

The evidence supporting continental drift and plate tectonics seems overwhelming. It was time to change from hypothesis to theory. Too bad Wegener did not live long enough to see this change. Let's summarize just what has been determined. What we see today in placement of the continents started back in the Mesozoic Era as a super continent called Pangaea. Through slow processes operating throughout time, this super continent broke into smaller pieces called Laurasia and Gondwanaland. As more time progressed Laurasia broke into North America and Europe/Asia and Gondwanaland broke into South America, Africa, India, India, and Antarctica.

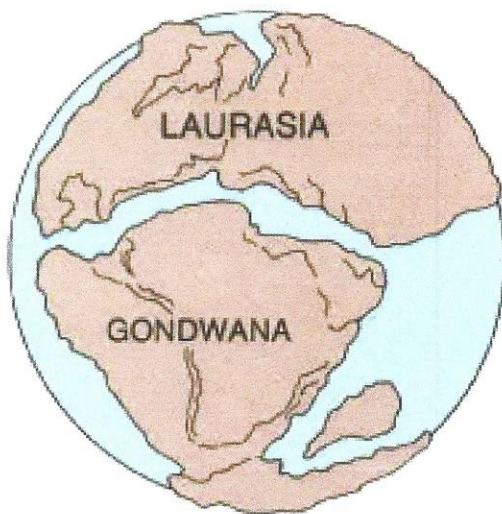
Tectonic plates separate at places called Mid-oceanic Ridges and moved apart. This is called a divergent plate boundary or a spreading center. The Atlantic Ocean is getting larger because of spreading at the Mid-Atlantic Ridge. Material from the



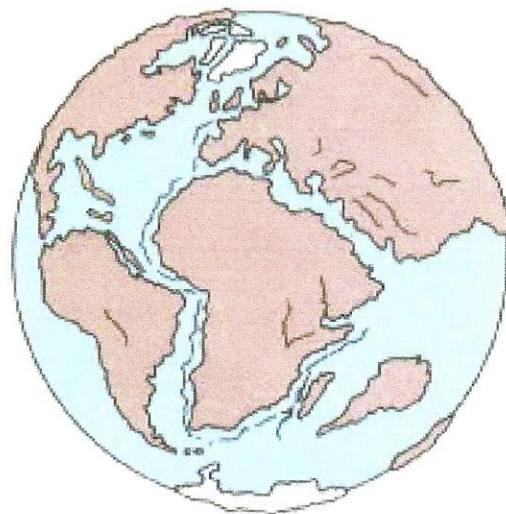
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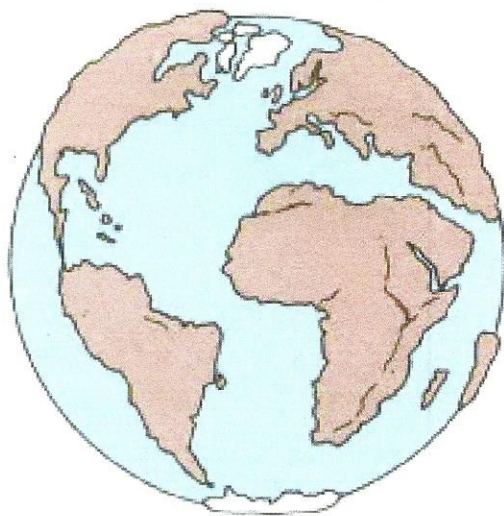
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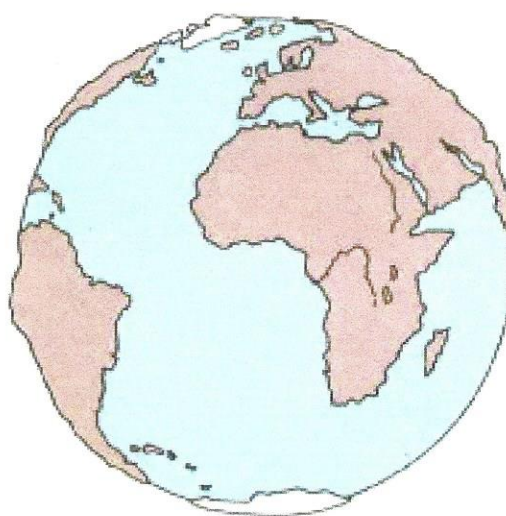
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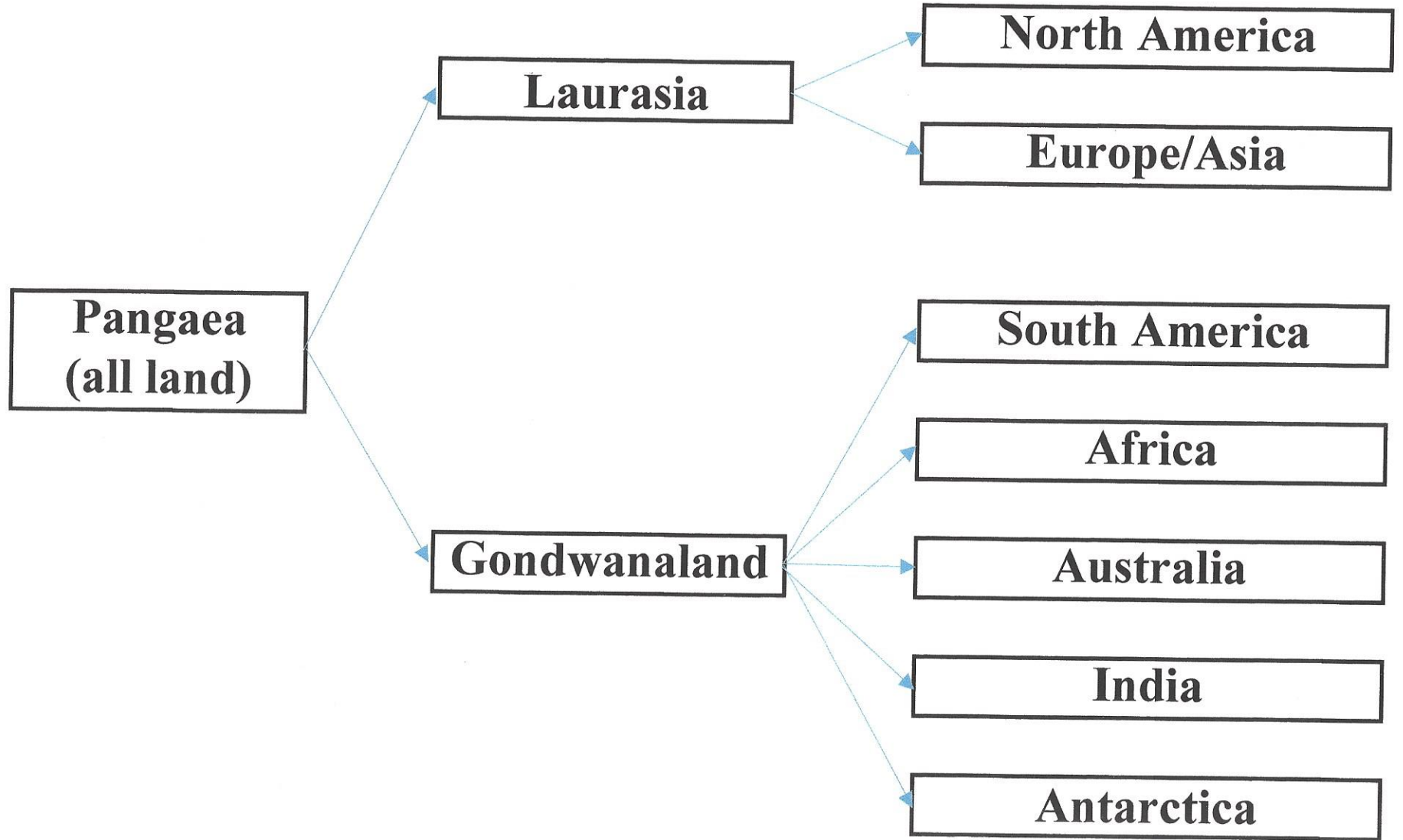


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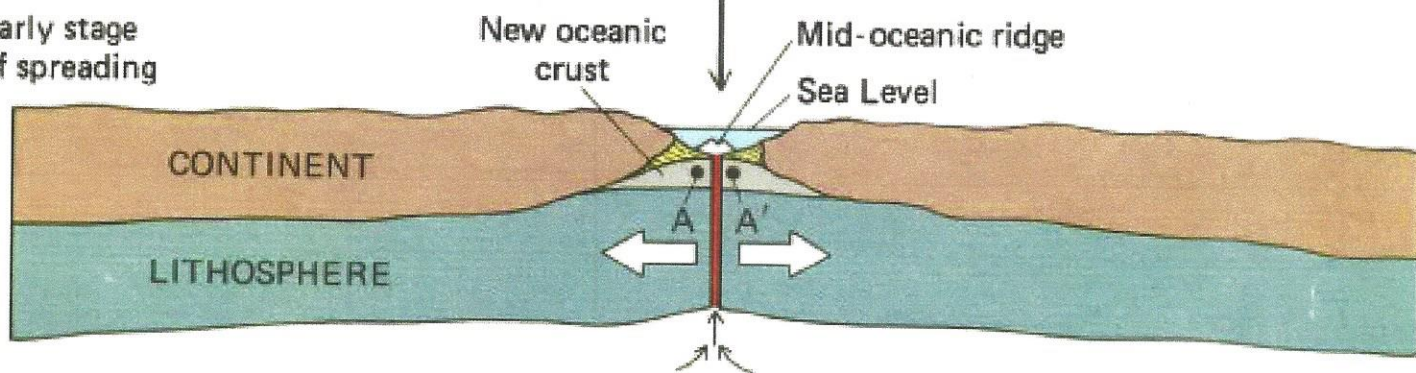
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The breakup of Pangaea:

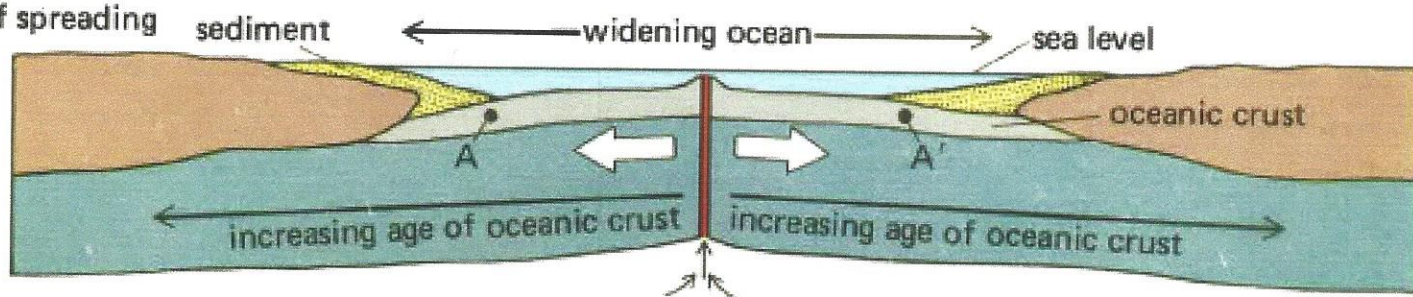


DIVERGENT BOUNDARY
and
SPREADING CENTER

Early stage
of spreading

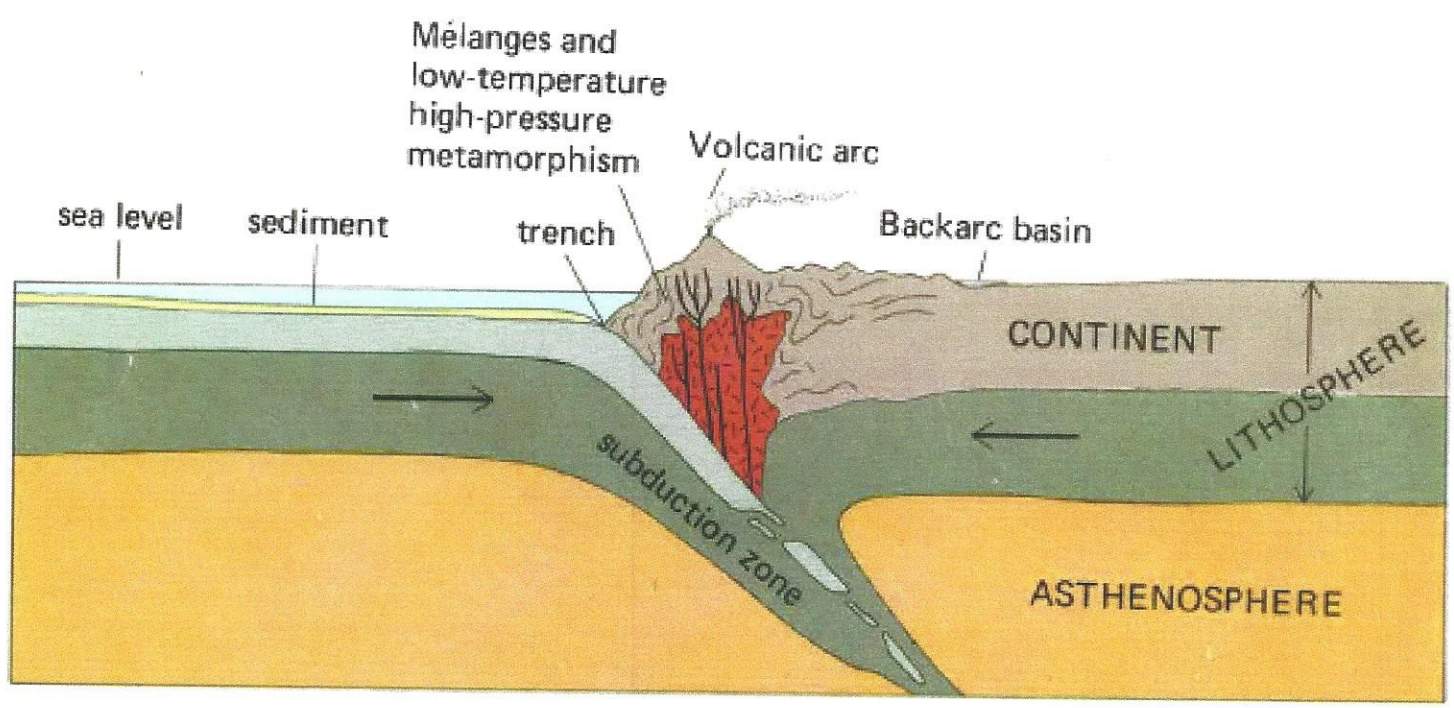
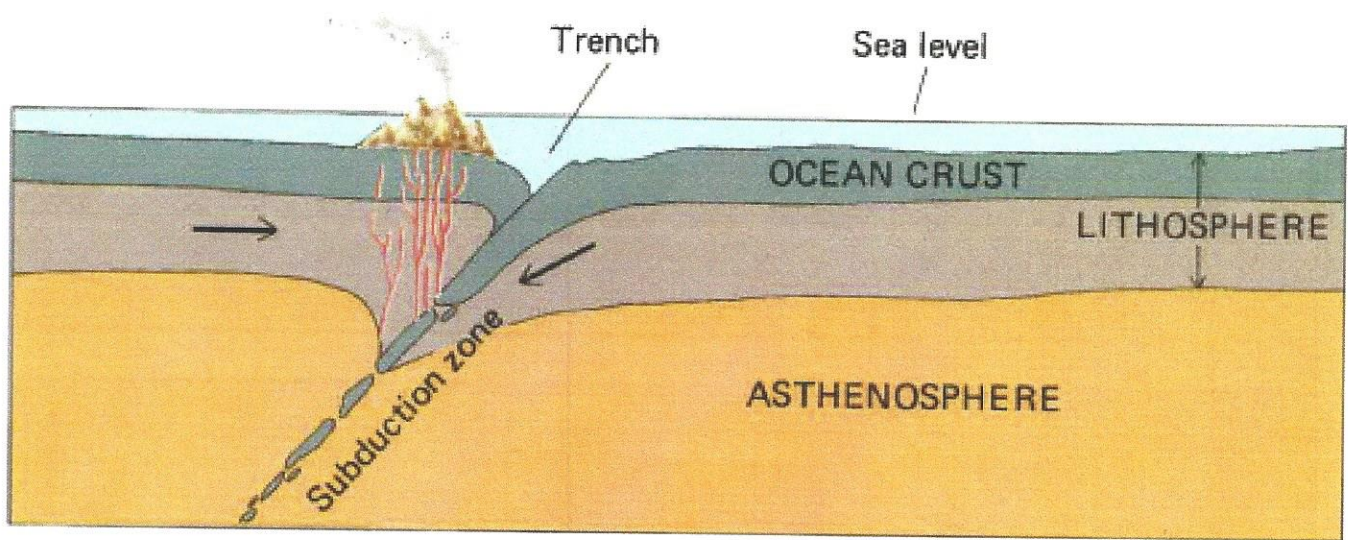


Late stage
of spreading



mantle is being brought to the surface and spread out.

In other places the continents are colliding. This is called a converging plate boundary. We see this all around the Pacific Ocean. The Pacific Ocean is getting smaller. On the west side of South America we see a good example of a converging plate boundary. Because of a difference in densities, the Pacific plate (higher density) is going under the South American plate (lower density). The Pacific plate is being subducted under the South American plate. This is also called the Benioff zone. Continental crustal material and oceanic crustal material together are being combined and moved to depths. Near the coast earthquakes have a shallow focus. As you go further inland, the foci occur at deeper depths as seen in the subduction or Benioff zone.



Another interesting converging plate boundary is seen where India is converging with Asia causing the Himalayan Mountains. India is still trying to ‘move north’ while Asia isn’t moving at all. Because of this Mt. Everest is continuing to get taller each year.

Using what you know about continental drift, you can predict what composition of magma/lava will occur. Remember the compositions we learned—acidic, intermediate, and basic.

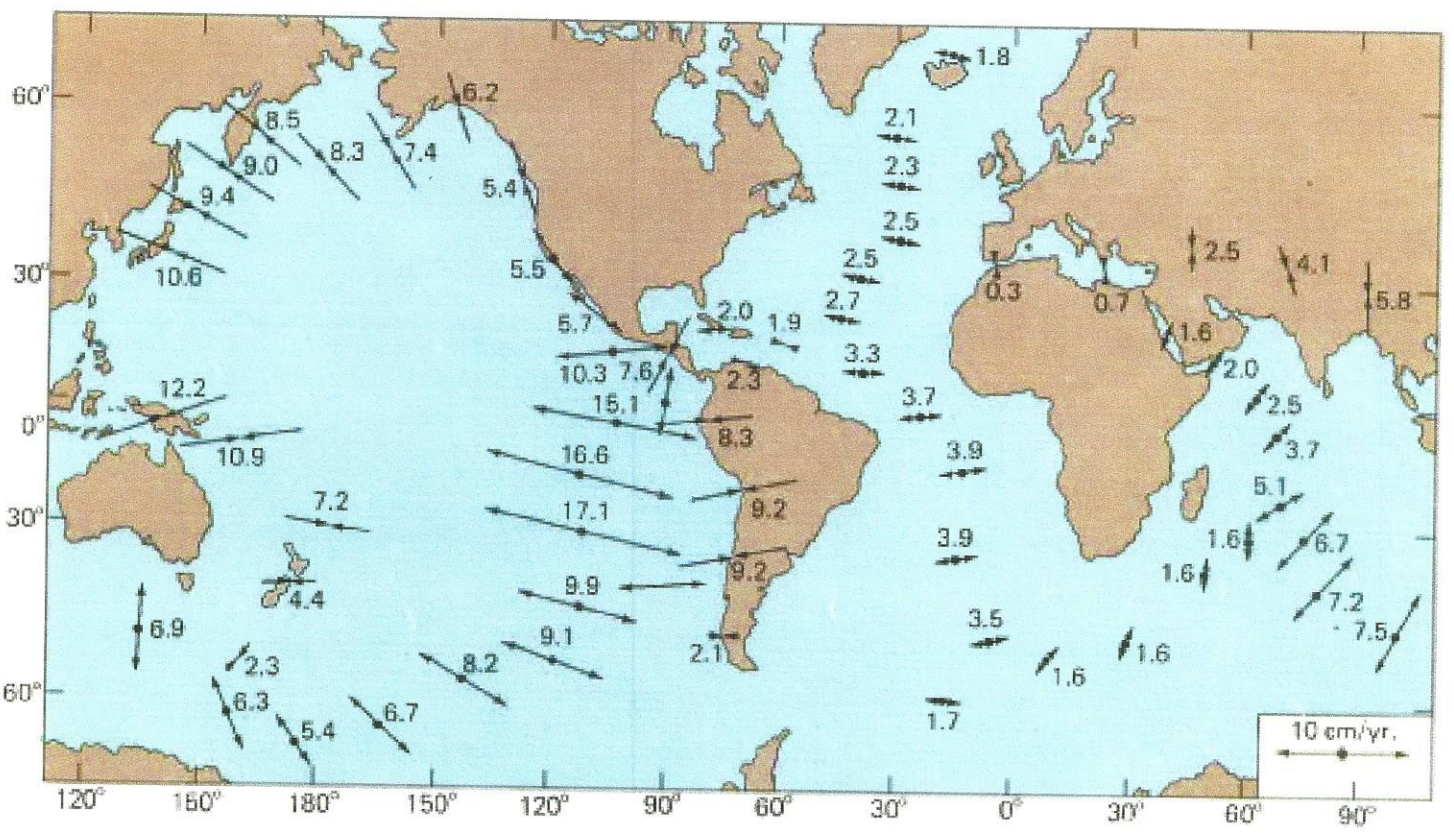
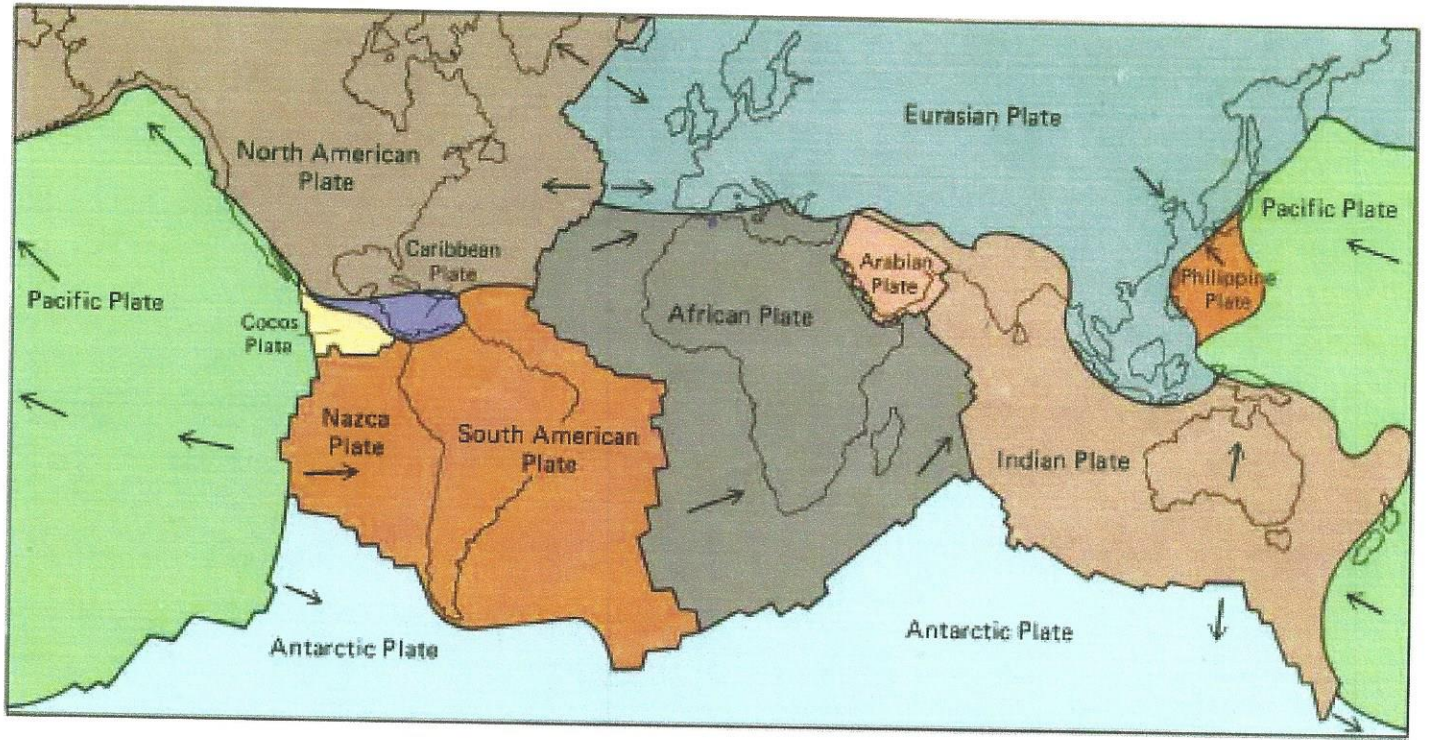
What type would we expect at a diverging plate boundary such as the Mid-Atlantic Ridge?

What type would we expect at a converging plate boundary such as along the west coast of South America?

What type would we expect at a hot spot such as the Hawaiian Islands?

There are seven major tectonic plates---(1) North American plate, (2) Pacific plate, (3) South American plate, (4) African plate, (5) Eurasian plate, (6) Indian plate, and (7) Antarctic plate.

Actual movements of plates either away or toward vary throughout the world. The Mid-Atlantic Ridge is separating somewhere around 20 to 30 centimeters a year. The boundary between the Pacific plate and western South America is converging about 80 to 90 centimeters a year.



Let's go back to the Doctrine of Uniformitarianism which we covered about the second day of lecture. The present is the key to the past (and actually the future). For example, we see the results of volcanoes happening today therefore we know what volcanoes did in the past and what volcanoes will do in the future. If we have evidence that a super continent formed and split, then this should have happened previously and should happen again in the future. Since Wegener's theory was accepted, at least 6 previous super continents have been recognized and the next one to form has been given a name.

Super continents---future, present, and past

Amasia---when the Pacific Ocean disappears and Asia and North America join, sometime in the future (don't hold your breath)

Pangaea---the most recent

Pannotia (Vendian)---about 540 mya

Rodinia---about 750 mya

Columbia (Nuna)---about 2.0 to 1.8 Ga

Kenorland/Artica

Ur

Vaalbara