The Theory of Plate Tectonics

This text is excerpted from an original work of the Core Knowledge Foundation.

In the 1960s, scientists formed a new theory about how Earth's surface changes. They called the theory plate tectonics.

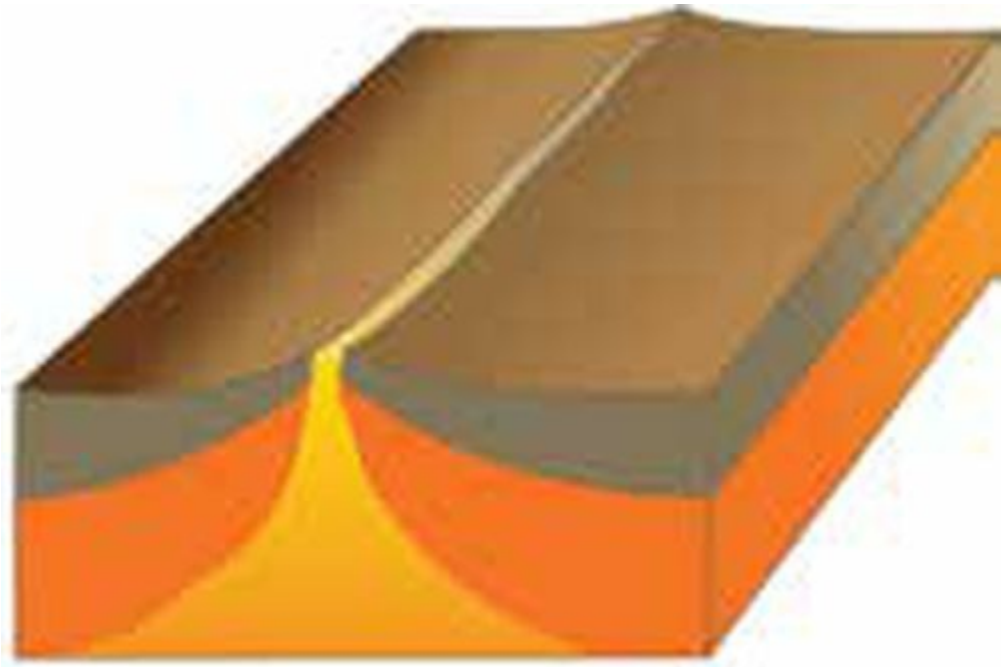
The theory of plate tectonics states that Earth's crust, together with the solid top of the mantle, is broken up into sections. These huge, rocky slabs are called tectonic plates. Tectonic plates fit tightly together. They aren't fixed in place though; they can move. They move because of heat and pressure in the mantle. As the material in the mantle slowly moves, it exerts enormous pressure on the overlying plates. All that pressure forces the plates to move as well-very, very slowly.

Earth's tectonic plates have been slowly moving and interacting for billions of years. They interact mostly along their edges, or boundaries. Plate boundaries are where two or more tectonic plates meet.

Earth's tectonic plates

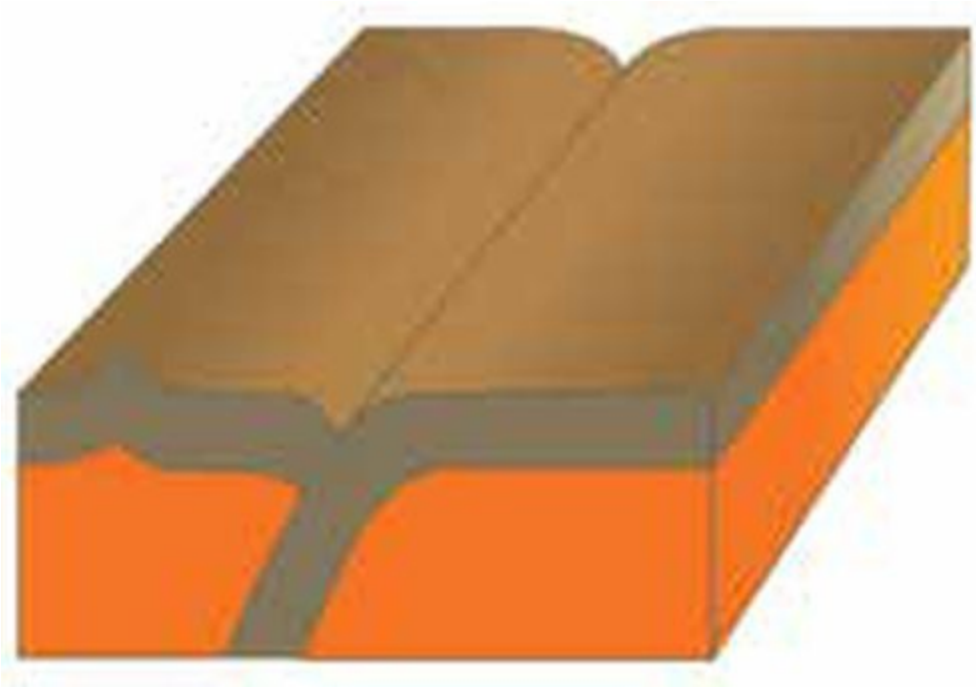
A Matter of Time

At some boundaries, tectonic plates are moving apart. As the plates separate, molten rock flows up from the mantle into the space between them, creating new crust. Mid-ocean ridges are an example of this type of plate interaction. Tectonic plates along the mid-ocean ridge in the Atlantic Ocean are moving apart at a rate of about 0.8 to 2 inches per year. That may not seem like much, but it adds up. Two hundred million years ago, the landmasses of North America and Europe were joined. So were South America and Africa. Thanks to separating plates, these continents now lie on opposite sides of a vast ocean.



Tectonic plates move apart.

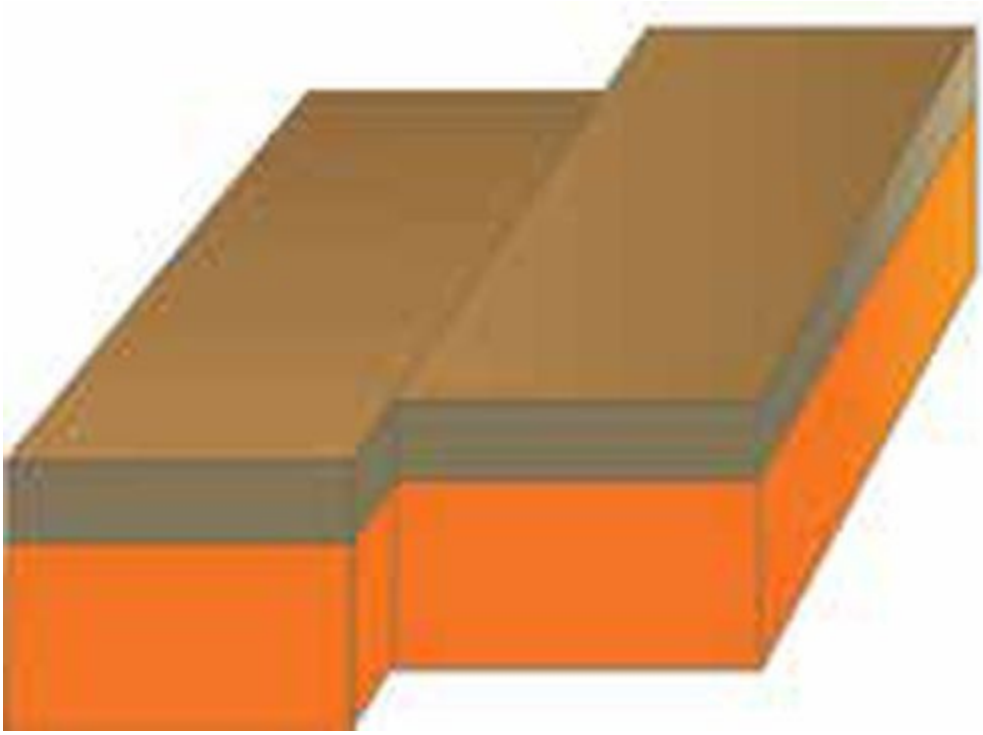
At other plate boundaries, tectonic plates are colliding, or crashing together. In some places, colliding plates slowly crash into each other. The crust at their edges gradually crumples and is pushed higher and higher, creating mountains. In other places, one of the colliding plates slides under the other.



Tectonic plates collide.

Two plates are colliding this way along the western coast of South America. A heavier oceanic plate is sliding under a lighter continental plate. Scientists call this process subduction. Subduction has created a deep ocean trench off the coast of Chile and Peru. It has also had a role in creating the towering Andes Mountains along the western edge of South America. Similar plate interactions have formed mountain ranges throughout Earth's long history.

Finally, tectonic plates slide sideways past one another. It's never a smooth process. Plate edges press together hard. They often get stuck while the pressure keeps building. Eventually the pressure gets too great. The stuck edges break free, causing the plates to jerk past each other.



Tectonic plates slide sideways past one another.

Providing the Answers

The theory of plate tectonics answered many questions in geology. It explained how Pangaea, the giant landmass hypothesized by Alfred Wegener in 1915, broke apart. It explained how the continents have been slowly rearranged over millions of years. The movement of the plates also explained mid-ocean ridges, deep ocean trenches, patterns in the locations of mountains, and many other features on Earth's surface. The theory has become the cornerstone of modern geology.