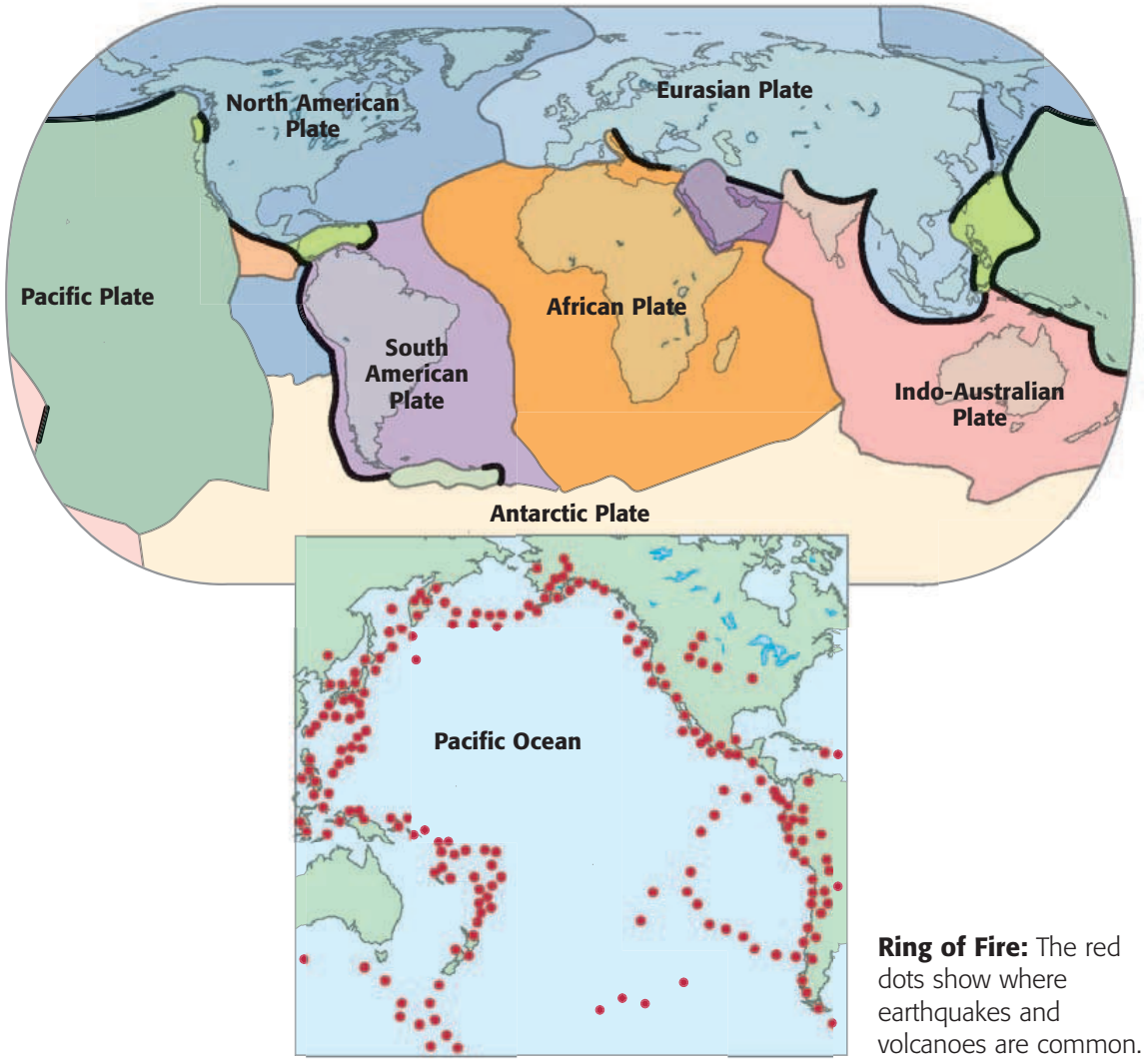
Earth's Moving Plates

Earth's crust is not one solid piece. It is broken into sections, like a cracked eggshell. The sections are called **plates.** The plates are always moving, although very slowly.

See Also
Volcanoes pages 178–179
Earthquakes pages 180–181

Some plates crunch into each other. Others move away from each other. Most earthquakes and volcanoes occur at or near the boundaries between plates. Movements at the boundaries can produce earthquakes. Weak spots in the crust at the boundaries can allow melted rock to reach the surface. This produces a volcano.



Ring of Fire: The red dots show where earthquakes and volcanoes are common.

About 100 years ago, a German scientist named Alfred Wegener noticed something curious about the map of Earth. Some continents fit together like the pieces of a jigsaw puzzle.

This observation led Wegener to suggest a new idea: The continents were once part of a single chunk of land that split apart millions of years ago. Over millions of years, the continents moved to their present locations.

Scientists have found evidence to support the idea that continents moved. For example, rocks found on the east coast of South America are the same as rocks found on the west coast of Africa. And these rocks are different from rocks found in other places on Earth.

More evidence came from fossils. Fossils of an animal that could not live in ocean water were found in both South America and Africa. Scientists reasoned that these animals must have walked between South America and Africa when the two continents were joined.

See Also
Fossils pages 185–186

All the evidence supported the idea that continents had moved. But no one could figure out *how* they moved. The discovery of Earth's moving plates solved the mystery. The continents are part of the plates, and they move with them.

Rapid Changes

Volcanoes, earthquakes, landslides, and floods can change Earth's surface very quickly.

Volcanoes

Temperatures are so high at the bottom of Earth's crust that rocks melt. Melted rock below Earth's surface is called **magma.**

See Also
Earth's Moving Plates
pages 176–177

As magma heats and expands, it pushes in all directions. It moves to Earth's surface where the crust is weakest. Many weak places exist where Earth's rocky plates meet. At these places, magma may shoot or pour out of the surface in an eruption. Magma that reaches the surface is called **lava.**

An eruption can also throw hot boulders, ash, gases, and cinders into the air A **volcano** is a mountain built up from hardened lava, rocks, and ash that erupted out of Earth.

Some eruptions occur slowly. The volcanoes of Hawaii produce slow eruptions. The magma rises to the surface and forms lakes of lava. During an eruption, the lakes overflow and lava flows down the sides of the volcano.

Kilauea in Hawaii

Other eruptions occur quickly as explosions. Mount St. Helens is a volcanic mountain in the Cascade Range in Washington State. In 1980, the mountain exploded.

Magma and gases had built up and were trapped inside the mountain. The pressure grew to be enormous. It became so great that in an instant it blew away one side of the mountain. The explosion was so powerful that it knocked down trees 25 kilometers away. It shot steam and ash 20 kilometers into the sky.

Mount St. Helens

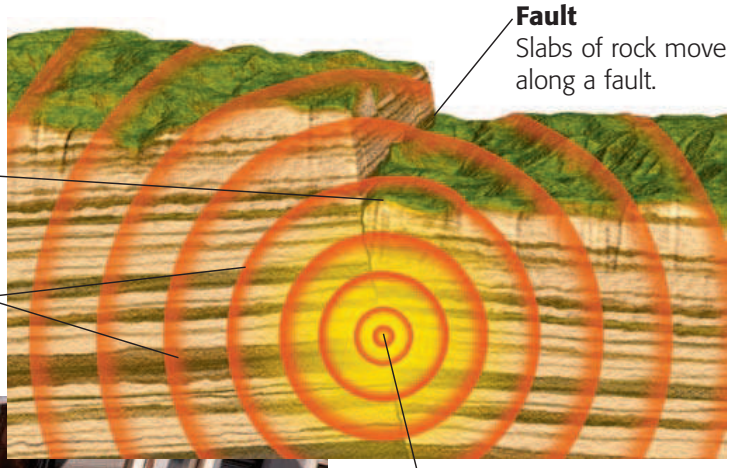
Earthquakes

An **earthquake** happens when huge slabs of rock move against each other deep below Earth's surface. The slabs touch at a fault. A **fault** is a crack in Earth's crust.

The rock slabs do not move slowly and steadily along the fault. Instead, they stick together until the forces pushing on them become very great. Then one of the slabs suddenly moves a short distance. This jolt produces waves in the crust like ripples in a pond. These waves can be felt as an earthquake.

See Also
Mountain Building
pages 174–175

In some places, land may drop during an earthquake. In other places, land may rise. So earthquakes can build up or destroy land.



All earthquakes are not alike. Some release more energy than others. Some are more destructive than others. The strength of an earthquake can be measured by the energy it releases or by the destruction it produces.

In 1935, an American scientist named Charles Richter developed a way of comparing the strengths of earthquakes. His invention is called the Richter Scale.

The Richter scale has the numbers 1 through 9. Number 1 is the weakest earthquake, and number 9 is the strongest.

Each larger number means an earthquake 10 times stronger than the number before it. For example, an earthquake that measures 3.0 on the Richter Scale is 10 times stronger than an earthquake that measures 2.0. An earthquake that measures 4.0 is 10 times stronger than one that measures 3.0 and 100 times stronger than one that measures 2.0.

Richter Scale

Strength	Effects
1–3	Not felt by people
3–4	Felt by some people; little damage
5	Felt by most people; causes slight damage near epicenter
6	Damage caused to weak buildings and other structures within about 10 km of the epicenter
7	Great damage to structures up to 100 km from the epicenter
8	Very destructive; may injure and kill people more than a few hundred kilometers from the epicenter
9	Very rare; great damage to areas up to 1,000 km from the epicenter

Tsunamis A tsunami (tsoo NAH mee) is a giant ocean wave caused by an undersea earthquake. When an earthquake occurs on the ocean floor, it releases a lot of energy. The energy travels through the water and produces a small wave on the surface.

The wave moves outward in all directions. Far out at sea, the wave may be less than a meter tall. But as it nears land, it piles up into a huge, tall wave. When it hits the shore, it may be more than 20 meters tall.

Landslides and Floods

The force of gravity can cause rapid changes in the land. For example, gravity pulls downward on the rocks and soil on the slope of a hill. During a rainstorm, earthquake, or volcanic eruption, the rocks and soil can be loosened. Then the force of gravity pulls the rocks, soil, and mud down the hill in a **landslide.**

Landslides destroy structures such as hills and cliffs. But new land is built up at the bottom of the landslide. The land is quickly worn away, or eroded. But just as quickly, it is deposited somewhere else.

In many parts of the world, farmers plant crops on the sides of steep hills. To help prevent landslides, they dig terraces into the hills. Planting trees also helps prevent landslides. The trees' roots hold on to the soil.

See Also
Erosion and Deposition pages 172–173

Floods also change the land suddenly. They sweep land away from one place and deposit it in another place, such as at the mouth of a river.

Ohio River flood in 1997

River floods are usually caused by long, steady, heavy rains or by rapid melting of large amounts of snow. The soil cannot absorb the water fast enough. The water runs into rivers, which then overflow.

A heavy rainstorm can cause a sudden flood called a flash flood. In a flash flood, water enters a stream very rapidly. The stream cannot carry away the water fast enough. The water flows over the banks of the stream or fills a steep-sided canyon.

Not all river floods can be prevented. But dams, levees, and other flood-control measures can help prevent damage.