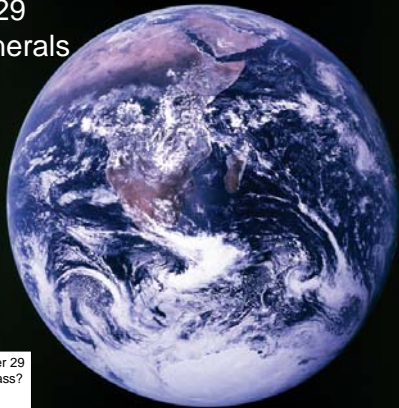
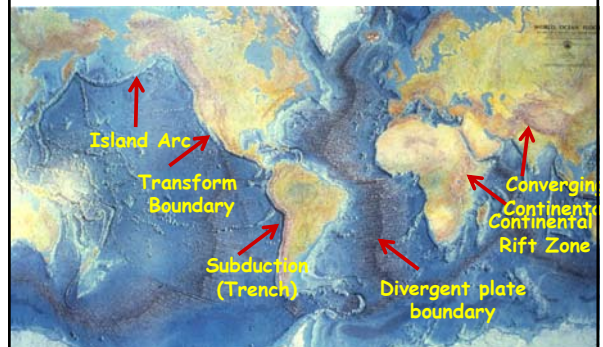


Chapter 29
Earth Minerals

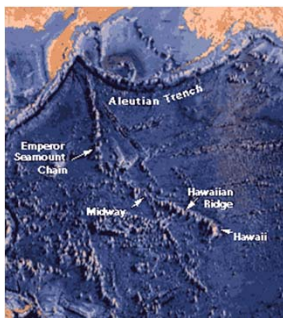


Did you read chapter 29 before coming to class?
A. Yes
B. No

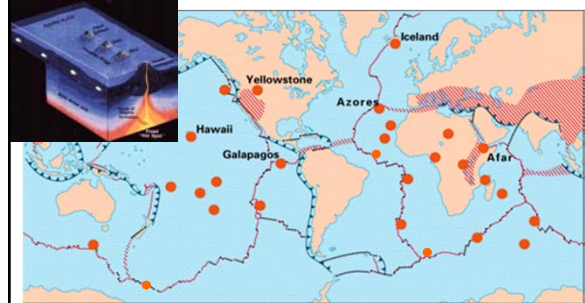
Lets play "Name that boundary"!



Explain the processes that formed the undersea mountain range that begins in Hawaii



Other "Hot Spots" around the world



The interior structure of Earth has been determined mostly from

- a) Drilling
- b) Exploration
- c) X-Rays
- d) Earthquake waves
- e) Chemical analysis

What causes the S-wave shadow zone?

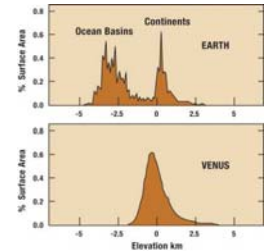
- A. The distance is too far to sustain any amplitude
- B. The waves refract and are directed away
- C. The waves reflect back to the epicenter
- D. Shear waves cannot pass through the liquid outer core

What is different on earth (as opposed to other planets)?



Continents

- Why does the Earth have continents?
- Because it has **WATER** and sufficient **INTERNAL HEAT!**
- Water is necessary to make granite, and granite is what continents are made of



The best estimate that science gives for the age of the earth is

- Several thousand years
- Several million years
- Several billion years
- Several trillion years

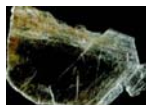
Rocks from the moon date to about 4.6 billion years, but on earth the oldest we find is about 4 billion. Why are Rocks on Earth Younger?



- It has a **Tectonic System**
- It has a **Hydrologic System**

What is the Earth made of?

- Mostly Oxygen, Silicon, and Iron
 - Near the surface, iron is less common
- Atoms combine to form "Minerals"
- Minerals combine to form "Rocks"



A Mineral

- Is naturally occurring
- Is an inorganic solid
- Has a fixed or narrowly limited chemical composition
- Has a definite internal crystal structure
- Has some stability limits in the face of varying pressure, temperature, or in the presence of water



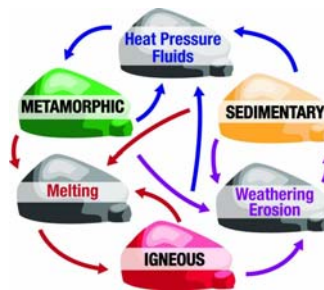
What are the main types of Rocks?

- **IGNEOUS ROCKS** - Form from hot, liquid magma
 - Plutonic: Cools below surface
 - Volcanic: Cools on surface
- **SEDIMENTARY ROCKS** - Form as layered deposits in oceans, lakes, and on land
- **METAMORPHIC ROCKS** - Form when pressures, temperatures and fluids change rocks in the solid state



PRESSURE

The Rock Cycle



Common Igneous Rocks

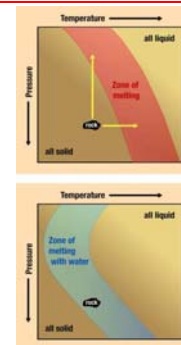
- **GRANITE**
 - High in Si
 - Low in Fe, Mg
 - Low Density
- **BASALT**
 - Lower in Si
 - Higher in Fe, Mg
 - Higher Density
- **PERIDOTITE**
 - Lowest in Si
 - Highest in Fe, Mg
 - Highest Density



Why is granite generally lighter in color than basalt or peridotite?

The kind of magma that forms to create igneous rocks varies

- Melting temperature depends on:
 - Pressure
 - Temperature
 - Amount of water present
- This is the reason we can make granite from basalt.



Common Sedimentary Rocks

- **SHALE**
 - Clay-sized particles
- **SANDSTONE**
 - Sand-sized particles
- **CONGLOMERATE**
 - Pebbles & cobbles
- **LIMESTONE**
 - Precipitates out of water



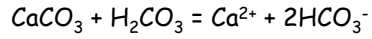
Weathering

- The formation of sedimentary rock requires weathering of older rock



Weathering can also take place as chemical reactions

Calcite in contact with ground water (Carbonic acid)



Limestone caverns form as groundwater dissolves the rock



When underground caverns collapse, we get sinkholes



San Joaquin Valley is sinking



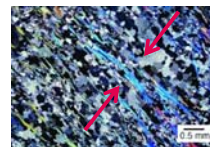
Common Metamorphic Rocks

- **SLATE**
 - Formed from Shale
- **QUARTZITE**
 - Formed from Sandstone
- **GNEISS**
 - Formed from Shale or Granite
- **MARBLE**
 - Formed from Limestone



You can get striping without being sediment layers

- When pressure is different in the different directions, crystals tend to grow along the lower pressure direction



Metamorphic rocks are exposed in tectonic processes

- Formation occurs deep (~10 km)
- Convergent boundaries force the rock up, and weathering exposes it.

