Hon Env Sci
Period _____ Date _____

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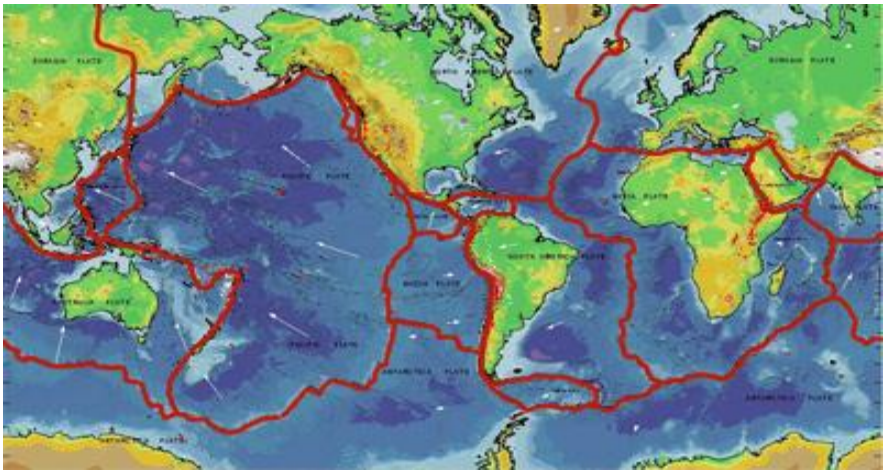
Plate Tectonics Lab



Purpose

- Plot key geologic events (earthquakes, volcanic eruptions, and mountain ranges), investigate patterns in their distribution, and correlate them to tectonic plate boundaries.
- Analyze how these geologic events affect the planet and its inhabitants.

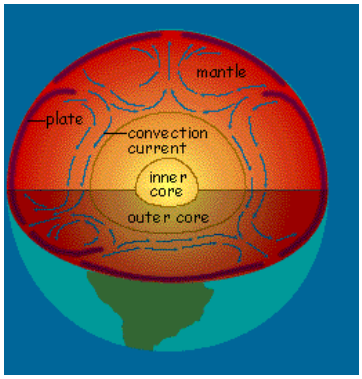
Introduction

In the 1960s and 1970s it was becoming obvious that the map of Earth's continents has been continuously changing over a large portion of geologic history.

Continental land masses crashed into and moved away from each other for over 2.0 billion years (see figure 1). These movements can be inferred from present-day geologic features resulting from these collisions and breakups. Rocks and fossils found in western Africa are also found in eastern South America. And scratches left of rocks by moving glaciers suggest how continents have moved over the last 300 million years.

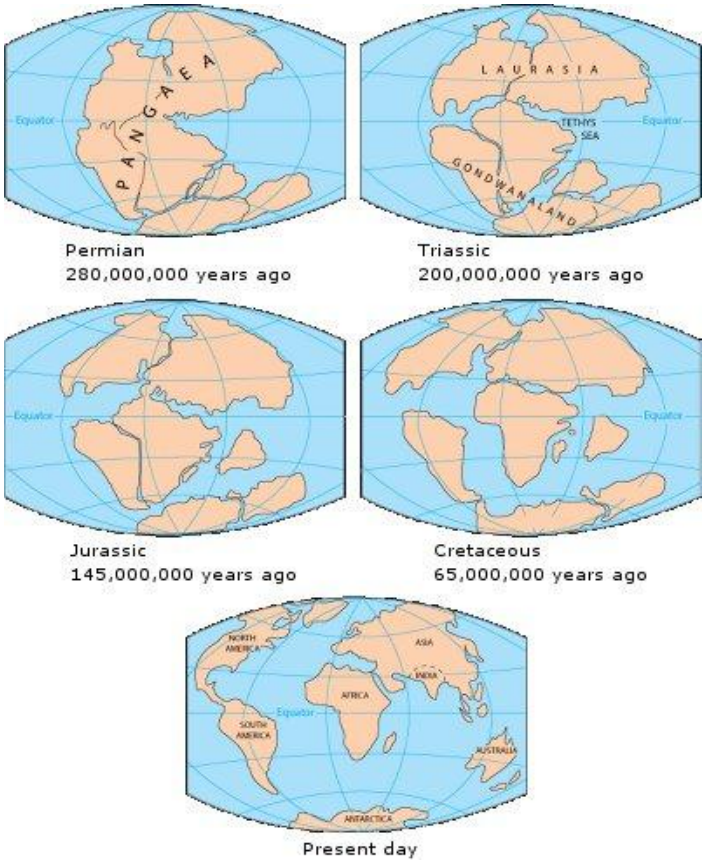
The idea of drifting continents was first proposed in 1912 by Alfred Wegener, who observed that the continents seem to fit together like the pieces of a puzzle. Although the evidence suggested that Wegener was correct, he could not find a mechanism to explain how whole continents could move thousands of miles across the Earth's surface.

It is now believed that the continents move on pieces of the Earth's crust called tectonic plates. The surface of the Earth seems to be divided into seven or eight major plates and maybe a dozen smaller ones. The best explanation for the mechanism is that heat escaping from the planet's interior creates convection currents that move the plates into and away from each other. From a geological point of view, the most interesting places are the plate boundaries where the plates collide, separate, or slide past each other. Scientists infer the size, shape, and location of the plates by a process similar to the one you will undertake in this project.



***Lab adapted from Laboratory Investigations for AP Environmental Science, William Molnar, Peoples Education**

Fig. 1 Earth's changing continents over time



Procedure

Step 1. Go to USGS.gov and plot 25 of the most recent earthquakes that are NOT in the same location on the map provided. Use *small circles* for your plotted points. Record the coordinates and location for the earthquakes you choose- keep a running list.

Step 2. Using the same map, *shade* in the locations of the mountain ranges listed below. Use colored pencils or a number system to *differentiate each mountain range* and *provide a key* on your map.

Alps
Andes
Appalachians
Atlas
Balkin Mts.
California Coast Ranges
Carpathians
Cascades
Dolomites
Himalayas
Karakoram
Scandinavian Mts.
Sierra Nevada Mts.
Urals

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Step 3. Using the same map, plot the Volcanoes listed below. Use *small triangles* for your plotted points. Due to scaling issues that may have resulted when enlarging the map, *confirm the location* of the volcanoes using the internet before you plot the points using the coordinates. In other words, *put the volcanoes where they would be geographically located on the map* even if the coordinates say otherwise.

Mt. Etna, Italy - 37.73N, 15.00E
Ayelu, Ethiopia - 10.082N, 40.702E
Likaiu, Kenya - 2.17N, 36.36E
White Island, New Zealand - 37.52S, 177.18E
Santorini, Greece - 36.4N, 25.4E
Askja, Iceland - 65.03N, 16.75W
El Chichon, Mexico - 17.4N, 93.2W
Mt. Wrangell, USA - 62.66N, 144.12W
Redoubt, USA - 60.5N, 152.7W
Mount Rainier, USA - 46.58N, 121.75W
Lassen Peak, USA - 40.5N, 121.5W
Unimak Island, USA - 54.47N, 163.9W
Mt. Pelee, West Indies - 14.8N, 61.1W

Blup Blup, Papua New Guinea - 3.5S,144.6E
Pinatubo, Philippines - 15.13N, 120.35E
Tambora, Indonesia - 8.3S, 118.0E
Gamalama, Indonesia - 0.8N, 127.3E
Irazu, Costa Rica - 9.979N, 83.853W
Lascar, Chile - 23.32S, 67.44W
Nevado del Ruiz, Columbia - 4.9N, 75.3W
Krasheninnikov, Russia - 54.58N, 160.26E
Fuji, Japan - 35.4N, 138.7E
Chaine des Puys, France - 45.5N, 2.8E
Soufriere Hills, Montserrat - 16.7N, 62.2W
Ararat, Turkey - 39.70 N, 44.28 E
Savo, Solomon Islands - 9.1S, 159.8E

Lab Questions and Analysis. *All questions must be typed on a separate sheet of paper and make sure to cite all of your sources for independent research.*

1. What patterns do you observe in the locations of these earthquakes, volcanoes, and mountain ranges?
2. Look at the diagrams of Earth's tectonic plates and mid ocean ridges, and compare to your plotted earthquakes, volcanoes, and mountain ranges. Describe any correlations.
3. Describe how the theory of plate tectonics is strengthened by these correlations.
4. Explain what is meant by the term "Ring of Fire".
5. What processes are going on in eastern Africa? Explain what is meant by a triple junction.
6. What are hot spots and what do they tell us about plate movement and the formation of islands?
7. Scientists have determined that plates move at different speeds. Some travel as slow as 2 cm/year and others as fast as 15 cm/year. Describe how hot spots could be used to determine the speed of plate movement.
8. What information and measurements would you need to calculate the rate of movement?
9. How did the Himalayan and Karakoram mountain ranges form? Twenty-two mountains in these ranges are 8,000 m (26,240 ft) or higher with Mt. Everest being the tallest on Earth at 8,850 m (29,028 ft). Why are these ranges so high even though they are not near a coast line?
10. Compare the Urals, another mountain range that is not near a continental edge, to the Himalayan and Karakoram mountains. The highest mountain in the Urals is Naroda Mountain at 1,895 m (6,215 ft). Why are the Himalayan and Karakoram mountains so much higher?

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