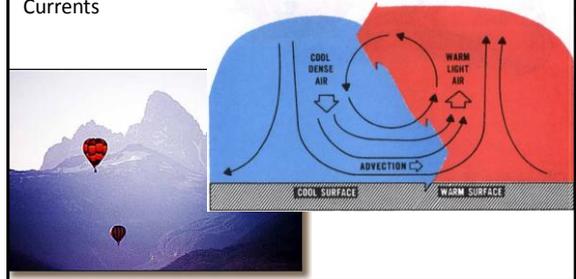


Earth's Structural Key Elements & the Hazards of Plate Movement

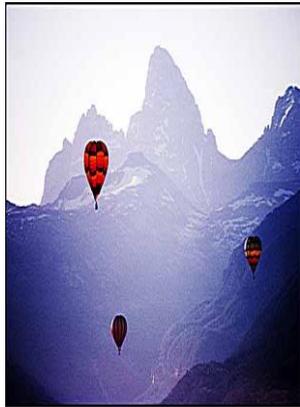
AICE EM: Lithosphere
Key Content 1 & 2

Before We Begin, You Need to Understand These Terms:

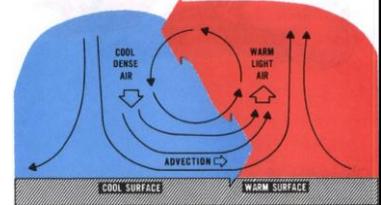
- Density
- Convection Currents



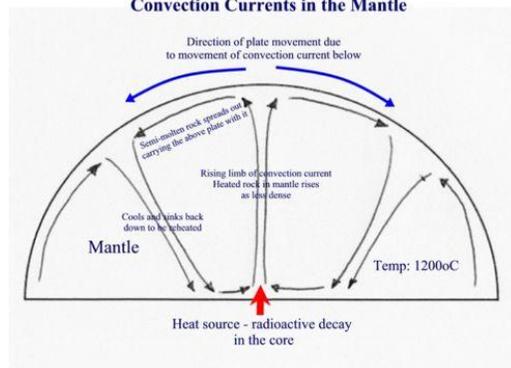
- Density: heat rises, so this causes many of the Earth's cycles



- Convection Currents: plates move due to the constant cycling of magma beneath the Earth's crust



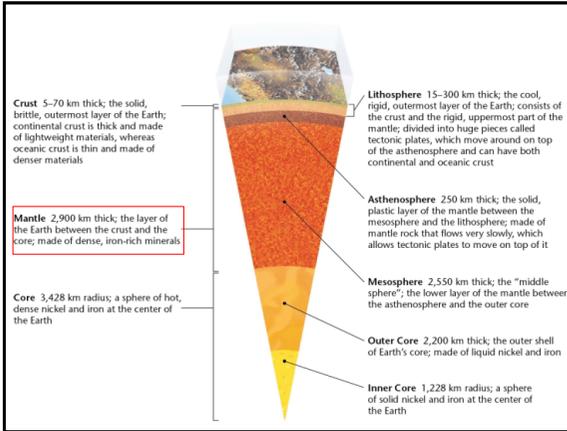
Convection Currents in the Mantle



Convection Currents Cause Motion

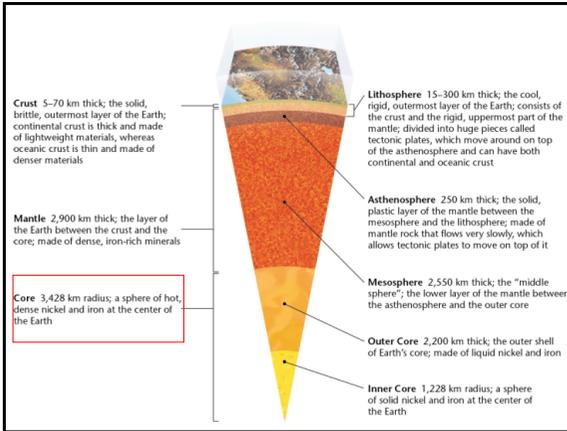
Picture drawing an arrow from the base of the fountain up and out in any direction that the water flows. This is the possible path for convection currents. When you see the next slide, it is a cross section of the planet.





Core

- 3,428km in radius
- Incredibly hot sphere of very dense nickel and iron
- Center of the Earth
- Likely composed of giant crystals of metal running North to South
- Convection of core likely gives rise to Earth's magnetic fields



Chemical vs. Physical Layers of Earth

- Physical: modern way of thought with more detail and more layers.
- Outside to inner: Lithosphere, Asthenosphere, Mesosphere, outer core, inner core
- Alternating physical layers

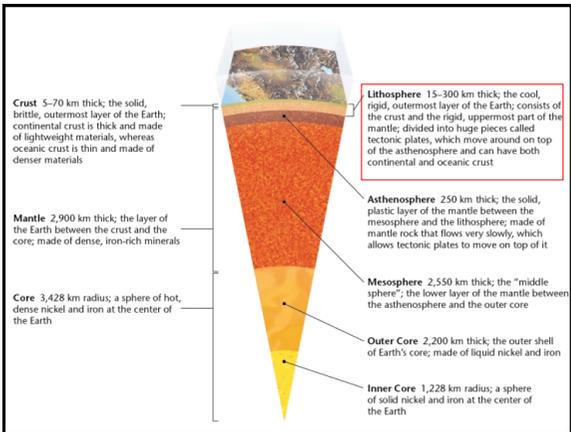
Modern (Physical State)

150 km
700 km
2900 km
6100 km
6370 km

Lithosphere
Asthenosphere
Lower Mantle (Mesosphere)
Outer Core
Inner Core
Solid
Liquid
Solid
Solid

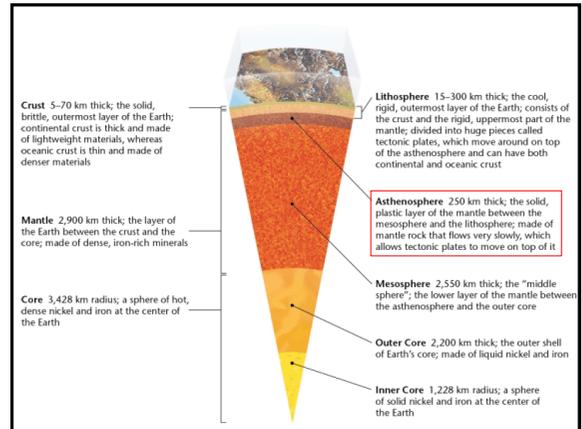
Lithosphere

- Crust and outer, rigid mantle-- roughly solid
- 15-300km thick
- Divided into tectonic plates which float on the asthenosphere
- Continental and oceanic crust



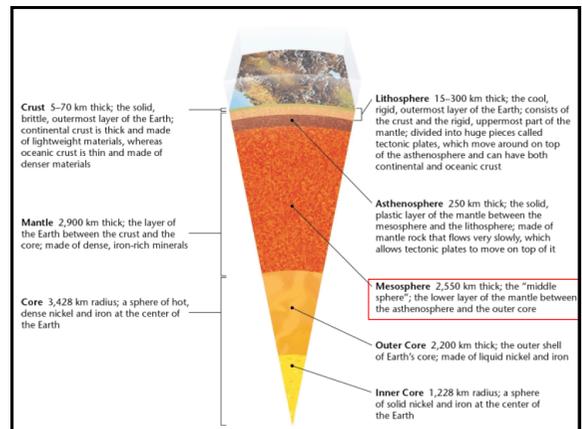
Asthenosphere

- Section below lithosphere: upper mantle
- Potentially 250-600km thick
- Very high temperatures make it fluid, but high pressures keep it plastic
- Made of mantle rock that flows very slowly
 - Convection cells from flowing cause movement of tectonic plates
 - Movements can cause the brittle lithosphere to crack (faults)



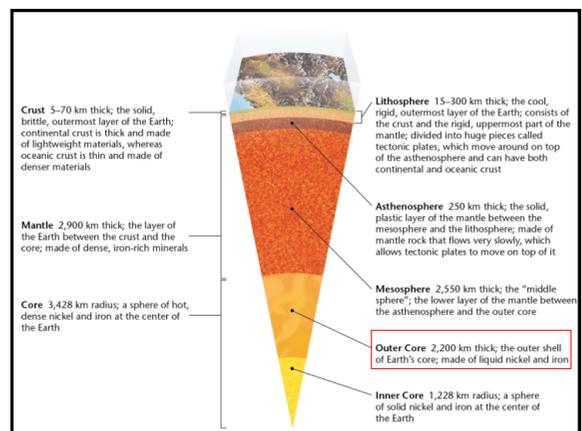
Mesosphere

- The "middle sphere"
- Lower mantle below Asthenosphere and above core
- 2,550km thick
- Higher temperatures and pressure means different physical characteristics from Asthenosphere
 - Denser and more rigid, less plastic
- Outer boundary has high levels of seismic activity



Outer Core

- Liquid layer below mantle
- 2,200km thick
- All of core is nickel and iron alloys, but in the outer core temperatures are high enough to melt these compounds
- Very low viscosity fluid (10x lower than in liquid metals at surface)
- Convection and eddy currents likely give rise to the Earth's magnetic field



Inner Core

- Solid innermost layer of the Earth comprised of iron and nickel alloys
- 1,228km radius
- Incredibly high pressure from layers above crowd atoms, preventing liquid even at high temperatures
- Many radioactive metals give rise to Earth's heat
 - As radioactive decay occurs, energy given off as heat

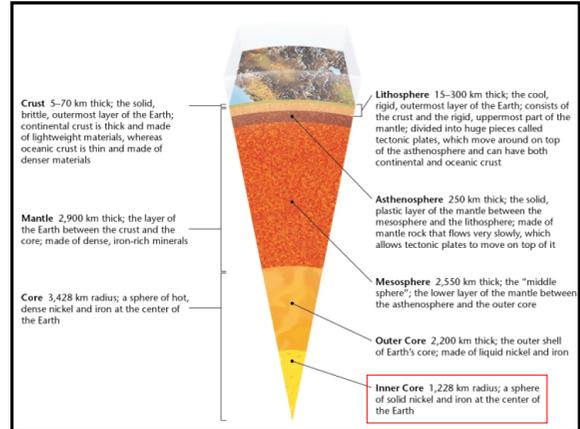
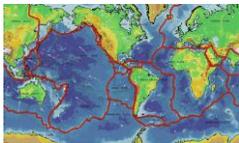


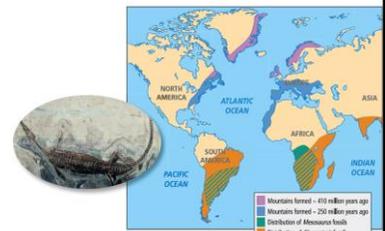
Plate Tectonics

- Theory that the Earth's lithosphere is made of giant plates that move on the plastic asthenosphere below
- Remember: scientific "theory" is MUCH better than a guess!
 - Incredibly well supported by evidence



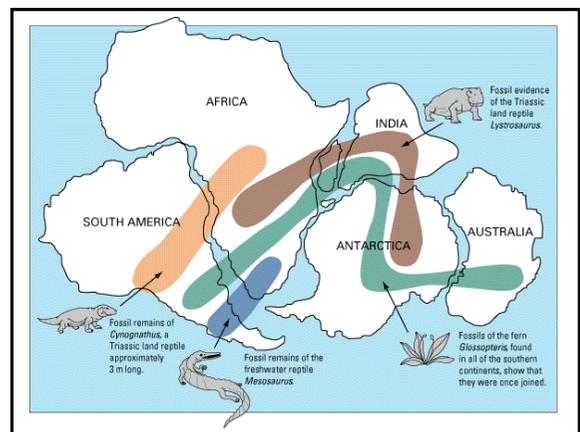
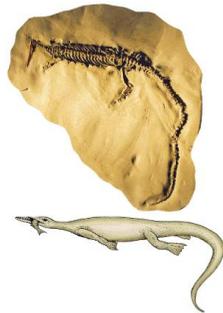
- In 1912 Alfred Wegener - hypothesis of continental drift
- Suggested land bridges and that the planet was contracting and cracking
 - Theory was originally opposed because Wegener's mechanism was disproved

The Evidence



Fossil Evidence

- Fossils from the same organisms found in opposite ends of the Earth
- Species similarities would only make sense if continents joined at one point



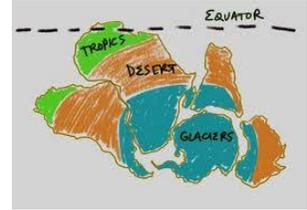
Rock Formations

- Rock formations on continents that once touched are very similar or contain the same materials



Climatic Evidence

- Parts of the Earth that once touched have very similar climate bands in the geological history



Geographic Evidence

- Continents are like puzzle pieces that fit together

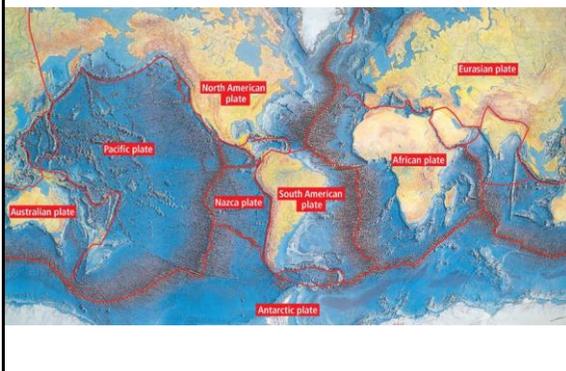


Mechanisms of Plate Tectonics

- Various ways the plates move and interact depends on where the plate is located and what convection currents are beneath them

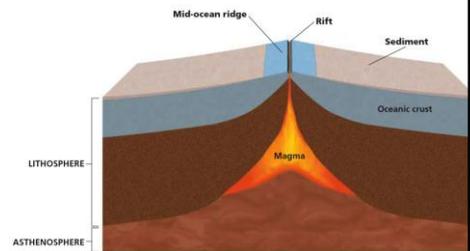


Continents in Motion

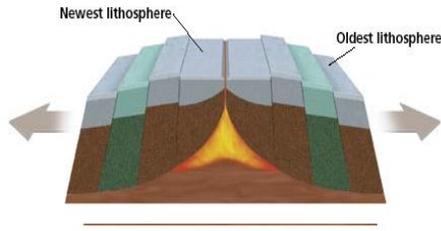


Mid-Ocean Ridges

- Oceanic mountain ranges formed by plates pulling apart

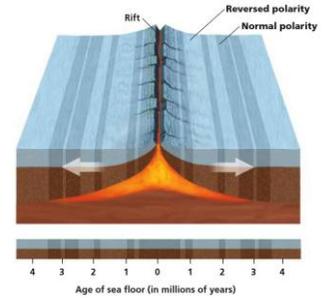


MORs – How They Cause Sea-Floor Spreading

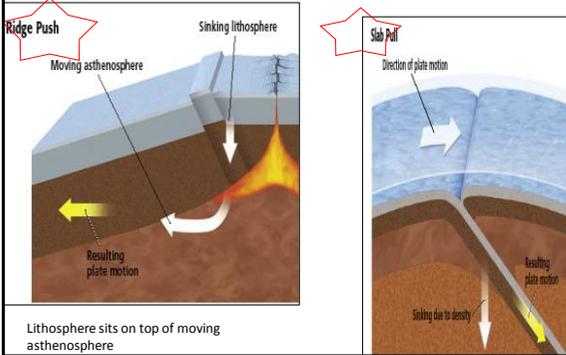


More Evidence

- **Paleomagnetism**
 - Normal polarity
 - Reversed polarity
 - MORs have alternating magnetic fields



Sea-floor Spreading Also Causes Motion

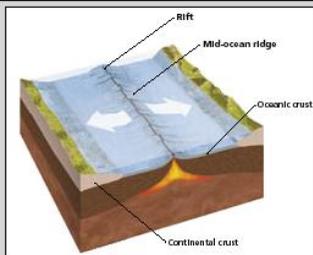


Boundary Types

- **Convergent**
- **Divergent**
- **Transform**
- **Constructive**
- **Destructive**
- **Conservative**

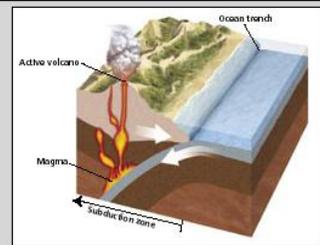
Type of Margin	Divergent	Convergent	Transform
Motion	Spreading	Subduction	Lateral sliding
Effect	Constructive (oceanic lithosphere created)	Destructive (oceanic lithosphere destroyed)	Conservative (lithosphere neither created or destroyed)
Topography	Ridge/Rift	Trench	No major effect
Volcanic activity?	Yes	Yes	No

Divergent Boundary



Note location of MOR, rift valley, oceanic & continental crust

Convergent Boundary



Note: ocean trench, active volcano, magma, subduction zone.

