**Plate Tectonics:**

**Unit 2: Earth’s History**

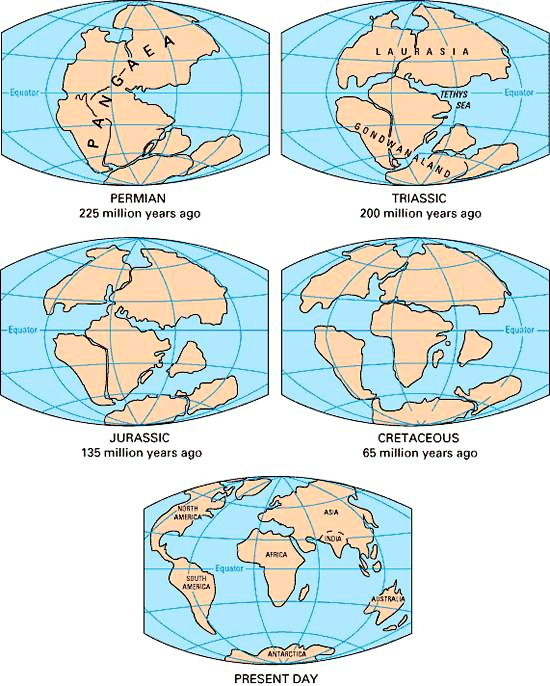
**Mini-Unit:** Plate Tectonics

**Goal 2**:The student will demonstrate the ability to explain the Theory of Plate Tectonics and relate it to Earth’s dynamic nature

**Objectives – The student will be able to:**

* Summarize the evidence and thinking the resulted in the development of the Theory of Plate Tectonics
* Explain plate tectonics in terms of magnetic reversals and outer core circulation, mantle convection, sea floor spreading, and subduction
* Describe how the Theory of Plate Tectonics explains the location of earthquakes, volcanoes, hot spots, mountains, mid-ocean ridges, deep sea trenches, and island arcs
* Give examples of how progressive changes on Earth’s surface, including Pangea, are used to document the evolution of Earth through time

**Textbook:** Unit 4, Chapters 10, p. 238

Continental Drift:

Theory of Continental Drift:

Proposed by Alfred Wegener in 1912; the hypothesis that states that the continents once formed a single landmass (Pangea), broke up, and drifted to their current location

Wegeners’s Evidence:

1. Shape of the continents
2. Fossil evidence that showed up on both sides of the Atlantic
3. Rock formations that showed up on both sides of the Atlantic
4. Climatic evidence (i.e. evidence of glaciers in Southern Africa)

Problems with Theory:

He could not come up with the mechanism or process that allowed the continents to move

Missing Evidence:

1. Mid-Ocean Ridges – a long, undersea mountain chain that has a steep, narrow valley at its center, that form as magma rises from the mantle, and that creates new ocean floor as tectonic plates move apart
2. Sea Floor Spreading – The process by which new oceanic crust forms as magma rises to Earth’s surface and solidifies at a mid-ocean ridge, symmetry of rock layers show oldest layers are farther from the mid-ocean ridge
3. Paleomagnetism –
   * As magma solidifies, iron particles lines up with the Earth’s magnetic field
   * Rocks show reversals in the Earth’s magnetism
   * Rocks show symmetrical patterns on both side of the ridges, thus both plates formed at same time

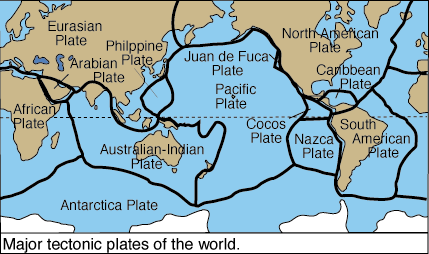
How Continents Move:

Plate Tectonics – the theory that explains how large pieces of the crust, called plates, move and change shape

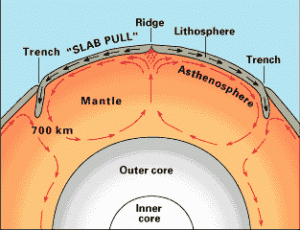
Lithosphere – solid, outer layer of Earth that consists of the crust and the rigid upper part of the mantle

Athenosphere – the solid, plastic layer of the mantle the flows slowly

Tectonic Plates – scientists have identified 15 major plates



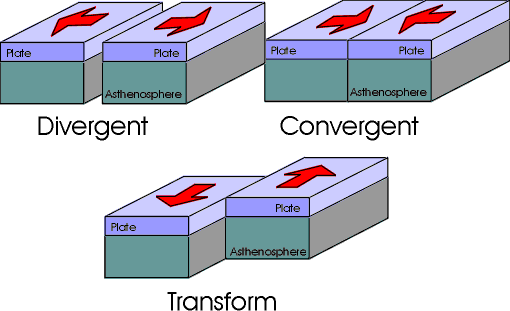
Causes of Plate Motion:

 Convection – the movement of hot, less dense material up and cold, more dense material down

Mantle Convection:

* Interior of the Earth heats the mantle which rises to the surface at Mid-Ocean Ridges
* Cools into rock and eventually sinks back into the mantle where it is melts and sinks
* This movement of the mantle drags the plates with it

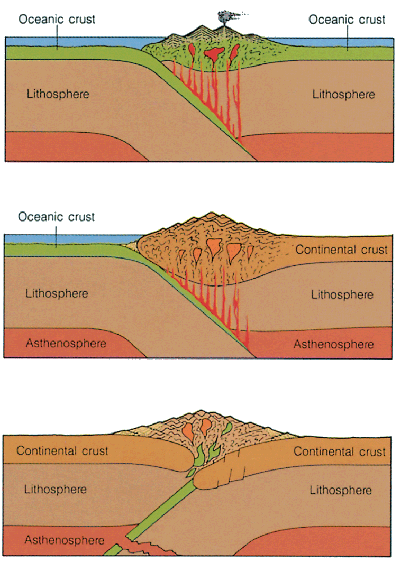
Plate Boundaries:



Divergent Boundaries: The boundary between tectonic plates that are moving away from each other

Results in: magma rises to surface, forms mid-ocean ridges and rift valleys

Convergent Boundaries: The boundary between tectonic plates that are moving towards each other



1. Oceanic-Oceanic – one plate subducts under the other, forming a trench and melting the plate causing an island arc
2. Oceanic-Continental – the oceanic plate subducts under the less dense continental plate, the oceanic plate melts, causing volcanoes above
3. Continental-Continental – neither plate is dense enough to subduct, thus mountains are built up

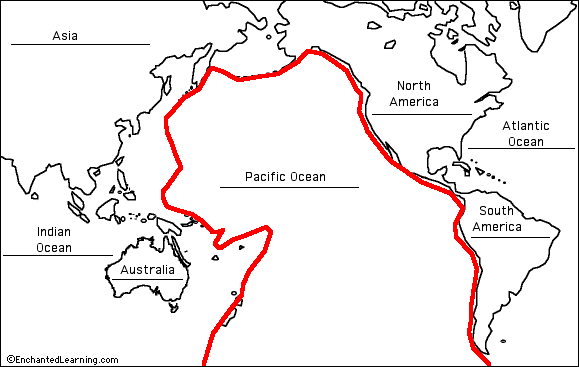
Transform Boundaries: The boundary between two tectonic plates that are sliding past one another, like the San Andreas fault

Results of Plate Tectonics:

Earthquakes – created by the sudden movement of tectonic plates, typically occur along plate boundaries

Volcanoes – places where magma erupts from the surface

Ring of Fire – an area around the Pacific Ocean characterized by volcanoes and seismic activity



Hot Spots – Areas where magma reaches the surface, under the plates so the plates do not move, creates island arcs like Hawaii

