What Does Plate Tectonics Explain About the Earth?

The ground we stand on may feel still, but the surface of the Earth is moving. Sometimes, we can feel this movement as earthquakes. The Earth’s surface has moved so much that the continents have actually changed locations.

The Earth has a thin, cool outer layer called the **lithosphere**. This layer is broken into several small sections called **tectonic plates**. These plates rest on a layer of rock called the **mantle**. The mantle is solid, but it moves very slowly. As the mantle moves, it drags the tectonic plates on top of it.

Earth has about 12 large plates and many smaller ones. The theory of how Earth’s tectonic plates move and change shape is called **plate tectonics**. Tectonic plates can move in three ways: toward each other, away from each other, or past each other. Where plates move apart, new lithosphere forms. When plates move toward each other they may collide, in some cases, to form mountains. In other cases, one plate slides under the other plate and into the mantle.
What Happens to Continents as Plates Move?

As tectonic plates move, the continents move along with them. Continental drift describes how continents have moved around Earth’s surface throughout its history. As a continent moves, it carries with it rocks and fossils. Today, the rocks and fossils can give evidence of how the continent moved.

GEOLOGIC EVIDENCE FOR CONTINENTAL DRIFT

Rocks in India, southern Africa, and Brazil contain deep scratches and scars that were formed by glaciers. But how could glaciers exist in places with such warm climates? The climates of these areas must have been much colder at one time. Scientists now know that these areas were part of a single land mass, or continent. It was located near the South Pole about 280 million years ago.

FOSSIL EVIDENCE FOR CONTINENTAL DRIFT

Fossils can also give evidence for continental drift. Fossils of a reptile called Mesosaurus are found in South America and southern Africa. The continents are separated by 3,000 miles of ocean. Scientists don’t think Mesosaurus could have swum across this ocean. This suggests that the two continents were once joined.

Math Focus

3. Calculate Tectonic plates move slowly, but may be moving for millions of years. If a plate moves 4 cm per year, how many kilometers would it move in 1 million years?

TAKE A LOOK

4. Explain How do the shaded areas on the map give evidence for continental drift?
SECTION 2 Earth’s Changing Continents continued

How Have the Continents Changed?

By putting together all the evidence, scientists can draw maps that show how Earth’s geography has changed over time. The figure below shows how the continents have shifted through Earth’s history.

When the large land mass called Pangaea split apart, the plants and animals living on each continent were separated. This process explains why different organisms live on different continents. It also explains why fossils of the same organisms are found on different continents.

Continental drift also led to changes in climate. It caused ocean currents and winds to flow differently. These changes affected the flow of heat around the Earth.

Critical Thinking

5. Predict Do you think the continents will look the same way in 50 million years as they do today? Explain your answer.

The Breakup of Pangaea

About 245 million years ago, the continents were one giant land mass called Pangaea.

About 136 million years ago, Pangaea broke apart. The North Atlantic and Indian oceans began to form. Plants and animals were separated. Ocean currents and wind patterns changed as new oceans formed.

TAKE A LOOK

6. Explain Why did it take so long for the continents to move to where they are today?

Today, the continents continue to move about 2 cm to 5 cm per year.
What Is the Panama Land Bridge?

About 3 million years ago, North and South America became joined by a strip of land called the Panama Land Bridge. This land bridge led to changes in both life and climate.

Before the Land Bridge Formed

Before the bridge formed, land animals could not move between continents. Animals in the sea, however, could move between the two oceans. Warm tropical waters flowed between the continents.

The land bridge let some animals move to other continents. Camels and cats moved into South America.

After the Land Bridge Formed

The bridge affected ocean currents and made the Gulf Stream. The Gulf Stream moves warm water across the Atlantic Ocean. This gives western Europe a mild climate.

Sea creatures, such as clams, corals, and whales, were separated by the bridge. After populations were separated, some evolved into different species.

Opossums and armadillos moved into North America.

CALIFORNIA STANDARDS CHECK

7.4.f Students know how movements of continental and oceanic plates through time, with associated changes in climate and geographic conditions, have affected the past and present distribution of organisms.

Word Help: affect
to change; to have an effect on; to influence

Word Help: distribution
the relative arrangement of objects or organisms in time or space

7. Explain How did life on the North and South American continents change after the land bridge formed?

TAKE A LOOK

8. Explain How does the Gulf Stream affect the climate of western Europe?
Section 2 Review

1. Explain What makes tectonic plates move?

2. Identify Where does new lithosphere form?

3. List Give two types of evidence for continental drift with an example of each type.

4. Apply Concepts Scientists have found fossils of the same organism on different continents. What does this suggest?

5. Describe What was Pangaea and how does it relate to the continents today?

6. Explain How did the Panama land bridge affect sea creatures?

7. Explain How did continental drift cause climates to change?