

Continental Drift

For many years, people had a view of the Earth as an unchanging planet in the center of the universe. However, we now know that the Earth is a very dynamic planet undergoing continual transformation. Please click the link to read and see images about [Plate Tectonics - Pangaea Continent Maps](#) from Geology.com

As early as 1620, Sir Francis Bacon, an English philosopher, noted that the coasts of the continents on the opposite sides of the Atlantic ocean fit together like puzzle pieces. It was later suggested that perhaps they were once joined and over time, evidence was found to support this idea. For example, coal deposits and other geologic formations match up on opposite sides, as do fossils. Using this evidence, Alfred Wegener, a German geophysicist, proposed the hypothesis of continental drift. Wegener stated that all the continents had once been joined as a supercontinent, which he called Pangaea. Wegener thought that Pangaea began to break up into the continents that we know today about 180 million years ago.

Plate Tectonics

Wegener's hypothesis of continental drift was not widely accepted in his time because he could not explain how the continents might have moved. However, in the 1950's and 60's, scientists were able to connect all of the evidence and propose the Theory of Plate Tectonics. The final evidence needed to explain Wegener's hypothesis came following World War II. Sonar, used during the war, allowed for the first detailed images of large areas of the sea floor. These surveys led to the discovery of mid-ocean ridges, which are a chain of underwater volcanic mountains that encircle the globe like the seams on a baseball. In some instances, these mountains have risen so high that they break the surface of the ocean to form islands. Examples of this are Iceland and the Azores. The mid-ocean ridge in the Atlantic Ocean is called the Mid-Atlantic Ridge. The sonar surveys also revealed deep depressions in the ocean floor, called trenches.

The discovery of the mid-ocean ridges was of great significance in building the Theory of Plate Tectonics. The rock at the ridges is very young and gets older moving away from the ridge. At the ridge, there is very little sediment, but in moving away from the ridge the sediment become increasingly thicker. These findings indicate that new rock is flowing up from the mantle at the ridges.

Plate Tectonics - A Documentary

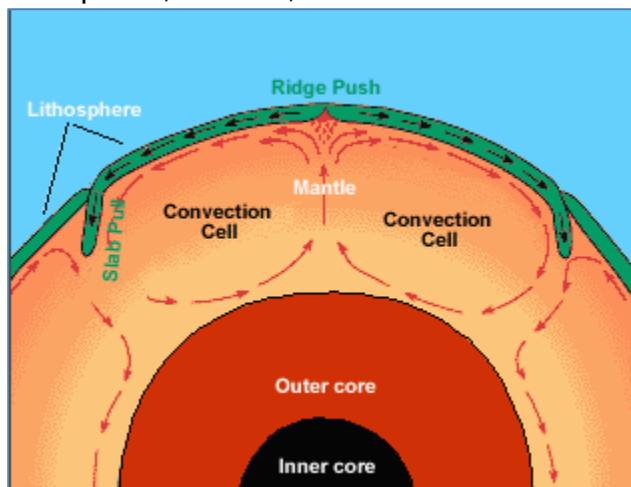
Please click the link, [Plate Tectonics - A Documentary](#) to see an informative documentary from Isaac Frame. Ever thought of how the continents were formed? How

they oddly just, "fit together." Well there is a simple answer, and it is revealed through a process called plate tectonics. It answers the whole issue of continental drift, and is more concrete than an "expanding earth" theory. This subject covers a variety of processes including subduction, transduction, etc.

Sea Floor Spreading

Another important finding came from studying of the magnetism of the sea floor. About every 300,000 years, the Earth's magnetic field reverses, although there are times in Earth's history when this span is much longer or shorter. Many rocks contain tiny particles of magnetic minerals. When the rock is molten, these minerals can act like tiny compasses and point either north or south depending on the Earth's current magnetic field. When the rocks cool, the minerals are frozen in their orientation. Therefore, it is possible to read the history of Earth's magnetic field by analyzing the stripes, or bands, of magnetic minerals in the rocks on the sea floor. These stripes tell scientists that the sea floor was not formed all at once, but rather over time.

The Earth's core heats the molten rocks of the mantle and causes it to move in a circular pattern called a **convection current**. The hottest molten rock rises toward the lithosphere, or crust, while the cooler molten rock of the mantle sinks back toward the



core where it is heated. This cycle creates a convection current that was once thought to move the Earth's plates along like a conveyor belt. Although the convection currents may still have some impact on the movement of the plates, the most current view is that the movement is caused more by the sinking of dense oceanic crust. As the oceanic crust ages, it becomes cooler and more dense. Eventually, it will sink back into the mantle and in doing so, it creates a

trench and pulls the rest of the oceanic plate behind it. This is called "slab pull". This pull causes the plates to separate at the mid-ocean ridges allowing fresh magma to rise to the surface.

Geologic History of the Earth

Two hundred million years ago, all of the continents were joined together as the supercontinent **Pangaea**. Pangaea was surrounded by a single ocean called Panthalassa which covered the rest of the planet. Approximately 180 million years ago,

a new rift appeared between what would be North America, South America and Africa. This rift would become the Mid-Atlantic Ridge. As the rift developed and pushed apart these continents, the space between would become the Atlantic Ocean. Pangaea was now divided into two continents called **Laurasia** and **Gondwana**. Laurasia was made up of current day North America and Eurasia. Gondwana was made up of South America, Africa, Antarctica, India and Australia. More rifts began to appear during this time, breaking up Gondwana, moving these continents further apart from each other as well.

About 135 million years ago, a rift occurred between South America and Africa. This rift continued to expand and eventually joined with the mid-ocean ridge in the North Atlantic form a single mid-oceanic ridge in the Atlantic. More ridges would form and further divide the remaining clumps of Pangaea over time to form the positions of continents as we know them today. However, this movement is not complete. The continents will continue to flow adrift the **asthenosphere**, colliding and reforming new landmasses only to break up and drift apart again.

Sediments in the ocean can provide a wealth of information for scientists about the history of our planet. Scientists can review **lithogenous sediment**, which is the sediment from the weathering of rocks, and **biogenous sediment**, which is the skeletons and shells of marine organisms. The fossils in ocean sediment can reveal information about the ocean temperatures at specific times in our history, giving clues about the Earth's climate and ocean currents.

The climate of Earth has fluctuated over its history. There have been **interglacial periods**, or warm periods followed by cold periods called ice ages. The Earth is presently in an interglacial period. During ice ages, large amounts of water trapped in ice as glaciers on land. Because water is trapped in this ice, less water flows into the oceans through streams and rivers and therefore the sea level is lower during these times.

Earth experienced its most recent ice age about 18,000 years ago. During that time, North America was covered in ice nearly 2 miles thick. Sea level at the time was approximately 425 feet lower than it is today.

Photo Attribution

Description: This image is a cross section through the Earth showing the convection cells of the mantle.
Source: Windows to the Universe