VOCABULARY
plate tectonics p. 241
mid-ocean ridge p. 242
rift p. 242
sea-floor spreading p. 242

SCIENCE CONCEPTS
- how plates move
- what happens when plates move

READING FOCUS SKILL
COMPARE AND CONTRAST Look for different ways plates can move.

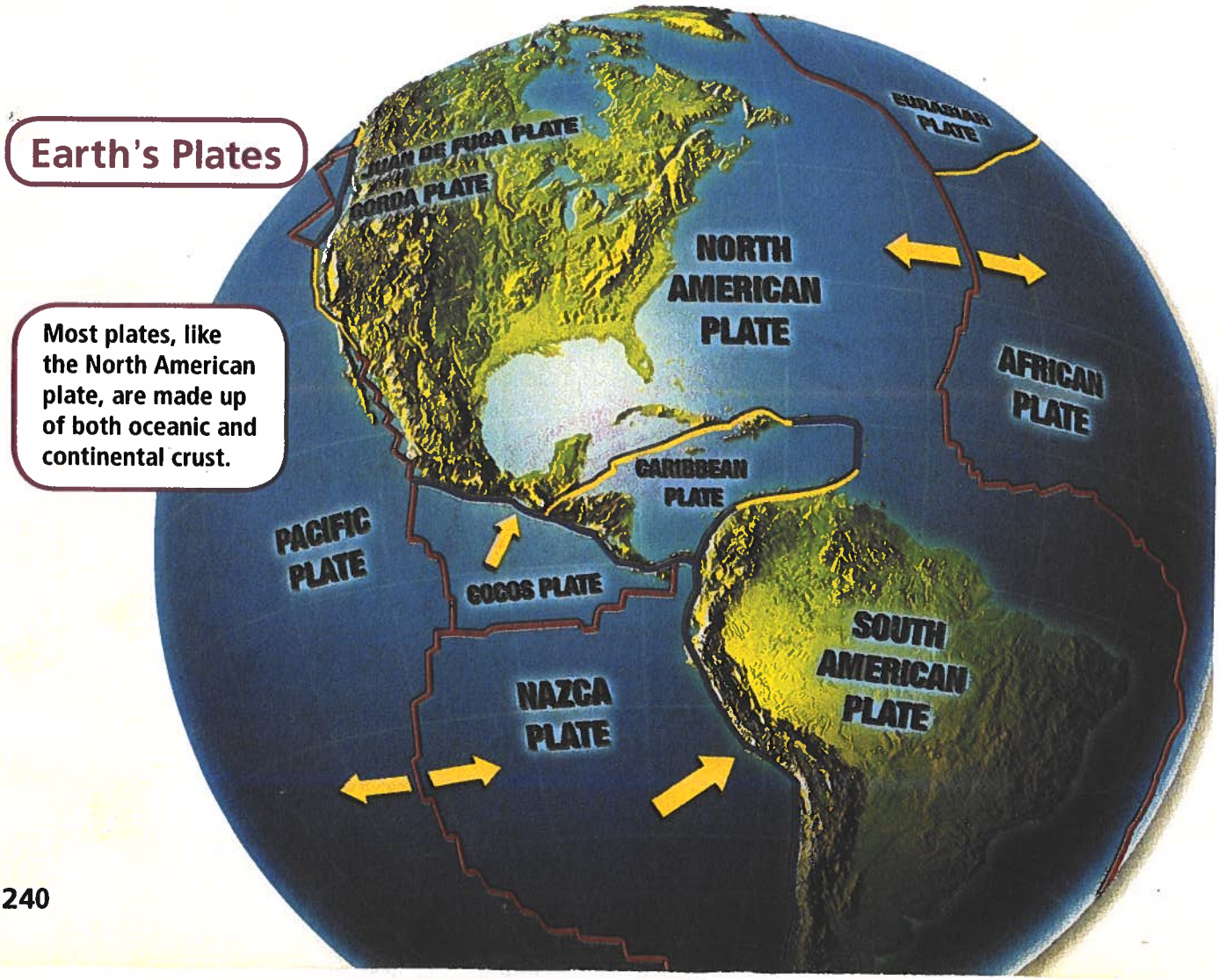
alike — different

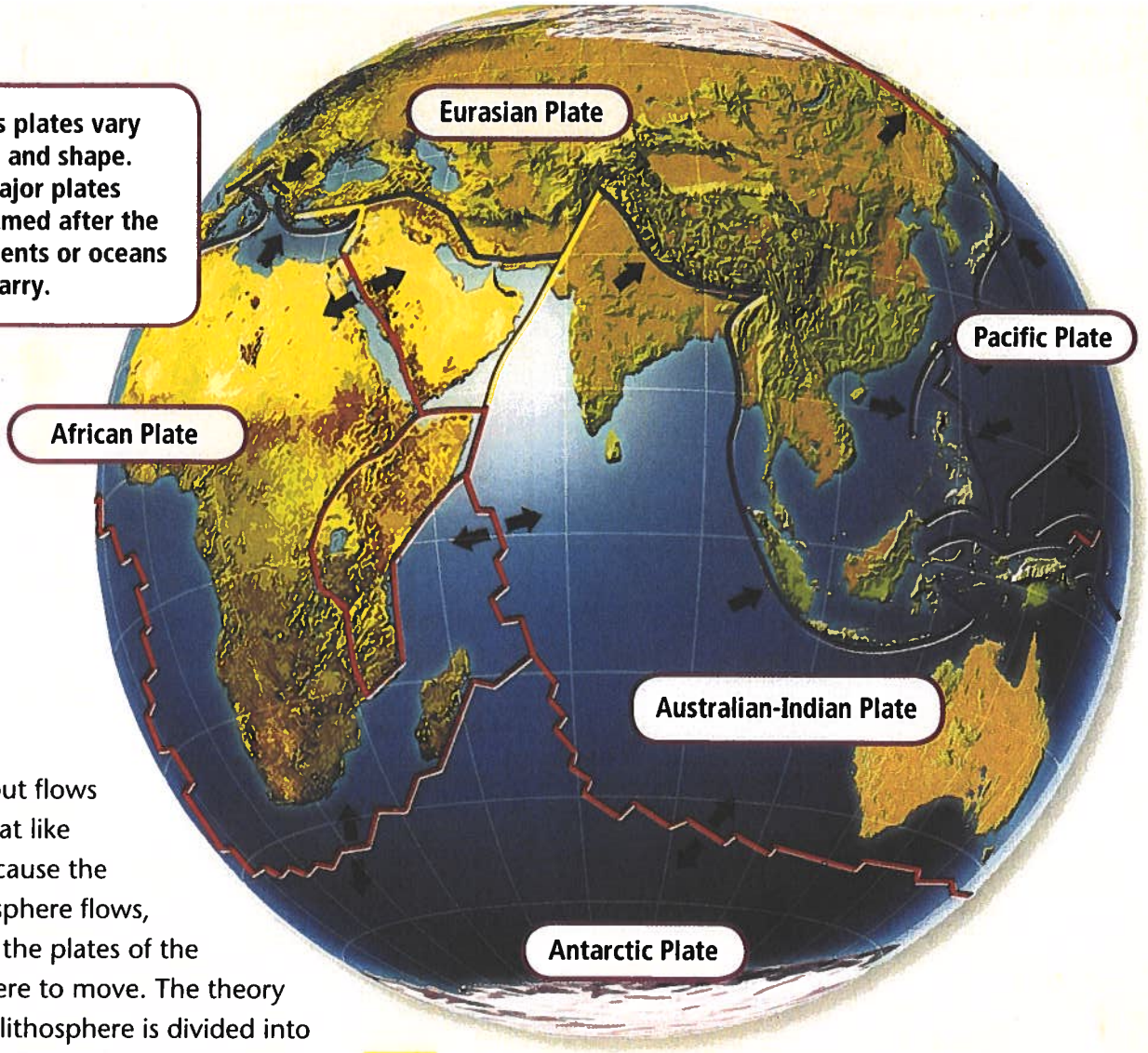
Earth's Plates

In Lesson 1, you learned that the crust and the rigid upper part of the mantle form the part of Earth called the lithosphere. The lithosphere is not one continuous sheet of rock. Instead, it's made up of many plates of rock. Some of the plates, such as the Pacific plate, span tens of thousands of kilometers and are capped mostly by thin, oceanic crust. Other plates, such as the Cocos plate, are quite a bit smaller. And some plates, such as the Eurasian plate, are capped mostly by the thicker continental crust.

Look at the globes on these pages. As you can see, the lithosphere's plates fit against each other like pieces of a huge jigsaw puzzle. But unlike puzzle pieces, the plates are constantly on the move. At first glance, this may seem impossible. After all, the continents aren't moving, are they? Actually, they are!

Remember that Earth's lithosphere sits on top of the asthenosphere. The asthenosphere is part of the mantle. The rock of the asthenosphere



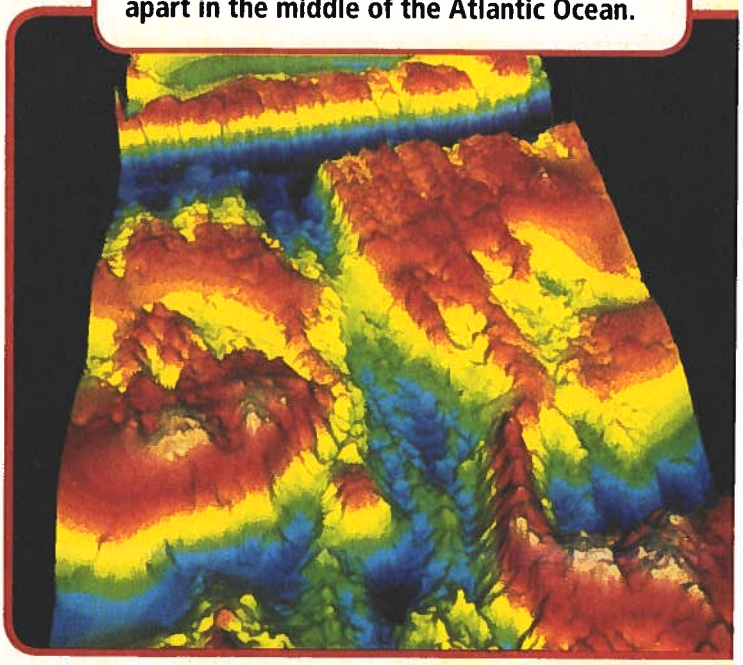


Earth's plates vary in size and shape. The major plates are named after the continents or oceans they carry.

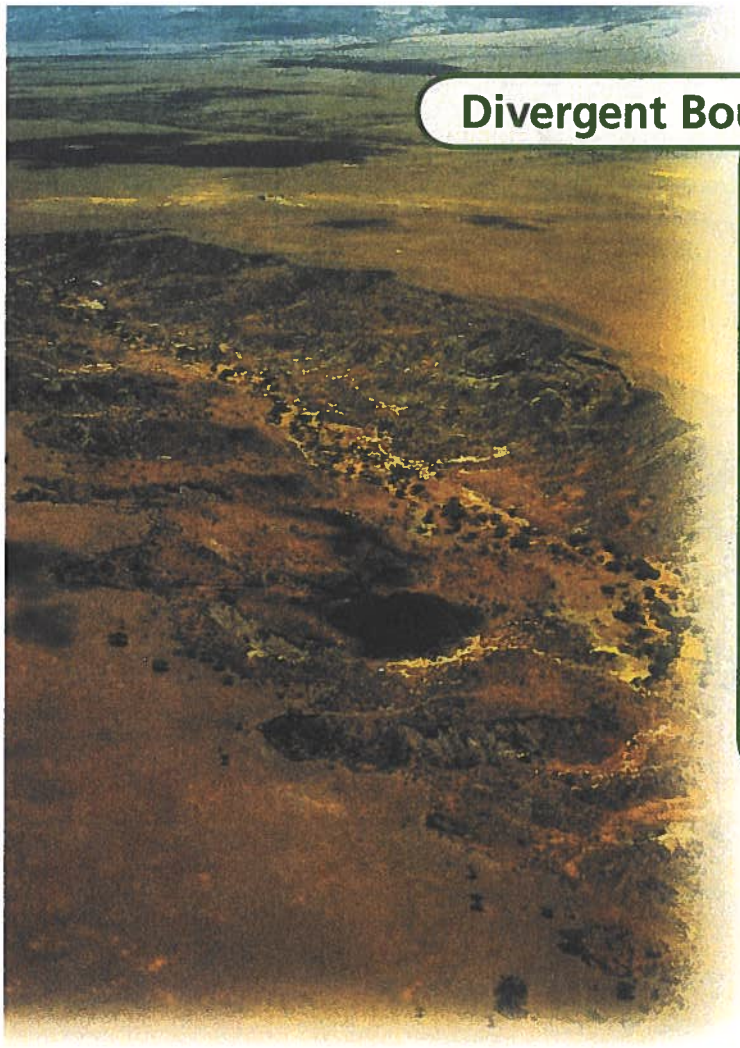
is solid but flows somewhat like taffy. Because the asthenosphere flows, it allows the plates of the lithosphere to move. The theory that the lithosphere is divided into plates that are always moving is called **plate tectonics**. The word *tectonics* comes from a Greek word meaning "to build," because plate movements build Earth's largest landforms.

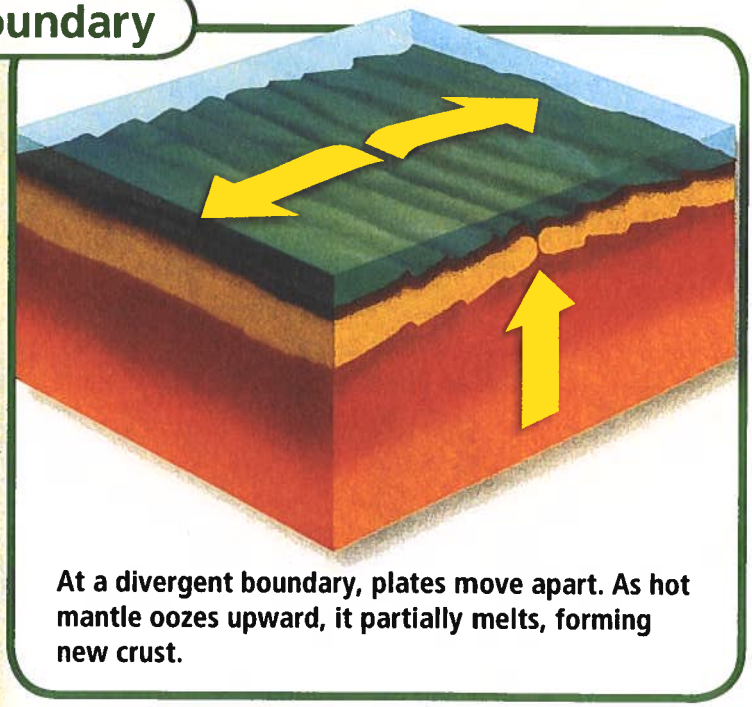
The lithosphere does not move quickly. In fact, most plates move only a few centimeters a year. But over many years, this movement can cause major changes in the plates. Some plates may break apart. Others may move together and become one. Some plates may shrink as their edges are pushed down, heated up, and recycled into the mantle. New plates can grow as hot rock from the mantle moves up and part of it melts. The melted rock cools and forms thin, new oceanic crust.

Focus Skill **COMPARE AND CONTRAST** Look at the map on page 240. Compare the North American plate with the Pacific plate.



New crust is being formed as plates spread apart in the middle of the Atlantic Ocean.





At a divergent boundary, plates move apart. As hot mantle oozes upward, it partially melts, forming new crust.

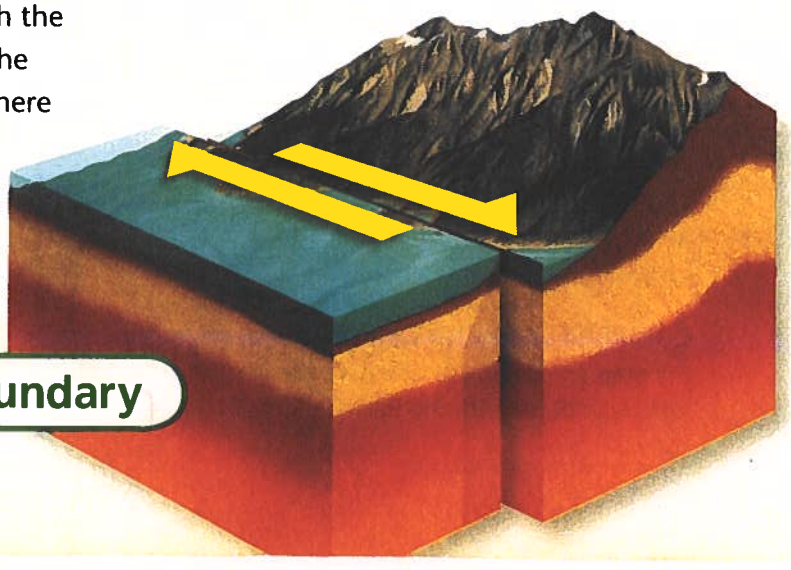
◀ This divergent boundary in Tanzania is on land. As the plates spread apart, the land grows.

Plate Boundaries

Tectonic plates meet each other along plate boundaries. There are three main types: divergent boundaries, convergent boundaries, and transform fault boundaries.

A divergent boundary is a place where two or more plates are moving away from each other. Most divergent boundaries are found along the **mid-ocean ridge**, a chain of mountains that runs about 67,000 km (41,600 mi) through the world's oceans. Along the highest part of the mid-ocean ridge is a deep valley, or **rift**, where plates move apart. As the plates separate, hot rock from the mantle moves up. The melted rock cools and freezes, forming new crust. The crust and mantle near the bottom of the ocean are able to cool and become rigid, forming new lithosphere. This process along the mid-ocean ridge is called **sea-floor spreading**.

At a transform fault boundary, two plates move past each other. Crust is neither formed nor destroyed there. Instead, the plates along the boundary grind past each other as they move in opposite directions. This movement



often causes earthquakes. A famous transform fault boundary is the San Andreas fault in California.

Where two tectonic plates push into each other, a convergent boundary forms. There are three kinds of convergent boundaries. The first kind occurs where a continental plate collides with another continental plate. The colliding plates fold and bend, forming mountain ranges. The second kind occurs where a continental plate collides with a denser oceanic plate. Where this happens, the oceanic plate sinks under the continental plate. Mountains and volcanoes form along this boundary. The third kind of convergent boundary occurs where two oceanic plates collide. One of the two plates will sink under the other. This causes a deep-ocean trench to form and causes melting in the asthenosphere, leading to an arc of volcanic islands.

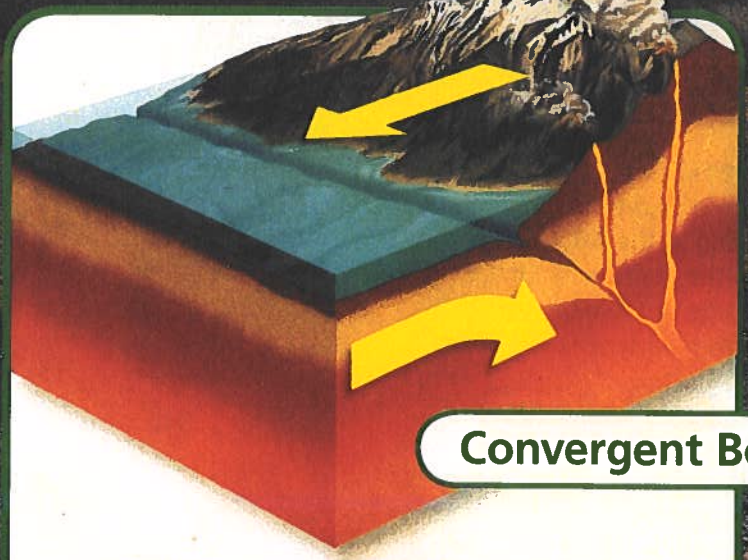
Focus Skill **COMPARE AND CONTRAST** **Compare and contrast the different kinds of convergent boundaries.**

Insta-Lab

Continents on the Go

Using a world map, trace the outline of each of the continents onto a blank sheet of paper. Cut out the continent shapes, and lay them on a table in the correct positions relative to each other. What do you notice about the shapes? Do any of the continents look as if they could fit together? Try putting the continents together into one landmass. Compare your results with the illustration on the next page.

Many volcanoes form along convergent boundaries. Melted rock is slowly pushed upward and then erupts at the surface, forming mountains. ▼



Convergent Boundary

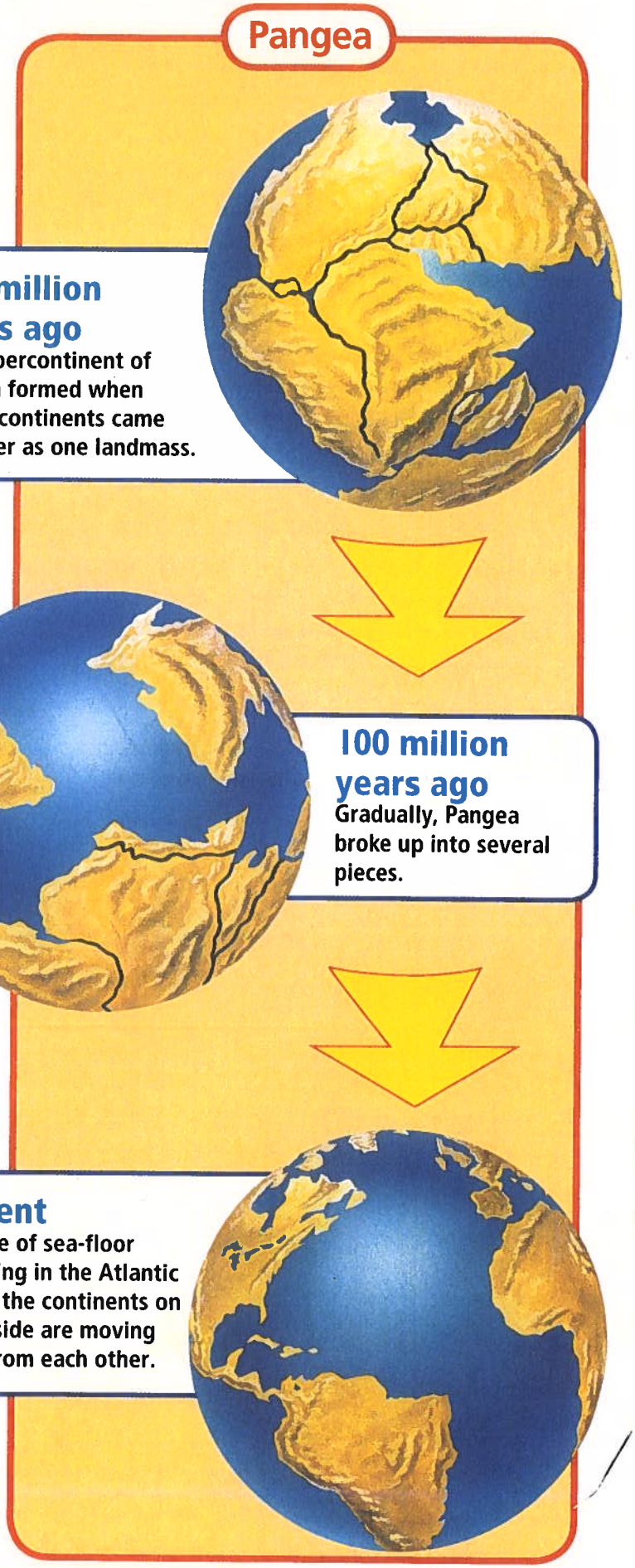
At a convergent boundary, plates move together.

Plate Movements Change Earth's Surface

You now know that plates move. But in which directions do they move, and where were they in the past? Scientists have used several kinds of evidence to find out where plates were long ago. The shapes of some continents, such as South America and Africa, seem able to fit together. Also, rock types along the edges of some continents are the same. Furthermore, the same kinds of plant and animal fossils show up on different continents that are now separated by oceans.

By examining traces of Earth's magnetic field in rocks, by matching rock types and fossils, and by studying how plates move, scientists have concluded that all the continents once formed a single supercontinent. Scientists call it *Pangea* (pan•JEE•uh), and it existed about 220 million years ago. Pangea may not have been the first supercontinent. Scientists hypothesize that at several times in Earth's history, the continents joined to form a supercontinent and then pulled apart.

Today, the Atlantic Ocean is growing and the Pacific Ocean is shrinking. This is causing North and South America to move farther away from Europe and Africa and closer to Asia. In addition, Africa is shifting north toward Europe. If these changes continue, the Earth's surface will look very different in another 200 million years.



Focus Skill **COMPARE AND CONTRAST** **Contrast the movements of the continents in the past with how they are moving now.**