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How Plates Affect Our Planet

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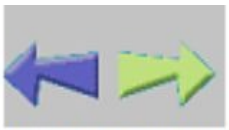
How Plates Affect Our Planet: Plates on the Move

This text is provided courtesy of OLogy, the American Museum of Natural History's website for kids.

Look around you. It may seem that the earth is perfectly still. But the earth's outer shell, or surface, is actually moving all the time.

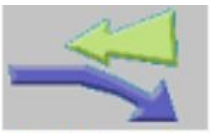
The earth's thin outer shell is broken into big pieces called tectonic plates. These plates fit together like a puzzle, but they're not stuck in one place. They are floating on the earth's mantle, a really thick layer of hot flowing rock. The flow of the mantle causes the plates to move in different directions. When the edges of plates meet, four things can happen:

Slip: two plates slide past each other



Spreading: two plates move apart from each other

Collision: two plates crash and fold up



Subduction: one plate sinks below the other

Even though plates move very slowly, their motion, called plate tectonics, has a huge impact on the earth. Plate tectonics form the oceans, continents, and mountains. It also helps us understand why and where events like earthquakes occur and volcanoes erupt.

How Plates Affect Our Planet: Hot Spots

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Some volcanoes pop up in random places, often far from the edge of a tectonic plate. These volcanoes are found over "hot spots."

A hot spot is an intensely hot area in the mantle below the Earth's crust. The heat that fuels the hot spot comes from very deep in the Earth. This heat causes the mantle in that region to melt. The molten magma rises up and breaks through the crust to form a volcano.

While the hot spot stays in one place, rooted to its deep source of heat, the tectonic plate is slowly moving above it. As the plate moves, so does the volcano, and another one forms in its place. The volcano that moved is no longer active. This is why a chain of extinct volcanoes is often found extending from a hot spot.

Hot spots are found around the globe, on land and in the ocean. The Hawaiian Islands are the youngest volcanic mountains in a long chain of volcanoes that former over a hotspot. They are still forming today. Another hot spot is under Yellowstone National Park, where the heat causes boiling mud pools and geysers like Old Faithful.

The Hawaiian Islands are still forming above a hotspot.

Old Faithful geyser in Yellowstone National Park.

How Plates Affect Our Planet: Volcanoes

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Some mountains are made of solid rock, like the Rocky Mountains or the Swiss Alps. But some mountains are actually volcanoes.

Volcanoes are vents, or openings in the earth's crust, that release ash, gases and steam, and hot liquid rock called lava. When the lava cools and hardens, it forms into the cone-shaped mountain we think of as a volcano. Most of the world's volcanoes are found around the edges of tectonic plates, both on land and in the oceans.

The Ring of Fire is a large circle of explosive volcanoes around the Pacific Ocean. The circle is formed by the subduction of the Pacific Plate and some smaller plates under surrounding plates.

On land, volcanoes form when one tectonic plate moves under another. Usually a thin, heavy oceanic plate subducts, or moves under, a thicker continental plate. When this happens, the ocean plate sinks into the mantle.

Water trapped in the rocks in this plate gets squeezed out. This causes some of the rocks to melt. The melted rock, or magma, is lighter than the surrounding rock and rises up. This magma collects in magma chambers, but it is still miles below the surface.

The Mount Rainier volcano in Washington is considered "dormant." Volcanoes are classified as active (erupted recently), dormant (expected to erupt in the future), or extinct (not expected to erupt again).

When enough magma builds up in the magma chambers, it forces its way up to the surface and erupts, often causing volcanic eruptions.

In the ocean, volcanoes erupt along cracks that are opened in the ocean floor by the spreading of two plates called a mid-ocean ridge. Magma from the earth's upper mantle rises up to fill these cracks. As the lava cools, it forms new crust on the edges of the cracks. These mid-ocean ridges are actually long chains of underwater volcanoes that circle the earth like the seams on a baseball.

About 80 to 90 percent of all volcanic eruptions occur where the plates spread apart.

How Plates Affect Our Planet: Mountains

This article is provided courtesy of the American Museum of Natural History.

It may seem like the Rocky Mountains have been there forever, but these mountains are very young compared to the age of the Earth. In the history of the Earth, mountain chains like the Rockies have risen and worn away many times.

Mountains form where two continental plates collide. Since both plates have a similar thickness and weight, neither one will sink under the other. Instead, they crumple and fold until the rocks are forced up to form a mountain range. As the plates continue to collide, mountains will get taller and taller.

The youngest mountains on Earth, like the Himalayas in Asia, are high. They started forming 60 million years ago and are still rising. Mount Everest in the Himalayas is the tallest mountain in the world.

Old mountain ranges, like the Appalachians in the eastern U.S. are not as high. They stopped forming long ago, and have been worn down over millions of years by the erosive power of water and wind. The Appalachians formed about 400 million years ago.

How Plates Affect Our Planet: Structure of the Earth

This article is provided courtesy of the American Museum of Natural History.

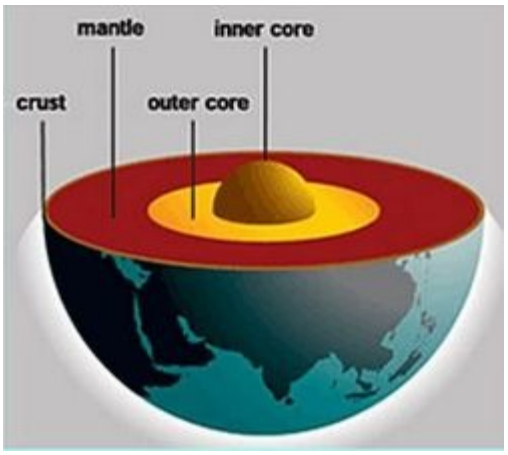
Imagine you could travel from one point on Earth straight through the center of the planet and out the other side. Your journey would be nearly 12,870 kilometers (8,000 miles).

Along the way, you'd pass through all of Earth's layers:

Crust

- The rocky surface of the Earth is a thin outer shell, much thinner than the other layers.
- The land that we see, or continental crust, is about 30 kilometers (19 miles) thick. Under the sea, oceanic crust is much thinner (8 to 10 kilometers, or 5 to 6 miles thick), but it's also much heavier.

- The Earth's crust and the top part of the mantle are broken into ten large plates and many smaller ones.
- Most plates are made of both continental and oceanic crust.



Mantle

- The crust floats on a thick layer of rock, almost 100 times thicker than continental crust.
- The solid rock isn't like the rock we know. Extreme heat makes it move in circles.
- It flows very, very slowly, but it's enough to cause the plates above it to move over long periods of time.
- The plates move about 8 centimeters (3 inches) per year.

Core

- The core is even thicker than the mantle.
- It's made of a liquid metal outer core that flows around a solid metal inner core.
- The motion in the outer core creates a magnetic field around the Earth. It's the same field that makes a compass work!
- The core gives off incredible heat, which is one of the driving forces that causes the mantle to flow.

How Plates Affect Our Planet: Earthquakes

This text is provided courtesy of OLogy, the American Museum of Natural History's website for kids.

Earthquakes can cause the ground to shake and crack apart. Earthquakes can be very powerful, and if they occur in or near areas where people live, they can make buildings collapse, bridges sway, and roads buckle.

But not all earthquakes are powerful enough to cause damage. In fact, earthquakes are happening all the time, on land and in the ocean. Most are so small that people don't even feel them.

An earthquake is the sudden movement of the Earth's crust. Earthquakes occur along fault lines, cracks in the Earth's crust where tectonic plates meet. They occur where plates are subducting, spreading, slipping, or colliding. As the plates grind together, they get stuck and pressure builds up. Finally, the pressure between the plates is so great that they break loose. Depending on how much pressure has built up, the ground may tremble slightly or shake forcefully.

Scientists describe the intensity of an earthquake using the Richter Scale. It measures earthquakes on a scale of 1 to 10. People barely feel a magnitude 3 earthquake, and windows might rattle at magnitude 4. A magnitude 6 earthquake is considered major, causing houses to move and chimneys to fall. The largest earthquake on record had a magnitude of 9.5.

An Alaskan earthquake caused the ground to crack apart.

This highway in California collapsed during an earthquake.

How Plates Affect Our Planet: Pangaea

This article is provided courtesy of the American Museum of Natural History.

About 200 million years ago, all the continents on the Earth were actually one huge "supercontinent" surrounded by one enormous ocean. This gigantic continent, called Pangaea, slowly broke apart and spread out to form the continents we know today.

Sound amazing? Believe it or not, the continents have come together and spread apart at least three times before. After all, our planet is 4.5 billion years old. On that time scale, 200 million years ago isn't such a long time!

What can make the continents move? Plate Tectonics!

Scientists have found many kinds of evidence that support this idea. Here are just a few:

The shapes of continents fit together like a puzzle. Just look at the east coast of South America and the west coast of Africa-it's almost a perfect fit!

Identical rocks have been found on different continents. These rocks formed millions of years ago, before the continents separated. They formed from the same minerals and under the same conditions.

Fossils of the same kinds of dinosaurs, Mesosaurus, have been found in South America and Africa. These dinosaurs roamed the Earth before the two continents broke apart.

All the Earth's continents were once combined in one supercontinent, Pangaea.

Over millions of years, the continents drifted apart.