7th Grade Unit 4: Restless Earth

*Lesson 1: What are Earth’s layers?*

*Vocab: crust, mantle, convection, core, lithosphere, asthenosphere, mesosphere*

3 layers based on chemical composition:

* Core- form the mantle to the center of Earth
	+ Mostly made of iron and some nickel
	+ May have some oxygen, silicon, aluminum, magnesium
	+ The densest layer
	+ ⅓ of Earth’s mass
	+ Mantle- located between the core and the crust
		- Region of hot flowing rock
		- Convection currents happen here
		- Convection- movement of matter caused by temperature differences
		- Warm matter rises b/c it is less dense and cool matter falls b/c it is more dense
		- Made of larger amounts of magnesium and aluminum
* Crust- the solid outermost layer of Earth
	+ 2 types: continental (land) and oceanic (under oceans)
	+ Both types are mostly oxygen, silicon, and aluminum
	+ The oceanic crust is more dense and has 2x the iron, calcium, and magnesium
* aka. Compositional layer

Physical layers are defined by their physical properties (state of matter, temp. etc.)

* Inner core
	+ Solid and the most dense
	+ Center of the Earth is 6,380 km below the crust
* Outer core
	+ Liquid outer layer of the core
* Mesosphere
	+ Lower part of the mantle
	+ Rock flows more slowly here than in the asthenosphere
* Asthenosphere
	+ Layer of weak or soft mantle made of rock that flows slowly
	+ Tectonic plates move on this layer
* Lithosphere
	+ Outermost rigid layer; solid rock
	+ Divided into tectonic plates
	+ Made of 2 parts the rigid upper mantle and the crust



*Lesson 2: What is plate tectonics?*

*Vocab: Pangea, sea-floor spreading, plate tectonics, tectonic plates,*

*convergent boundaries, divergent boundaries, transform boundaries, convection*

Evidence for Continental drift or the continents moving

* Continents look like puzzle pieces that should fit together
* Fossils of the same species are found on continents on different side of the Atlantic ocean (species that could not have crossed an ocean)
* Locations of mt. ranges and rock formations
* Sedimentary rock evidence of climate conditions on several continents (plants in Antarctica)

Pangea- a supercontinent that existed 245 MYA

* During the time of Pangea there was only one ocean, Panthalassa
* 200 MYA a rift formed and created 2 continents, Laurasia and Gondwana
* Drifted further apart forming the Atlantic ocean 150 MYA
* Continents collided into other continents creating mt. ranges

Discoveries that supported Alfred Wegener’s idea

* Harry Hess mapping the ocean floor; discovered the mid-Atlantic ridge
* Led to the theory of plate tectonics
* Rock samples from the mid-Atlantic ridge show that youngest rocks are near the crack and the oldest are nearest the continents on either side
* The rocks show magnetic patterns that are mirror images on either side
* Sea-floor spreading- process where molten rock is rising to the crack/ridge where it cools to form new oceanic crust
	+ As the sea floor moves and expands the continents move
* Ocean trenches are places where oceanic crust is going under continental crust and back into the mantle
	+ Oldest rock is pushed under the continent and recycled
	+ This conveyor belt of rock is why rock is being made but Earth doesn’t get any bigger

Plate tectonics- describe the large scale movement of the Earth’s lithosphere, which is broken into plates (tectonic plates)

* Plates move on the asthenosphere
* Ex. N. American, Nazca, S. American, African, Australian, Eurasian, Indian, Antarctic, Pacific
* Some have continent and ocean some only have one type
* Ocean plate is more dense than continent so it will sink down 

3 types of boundaries

Convergent boundaries- area where 2 plates push together (collide)

* 3 types
* Continent to continent- very thick plates buckle and thicken to create mountains
* Ocean- to continent- thin dense oceanic plate is forced under thick less dense continental plate creates a subduction zone; volcanoes occur here due to hot spots caused by friction
* Ocean to ocean- the older denser plate will go under the younger less dense plate; creates archipelagos or chains of volcanic islands (ex. Hawaii and Japan)
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Divergent boundaries- two plates that pull away from each other

* Allows the asthenosphere to rise up creating lava that then makes new rock
* Creates ocean ridges (raised area around the crack); mid-Atlantic ridge
* Creates a rift valley on land; the Great Rift Valley in Africa

Transform boundaries- two plates move past each other horizontally

* Causes earthquakes when the built up energy finally slips
* Ex. San Andreas fault in CA between the Pacific plate and the N. Amer. plate
* Short segments of other boundaries connected by transform faults are called fracture zones

Causes of plate movement

* 3 ideas for how it happens
	+ Mantle convection-hot rock rising and cool rock sinking back towards the core
	+ Ridge push- gravity causing new rock at the ridge to push old rock away from the ridge
	+ Slab pull- at subduction zone the dense rock going down pulls the rest with it
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