Section 12.1.
Evidence for Continental Drift.

Textbook pages 506 to 517.

Before You Read.

Scientists did not accept the continental drift theory for a long time. Why do you think this was the case?

What is continental drift?

In the early twentieth century, German scientist Alfred Wegener proposed the **continental drift theory**, which argues that the continents "drifted" to their present locations over millions of years. On a world map, the curves of South America's eastern coastline and Africa's western coastline seemed to match, giving Wegener his first piece of evidence for continental drift. The fit suggested that, millions of years ago, all the continents were joined as a "supercontinent" named Pangaea (from the Greek words *pan*, meaning all, and *gaea*, meaning Earth). Wegener also noted that regions of some continents that are far apart have similar rocks, mountain ranges, fossils, and patterns of **paleoglaciation** (evidence of ancient glaciers and the rock markings they left behind).

How do continents move?

After Wegener's death, scientists discovered that the surface of Earth is broken into **tectonic plates**, large, movable slabs of rock that slide over a layer of partly molten rock. According to **plate tectonic theory**, when tectonic plates move across Earth's surface, they carry the continents with them. Many volcanoes and earthquake zones on a map reveal the boundaries between the plates. Chains of volcanic islands, such as the Hawaiian Islands, reveal where tectonic plates have passed over geological **hot spots—** areas where molten rock has risen to Earth's surface. This idea was first suggested by Canadian scientist J. Tuzo Wilson.

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The process of **sea floor spreading,** first proposed by Harry Hess, provides a mechanism for continental drift. This process involves magma, molten rock from beneath Earth's surface. Because it is molten, magma is less dense than the surrounding rock. Thus, magma rises and breaks through Earth's crust in certain weak areas. One such place is a **spreading ridge**, a gap in the sea floor that is gradually widening as tectonic plates move apart. Magma cools and hardens as it intrudes into this gap, pushing older rock aside as it creates new sea floor. The largest of all spreading ridges, and the first one discovered, is the **Mid-Atlantic Ridge**, a mountain range running north to south down the length of the Atlantic Ocean.

The evidence for sea floor spreading includes the following:

1. Age of ocean rocks: The youngest rocks are found closest to the ridge, indicating that new rock is being formed.
2. Sediment thickness: The layer of ocean sediment—the small particles of silt and organic debris deposited on the ocean floor—becomes thicker the farther it is from the ridge. This indicates that the sea floor is older and farther away from the ridge.

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3. Magnetic striping: At a spreading ridge, iron-containing minerals in the magma align themselves with Earth's magnetic field as the magma cools. Because the orientation of Earth's magnetic field has switched many times over history, rocks on the sea floor exhibit both normal polarity and reverse polarity, depending on when they cooled. When scientists used a magnetometer, a device that detects variations in magnetic fields, they found a pattern of alternating polarity repeated on both sides of the Mid-Atlantic Ridge, as shown below.

This phenomenon, known as **magnetic striping**, indicates that new rock is being laid down on the sea floor.