

Parent Guide for Unit 6: Plate Tectonics

The earth's plates sit on a hot, slightly softened layer of the earth.

Rocks can be solid, liquid, or in a slightly softened form. The layer beneath earth's plates is made of rock that is hotter and less rigid than the plates. The layer beneath earth's plates is just slightly softened (just as wax and metal become softened when heated but not yet melted). The layer beneath earth's plates moves very slowly and in different directions in different locations around the earth. The layer beneath the plates is called the asthenosphere; it is not uniform and liquid magma flows through parts of it. The asthenosphere is heated by heat produced by radioactive decay in Earth's core. This heat causes the convection currents in the mantle that drive plate tectonics.

The earth's plates move very slowly, pressing against one another in some places and pulling apart in other places.

The earth's plates move continuously and very slowly (several inches per year) along with the slightly softened layer of rock beneath them. The motion of the plates results in the motion of all things that are part of the plates (e.g., continents, ocean basins, mountain ranges) and all things that sit on top of the plates (e.g., soil, ocean sediment, living things, and buildings). Because the slow motion of plates is continuous, it can result in plates moving great distances across the surface of the earth over very long periods of time. The direction of motion is different for different plates, and the direction of motion of a plate can change over time so that where a plate once pushed into another plate, it can later pull away from that plate. Because different plates move in different directions, plates can press together, move away from each other, and move alongside (parallel to) each other. It is possible to measure the rate of motion and direction of motion of a plates.

When continental plate material from one plate presses against another plate, the continental plate material is forced upward, forming mountains.

Continental plate material makes up continents, oceanic plate material makes up ocean basins, and the top part of any plate can be made of either oceanic or continental plate material or continental plate material in some places and oceanic plate material in other places. Continental plate material is made of rock that is less dense and much thicker than oceanic plate material. When two plates press together, if one plate has plate material at its edge that is less dense than the edge of the other plate, the less dense plate material will crumple upward, creating a bend or fold in the plate material but not causing the plate to break into smaller pieces of rock. If the plate material is approximately the same density on both edges, the edges of both will crumple upward. The result of a plate crumpling up is mountains, which are composed of the continental plate material that has been folded upward. New mountains have formed throughout earth's history, and mountains continue to develop as plates move and press together. When continental plate material from one plate presses against oceanic plate material from another plate, the continental plate material crumples up over the oceanic plate material, and the oceanic plate sinks below, creating a trench.

When two plates are pulling apart, melted rock material rises up between the plates, creating new plate material.

When two plates pull apart from each other, melted rock rises up between the plates. This rock solidifies as it cools, adding new oceanic plate material to the edges of both plates so that the plates are always in contact with each other and no space forms between them. The process of melted rock rising up between the plates can be gradual, with the melted rock material slowly welling up between the plates, and it can be sudden, with melted rock material suddenly projecting out from between the plates in volcanic eruptions. Melted rock can well up or erupt anywhere along the boundary where two plates are pulling apart. As the melted rock cools, it begins to form a row of mountains along the edges of both plates where they are pulling apart. When two plates move apart and split a continent in two, an ocean basin forms between them that widens over time. The ocean basin grows as new plate material is continuously added to the edge of the separating plates. At the same time that new plate material is being added as plates pull apart, other plate material is being folded upward or recycled into the interior of the earth so that the plate material that is lost in one place is balanced by the new plate material that is gained in another.

When oceanic plate material from one plate presses against another plate, it can slide under the other plate, sinking deep into the earth.

Some oceanic plate material is denser than other oceanic plate material. When oceanic plate material from one plate presses against another plate that is less dense than it (made of continental or oceanic plate material), it will slide beneath the other plate toward the interior of the earth. The edge of the denser plate will continue to fall toward the interior of the earth as long as the two plates move toward each other. This can create volcanoes.