

# **Evidence For Plate Tectonics**

The main evidence to support the idea of plate tectonics focuses on the different plate boundaries. The many different features seen at these boundaries provide overwhelming proof that the sea floor is indeed moving, in fact, it is being **recycled**.

## **Evidence supporting Plate Tectonics Include:**

- 1) Earthquakes and Volcanoes
- 2) Polar wandering
- 3) Magnetic Reversals and Seafloor Spreading
- 4) Ocean Drilling
- 5) Hot Spots

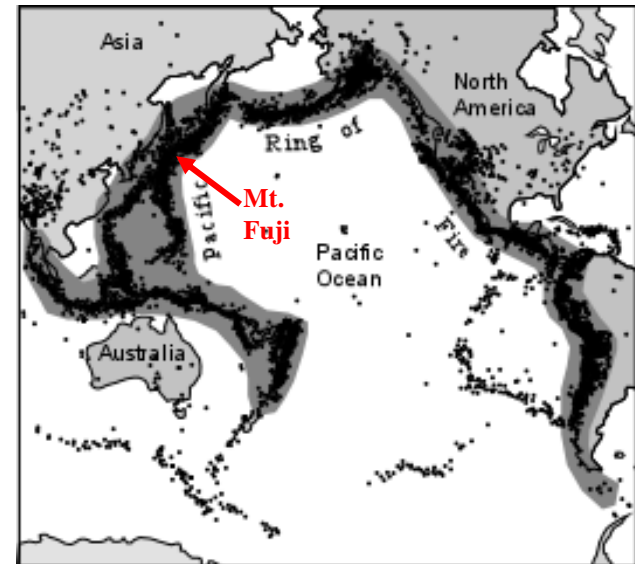
### **Reference:**

Tarback and Lutgens  
Pages 196 - 201

# Evidence For Plate Tectonics

## Earthquakes and Volcanoes

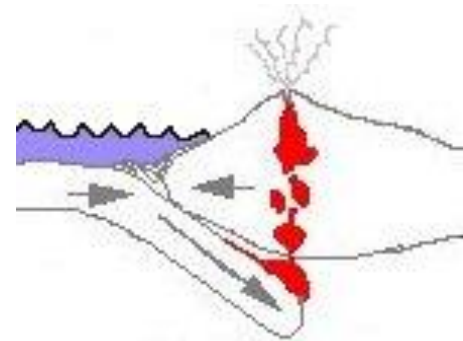
- Earthquakes and volcanoes do not occur randomly throughout the world, but occur in rather limited belts. These belts mark the location of Plate Boundaries.
- The largest active belt in the world surrounds the Pacific Ocean and is referred to as **“The Pacific Ring of Fire”**. 90% of all the world’s earthquakes occur there. Some of the more famous volcanoes are found surrounding the Pacific.



# Evidence For Plate Tectonics

## Earthquakes and Volcanoes

- These boundaries are areas where compressional forces cause tectonic plates to move toward one another and stress builds up. When the stress is too great, fractures (faulting) may occur within the tectonic plates or the plates may slip abruptly and **earthquakes** result.
- The boundaries are also places of high heat flow, where molten rock rises to the surface and forms **volcanoes**.  
Example: Mount Saint Helens in USA.



# **Evidence For Plate Tectonics**

## **Paleomagnetism (Fossil Magnetism)**

- **The permanent magnetism in rocks which indicate the direction of the magnetic field when the minerals became magnetized.**
- **The most persuasive evidence to support the Plate Tectonic theory comes from the study of Earth's magnetic field. Polar wandering and magnetic reversals in the ocean floor provide this evidence.**
- **Basaltic rocks contain iron-rich minerals which become magnetized in the direction of the magnetic field at the time when the rock solidified. If the rocks move or if the magnetic poles change the magnetism in the rocks retain its original magnetic alignment. Rocks that formed millions of years ago “remember” the location of the magnetic poles at that time.**

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## **Polar Wandering**

- **Is the apparent movement of the magnetic poles as outlined from studying the magnetism fossilized in successive basaltic lava flows ranging in age over millions of years.**
- **A plot of this magnetism showed that the magnetic pole appeared to change position considerably over the past 500 million years.**
- **This was clear that either the magnetic pole had moved with time, an idea known as polar wandering, or the lava basaltic lava flows had moved, explained by continental drift.**
- **Plate Tectonic theory is believed to be the best explanation for polar wandering. If the magnetic poles remain stationary, then their apparent movement was caused by the drifting of continents.**

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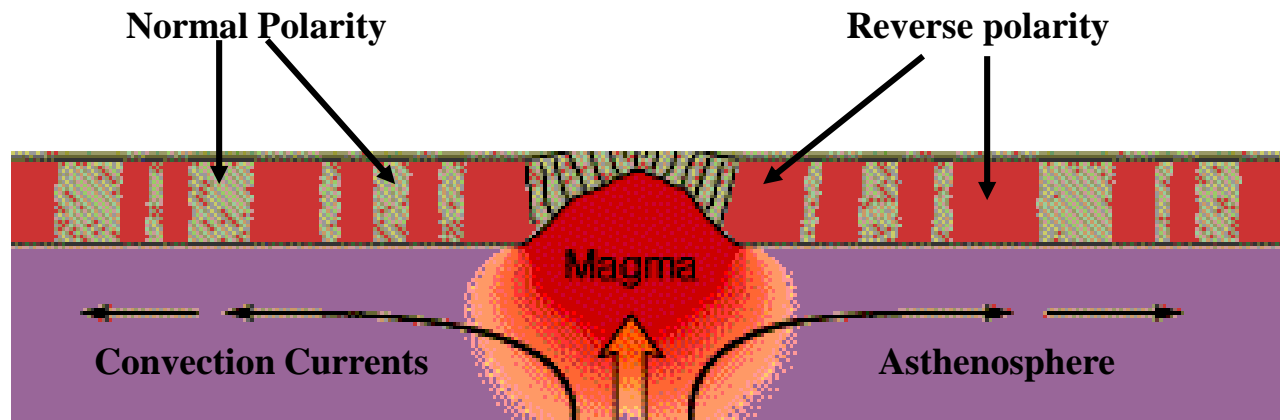
## Magnetic Reversals and Seafloor Spreading

- Paleomagnetism also provided evidence for the Plate Tectonic theory when scientist discovered that the magnetic field reverses polarity. Basaltic lavas solidifying during a time of reverse polarity would display opposite magnetism as rocks forming today.
- Rocks with magnetism the same as our present magnetic field is said to have **normal polarity**, while rocks with opposite polarity is said to have **reverse polarity**.
- This alternating magnetic polarity can be seen in; 1) successive lava flows making up a volcano and 2) the basaltic rock making up the ocean floor.

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## Magnetic Reversals and Seafloor Spreading

- At oceanic ridges the plates move apart and new basaltic rock is added to each plate. The magnetism of these basaltic rocks appears to alternate to produce identical magnetic patterns on both sides of oceanic ridges. This proved to be the strongest evidence to support seafloor spreading and therefore Plate Tectonics.



# Evidence For Plate Tectonics

## Ocean Drilling

- From 1968 to 1983, the Deep Sea Drilling Project collected convincing evidence confirming the seafloor spreading idea and the Plate Tectonic theory.
- Drill core samples of the ocean floor and sediments on the ocean floor were collected with increasing distance from ocean ridges.
- When the oldest sediment from each drill site was plotted against the distance from the ocean ridge, it was noted that the age of the sediment increased with increasing distance from the ridge.
- This evidence also confirmed the idea that the ocean basins are relatively young, because no sediment older than 160 million years was found. Continents were dated to be 4.6 billion years.



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## Hot Spots

- Mapping of the seafloor in the Pacific revealed a chain of volcanoes and seamounts that extend from the Hawaiian Islands to the Midway Islands and continue north to the Aleutian trench of the coast of Alaska.
- Scientist proposed that a plume of magma presently exist beneath Hawaii and the Pacific plate moved over this stationary magma chamber. This confirmed that the tectonic plates do move in relation to earth's interior thereby supporting the theory of Plate Tectonics.
- Radioactive age dates of the seamounts and volcanic islands confirm that the age increases the farther away you go from Hawaii, and the hot spot.

