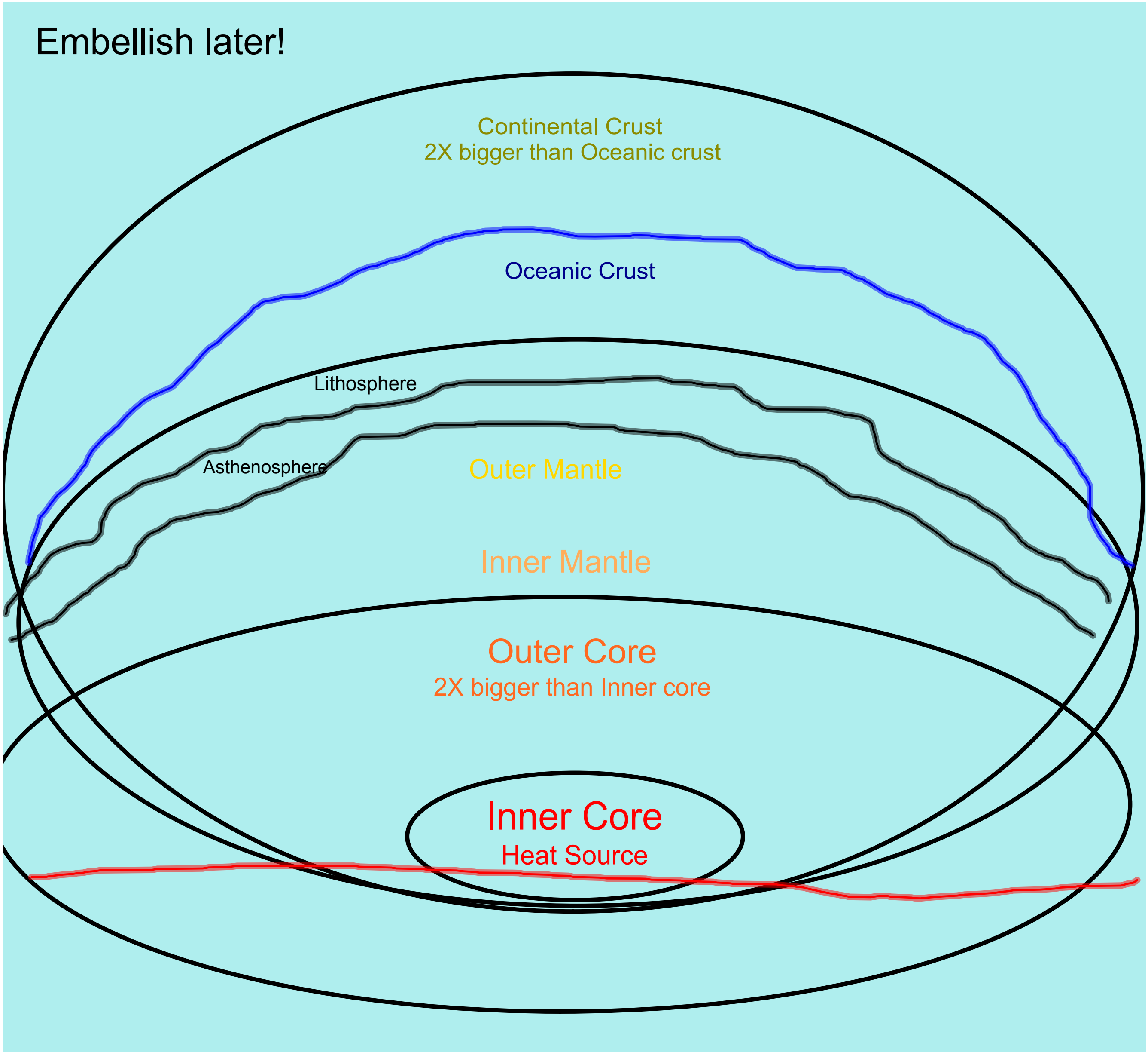
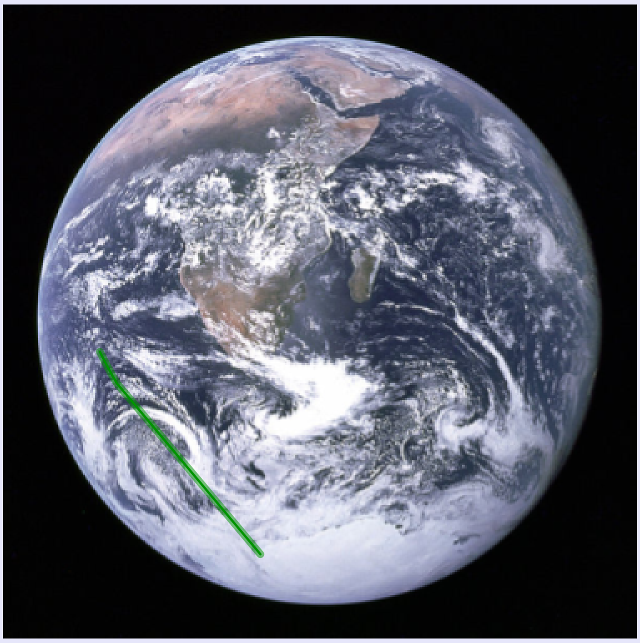
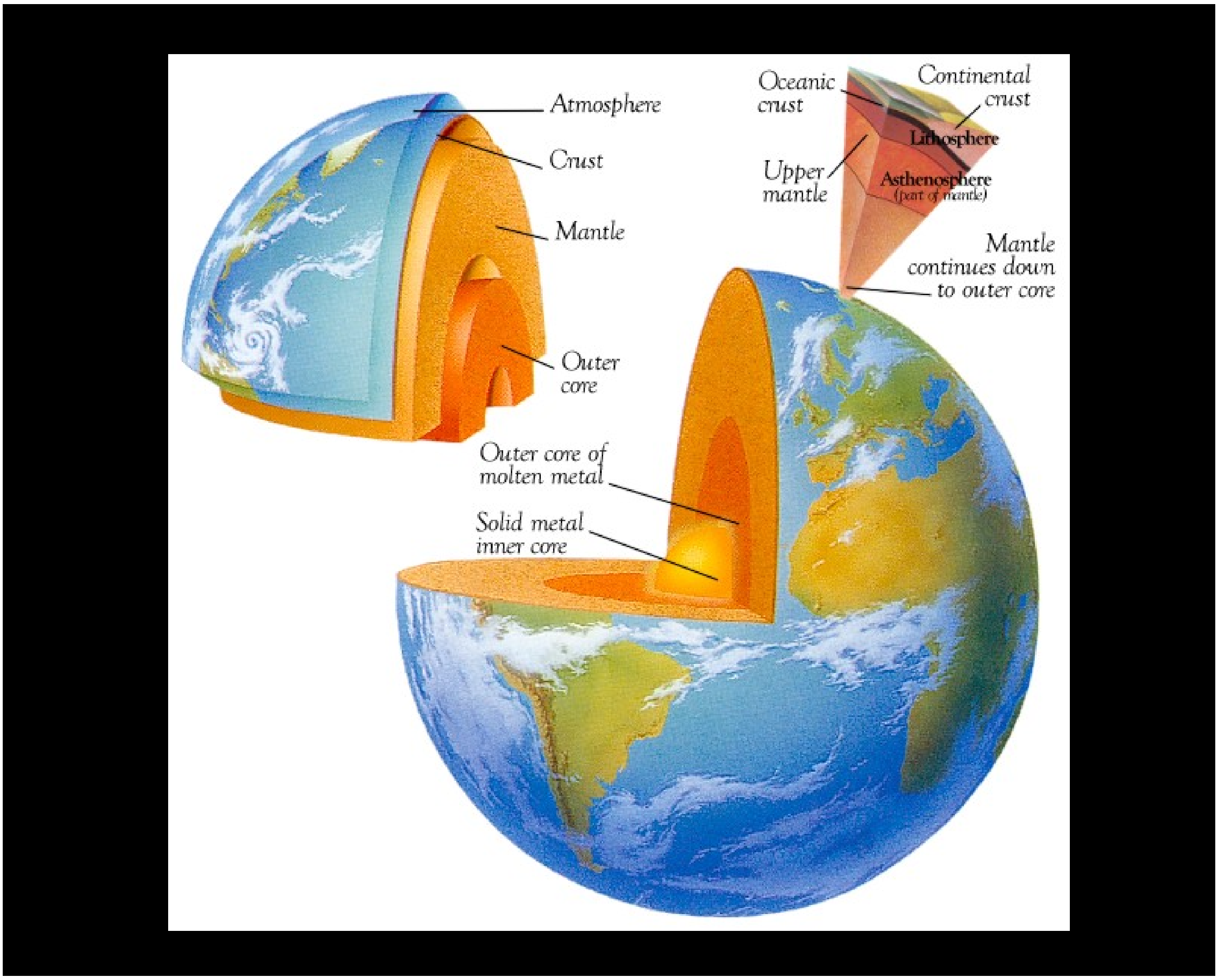

Embellish later!
Continental Crust
2X bigger than Oceanic crust
Oceanic Crust
Lithosphere
Asthenosphere
Outer Mantle
Inner Mantle
Outer Core
2X bigger than Inner core
Inner Core
Heat Source

http://www.scienceupdate.com/2003/07/the-core/

http://www.scienceupdate.com/2008/04/solar-burnout/





Atmosphere
Crust
Mantle
Outer core
Oceanic crust
Continental crust
Lithosphere
Upper mantle
Asthenosphere (part of mantle)
Mantle continues down to outer core
Outer core of molten metal
Solid metal inner core

Set up the below graphic organizers under each flap

Inner Core

Measure	Temp.	Comp.

Outer Core

Measure	Temp.	Comp.

The Core

Inner core:
It is 3,200 - 3,960 miles (5,150-6,370 km) below the earth's surface and mainly consists of iron, nickel and some lighter elements (probably sulphur, carbon, oxygen, silicon and potassium. The temperature in the inner core is about 9032 - 10832 ºF (5000-6000 ºC). Because of the high pressure, the core is solid. The average density of the core is about 15g/cm³.

Outer core:
The outer core is at 1,800 - 3,200 miles (2,890-5,150 km) below the earth's surface. The outer core is liquid and mainly consists of iron, some nickel and about 10% sulphur and oxygen. The temperature in the outer core is about 7200 - 9032 ºF (4000-5000ºC). The density of the outer core is between the 10g/cm³ and 12,3g/cm³. The outer core and inner core together cause the earth's magnetism.

Set up the below graphic organizers under each flap

Inner Mantle

Measure	Temp.	Comp.

Outer Mantle

Measure	Temp.	Comp.

The Mantle

<u>Inner Mantle:</u> the inner mantle can be found between 190 miles (300 km) an 1,800 miles (2,890 km) below the earth's surface. The average temperature is 5400 ºF (3000ºC), nevertheless the rock is solid because of the high pressures. The inner mantle for the biggest part probably consists of sulphides and oxides of silicon and magnesium. The density is between 4.3g/cm³ and 5.4g/cm³.

<u>Outer Mantle:</u> The outer mantle is a lot thinner than the inner mantle. It can be found between 7 miles (10 km) and 190 miles (300 km) below the surface of the earth. You can divide the outer mantle into two different layers. The bottom layer is tough liquid rock and probably consists of silicates of iron and magnesium. The temperature in this part is between 2520 ºF (1400ºC) and 5400 º F (3000ºC) and the density is between 3.4g/cm³ and 4.3g/cm³. The upper layer of the outer mantle consists of the same material but is stiffer because of its lower temperature.

Set up the below graphic organizers under each flap

Oceanic Crust

Measure	Temp.	Comp.

Continental Crust

Measure	Temp.	Comp.

The Crust

Oceanic crust:

As the name already suggests, this crust is below the oceans. There, the crust is 4-7 miles (6-11 km) thick. The rocks of the oceanic crust are very young compared with the rocks of the continental crust. The rocks of the oceanic crust are not older than 200 million years. The material of which the oceanic crust consists is for the greater part tholeiitic basalt (this is basalt without olivine). Basalt has a dark, fine and gritty volcanic structure. It is formed out of very liquid lava, which cools off quickly. The grains are so small that they are only visible under a microscope. The average density of the oceanic crust is 3g/cm³.

Continental crust:

The earth's crust is the thickest below the continents, with an average of about 20 to 25 miles (30 to 40 km) and with a maximum of 45 miles (70 km). The continental crust is older than the oceanic crust, some rocks are 3.8 billion years old. The continental crust mainly consists of igneous rocks and is divided into two layers. The upper part mainly consists of granite rocks, while the lower part consists of basalt and diorite. Granite is lightly-colored, coarse-grain, magma. Diorite has the same composition, but it's scarcer than granite and is probably formed by impurities in the granite-magma. The average density of the continental crust is 2.7g/cm³.

Word Bank:

formation move Lithosphere peak

fossils mountains Pattern oceans

I. **Plate Tectonics – Chapter 21.1**

A. **Plate Tectonics**

1. Definition: theory that pieces of Earth's ____________________, called plates, __________ about slowly on top of the mantle.

2. What does plate tectonics explain?

   the _______________ and movement of Earth's plates

3. List some aspects of geology that scientists could not explain / things that were not well understood.

   a. Locations of _____________________ & _______________

   b. Why ______________ of marine organisms were found in rock at the __________ of mountain ranges

   c. What caused the ________________ of earthquakes and volcanoes

Word Bank:

Alfred   Mesosaurus   joined   forces   Pangaea

1912   shape   Wegener

B. Continental Drift

1. This theory was proposed in ________ by ______________________.
2. What did his theory say?

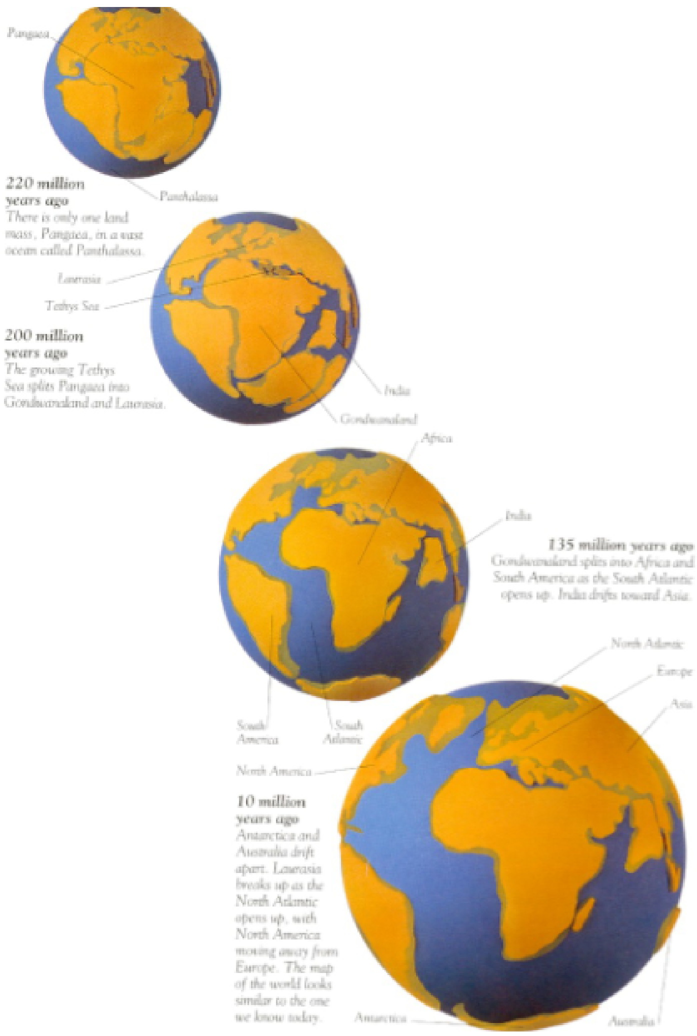
   Continents were once ____________ in a single supercontinent, called ______________, which then broke into pieces and moved apart

3. List two evidences for continental drift:
   a. ____________ of continents (they seem to "fit together")

   b. _____________ - animals that lived in only one region whose fossils were scattered across the globe

4. What was a major problem with the theory of continental drift?

   Couldn't explain what __________ could move the continents



220 million years ago
There is only one land mass, Pangaea, in a vast ocean called Panthalassa.

200 million years ago
The growing Tethys Sea splits Pangaea into Gondwanaland and Laurasia.

135 million years ago
Gondwanaland splits into Africa and South America as the South Atlantic opens up. India drifts toward Asia.

10 million years ago
Antarctica and Australia drift apart. Laurasia breaks up as the North Atlantic opens up, with North America moving away from Europe. The map of the world looks similar to the one we know today.

Word Bank:

decay

convection

older

rate

constant motion

Big Bang

D. The Theory of Plate Tectonics

1. Earth's plates are in __________ ____________, each moving with a different _______ and direction.
2. What force is powerful enough to move the plates?
   ___________________ currents in the mantle (asthenosphere)

1. Where does this heat come from that drives convection in the mantle? Some heat is still being released from when Earth was first formed (____ _________) and heat is released from the ____________ of radioactive elements.

Word Bank:

older

younger   deep valley on either side   forces

underwater

new   created

C. Sea-Floor Spreading

1. New evidence was uncovered by geologists several decades after Wegener proposed continental drift…where did it come from?

2. Mid-Ocean Ridges

a. Definition: chain of _________________ mountains

b. Where do they occur?

c. Feature associated with mid-ocean ridge:

d. Rocks on the ocean floor are ____________ near mid-ocean ridges.

3. Formation of Ocean Crust

a. Sea-floor spreading → process by which ______ oceanic crust is _____________ at mid-ocean ridges as ____________ crust moves away

Word Bank:

ocean

magnetic depression new forces sinks

sinks

gravity oceanic old younger age zones

destroys/recycles

4. **Subduction** of Oceanic Plates

a. Define subduction: process by which old __________ crust _________ into the mantle, getting re-melted

b. Where does subduction occur? Near the edges of ocean plates (called subduction _________)

c. What is a trench? A ______________ in the ocean floor where a plate __________ into the mantle.

d. Why does subduction occur? ____________ causes / pulls down old ocean crust into the mantle.

e. Sea-floor spreading creates _______ oceanic crust at mid-_______ ridges while subduction _______________ ocean crust at subduction zones.

f. So how does the age of oceanic crust compare to the age of continental crust?

5. Evidence for Sea-Floor Spreading

a. pattern of ____________ polarity (normal vs. reversed) on either side of a mid-ocean ridge

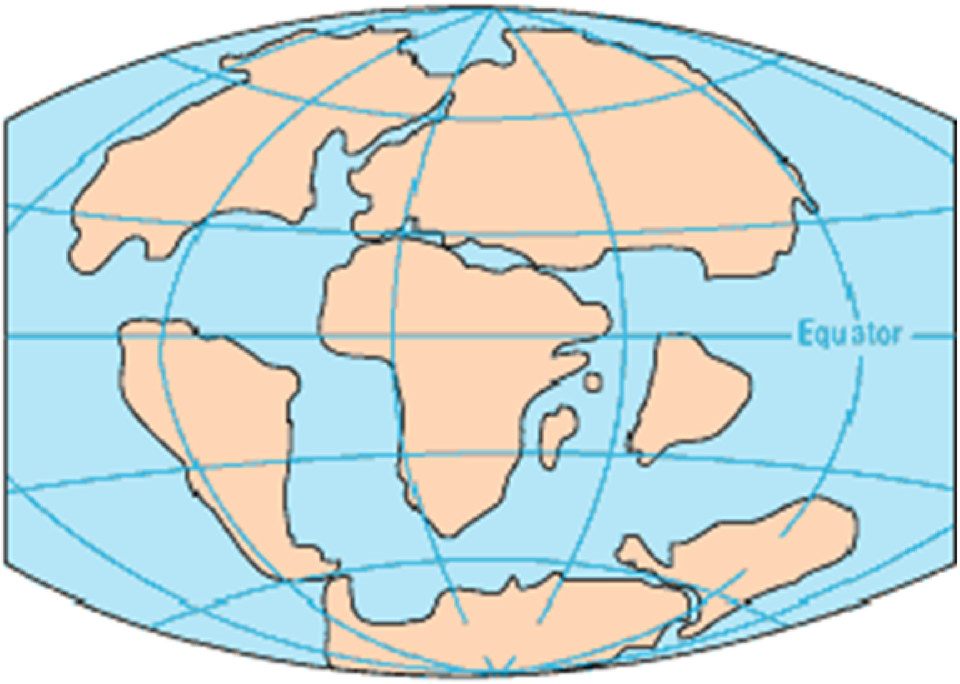
b. _______ of rocks on either side of a mid-ocean ridge

Alfred Wegener

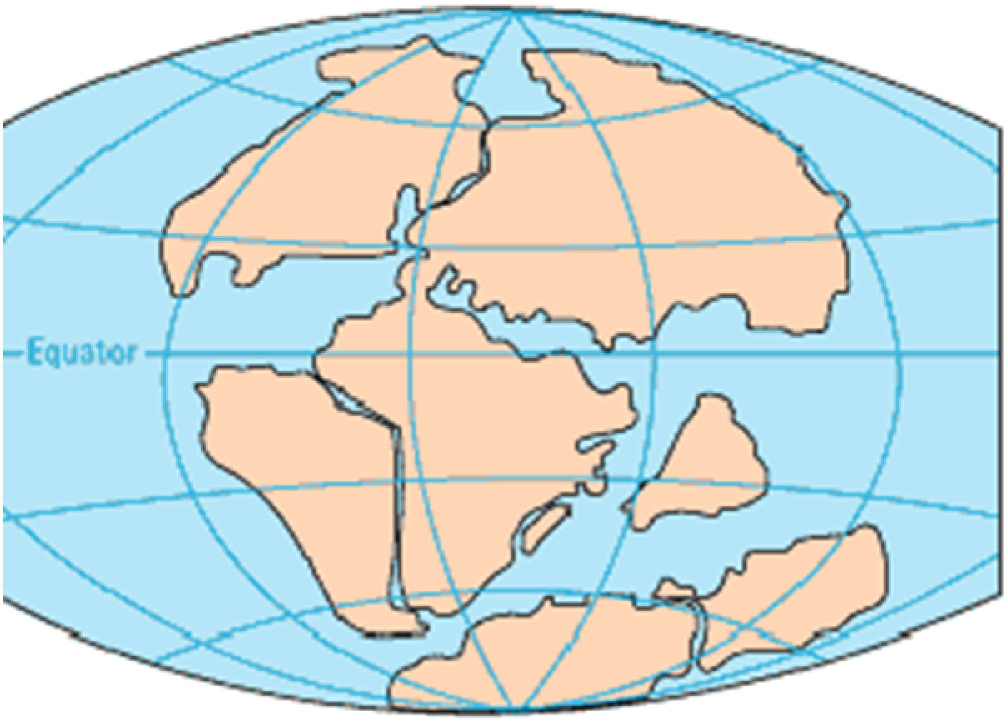
r


NORTH AMERICA
ASIA
INDIA
AFRICA
Equator
SOUTH AMERICA
AUSTRALIA
ANTARCTICA

PRESENT DAY

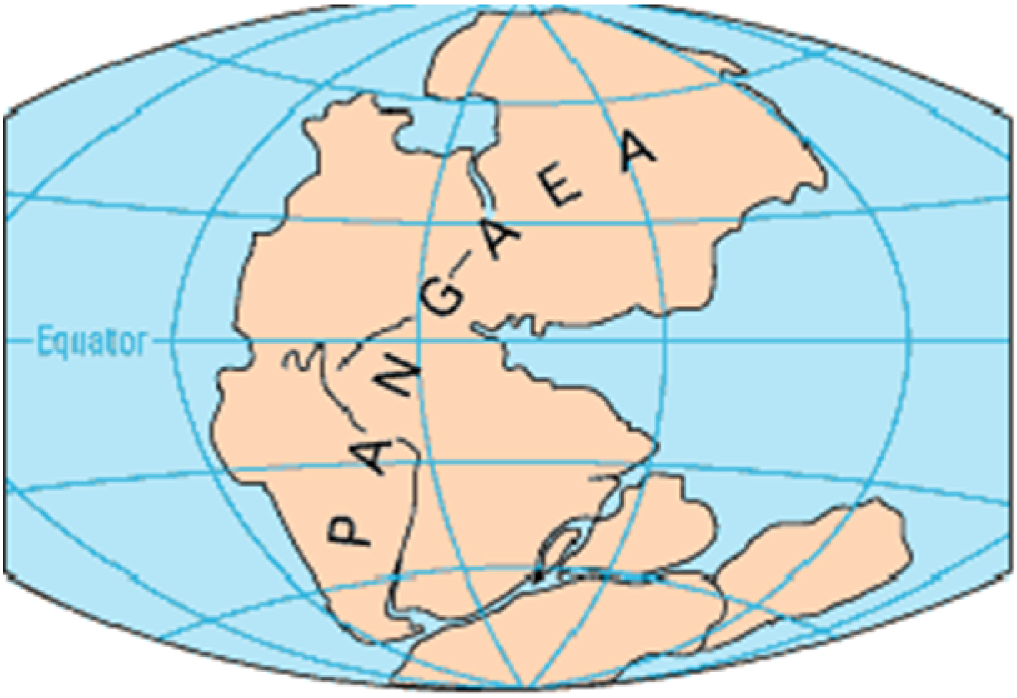


CRETACEOUS
65 million years ago

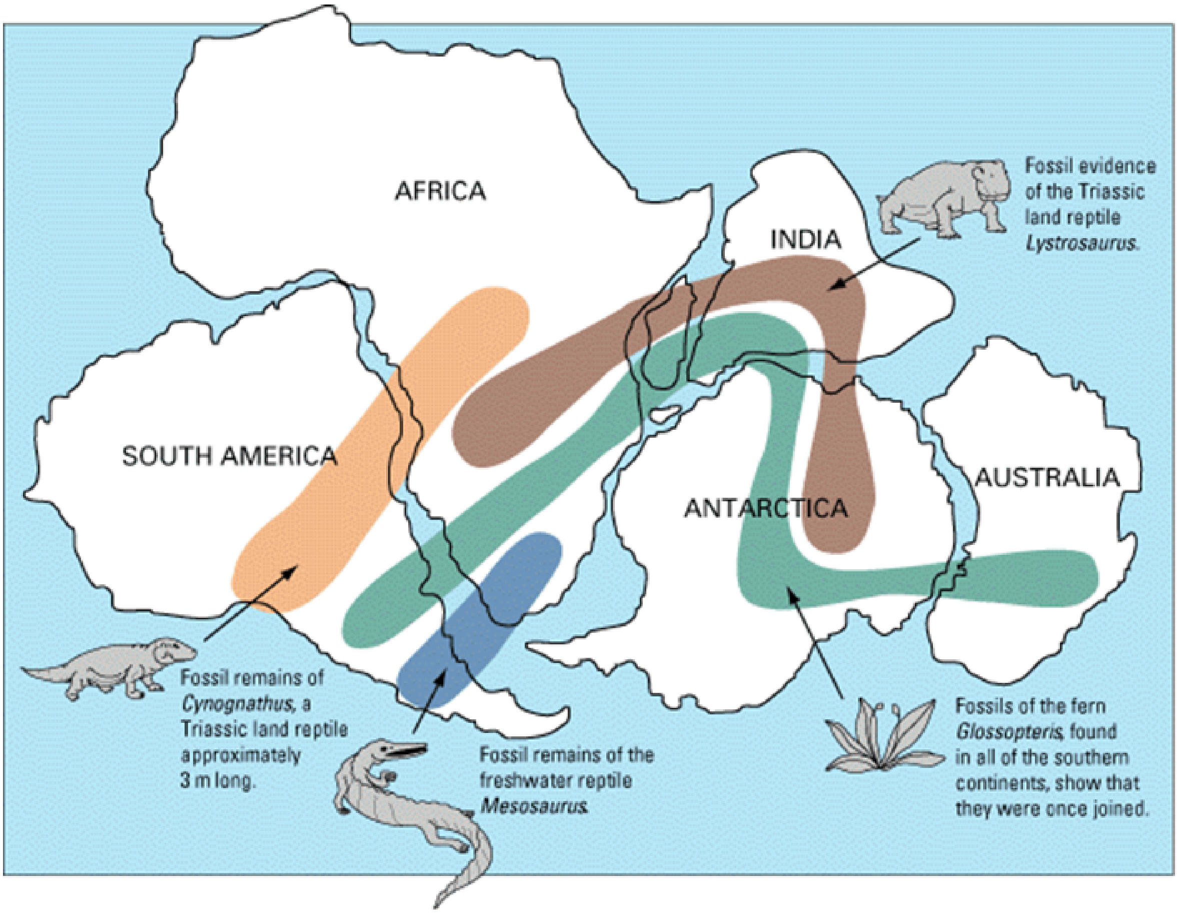


JURASSIC
135 million years ago

TRIASSIC
200 million years ago



PERMIAN
225 million years ago


AFRICA
INDIA
SOUTH AMERICA
ANTARCTICA
AUSTRALIA
Fossil evidence of the Triassic land reptile *Lystrosaurus*.
Fossil remains of *Cynognathus*, a Triassic land reptile approximately 3 m long.
Fossil remains of the freshwater reptile *Mesosaurus*.
Fossils of the fern *Glossopteris*, found in all of the southern continents, show that they were once joined.

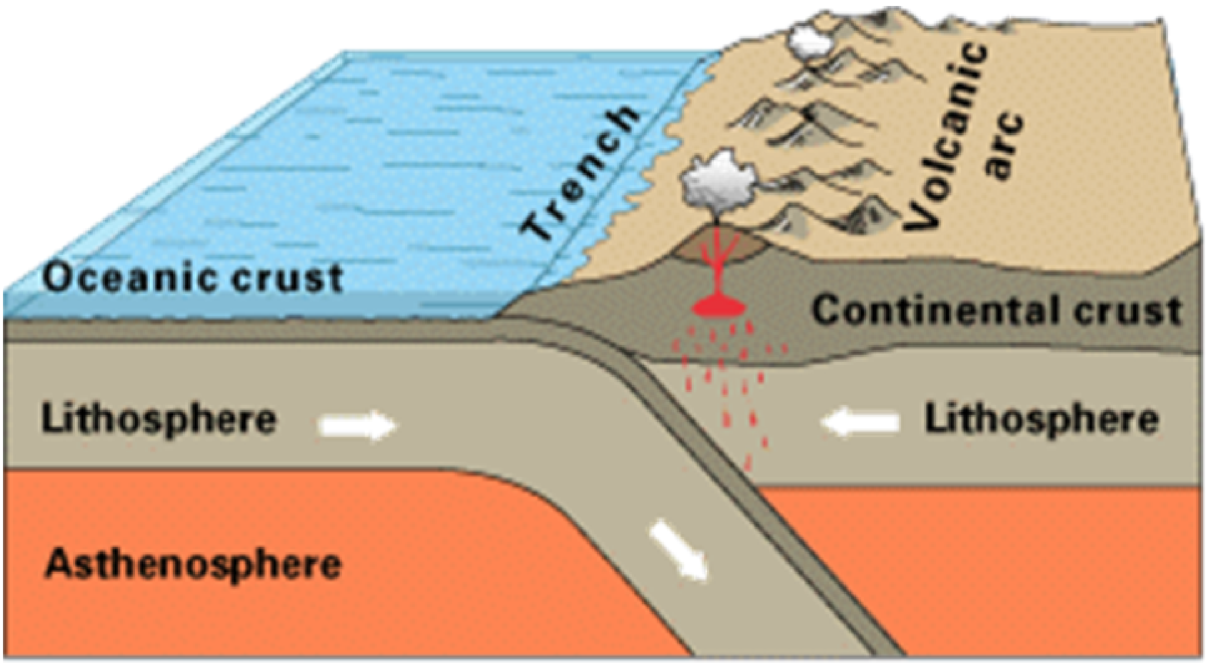
Kontinentalverschiebung

Station # 1 On state map: identify mountains by circling the "peaks" in one color , valleys in another color. Draw a "line of best fit" through the plotted circles and copy ONLY the "line of best fit" on to <u>your</u> map. Erase and switch stations

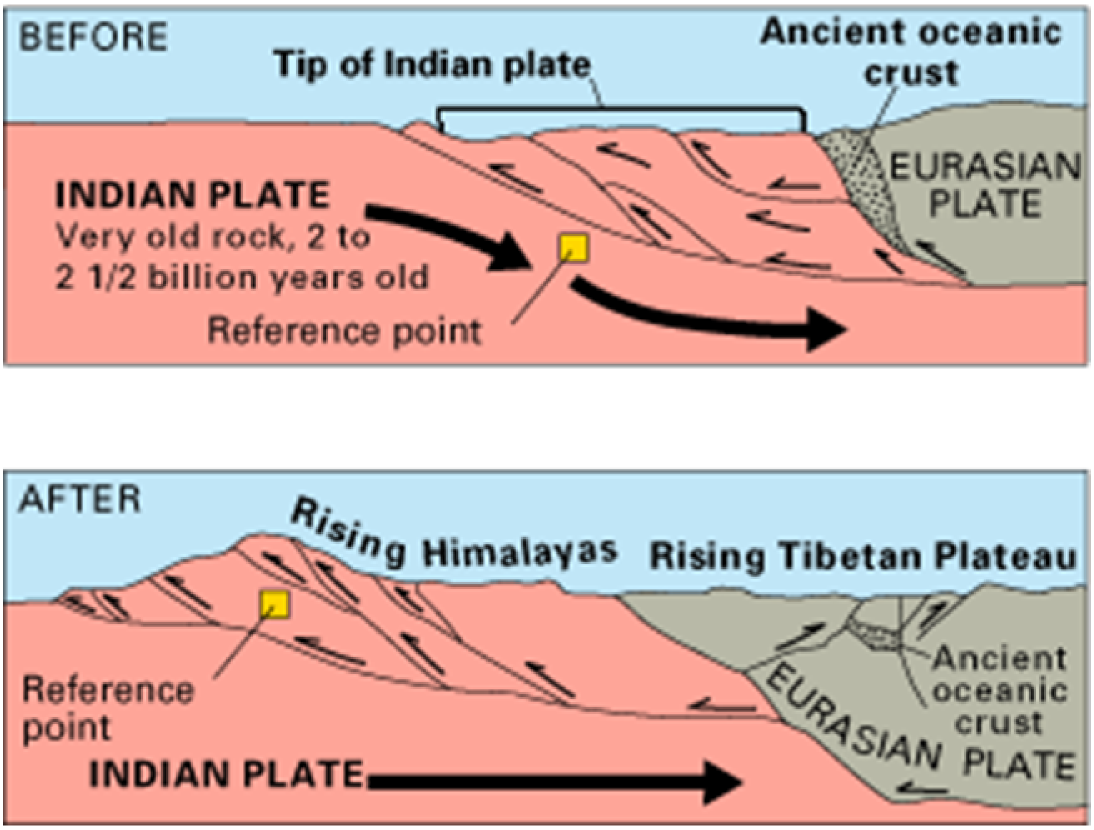
Station # 2 On world map: circle location of earthquakes that have happened in last 2 days,Draw a "line of best fit" through the plotted circles and copy ONLY the "line of best fit" on to <u>your</u> map. Erase and switch stations

Alfred Wegener

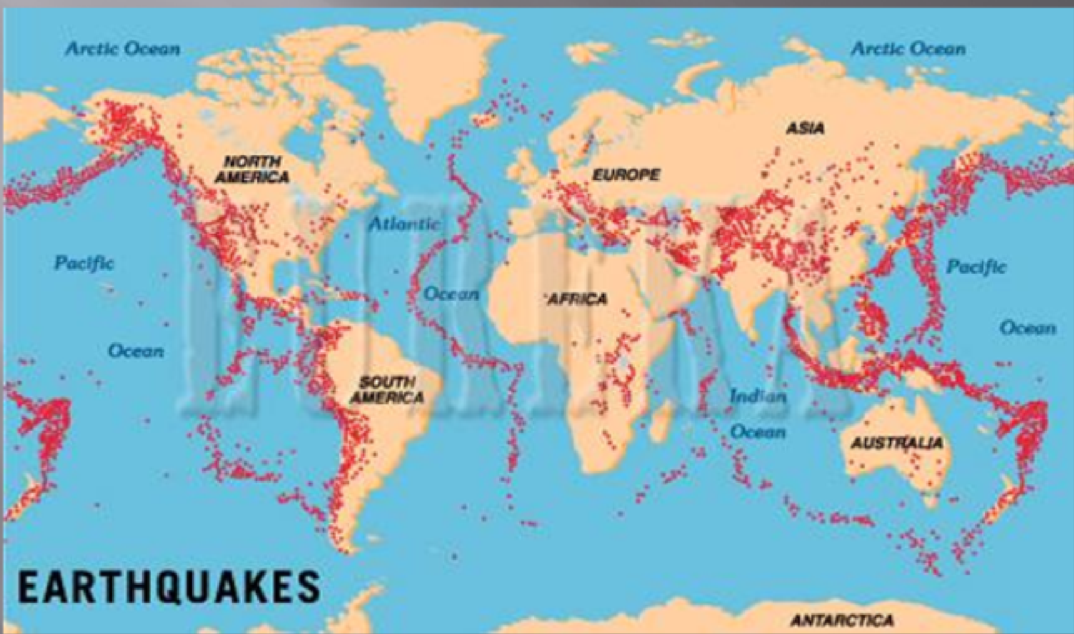
Mountains Form between types of crust

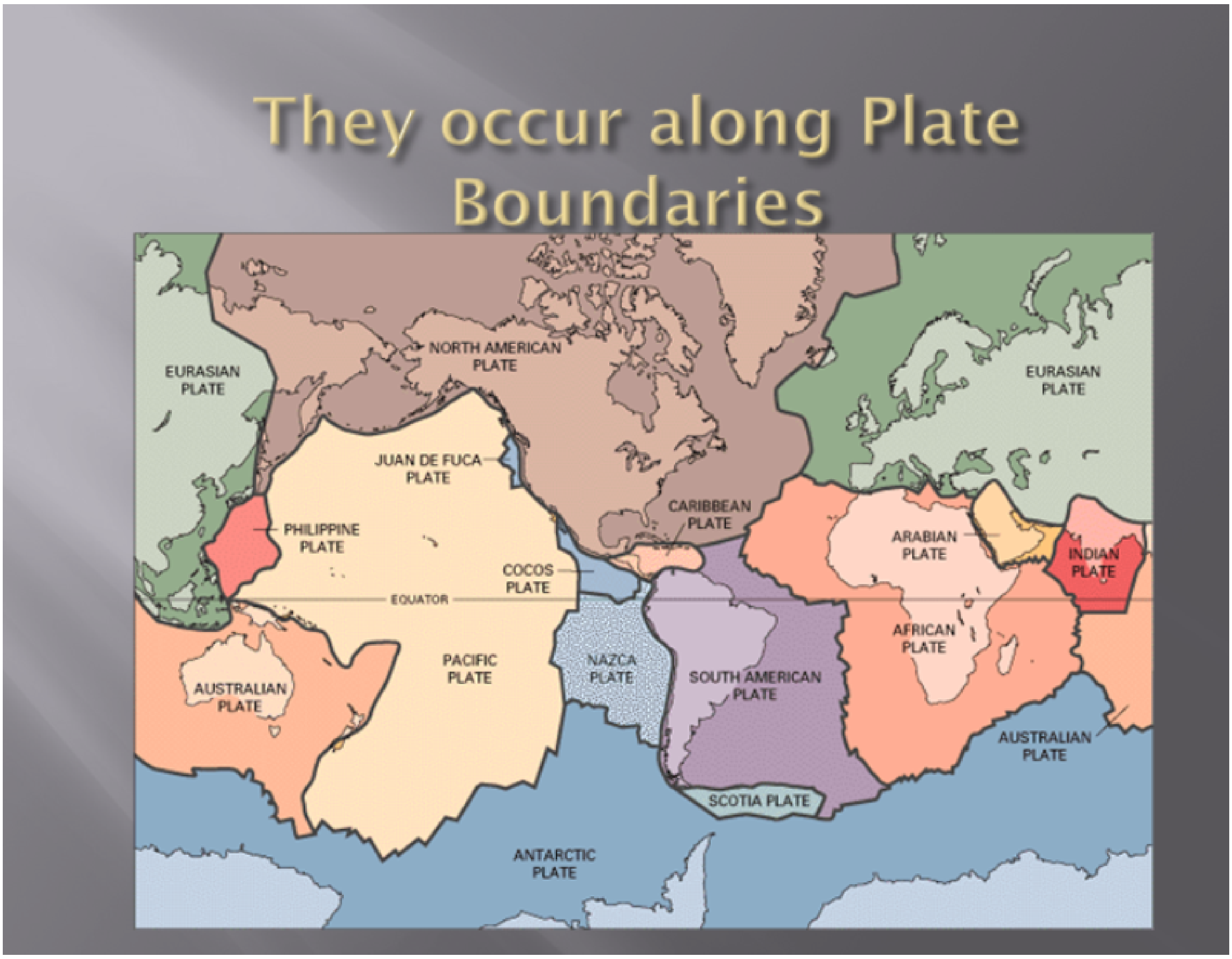


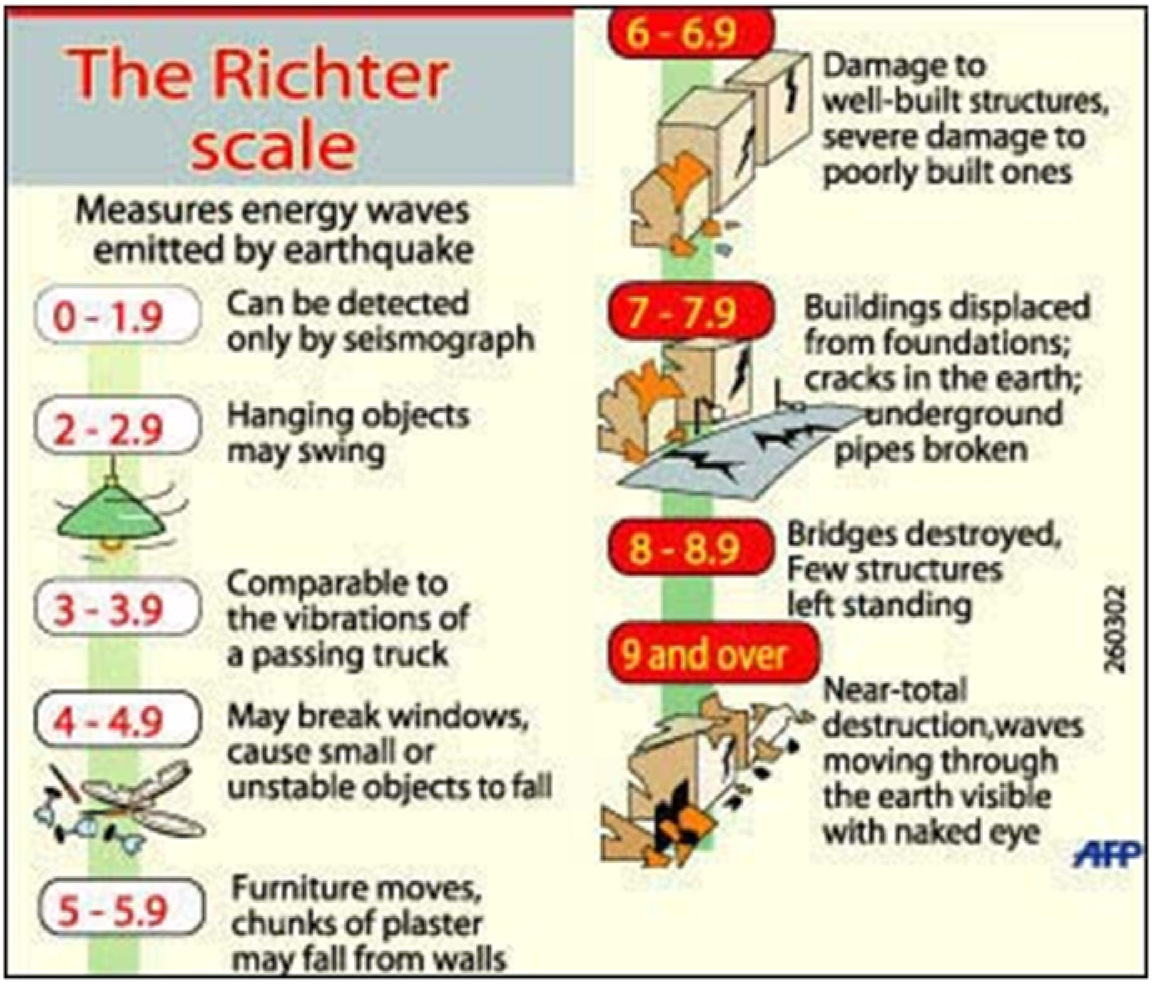
Mountains Form as plates collide


BEFORE
Tip of Indian plate
Ancient oceanic crust
EURASIAN PLATE
INDIAN PLATE
Very old rock, 2 to 2 1/2 billion years old
Reference point
AFTER
Rising Himalayas
Rising Tibetan Plateau
Reference point
Ancient oceanic crust
EURASIAN PLATE
INDIAN PLATE

Where do EQ's occur in the world?




They occur along Plate Boundaries
EURASIAN PLATE
NORTH AMERICAN PLATE
EURASIAN PLATE
JUAN DE FUCA PLATE
CARIBBEAN PLATE
PHILIPPINE PLATE
ARABIAN PLATE
INDIAN PLATE
COCOS PLATE
EQUATOR
AFRICAN PLATE
PACIFIC PLATE
NAZCA PLATE
SOUTH AMERICAN PLATE
AUSTRALIAN PLATE
AUSTRALIAN PLATE
SCOTIA PLATE
ANTARCTIC PLATE


The Richter scale
Measures energy waves emitted by earthquake
0 - 1.9
Can be detected only by seismograph
2 - 2.9
Hanging objects may swing
3 - 3.9
Comparable to the vibrations of a passing truck
4 - 4.9
May break windows, cause small or unstable objects to fall
5 - 5.9
Furniture moves, chunks of plaster may fall from walls
6 - 6.9
Damage to well-built structures, severe damage to poorly built ones
7 - 7.9
Buildings displaced from foundations; cracks in the earth; underground pipes broken
8 - 8.9
Bridges destroyed, Few structures left standing
9 and over
Near-total destruction,waves moving through the earth visible with naked eye
260302
AFP


VIDEO COURTESY: NHK
LIVE
SENDAI
JAPAN
NHK WORLD
JAPAN
Tokyo
VOICE OF:
TOMOKO HOSAKA
AP CORRESPONDENT


Explorer ridge
CANADA
Juan de Fuca ridge
Subduction zone
Blanco fracture zone
UNITED STATES
Mendocino fracture zone
Relative motion of North American Plate
San Francisco
San Andreas fault
Murray fracture zone
Relative motion of Pacific Plate
Los Angeles
MEXICO
East Pacific Rise
Molokai fracture zone

Aerial view of the San Andreas fault slicing through the Carrizo Plain in the Temblor Range east of the city of San Luis Obispo.

Creeping along the Calaveras fault has bent the retaining wall and offset the sidewalk along 5th Street in Hollister, California (about 75 km south-southeast of San Jose).

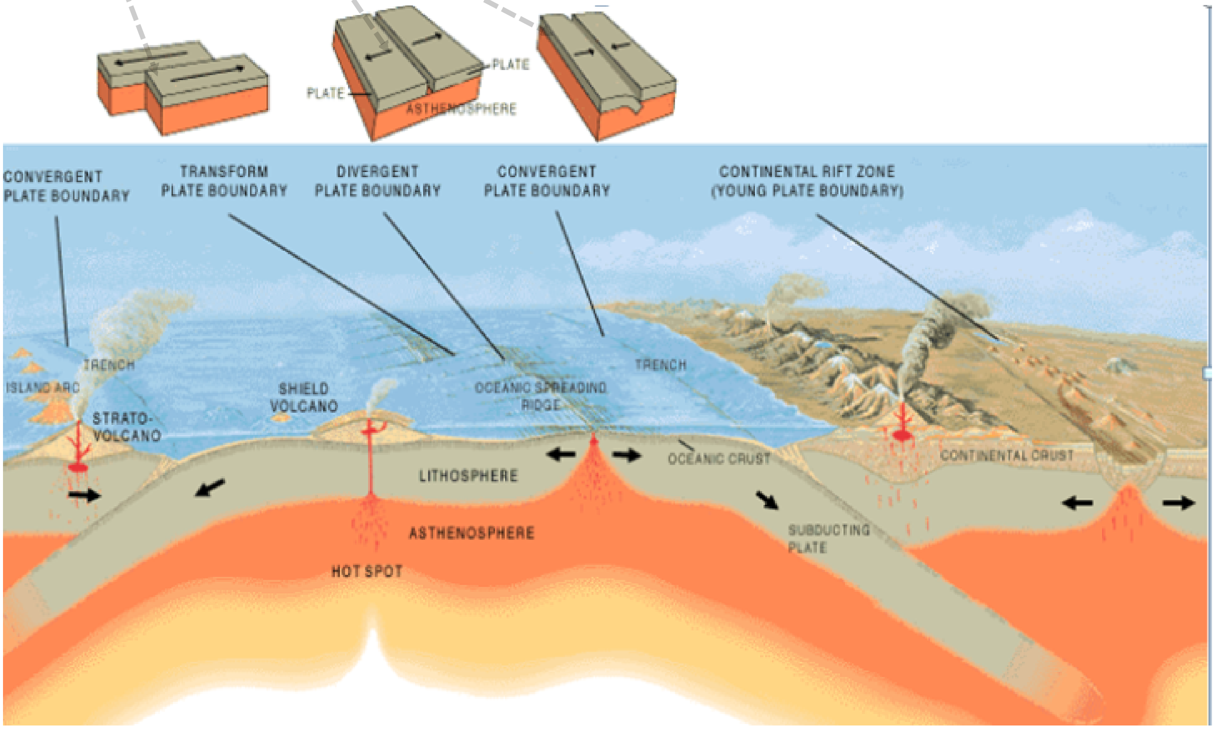
Close-up of the offset of the curb.

E. Plate Boundaries

1. Divergent: two plates moving ____________

2. Convergent: two plates moving ________________

3. Transform / Sliding: two plates ______________ past each other in opposite directions



F. Mountain Building

1. Occur mostly along ___________ boundaries
2. Two Examples:
   a. Continental → Continental plate
      Crust __________, folds, thickens, pushing up mountains

   b. Continental → Oceanic plate
      Ocean subducts but crust from continent ___________ up

3. Mountains can also form at ___________ boundaries.
   a. Mid-ocean ridges on the ___________ floor; sometimes these can rise above sea level like in _____________.