Investigation #6

SUPERCONTINENTS

Continental Drift

As You Read...
Think about:
1. In your own words, explain the theory of continental drift.
2. What was Pangea?
3. How is a suture zone formed?
4. Why is the Pacific Ocean shrinking?

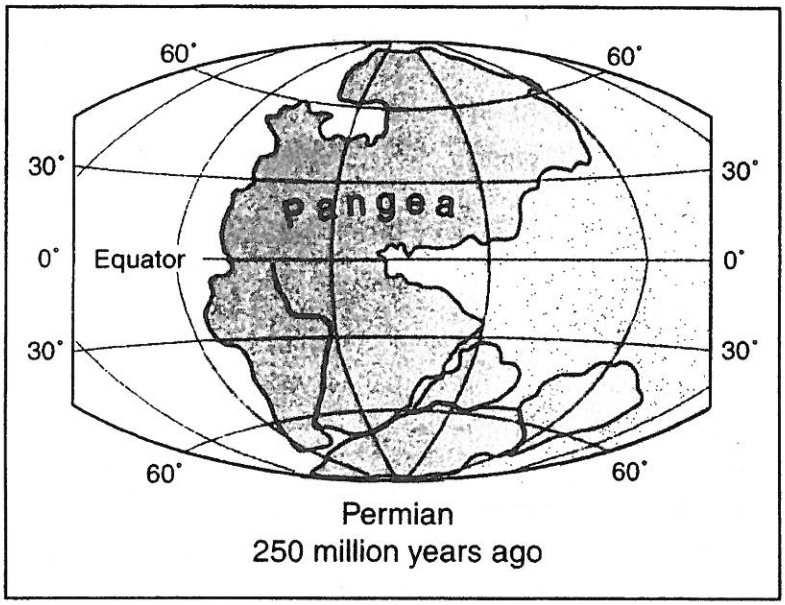
When you tried to assemble the continents like jigsaw-puzzle pieces, it probably seemed natural to you that Africa and South America fit together fairly well if you remove the ocean. This is one of the pieces of evidence that caused scientists 100 years ago to think that the two continents were once a single continent. The idea is that the single continent broke apart and the pieces drifted away from each other, to form the Atlantic Ocean. The fit of the continents is not the only evidence that supports the theory of continental drift. For example, you saw in your investigation that fossils of the same plants and animals are found in areas that are now separated by wide oceans and are in very different climatic zones.

Does it surprise you that it took a long time for most geoscientists to accept the theory of continental drift, even with the good evidence you worked with? The main reason was that no one could think of a way that the continents could plow along through the mantle beneath. When the theory of plate tectonics was developed in the 1960s, however, it gave a natural explanation for continental drift. Plate tectonic theory proposes that the outermost layer of the Earth, the lithosphere, behaves as a rigid layer. The lithosphere is broken into plates. These plates move relative to one another at their boundaries. Nowadays nearly all geoscientists believe in the reality of continental drift.

Supercontinents

In **Investigation 4** you learned that subduction can lead to the closing of an ocean and then continent–continent collision. When that happens, two separate continents

become one large continent. Geoscientists are now sure that about 250 million years ago all of the Earth's continents were gathered into a single very large "supercontinent." That happened by a long series of continent–continent collisions. That supercontinent has been named Pangea (***pan*** means "all", and ***gea*** means "land"). The diagram below is a map that shows geoscientists' best estimate of what Pangea looked like.

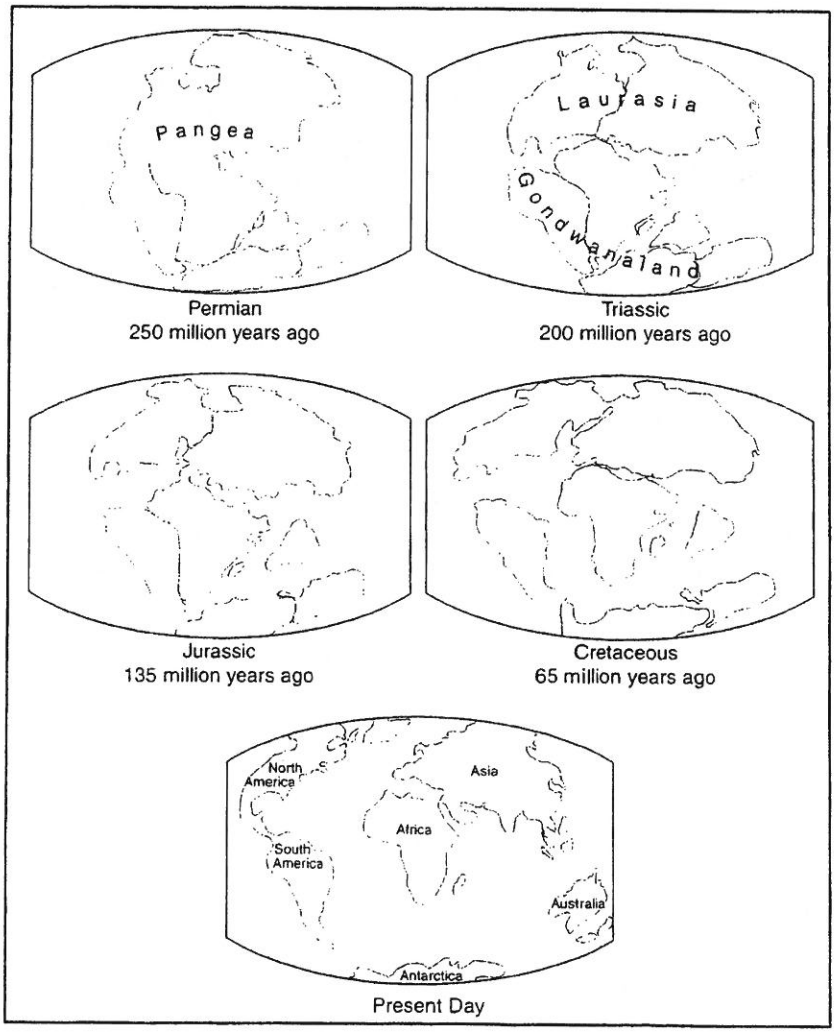


Permian
250 million years ago

You've already learned about some of the evidence for the existence of Pangea: for example, the fit of continents like Africa and South America, and similar fossils that are now far apart but must have been together in the past. Another important kind of evidence is the existence of former continent–continent collision zones, called suture zones, in the interiors of today's continents. These suture zones are the places where the earlier continents came together to form Pangea. The Appalachian Mountains, in eastern North America, are an example of these suture zones.

The Breakup of Pangea

About 200 million years ago the pattern of convection cells in the mantle changed, for reasons geoscientists are not yet sure about. This change caused Pangea to slowly split apart into several pieces. This process is called continental rifting. The pieces, which we know as today's continents, gradually drifted apart. That caused the Atlantic Ocean and the Indian Ocean, and the Antarctic Ocean to grow larger. The rifts didn't develop in exactly the same places where Pangea



was first sutured together. For example, the rift that formed the Atlantic Ocean was located to the east of the present Appalachian Mountains. That's why you sometimes hear that areas along the East Coast of the United States were once part of Africa! What does that really mean? They were on the ***east*** side of the ocean that vanished when northern Africa and North America were sutured together, but they were left on the ***west*** side of the new Atlantic Ocean that formed when Pangea was rifted apart.

There's evidence of earlier supercontinents, much farther back in geologic time. There seems to have been a supercontinent that formed and then rifted apart about 600 million years ago. Not nearly as much is known about the nature of that earlier supercontinent, because of the later movement of the continents while Pangea was being assembled.

At the time of Pangea, the Pacific Ocean was the world's only ocean! As the new oceans (the Atlantic, Indian, and Antarctic Oceans) have widened after Pangea was rifted apart, the Pacific Ocean has shrunk, although it's still the largest ocean. As you saw in **Investigation 4**, today's Pacific Ocean is surrounded by subduction zones. Those are the places where the floor of the Pacific Ocean is being consumed. What's going to happen in the geologic future? Will the Pacific continue to shrink, until all of today's continents collect there to form a new supercontinent? Or will the Pacific expand again, and the new oceans close up again to form a supercontinent where Pangea once existed? Most geoscientists think that the latter will happen.

Today scientists can actually measure how the plates are moving. They use orbiting satellites to directly measure the plates' movements as they happen. Only since the development of the satellite-based global positioning system (GPS) has this direct measurement of continental drift been possible.

Name: _____ Units: _____

Directions: After reading Investigation #6 from the book, please answer the following questions.

1.) What was Pangea?

2.) How is a suture zone formed?

3.) Why is the Pacific-Ocean shrinking?

4.) List three types of evidence that can be used to identify the former existence of a supercontinent (Pangea)?

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5.) In your own words, explain the theory of continental drift.

6.) Why do you think it took so long for most geoscientists to accept the theory of continental drift?