

Name _____

The Moving Earth

Has the Earth always looked like it does now? In the 19th Century, most people would have said, “Yes.” But as more people began to explore remote areas, some confusing evidence began to appear:

- Fossils of amphibians in the Arctic, that could only live in warm climates.
- Coal deposits (from plants) in Antarctica.
- Massive fossilized coral reefs in cold areas like Northern Michigan
- Mountain ranges in Africa and South America were very similar. So were formations in Canada and Scotland.

Most geologists simply shrugged. But one German meteorologist, Alfred Wegener, proposed a radical new idea. In 1911 he suggested that 300 million years ago there was just one continent, which he named Pangaea. He thought that some kinds of forces must have caused Pangaea to split apart. The continents then drifted through the ocean until they stopped as they are today. Wegener’s chief clue came from the continents themselves.

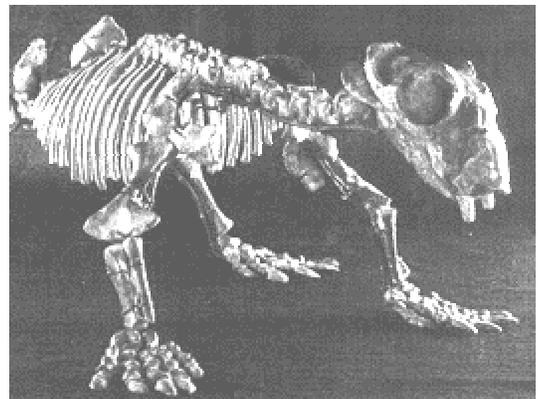
Clue #1: Obtain six pieces of the Pangaea map from your teacher. Arrange them on your desk so that they look about like the Earth. (You might need to look at a globe for help.) Then push them together as best you can.
How well do they fit? _____

Are there some areas that do not fit well? _____

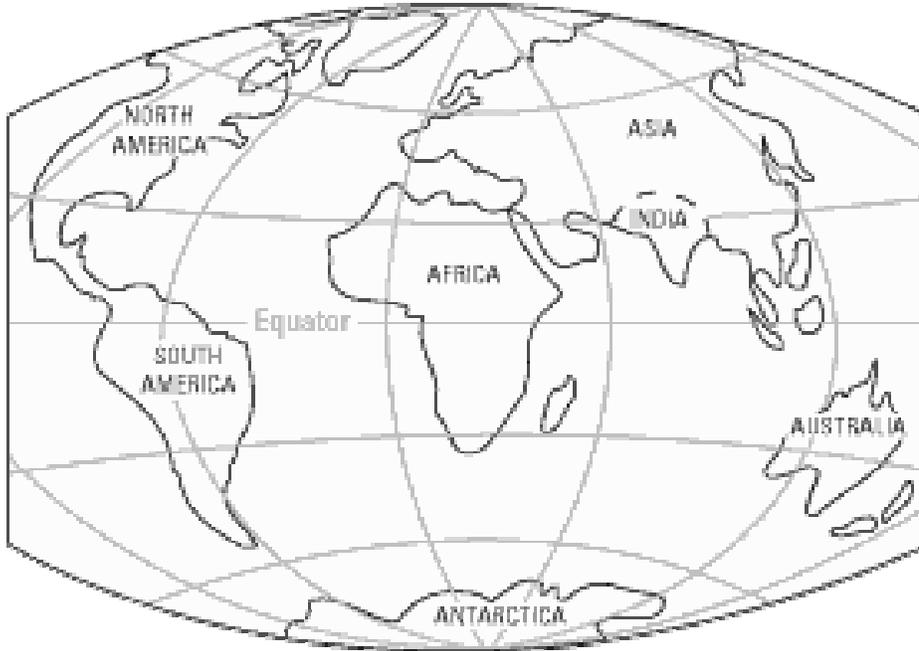
How could you explain? _____

The idea was not new, even Francis Bacon suggested this same idea in 1620. But it was radical. Wegener could not explain how continents could move. He was ridiculed and eventually his idea was forgotten—for a while. But it could not be forgotten. Eventually new clues emerged.

Clue #2: The Lystrosaurus was a large amphibian that lived in the Triassic period. It was the size of a small dog. Lystrosaurus fossils have been found in Africa, India, Antarctica, Indochina, and eastern China. Plot the location of Lystrosaurus on the map.



Glossopteris is a treelike fern whose fossils were found in South America, Africa, Madagascar, India, Antarctica, and Australia. It grew during the Carboniferous period. It had heavy seeds that did not float. Plot *Glossopteris* on the map.



(USGS Map)

What could explain the distribution of these two organisms?

Wegener's theory was forgotten but not gone. Eventually the clues piled up, and scientists began to look again for the explanation. To find a way the continents could move, scientists had to learn more about the Earth's crust. Some of the best clues came from the ocean floor.

Clue #3: The Mid-Atlantic Ridge

Look at the map of the mid-Atlantic Ridge provided by your teacher. This ridge has very young igneous rock. Can you explain it?

Scientists hypothesized that if the plates do separate, then perhaps some of the molten rock of the mantle might surface on Earth. In the 1960s marine scientists examined the mid-Atlantic Ridge, which is the longest mountain range on Earth and has many volcanoes issuing lava under the sea. By examining rock formations on either side of this range and carefully measuring distances by using satellite instruments, they found that the rocks were older as the distance from the ridge was greater. Then they looked at islands right on the ridge, like Iceland and Surtsey. They found fresh evidence of volcanic activity, making new crust down the middle of the Atlantic.

Most scientists now believe that the sea floor is spreading slowly. North America is slowly moving farther away from Europe. Finding this information provided the proof that scientists had sought for so long. Now the Theory of Continental Drift is widely accepted all over the scientific community.

There are some questions that have yet to be answered by this theory. Scientists cannot precisely describe the forces that drag the tectonic plates around the globe. The source of heat must come from the center of the earth, but the plates do not move evenly in the predicted directions. There must be a difference in the amount of heat at different places, but why?

Questions

After reading the essay and working with the clues, fill in the chart and answer the questions that follow. The questions will help you think about what else you must study to fully understand this theory.

1. Why would most volcanoes and earthquakes occur near plate boundaries? _____

2. If there were coal deposits found in Antarctica, how did the tropical forests that made coal get there? _____

3. Scientists think that Pangaea was a super continent 300 million years ago. They also think the earth is probably 4.5-5.0 billion years old. What do you think it must have been like before Pangaea? _____

4. Have the continents stopped drifting? Why do you think that? _____

An Iceland Journal

Today I decided to walk cross-country across an open area of Iceland. _____

Exploring

Here is a photo of Jupiter's moon Europa. Do you see any evidence of changes on the satellite? (NASA Photo: Jet Propulsion Laboratory)

