

Earth Science

Chapter 10 - Plate Tectonics

Section 3 - The Changing Continents

E.Q.: How have the movements of the tectonic plates changed Earth's surface and what is the supercontinent cycle?

STANDARDS:

SES2. Students will understand how plate tectonics creates certain geologic features, materials, and hazards.

- a. Distinguish among types of plate tectonic settings produced by plates diverging, converging, and sliding past each other.**
- b. Relate modern and ancient geologic features to each kind of plate tectonic setting.**
- e. Explain how plate tectonics creates and destroys sedimentary basins through time.**

SES5. Students will investigate the interaction of insolation and Earth systems to produce weather and climate.

- f. Relate changes in global climate to variation in Earth/Sun relationships and to natural and anthropogenic modification of atmospheric composition.**

SES6. Students will explain how life on Earth responds to and shapes Earth systems.

- d. Describe how fossils provide a record of shared ancestry, evolution, and extinction that is best explained by the mechanism of natural selection.**

Objectives:

- Identify how movements of tectonic plates change Earth's surface.**
- Summarize how movements of tectonic plates have influenced climates and life on Earth.**

- Describe the supercontinent cycle.

Reshaping Earth's Crust

- **terrane** a piece of lithosphere that has a unique geologic history and that may be part of a larger piece of lithosphere, such as a continent
- Continents change not only by breaking apart but also by gaining material. Most continents consist of cratons surrounded by a patchwork of terranes.
- Terranes become part of a continent at convergent boundaries. When a tectonic plate carrying a terrane subducts under a plate made of continental lithosphere, the terrane is scraped off of the subducting plate and becomes part of the continent.

Reading Check Answer

Describe the process of accretion.

As a plate subducts beneath another plate, islands and other land features on the subducting plate are scraped off the subducting plate and become part of the overriding plate.

Effects of Continental Change

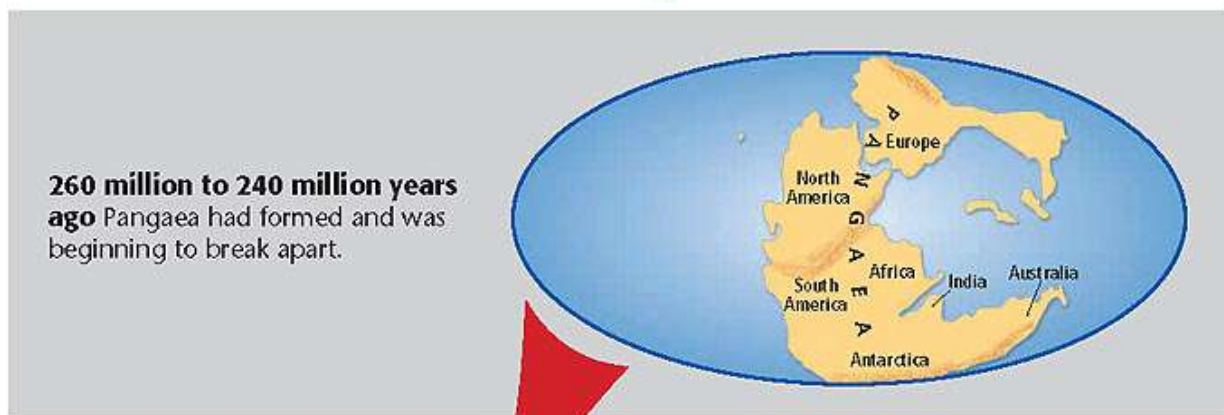
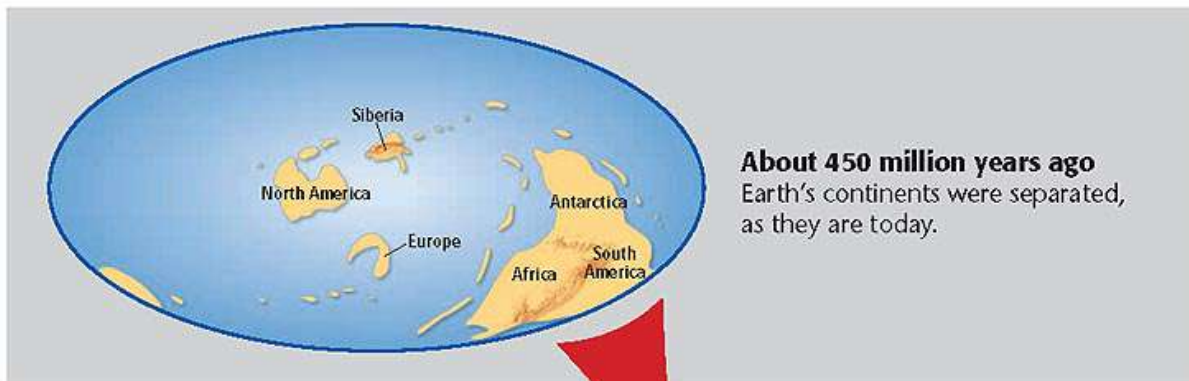
- Modern climates are a result of past movements of tectonic plates. When continents move, the flow of air and moisture around the globe changes and causes climates to change.
- Geologic evidence shows that ice once covered most of Earth's continental surfaces. As continents began to drift around the globe, however, global temperatures changed and much of the ice sheet melted.
- As continents rift or as mountains form, populations of organisms are separated. When populations are separated, new species may evolve from existing species.

The Supercontinent Cycle

- **supercontinent cycle the process by which supercontinents form and break apart over millions of years**
- **Pangaea the supercontinent that formed 300 million years ago and that began to break up beginning 250 million years ago**
- **Panthalassa the single, large ocean that covered Earth's surface during the time the supercontinent Pangaea existed**
- **Using evidence from many scientific fields, scientists can construct a general picture of continental change throughout time.**
- **Several times in the past, the continents were arranged into large landmasses called supercontinents.**
- **Supercontinents broke apart to form smaller continents that moved around the globe. Eventually, the smaller continents joined again to form another supercontinent.**
- **The process by which supercontinents form and break apart over time is called the supercontinent cycle.**
- **The movement of plates toward convergent boundaries causes continents to collide.**
- **Because neither continent subducts beneath the other, the plate boundary becomes inactive, and a new convergent boundary forms.**
- **Over time, all of the continents collide to form a supercontinent.**
- **Then, heat from Earth's interior builds up under the supercontinent, and rifts form in the supercontinent. The supercontinent breaks apart, and plates carrying separate continents move around the globe.**

Formation of Pangaea

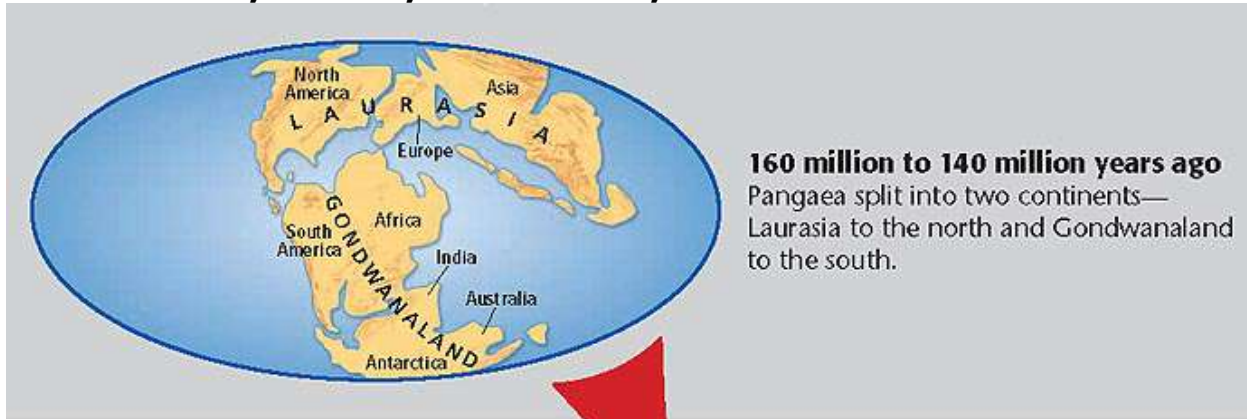
- The supercontinent Pangaea formed about 300 million years ago.
- Several mountain ranges, such as the Appalachian Mountains and the Ural Mountains formed during the collisions that created Pangaea.
- A body of water called the *Tethys Sea* cut into the eastern edge of Pangaea.
- The single, large ocean that surrounded Pangaea was called *Panthalassa*.



Breakup of Pangaea

- About 250 million years ago (during the Paleozoic Era), Pangaea began to break into two continents—*Laurasia* and *Gondwanaland*.
- Laurasia became the continents of North America and Eurasia.

- **Gondwanaland became the continents of Africa, South America, India, Australia, and Antarctica.**



The Modern Continents

- **Slowly, the continents moved into their present positions.**
- **As the continents drifted, they collided with terranes and other continents. New mountain ranges, such as the Rocky Mountains, the Andes, and the Alps, formed. Tectonic plate motion also caused new oceans to open up and caused others to close.**



Reading Check

What modern continents formed from Gondwanaland?
The continents Africa, South America, Antarctica, and Australia formed from Gondwanaland. The subcontinent of India was also part of Gondwanaland.

Geography of the Future

- **As tectonic plates continue to move, Earth's geography will change dramatically.**
- **Scientists predict that in 250 million years, the continents will come together again to form a new supercontinent.**

Locations of Earthquakes in South America, 2002–2003

