Inside the Earth

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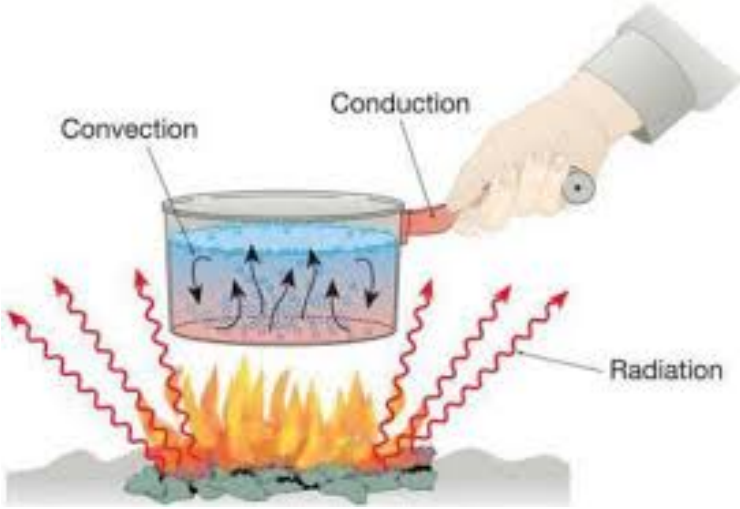
Ever wonder what's inside the Ear

- Mt Kilauea in Hawaii, Old Faithful in Yellowstone, earthquakes; all of these things can make people wonder…

- 2 main ways to learn about Earth's interior:
  - Rock samples (direct evidence) – deepest hole drilled is 12 km, take rock samples
  - Seismic waves (indirect evidence) – study the speed of the waves a d the path of the waves.

Convection and the Mantle

- There are 3 types of heat transfer:
- 1) radiation – transfer of energy through space (no direct contact)
- 2) Conduction – heat transfer between materials that are touching (spoon in pot)
- 3) Convection – heat transfer by movement of currents within a liquid (or a gas).



Convection

- Caused by differences in temperature and **density** of the fluid.
- Heat from the core and the mantle itself causes convection currents in the mantle.
- Deep in mantle its hot, hot material rises, causes current to move up. Then when material is up, it cools and then begins to sink again, causing current to move down
- These currents are the driving force for plate tectonics

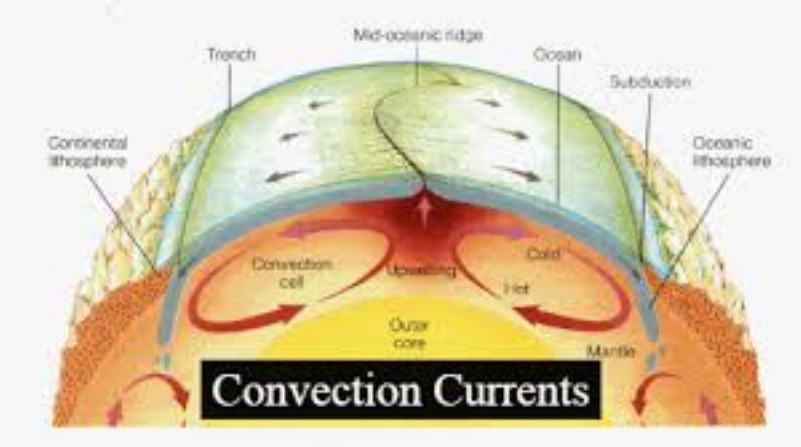
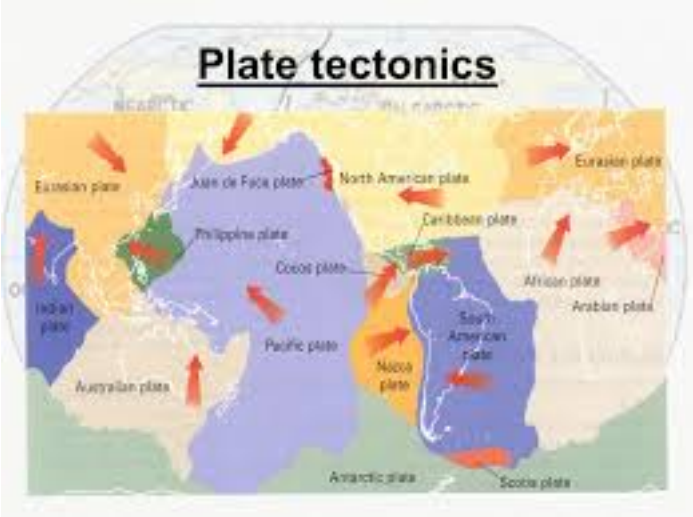


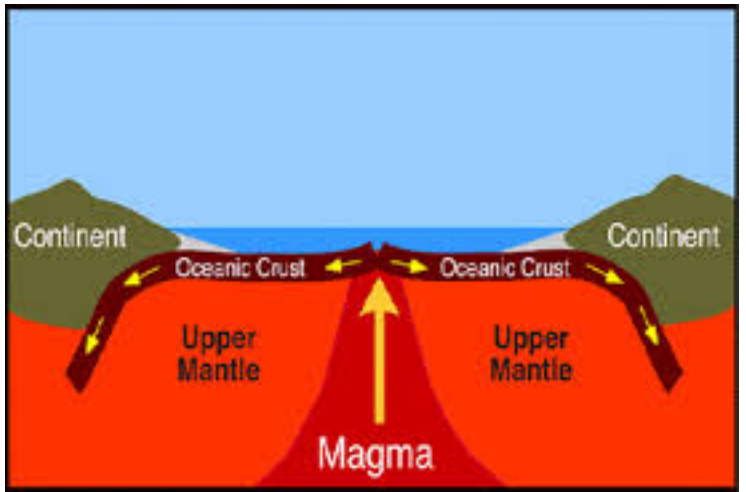
Plate Tectonics

- Alfred Wegener hypothesized that continents **were** once joined together in a single land mass and **have** since drifted apart. (Pangaea)
- He studied field features, fossils, an evidence of climate change.(1915)
  - Mountain ranges matched up (Africa and S america); fossils of shallow marine life on an actic island; evidence of glaciers in South Africa
- But he couldn't explain the source of the force



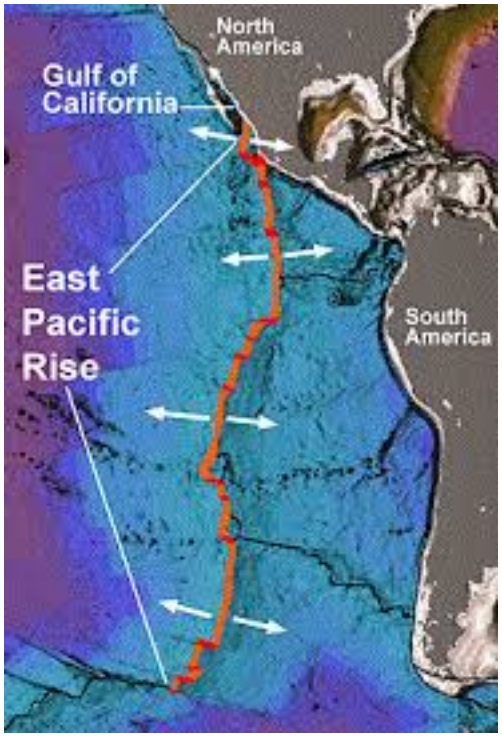
Sea Floor Spreading

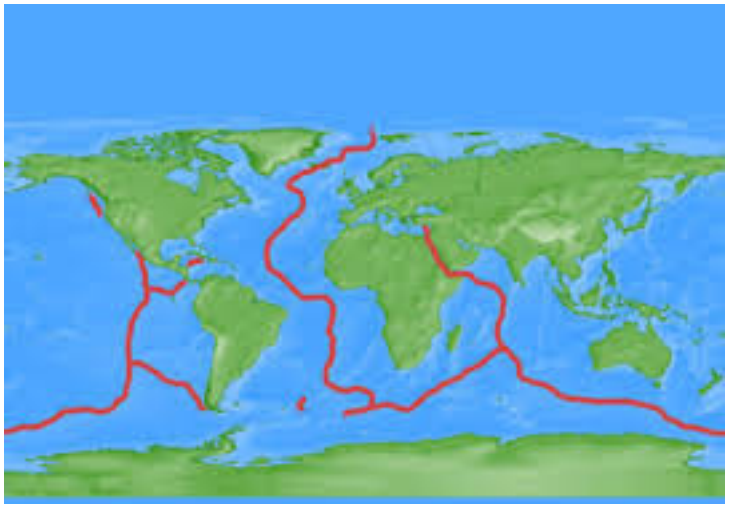
- This is where new ocean floor is created.
- Convection from the mantle drives two plates away from each other.
- The gap is filled with magma that reacts with the cold ocean water
- This creates black plumes of smoke on the ocean floor. “Black Smokers” and
- Extremophiles live in this environment



Where does this occur?

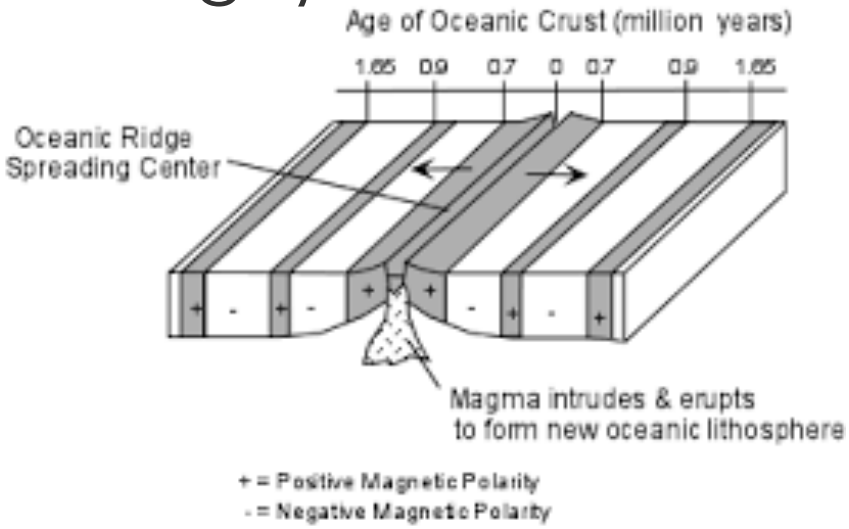
- All over the planet.
- East Pacific Rise and Mid Ocean Ridge.
- These are mapped by SONAR. (sound waves that bounce off of the surface)





Evidence of Sea Floor Spreading

- Scientists dove to ocean floor (Alvin), and found strange rocks that looked like pillows (pillow basalt)
- Magnetic stripe patterns in the rocks on ocean floor. Earth's magnetic poles reverse themselves (780,000 years ago).
- pieces of Fe line up)



Subduction at Trenches

- Part of the ocean floor sinks back into mantle **at** deep ocean trenches.
- Oceanic crust is denser that continental crust, so it goes down under continent.
- Subduction and Sea Floor Spreading are recycling Earth's crust continuously

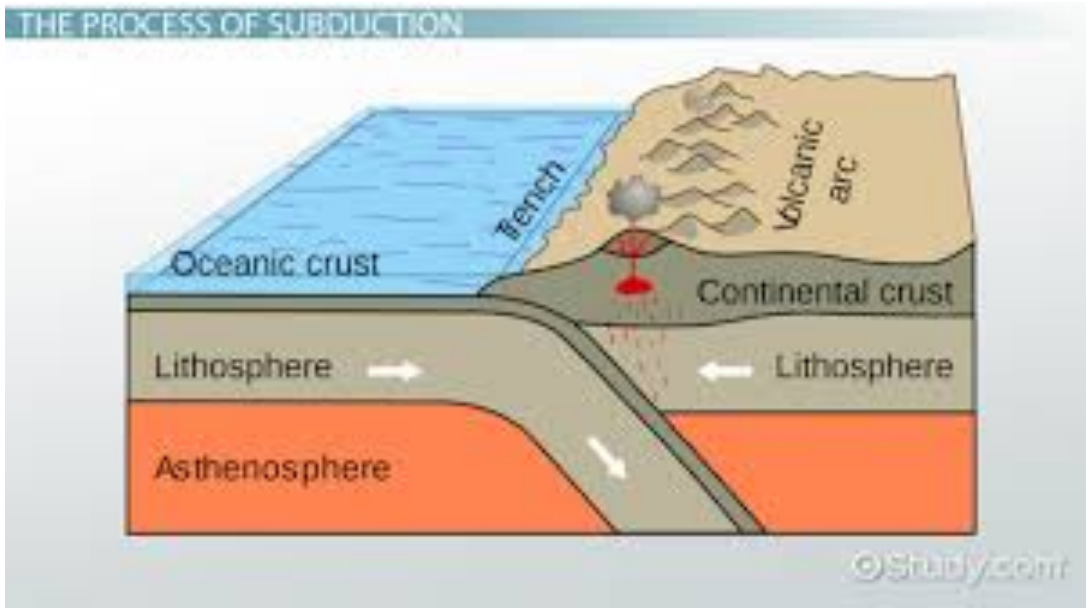
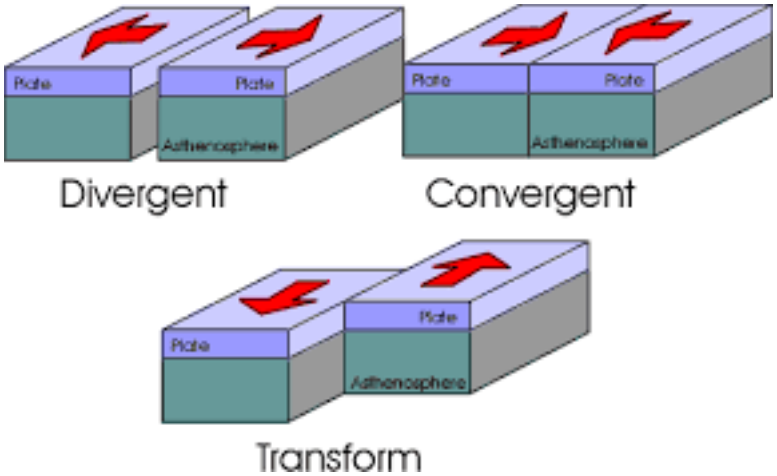


Plate Tectonics

- Lithosphere is cracked and brittle and made up of **"plates"**
- At the edges of the plates, there are faults.
- 3 types of plate boundaries:
  - 1) spreading – divergent (moving away) tensional forces create this
  - 2) colliding – convergent (moving towards) compressional forces
  - 3) sliding – two plates slide past each other, moving in opposite directions. (transform)



Videos

- https://www.youtube.com/watch?v=888nbjvkNts
- https://www.nps.gov/havo/planyourvisit/lava2.htm longer hawaii video
- https://www.youtube.com/watch?v=B1isqV-RE8M yellowstone
- https://www.youtube.com/watch?v=p0dWF_3PYh4 convection and plate tectonics
- https://www.youtube.com/watch?v=o1Y2mu0qrus pillow lava in rocks
- https://www.youtube.com/watch?v=MY1d5Saqrc4 extremeophils