Chapter 11
Plate Tectonics

In this chapter, you will learn about one of the most important discoveries of the 20th century plate tectonics. You have already learned that Earth's surface is covered with a lithosphere that is broken into pieces called "plates." Plate tectonics is the study of the movement of these plates. It is a relatively new field of study. Scientists have only arrived at our current understanding of plate tectonics over the past 40 years. This is a very short time in science history!

11.1 Pangaea

While looking at a map of the world, have you ever noticed that the continents look like pieces of a puzzle? If they were moved closer together across the Atlantic Ocean, they would fit together neatly to form a giant landmass (Figure 11.1). In this section, you will learn about Alfred Wegener and his idea that a "supercontinent" once existed on Earth.

Movement of continents

Continental drift

Alfred Wegener was a German scientist and arctic explorer who suggested the concept of continental drift. **Continental drift** is the idea that the continents move around on Earth's surface.

Wegener's hypothesis

In the early 1900s, Wegener hypothesized that the continents were once connected. Today, after a lot of scientific research and collected evidence, we know that Wegener was right.

Pangaea— a supercontinent

In 1915, Wegener published his ideas in a book, *Origins of the Continents and Oceans*. Wegener thought that the continents we know today had once been part of an earlier *supercontinent*. He called this great landmass **Pangaea** (Greek for "all land"). According to continental drift, Pangaea broke apart and the pieces moved to their present places, becoming today's continents.

What is plate tectonics?

In Chapter 1, you were introduced to plate tectonics, the study of lithospheric plates. You learned that the surface of Earth is broken into many pieces like a giant jigsaw puzzle. **Plate tectonics** describes how these pieces move on Earth's surface. By the time you finish this chapter, you will know more about this theory than any scientist knew only forty years ago. Wow! You will also learn that the development of this theory is an excellent example of how the scientific process works. Now, let's return to Wegener and his idea of continental drift.

Figure 11.1: *The continents on either side of the Atlantic Ocean fit together like puzzle pieces.*

Evidence for continental drift

Matching coal beds, mountains, and fossils

Wegener was not the only scientist to suggest that continents move. His theory stood out because of the evidence that he gathered to support his idea of continental drift. Wegener's evidence is presented in the graphic below and listed in Figure 11.2.

A good hypothesis

Wegener's theory that the continents were connected in the past was a good idea. It was a *scientific hypothesis based on observations*.

Continental drift was rejected

Continental drift was a good hypothesis that was rejected by other scientists. A key part of Wegener's hypothesis was that some unknown force had caused the continents to slide over, or push through, the rocky bottoms of the oceans. Yet, neither he nor anyone else could identify the source of the force needed to move continents. Continental drift helped explain issues in geology—like why South America and Africa seem to fit together. However, continental drift could not be accepted by scientists because there was no evidence to explain how the continents moved.

Wegener's evidence for continental drift

- Coal beds stretch across the eastern United States and continue across southern Europe.
- Matching plant fossils are found in South America, Africa, India, Australia, and Antarctica.
- Matching reptile fossils are found in South America and Africa.
- Matching early mammal fossils are found in South America and Africa.
- Fossils in South America and Africa are found in rocks of identical age and type.
- Matching rock types and mountain belts occur in North America and the British Isles, and Africa and South America.
- Evidence of glaciers is present in regions with warm, dry climates. This indicates that continents that are close to the equator today were once closer to the South Pole in the distant past.

11.1 Section Review

1. What is plate tectonics? Is it an old or a new field of science?
2. Alfred Wegener (Figure 11.3) is featured in this section. Who was he?
3. Alfred Wegener thought that all continents were once connected. Explain one observation that led to this belief.
4. Why did scientists reject Wegener's idea of continental drift?
5. In this section, you read that the development of the theory of plate tectonics is a good example of the scientific method.

a. How did Wegener follow the scientific method?

b. When scientists rejected continental drift, were they using the scientific method? Why or why not?

6. Would most scientists in 1900 have thought that Earth's surface was like a giant jigsaw puzzle? Why or why not?
7. Research: Find out more about the life and work of Alfred Wegener. Write your findings as a short essay.
8. Continental drift was a scientific hypothesis based on observations. Pick one question below and make observations. Record your observations. Extension: Develop a hypothesis that you could test with an experiment.
a. Where in my yard do plants grow best?
b. What is the sediment and soil like in my yard?
c. What activity does my pet spend the most time doing during one day?