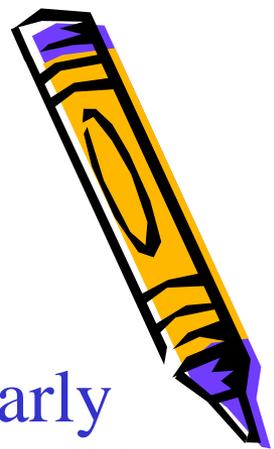


Plate Tectonic Theory

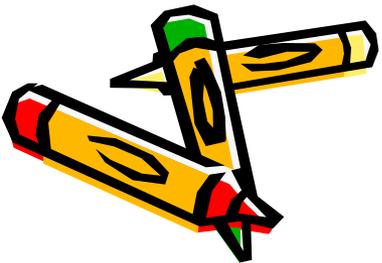
Evidence for
Plate Tectonics

CONTINENTAL DRIFT

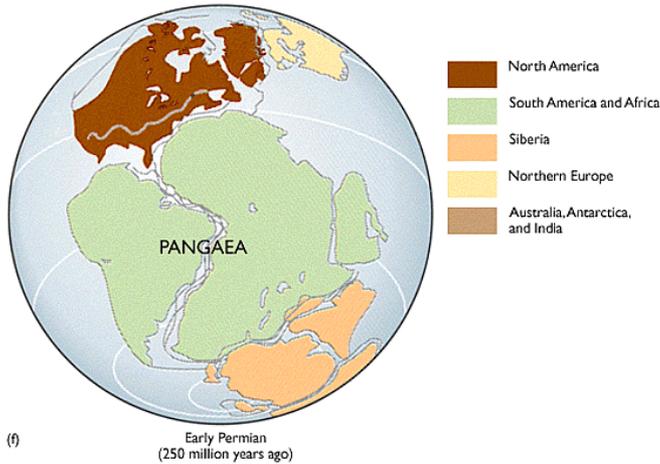


- **Alfred Wegener** in the early 1900's proposed the hypothesis that continents were once joined together in a single large land mass he called **Pangea** (meaning "all land" in Greek).

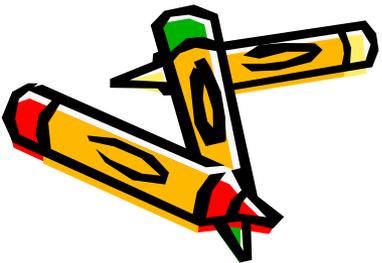
- He proposed that Pangea had split apart and the continents had moved gradually to their present positions - a process that became known as **continental drift**.



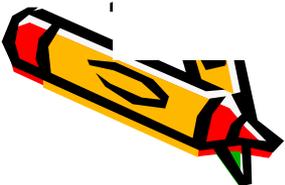
CONTINENTAL DRIFT



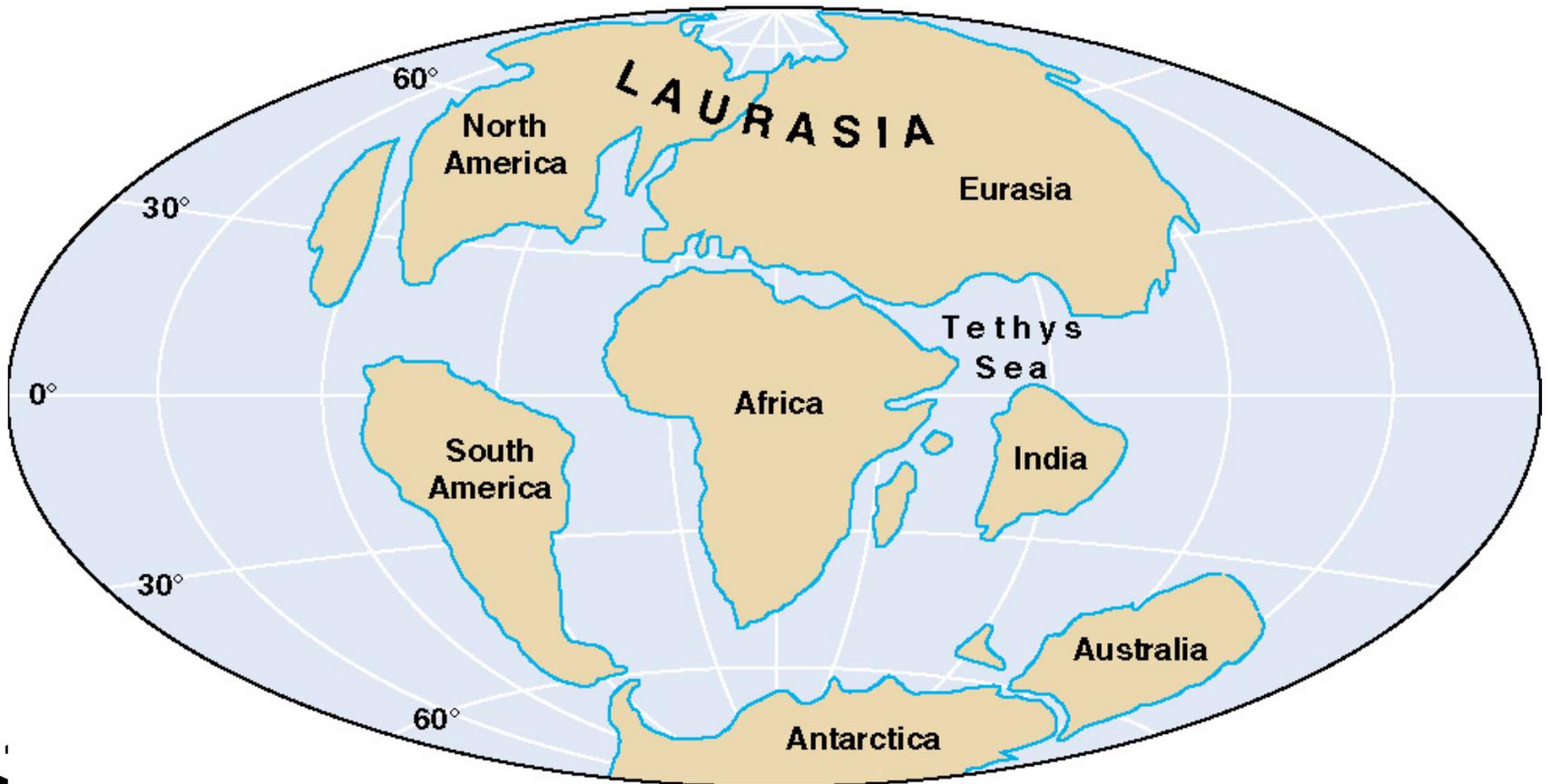
According to the hypothesis of **continental drift**, continents have moved slowly to their current locations.



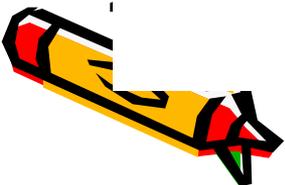
Pangaea about 200 million years ago, before it began breaking up. Wegener named the southern portion of Pangaea **Gondwana**, and the northern portion **Laurasia**.



The continents about 70 million years ago. Notice that the breakup of Pangea formed the Atlantic Ocean. India's eventual collision with Eurasia would form the Himalayan Mountains.

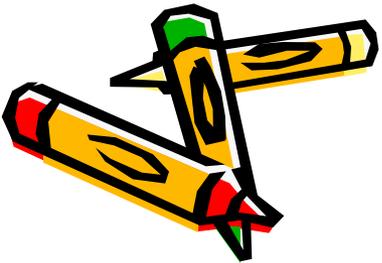
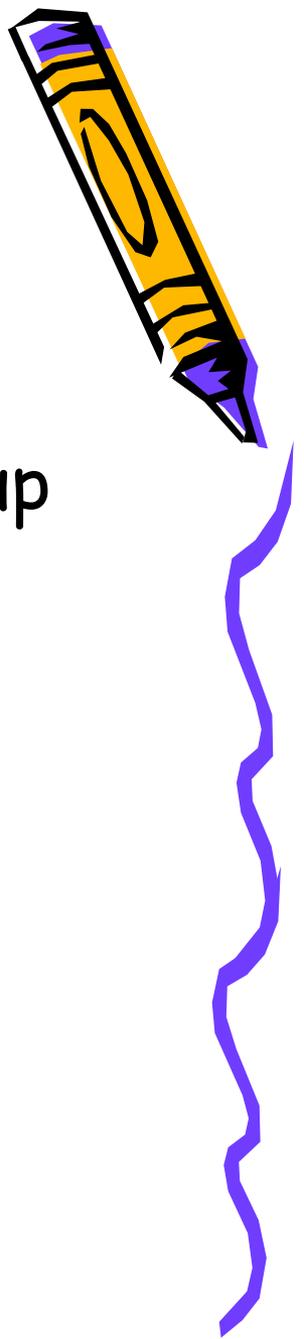


The position of the continents today. The continents are still slowly moving, at about the speed your fingernails grow. Satellite measurements have confirmed that every year the Atlantic Ocean gets a few inches wider!



Quick Check

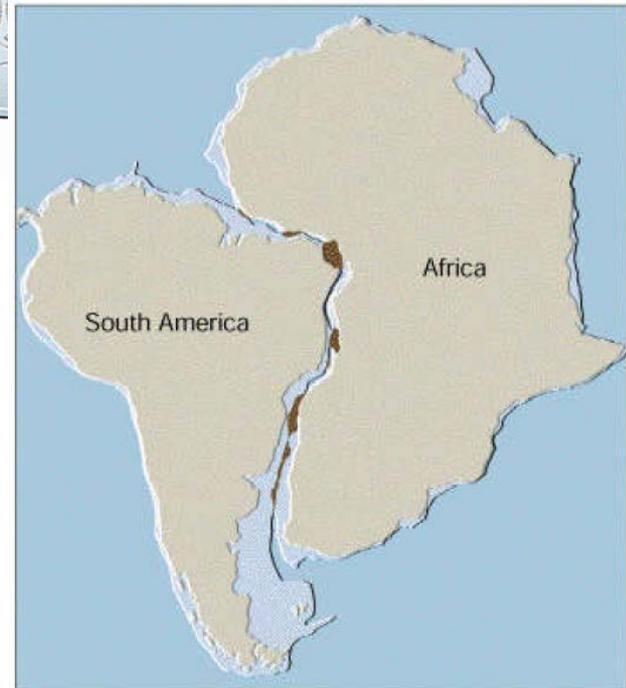
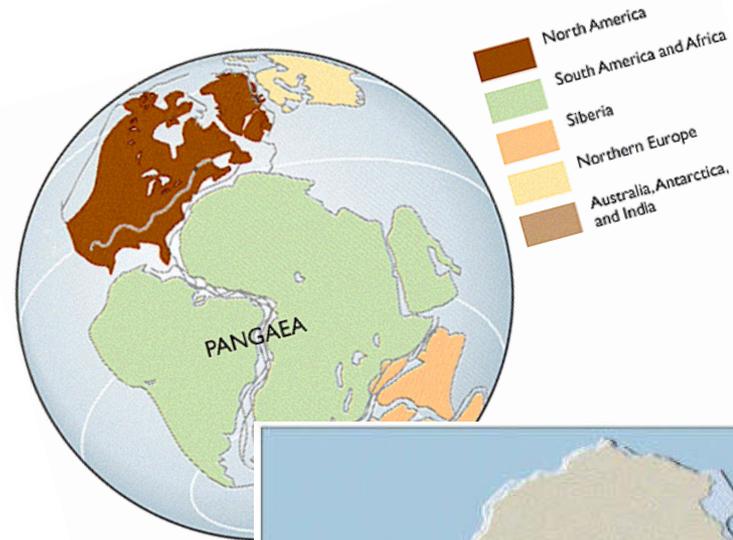
Turn and tell your neighbor who came up with the continental drift theory.



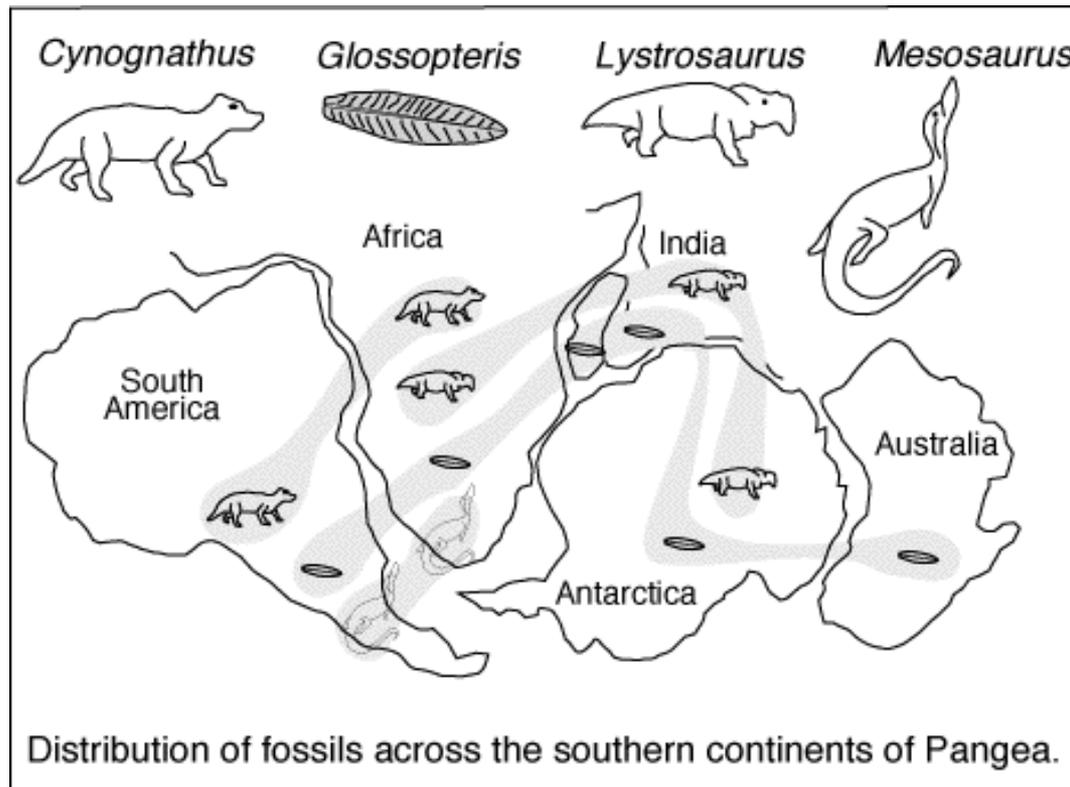
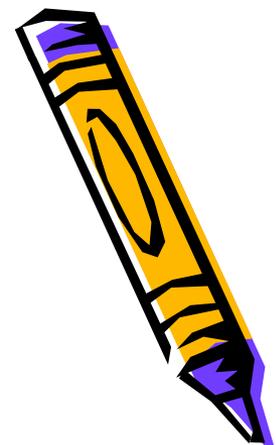
Wegener's Evidence for Continental Drift

Continents fit together like a puzzle....e.g. the Atlantic coastlines of Africa and South America.

The Best fit includes the continental shelves (the continental edges under water.)

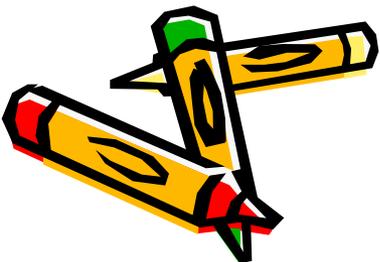


Wegener's Evidence for Continental Drift



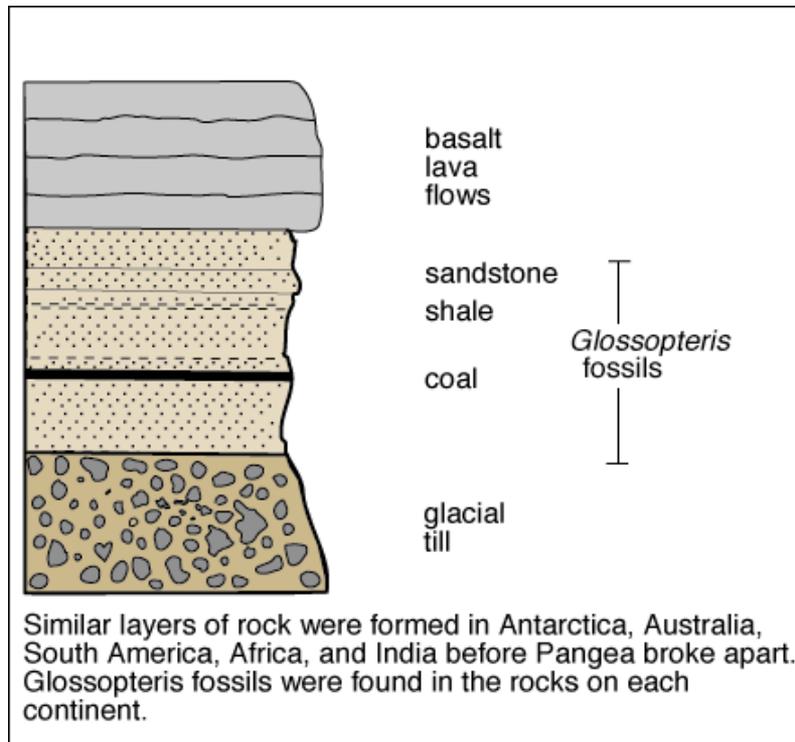
Picture from
http://volcano.und.edu/vwdocs/vwlessons/plate_tectonics/part3.html

Fossils of plants and animals of the same species found on different continents.

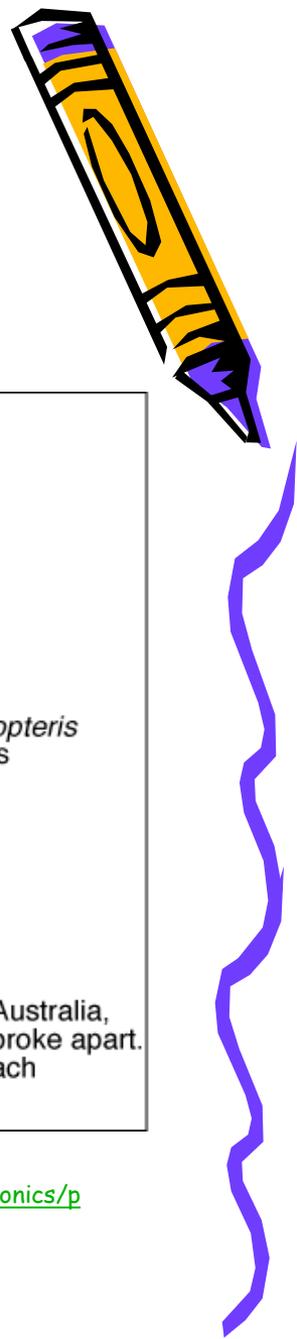
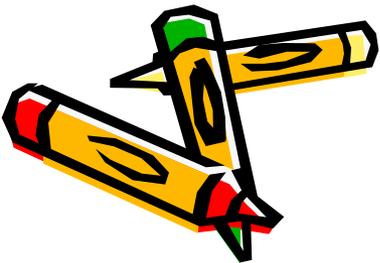


Wegener's Evidence for Continental Drift

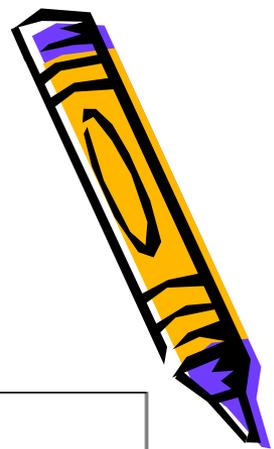
- Rock sequences (meaning he looked at the order of rock layers) in South America, Africa, India, Antarctica, and Australia show remarkable similarities.
- Wegener showed that the same three layers occur at each of these places.



Picture from
http://volcano.und.edu/vwdocs/vwlessons/plate_tectonics/art4.html

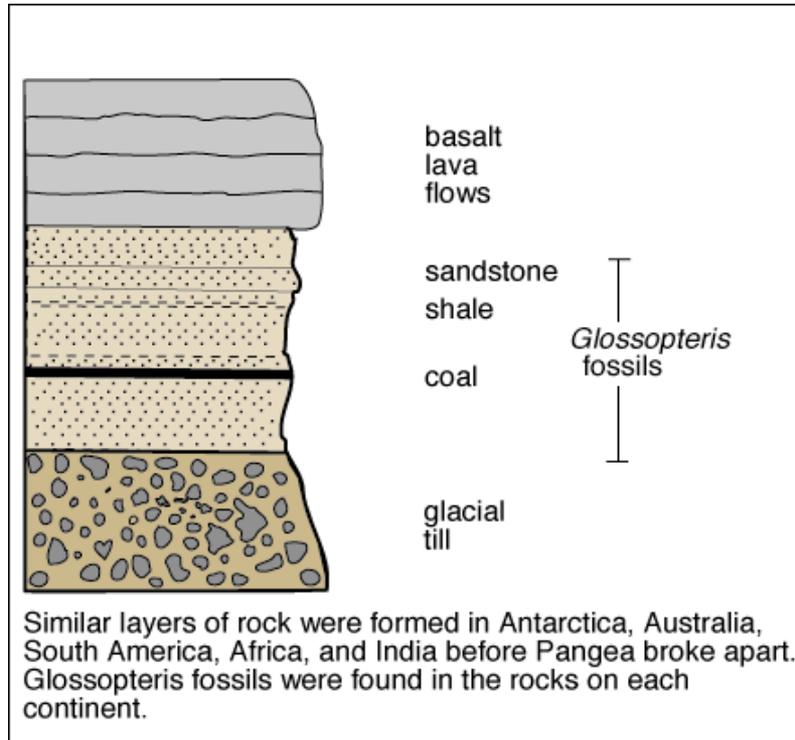


Wegener's Evidence for Continental Drift



- The same three layers are in the same order in areas now separated by oceans.
- Wegener proposed that the rock layers were made when all the continents were part of Pangea.
- He proposed that they formed in a smaller small joined land mass that was later broken and drifted

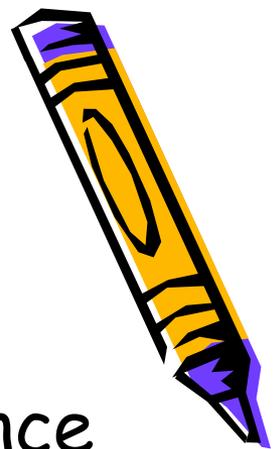
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Picture from
http://volcano.und.edu/vwdocs/vwlessons/plate_tectonics/part4.html



Seafloor Spreading

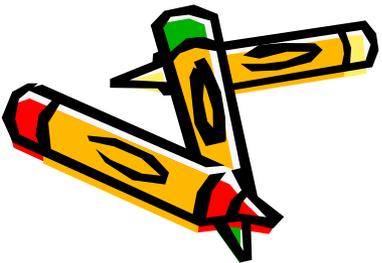
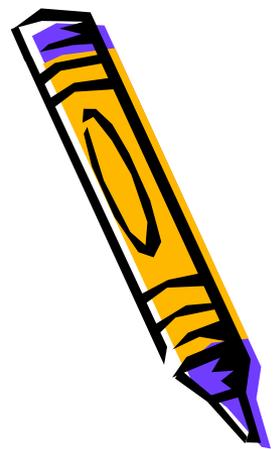
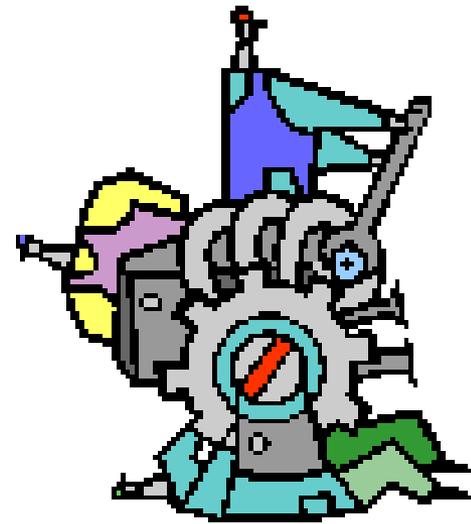


- Everyone agreed that Wegener's evidence was compelling. But wouldn't we feel the movement?
- Also, wouldn't there be evidence to show that the continents were still moving today?
- Wegener was a meteorologist and his theory was not well accepted. (He died on an expedition in Greenland collecting ice samples)



Seafloor Spreading

- One reason scientists had a hard time with Wegener's theory is that there was no mechanism for the continents motion.

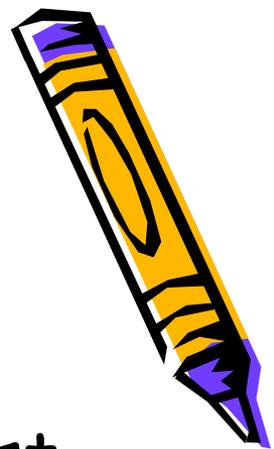


Seafloor Spreading



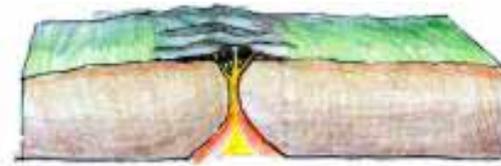
Picture from USGS
<http://pubs.usgs.gov/gip/dynamic/HHH.html>

- In the 1960's, a scientist named Henry Hess made a discovery that would vindicate Wegner.
- Using new technology, radar, he discovered that the seafloor has both trenches and mid-ocean ridges.
- Henry Hess proposed the seafloor spreading theory.



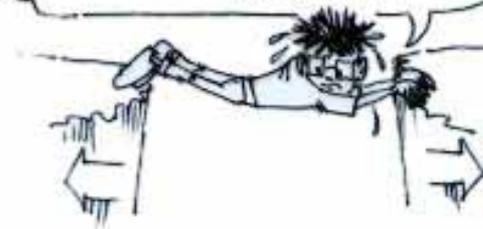
Seafloor Spreading

- Hess proposed that hot, less dense material below Earth's crust rises toward the surface at the mid-ocean ridges.
- Then, it flows sideways, carrying the seafloor away from the ridge in both directions.

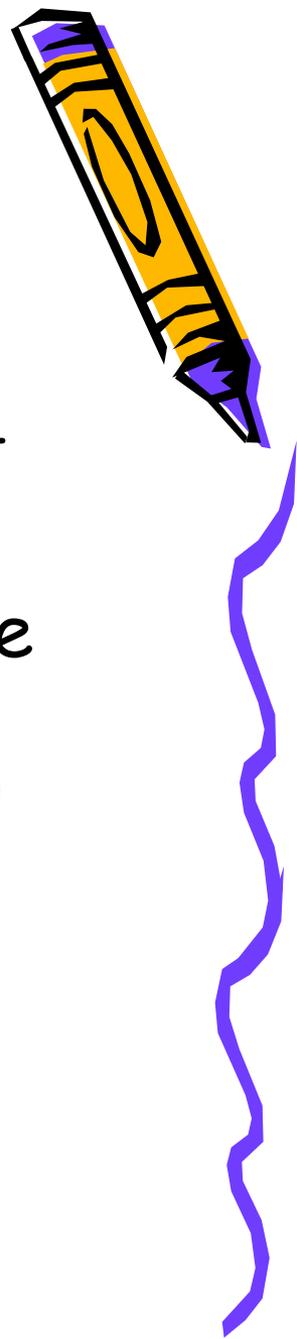


Sea Floor Spreading.....
It's tearing me apart.....

HELP!!



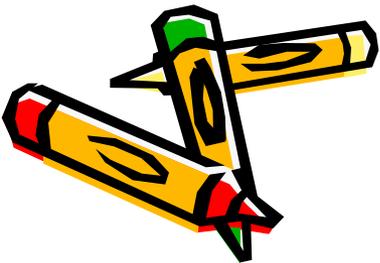
Seafloor Spreading



- As the seafloor spreads apart at a mid-ocean ridge, new seafloor is created.
- The older seafloor moves away from the ridge in opposite directions.
- This helped explain how the crust could move—something that the continental drift hypothesis could not do.

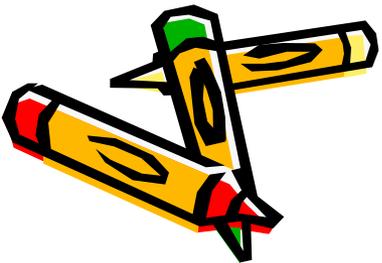
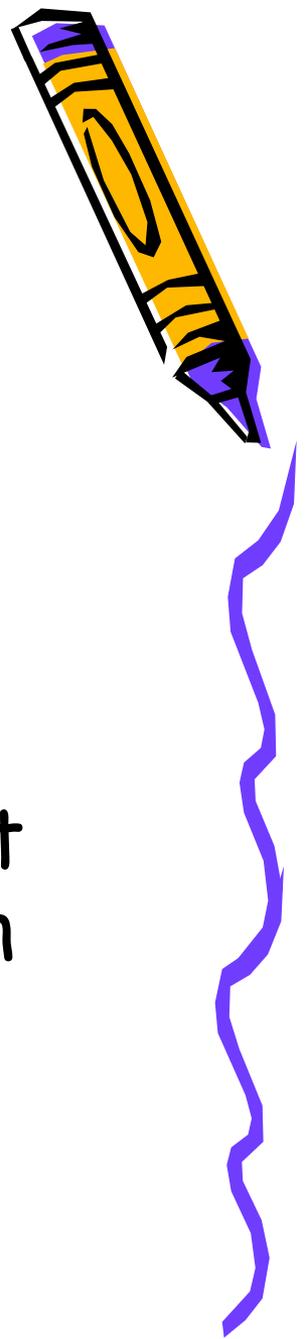


Picture from
<http://www.pbs.org/wgbh/aso/tryit/tectonics/divergent.html>



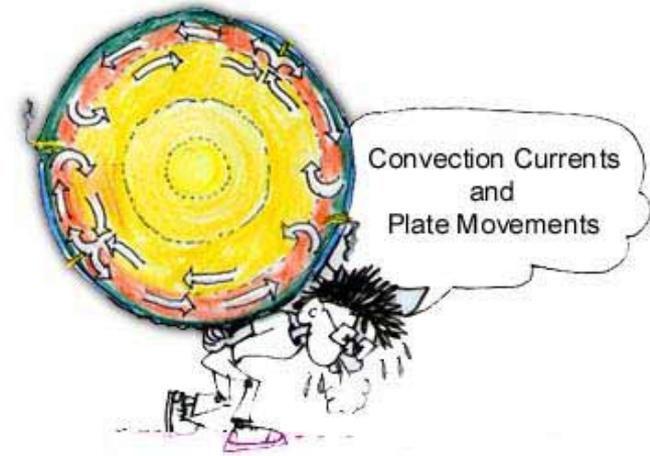
Evidence for Spreading

- In 1968, scientists aboard the research ship *Glomar Challenger* began gathering information about the rocks on the seafloor.
- Scientists found that the youngest rocks are located at the mid-ocean ridges.



Mechanism for Plate Tectonics

- Seafloor Spreading provided insight to the mechanism for how the continents moved.
- The magma which pushes up at the mid-ocean ridge provides the new land pushing the plates, and the subduction zones gobble up the land on the the other side of the plates.



Picture from
<http://library.thinkquest.org/17457/platetectonics/2.php>

The mechanism was
convection currents!

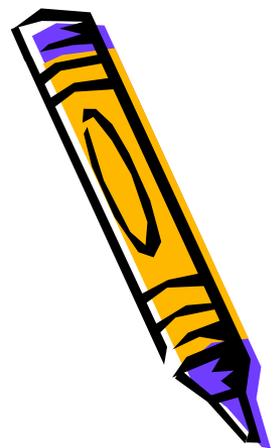
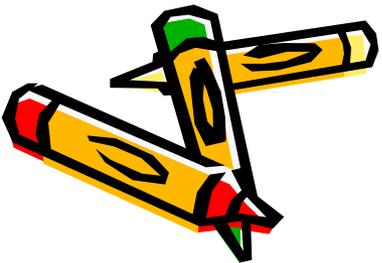


Plate Tectonic Theory

- Both Hess's discovery and Wegner's continental drift theory combined into what scientists now call the Plate Tectonic Theory.
- Theory of **plate tectonics**:
 - The Earth's crust and part of the upper mantle are broken into sections, called plates which move on a plastic-like layer of the mantle

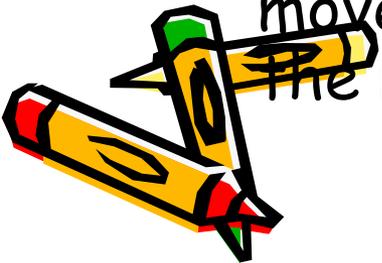
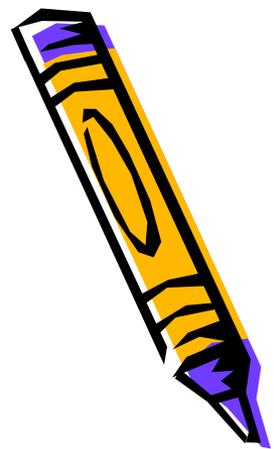
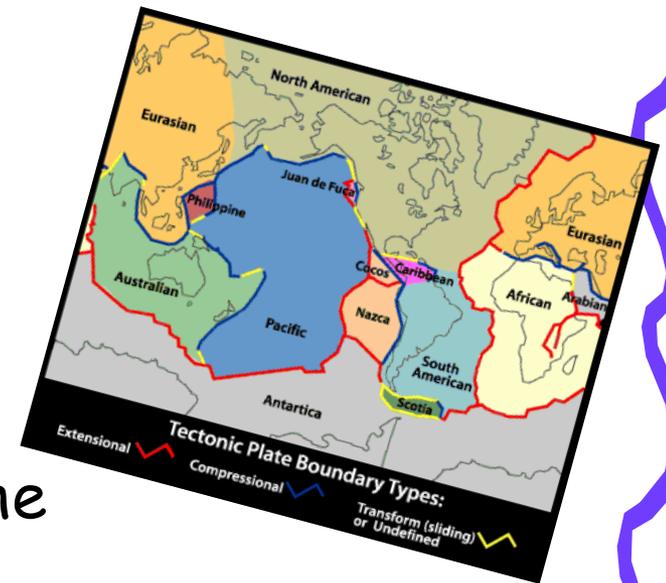


Plate Tectonic Theory

- Plate Tectonics explains
 - Earthquakes
 - Mountains
 - Volcanoes

