

Plate Tectonics ▪ *Section Summary*

The Theory of Plate Tectonics

Guide for Reading

- What is the theory of plate tectonics?
- What are the three types of plate boundaries?

Earth's lithosphere is broken into separate sections called **plates**. The plates fit closely together along cracks in the crust. They carry the continents, or parts of the ocean floor, or both. **Plate tectonics** is the geological theory that states that pieces of Earth's lithosphere are in constant, slow motion, driven by convection currents in the mantle. A **scientific theory** is a well-tested concept that explains a wide range of observations. **The theory of plate tectonics explains the formation, movement, and subduction of Earth's plates.**

The plates float on top of the asthenosphere. Convection currents rise in the asthenosphere and spread out beneath the lithosphere, causing the movement of Earth's plates. As the plates move, they produce changes in Earth's surface, including volcanoes, mountain ranges, and deep-ocean trenches. The edges of different pieces of the lithosphere meet at lines called plate boundaries. **Faults**—breaks in Earth's crust where rocks have slipped past each other—form along these boundaries.

There are three types of plate boundaries: transform boundaries, divergent boundaries, and convergent boundaries. The plates move at amazingly slow rates, from about 1 to 24 centimeters per year. They have been moving for tens of millions of years. A **transform boundary** is a place where two plates slip past each other, moving in opposite directions. Earthquakes occur frequently along these boundaries. The place where two plates move apart, or diverge, is called a **divergent boundary**. Most divergent boundaries occur at the mid-ocean ridge. When a divergent boundary develops on land, two slabs of Earth's crust slide apart. A deep valley called a **rift valley** forms along the divergent boundary. The place where two plates come together, or converge, is a **convergent boundary**. When two plates converge, the result is called a collision. When two plates collide, the density of the plates determines which one comes out on top. Oceanic crust is more dense than continental crust.

When two plates carrying oceanic crust meet at a trench, the plate that is less dense dives under the other plate and returns to the mantle. This is the process of subduction. When a plate carrying oceanic crust collides with a plate carrying continental crust, the more dense oceanic plate plunges beneath the continental plate through the process of subduction. When two plates carrying continental crust collide, subduction does not take place because both plates are mostly low-density granite rock. Instead, the plates crash head-on. The collision squeezes the crust into mighty mountain ranges.

About 260 million years ago, the continents were joined together in the supercontinent Pangaea. About 225 million years ago, Pangaea began to break apart. Since then, the continents have moved to their present locations.