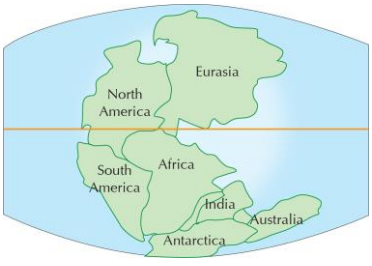
## Reflect

Has anyone ever told you to sit still? Did you know you can never really sit still? You have probably already learned that Earth is constantly moving through space, but did you know that the ground beneath your feet is constantly moving, too?

Have you ever noticed that the continents on Earth look like pieces of a puzzle? You are not the only one who has thought about that. More than 100 years ago, a man named Dr. Alfred Wegener thought that the continents once fit together. He said that a force caused the continents to drift apart over time. Once scientists figured out what that force was, the theory of plate tectonics was born!

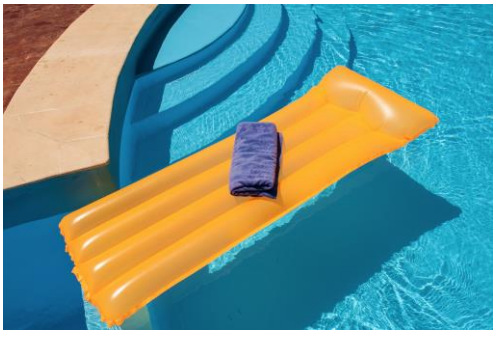
Dr. Alfred Wegener came up with the hypothesis of continental drift, which led to our theory of plate tectonics.


The continents look like pieces of a puzzle that would all fit together.




Shown is the supercontinent Pangaea before it broke up and the continents drifted.

Earth is made up of layers. The top layer is a very thin layer called the crust, and it is made of solid rock. Below the crust is the thick layer of molten (or melted) rock called the mantle. It is not an actual liquid, but it can move and shift around very slowly.

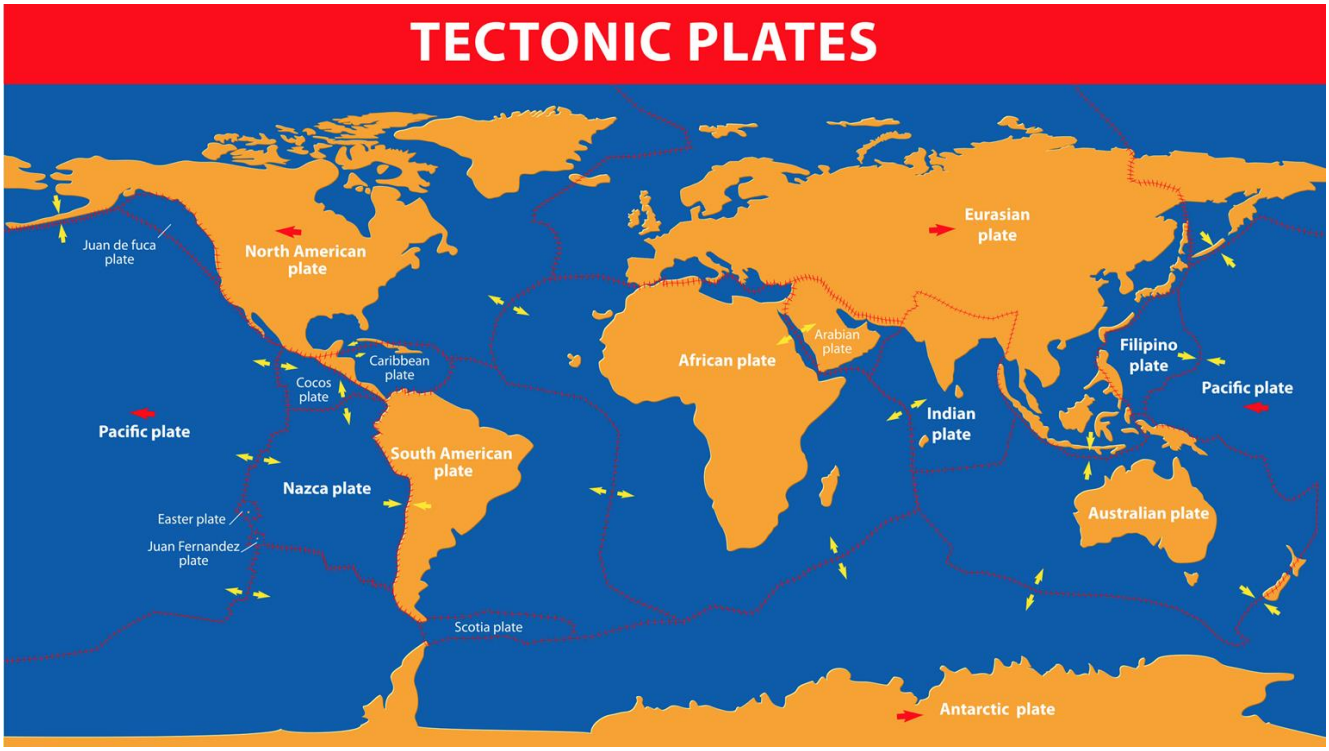


The solid crust is broken up into large chunks called tectonic plates. These plates float on top of the mantle. Think about a float in a swimming pool. Does the float stay in one place? No! It slowly moves over the surface of the water. Tectonic plates are moved around by the magma underneath them much like the pool float is moved across the water.

Stay tuned! This motion causes some interesting things to happen.

## Reflect

Scientists have figured out the borders around all of the plates on Earth's surface. They have given names to Earth's tectonic plates. This map shows the **major** tectonic plates in their present locations. Many of these plates are named for the continents or oceans on which they are found.




**Tectonic plates interact at plate boundaries.**

Tectonic plates are constantly moving. At different times, some plates move faster than others. However, even the fastest plates move only a few centimeters every year. That is about as fast as your fingernails grow.

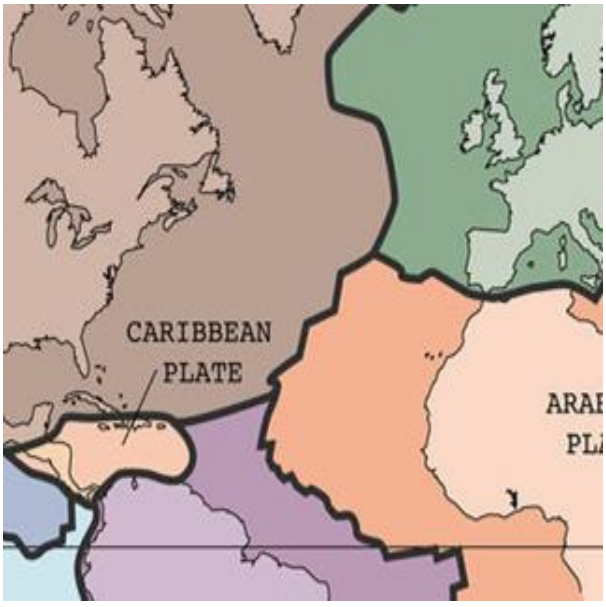
Tectonic plate boundaries are places where the edges of two or more plates meet and interact with each other. Earth's plates are all moving at different rates and in different directions. Some move toward each other, some move away from each other, and some move side to side of each other. When big chunks of crust interact, some changes to the landscape can happen. We can use what we know about these changes to figure out where the plates' boundaries are.

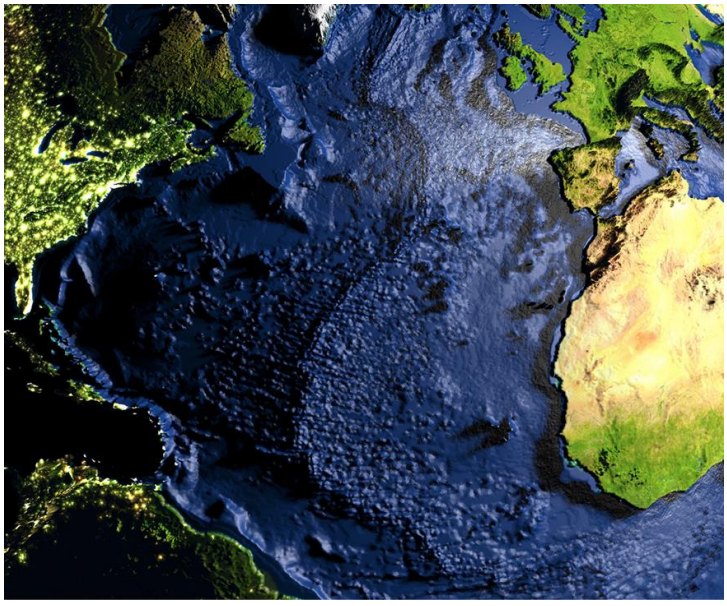
## What Do You Think?

# What are the effects of plate movement?

### Mountain Ranges

Look at the topographic map to the right. Do you see the yellow bumps? Those are mountains! Take a look at the second map of the tectonic plate boundaries. See how the mountains were formed right along the area where two plates meet? Those mountains were formed by the plates pushing rock together over time.

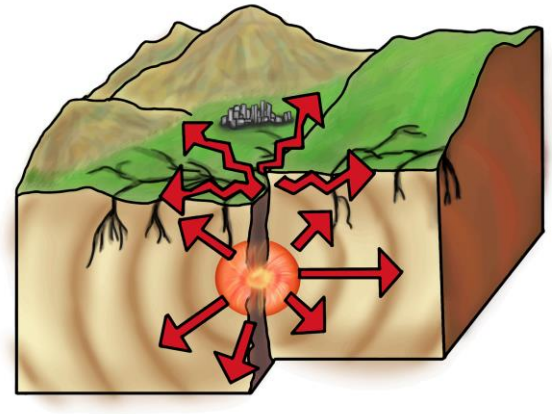



Did you know there are mountain ranges on the ocean floor? The image to the right shows the mid-Atlantic ridge. It is under water! Do you notice a relationship between the location of the ridge and the plate boundaries shown on the left?

Look Out!

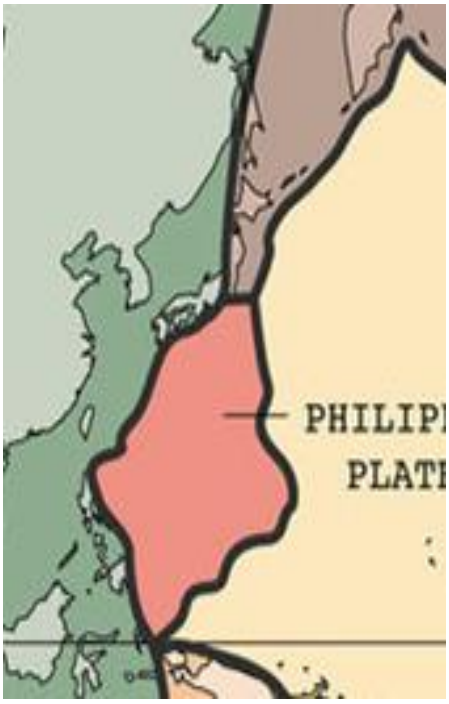
## Earthquakes



Picture yourself trying to open a small chip bag. You slowly pull harder and harder on each side to try to pry it open, but it is not moving! Finally, when the chip bag cannot handle any more force, it suddenly pops open! A similar situation like this can happen with tectonic plates. As plates are being pushed past each other, they may become somewhat stuck. The force builds up over time until SNAP!

The plate suddenly shifts in the direction of the force. This can cause the land in that area to violently shake and crack. The shaking can be dangerous for buildings, homes, and even the people that live there.

Look at the two maps below. Japan experiences a great number of earthquakes each year. The reason for this is the multiple plate boundaries that meet near Japan. If an earthquake happens along a plate boundary that is under water, it can cause a tsunami, or a very large wave, to wash over the land and cause damage.

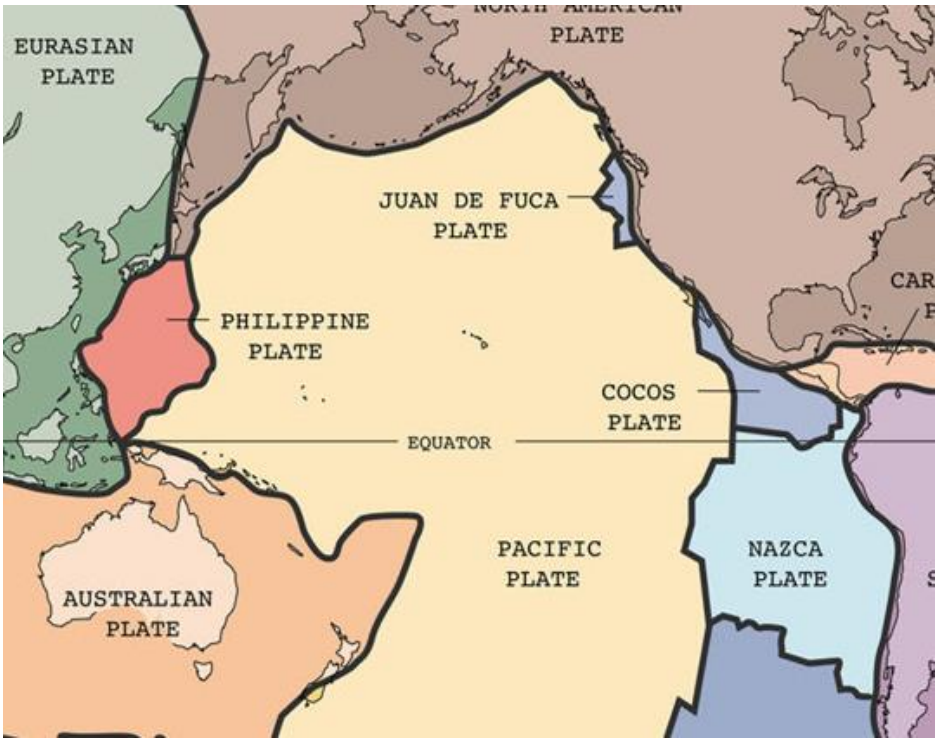



Look Out!

## Volcanoes

Do you remember that plates are floating on top of melted rock called magma? Sometimes the motion of the plates allows the magma to rise to the surface. These openings are called volcanoes.


Look at the map above. Each red triangle represents an area where there are volcanoes. Now look at the map to the right. Look for a pattern between the location of the volcanoes and the location of the plate boundaries.



## Connecting With Your Child

**Using Maps to Search for Tectonic Plate Boundaries**

To help your child learn more about tectonic plate boundaries, try examining a world map together. Tectonic plate boundaries are classified as convergent, divergent, or transform. Your child does not need to know the types of boundaries at this level, but it is an interesting topic to study! Each type of boundary is defined by the motion of tectonic plates. Often, there are clues from landforms and geologic events that scientists use to figure out what type of plate boundaries exist. You can use these clues too!

**Convergent plate boundaries** are boundaries where tectonic plates come together. When two continental plates meet, mountain chains, like the Himalayan Mountains, will often form on the land along these boundaries. Where continental plates and oceanic plates come together, there will often be volcanoes caused by the melting of subducting plates, like the Andes Mountains.

**Divergent plate boundaries** are boundaries where tectonic plates move away from one another. At divergent boundaries, new oceanic crust is made on the seafloor, creating mid-ocean ridges. Mid-ocean ridges are made of underwater mountain chains that are separated by a valley along the seafloor. The most famous of these is the Mid-Atlantic Ridge.

**Transform plate boundaries** are boundaries where tectonic plates slide horizontally past each other in opposite directions. Pressure builds along these boundaries from the friction between the plates. When this pressure is released, it can cause major earthquakes. The San Andreas fault in California is a transform boundary.

Examine a world map with your child. Take a close look at any landforms your child notices. Discuss any observations your child makes about the landforms, paying particular attention to mountain chains. Although it may not be possible to locate actual plate boundaries on a typical map, have your child explain where they think some boundaries are likely located and why.

**Here are some questions to discuss with your child:**

- What geologic features do you see on this map (e.g., mountain chains, volcanoes, ocean trenches, etc.)?
- Where do you think there may be a plate boundary? How do geologic features support this?
- What kind of plate boundary do you think it is?