegener hypothesis of continental drift?*

p. 182

p. 183

Name _____ Date _____

Plate Tectonics

Section 1 Continental Drift

Skim *through Section 1 of your book. Write three questions that come to mind from reading the headings and examining the illustrations.*

1. _____

2. _____

3. _____

Review Vocabulary

continent

Define continent *to show its scientific meaning.*

_____

_____

p. 182

New Vocabulary

Use your book to define the following terms. Then write an original sentence using each term.

continental drift

_____

_____

_____

p. 182

Pangaea

_____

_____

_____

p. 182

Academic Vocabulary

controversy

Use a dictionary to define controversy.

_____

_____

Name _____ **Date** _____

Section 1 Continental Drift (continued)

Main Idea

I found this information on page _____.

p. 185

Details

Model *what the continents may have looked like 250 million years ago.*

1 Draw where Star (★) is marked.

How could continents drift?

I found this information on page _____.

p. 185

Summarize *Wegener's explanations of how and why continental drift occurs.*

Wegener's explanation for continental drift

2 How: _____

3 Why: The continents are propelled by the spinning of E (our planet name) on its axis

EVALUATE IT

Do you think it was reasonable for scientists initially to reject the hypothesis of continental drift? Explain your response.

Imagine you are Alfred Wegener in 1915. Write your argument to support Continental Drift

Continental drift is the theory that the continents were once together in a large land mass that broke up and split apart.

Evidence

Example! fossils

Notes/Examples to help you!

Reasoning

Example: fossils of the same organism have been found on different continents.

You could talk about glacier, rock, plant, or climate evidence in your chart!

Appalachain m_____s match mountains in Europe. South America and Africa have matching rocks

"All the News That's Fit to Print"

The New York Times

Late Edition
New York: Today, cloudy. High 66. Tonight, slighly more humid. Low 55. Tomorrow, sun then clouds

VOL, CL . . No. 51,874 NEW YORK, TUESDAY, OCTOBER 6, 2015 75 CENTS

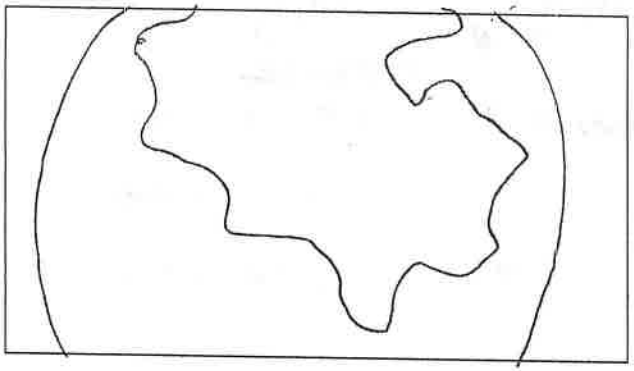
PANGAEA EXISTS

PUZZLE PIECED TOGETHER BY SCIENTIST

By

All of the continents were once together in a single landmass called Pangea. Pangea was in occurence about 200 million years ago. Since then, the landmass has broken apart into their current positions today. This is a process I call continental drift.

There has been many fossils of the same species found in continents that aren't even close to eachother. Fossils of the Mesosaurus have been found in both South America and Africa. These continents are really far apart.



Plants also help support the idea of continental drift. Plants of the same species have been found in different countries such as: Africa, Australia, India, America and Antarctica. It means that all of those continents were once together and had similar climates for the plant.

Another piece of evidence that supports continental drift is rock. Many mountain ranges have been found to connect to other mountains on different continents. The Appalachin mountains in America seem to connect with the mountains found in western Europe. Before continental drift, Pangea did exist

Chan

p. 73 #2

section 2

Seafloor Spreading

as you read

What You'll Learn

- Explain seafloor spreading.
- Recognize how age and magnetic clues support seafloor spreading.

Why It's Important

Seafloor spreading helps explain how continents moved apart.

Review Vocabulary
seafloor: portion of Earth's crust that lies beneath ocean water

New Vocabulary
- seafloor spreading

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Mapping the Ocean Floor

If you were to lower a rope from a boat until it reached the seafloor, you could record the depth of the ocean at that particular point. In how many different locations would you have to do this to create an accurate map of the seafloor? This is exactly how it was done until World War I, when the use of sound waves was introduced by German scientists to detect submarines. During the 1940s and 1950s, scientists began using sound waves on moving ships to map large areas of the ocean floor in detail. Sound waves echo off the ocean bottom—the longer the sound waves take to return to the ship, the deeper the water is.

Using sound waves, researchers discovered an underwater system of ridges, or mountains, and valleys like those found on the continents. In some of these underwater ridges are rifts, or long rift valleys where volcanic eruptions and earthquakes occur from time to time. Some of these volcanoes actually are visible above the ocean surface. In the Atlantic, the Pacific, and in other oceans around the world, a system of ridges, called the mid-ocean ridges, is present. These underwater mountain ranges, shown in **Figure 5**, stretch along the center of much of Earth's ocean floor. This discovery raised the curiosity of many scientists. What formed these mid-ocean ridges?

Reading Check *How were mid-ocean ridges discovered?*

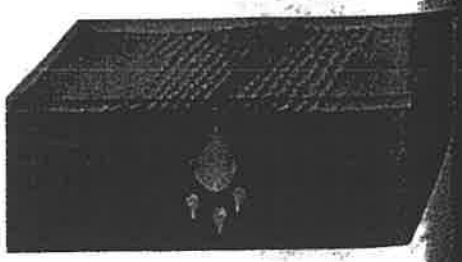

Figure 5 As the seafloor spreads apart at a mid-ocean ridge, new seafloor is created. The older seafloor moves away from the ridge in opposite directions.

Seafloor Moves In the early 1960s, Princeton University scientist Harry Hess suggested an explanation. His now-famous theory is known as **seafloor spreading**. Hess proposed that hot, less dense material below Earth's crust moves upward toward the surface at the mid-ocean ridges. There it flows sideways, carrying the seafloor away from the ridge in both directions, as seen in Figure 5.

As the seafloor spreads apart, magma is forced to the surface and flows from the cracks. It becomes solid as it cools and forms new seafloor. As new seafloor moves away from the mid-ocean ridge, it cools, contracts, and becomes denser. This cooler, denser seafloor sinks, helping to form the valleys. The theory of seafloor spreading was later supported by the following observations.

Reading Check *How does new seafloor form at mid-ocean ridges?*

Evidence for Spreading

In 1968, scientists aboard the research ship *Glomar Challenger* began gathering information about the rocks on the seafloor. *Glomar Challenger* was equipped with a drilling rig that allowed scientists to drill into the seafloor to obtain rock samples. Scientists found that the youngest rocks are located at the mid-ocean ridges. The ages of the rocks become increasingly older in samples obtained farther from the ridges, adding to the evidence for seafloor spreading.

Using submersibles along mid-ocean ridges, new seafloor features and life-forms also were discovered there, as shown in Figure 6. As molten material is forced upward along the ridges, it brings heat and chemicals that support exotic life-forms in the cold ocean water. Among these are giant clams, mussels, and tube worms.

Figure 6 Many new discoveries have been made on the seafloor. These giant tube worms inhabit areas near hot water vents along mid-ocean ridges.

INTEGRATE Chemistry

Curie Point Find out what the Curie point is and describe in your Science Journal what happens to iron-bearing minerals when they are heated to the Curie point. Explain how this is important to studies of seafloor spreading.

Magnetic Clues Earth's magnetic field has a north and a south pole. Magnetic field lines, or directions, of force leave Earth near the south pole and enter Earth near the north pole. During a magnetic reversal, the direction of magnetic force run the opposite way. Scientists have determined that Earth's magnetic field has reversed itself many times in the past. These reversals occur over intervals of thousands to even millions of years. The reversals are recorded in rocks forming along mid-ocean ridges.

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Name _____ Date _____

Plate Tectonics

Section 2 Seafloor Spreading

Predict *three things that might be discussed in Section 2 after reading its headings.*

1. _____
2. _____
3. _____

Review Vocabulary

Define seafloor. *Then use the word in a sentence.*

1. *seafloor*

_____

_____

_____

_____

New Vocabulary

Use your book to define seafloor spreading. *Then use the term in a sentence.*

2. *seafloor spreading*

_____

_____

Academic Vocabulary

Use a dictionary to define interval. *Then use the word in a sentence about magnetic clues to seafloor spreading.*

interval

_____

_____

_____

_____

Name _____ **Date** _____

Section 2 Seafloor Spreading (continued)

Main Idea — **Details**

Evidence for Spreading

I found this information on page _____.

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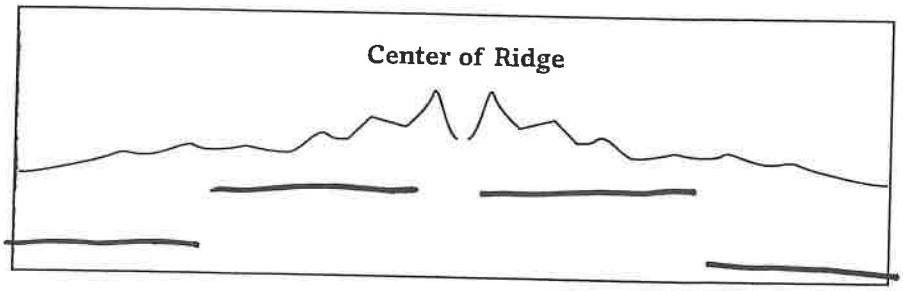
Choices: older rock (used twice) and newer rock (used twice)

I found this information on page _____.

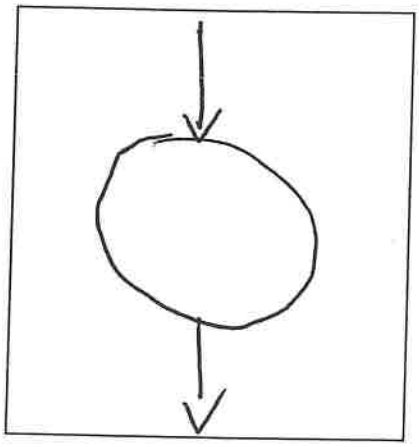
Choices:
North Pole
South Pole

Label *the diagram below to identify evidence for seafloor spreading. Add arrows to show the direction of spreading, and indicate where older rock and newer rock occur.*



Model *the polarity of Earth's magnetic field today.*

- Draw a sphere to represent Earth.
- Label the north pole and south pole.
- Draw arrows indicating the direction in which magnetic lines of force enter and leave Earth.



Summarize *how reversals in the direction of Earth's magnetic field have provided evidence of seafloor spreading.*

At times, the lines _____ force that pass through Earth have reversed _____ Reversals of Earth's magnetic field are recorded in _____ (rock or water) that forms along mid-O ridges. Scientists can detect magnetized st__s that are parallel to mid-ocean ridges. This occurs on both sides of the r__s

Using Vocabulary

asthenosphere p. 190 — Pangaea p. 182
continental drift p. 182 — plate p. 190
convection current p. 195 — plate tectonics p. 190
lithosphere p. 190 — seafloor spreading p. 187

Each phrase below describes a vocabulary term from the list. Write the term that matches the phrase describing it.

1. plasticlike layer below the lithosphere
2. idea that continents move slowly across Earth's surface
3. large, ancient landmass that consisted of all the continents on Earth
4. composed of oceanic or continental crust and upper mantle
5. explains locations of mountains, trenches, and volcanoes
6. theory proposed by Harry Hess that includes processes along mid-ocean ridges

Checking Concepts

Choose the word or phrase that best answers the question.

7. Which layer of Earth contains the asthenosphere?
   A) crust C) outer core
   B) mantle D) inner core
8. What type of plate boundary is the San Andreas Fault part of?
   A) divergent C) convergent
   B) subduction D) transform
9. What hypothesis states that continents slowly moved to their present positions on Earth?
   A) subduction C) continental drift
   B) erosion D) seafloor spreading

Use the illustration below to answer question 10.

10. Which plate is subducting beneath the South American Plate?
    A) Nazca C) North Americ...
    B) African D) Indo-Australi...
11. Which of the following features are evidence that many continents were at one time near Earth's south pole?
    A) glacial deposits C) volcanoes
    B) earthquakes D) mid-ocean ri...
12. What evidence in rocks supports the theory of seafloor spreading?
    A) plate movement
    B) magnetic reversals
    C) subduction
    D) convergence
13. Which type of plate boundary is the Atlantic Ridge a part of?
    A) convergent C) transform
    B) divergent D) subduction
14. What theory states that plates move around on the asthenosphere?
    A) continental drift
    B) seafloor spreading
    C) subduction
    D) plate tectonics

Thinking Critically

...y do many earthquakes but few ...e eruptions occur in the Himalaya?

...Glacial deposits often form at high ...es near the poles. Explain why gla... ...posits have been found in Africa.

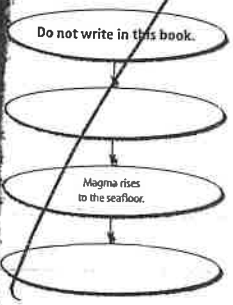
...how magnetism is used to support ...eory of seafloor spreading.

...why volcanoes do not form along ...n Andreas Fault.

...why the fossil of an ocean fish ...on two different continents would ... good evidence of continental drift.

...potheses Mount St. Helens in the ...de Range is a volcano. Use **Figure 9** ...U.S. map to hypothesize how it ...have formed.

...Map Make an events-chain concept ...hat describes seafloor spreading ...a divergent plate boundary. Choose ...the following phrases: *magma cools ...m new seafloor, convection currents ...late hot material along divergent ...dary,* and *older seafloor is forced apart.*



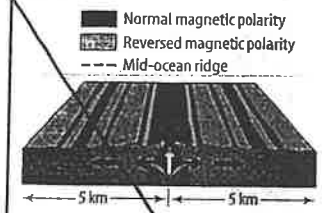
Performance Activities

22. **Observe and Infer** In the MiniLab called "Modeling Convection Currents," you observed convection currents produced water as it was heated. Repeat the experiment, placing sequins, pieces of wood, o... pieces of rubber bands into the water. How do their movements support your observations and inferences from the MiniLab?

Applying Math

23. **A Growing Rift** Movement along the African Rift Valley is about 2.1 cm per year. If plates continue to move apart at this rate, how much larger will the rift be (in meters) in 1,000 years? In 15,500 years?

Use the illustration below to answer questions 24 and 25.



24. **New Seafloor** 10 km of new seafloor has been created in 50,000 years, with 5 km on each side of a mid-ocean ridge. What is the rate of movement, in km per year, of each plate? In cm per year?
25. **Use a Ratio** If 10 km of seafloor were created in 50,000 years, how many kilometers of seafloor were created in 10,000 years? How many years will it take to create a total of 30 km of seafloor?