

12

The Continent Puzzle

INVESTIGATION

YOU HAVE LEARNED the different ways that lithospheric plates move. But how have the geological processes caused by plate movement changed Earth's surface over time? How do we know what ancient Earth looked like? Modern humans have been around for only hundreds of thousands of years, or 0.01% of Earth's 4.6-billion-year history.

Scientists use evidence from rock and fossils to figure out when events happened in Earth's history. Scientists use this evidence to put the major events in Earth's history in order. They usually refer to time periods of thousands, millions, and billions of years as **geological time**.

Alfred Wegener (1880-1930) was a German scientist. Over many years, he gathered evidence to support a new idea about Earth's history over geological time. His evidence included the location of fossils and rock layers on different continents. In this activity, you will use a model to analyze some of Wegener's evidence to better understand his idea.

GUIDING QUESTION

What evidence can we use to help us understand the movement of Earth's plates over time?



Fossilized Glossopteris leaves

ACTIVITY 12 THE CONTINENT PUZZLE

MATERIALS

For each group of four students

- 1 set of 7 World Puzzle pieces
- 1 set of markers or colored pencils

For each student

- 1 Student Sheet 12.1, "World Puzzle"
- 1 Student Sheet 12.2, "Earth's Surface Through Geological Time"

PROCEDURE

Part A: World Puzzle

1. With your group, carefully examine the location of the world's continents on the map below.
2. Record the names of the six continents in your science notebook.



The country of India can be seen in orange on the Eurasian continent.

3. Compare each World Puzzle piece to the continents on the map. Put a star next to each continent in your list that is represented by a puzzle piece. Then record the name(s) of any additional pieces.
4. Work with your group to arrange your puzzle pieces in locations similar to the ones shown on the world map.

5. Look at the symbols on some of the pieces. The symbols represent types of fossils or rocks found in several locations. Read the key to these symbols, which is shown below.

Key to Symbols on World Puzzle



Glossopteris, an extinct fern-like plant that could grow to 3.7 meters (12 feet) in height



Mesosaurus (MESS-oh-saw-rus), an extinct freshwater reptile about 0.5 meters (1.5 feet) in length



Cynognathus (sy-nog-NAY-thus), an extinct land reptile about the size of a wolf



Lystrosaurus (liss-tro-SAW-rus), an extinct land reptile about 1 meter (3 feet) long

6. Using evidence from the symbols on the puzzle pieces, work with your group to try to place all of the pieces into a single shape. Work together to decide where each piece belongs.
- Remember to listen to and consider the explanations and ideas of the other members of your group. If you disagree with other members of your group, explain why you disagree.
7. Once your group has agreed on your puzzle, ask your teacher for Student Sheet 12.1, “World Puzzle.” Use solid black lines to sketch the shapes of the puzzle pieces. Label the individual puzzle pieces with current continent names in your sketch.
8. Use five different-colored markers or different symbols to label the boxes in the key on the bottom of Student Sheet 12.1. Using the colors or symbols from your key, mark the locations of the fossil and rock evidence in your sketch of the completed World Puzzle.
9. Move the pieces back into positions similar to the location of the continents today. Then slowly move the pieces back together into the single shape.
10. Discuss with your group what this puzzle might tell you about the history of Earth.

Part B: The History of Earth's Surface

11. Ask your teacher for a copy of Student Sheet 12.2, "Earth's Surface Through Geological Time."
12. Discuss with your group what you think has happened to the land on the surface of Earth during geological time.
13. Compare the outline you sketched on Student Sheet 12.1 with Student Sheet 12.1. Identify when in Earth's history the continents were arranged in a similar way. Record this time period and the name of the land at this time on Student Sheet 12.1.

ANALYSIS

1. There are six continents and there were seven puzzle pieces. One of the puzzle pieces was different from the others in that it did not represent a continent. Why do you think this difference was part of the model?

Hint: Think about how you used the puzzle pieces to model changes on Earth's surface.

2. Explain how Earth's surface has changed over geological time.
 - a. Describe what has happened to the land on Earth's surface over the past 425 million years.
 - b. What types of evidence did the puzzle provide about changes on Earth's surface? Choose two pieces of evidence from the model. For each, describe what it is and how it supports the theory that the position of the continents has changed over geological time.

Hint: Think about how you used the puzzle pieces to model changes on Earth's surface.

3. A friend says that changes to Earth's surface happen only very suddenly, like when the ground shakes during an earthquake or when a volcano erupts. Do you agree or disagree with your friend? Use evidence to support your position and explain your reasoning.

4. Alfred Wegener used the phrase **continental drift** (kon-ti-NEN-tul) for his idea that the continents were once joined together as a single large continent and then slowly moved great distances apart. Why do you think Wegener used different pieces of evidence to support continental drift? Explain your ideas.
5. In the activity “Storing Nuclear Waste,” you learned that nuclear waste can be dangerous for at least 250,000 years. How would you compare that amount of time to the time gone by since the supercontinent Pangea existed? How would you compare it to the age of Earth?

Hint: Use fractions, percentages, or ratios to describe the relationship.

EXTENSION

Visit the *SEPUP Third Edition Geological Processes* page of the SEPUP website at www.seuplhs.org/middle/third-edition to learn what scientists predict about future plate movements. How will Earth’s surface be different in the future?