



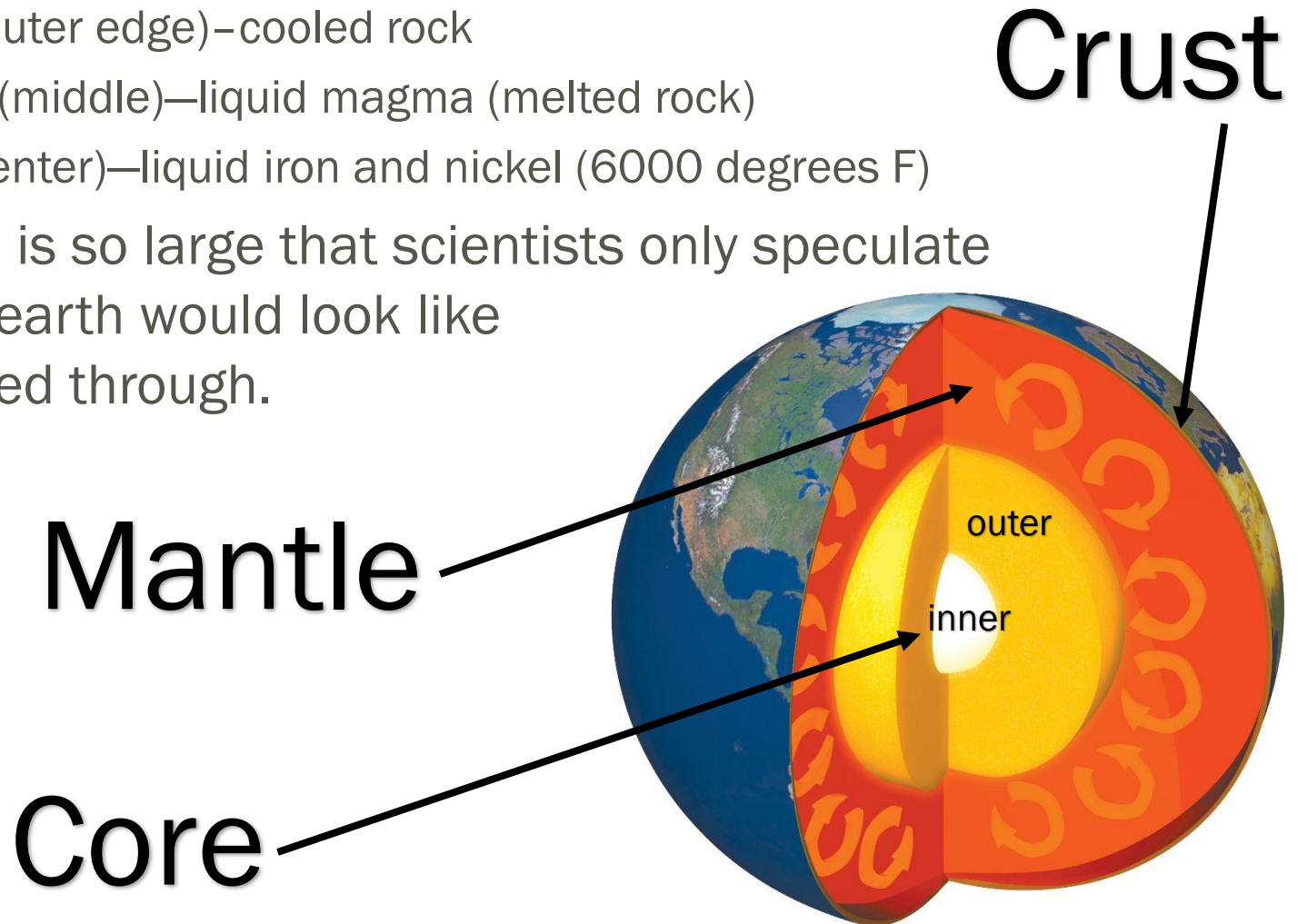
Earth Science

EQ: How is the earth affected by constructive and
destructive forces?



Layers of the Earth (p.4)

- ☞ The earth has 3 main layers:
 - Crust (outer edge)–cooled rock
 - Mantle (middle)—liquid magma (melted rock)
 - Core (center)—liquid iron and nickel (6000 degrees F)
- ☞ The earth is so large that scientists only speculate what the earth would look like when sliced through.
- ☞ [Website!](#)



The Crust—The Earth's Surface (p. 4)

- ☞ The crust or surface of the earth is constantly changing because of the way the earth is layered.
- ☞ The mantle below the crust is liquid, and the hard crust floats on top as “plates”.
- ☞ Sometimes the plates spread apart; sometimes they run in to each other.
- ☞ These movements under the crust are what cause earth's natural disasters to occur.
- ☞ Most scientists believe that the earth, at one time, was all stuck together as one mega-continent. However, many believe that it took millions of years for the earth to spread apart... what do you think we should believe as Christians?



Pangaea (p. 5)

Genesis 10:25~ “Two sons were born to Eber: One was named Peleg, because in his time the earth was divided; his brother was named Joktan.”



Watch the Earth Drift...

http://kids.earth.nasa.gov/archive/pangaea/Pangaea_game.html

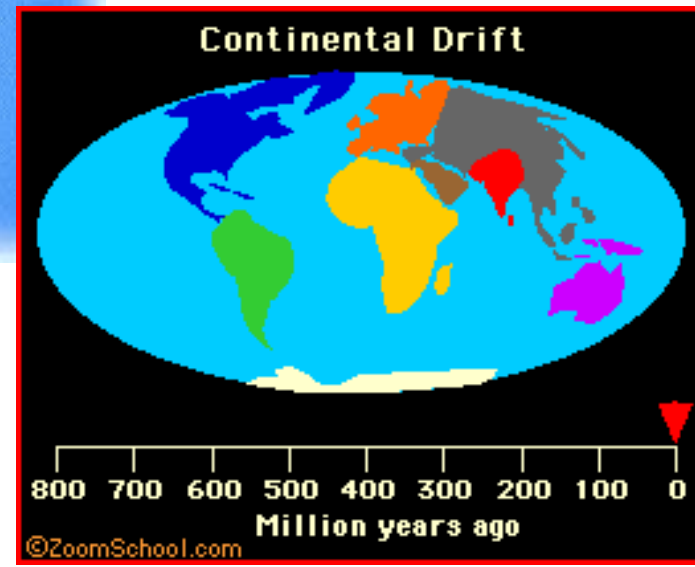
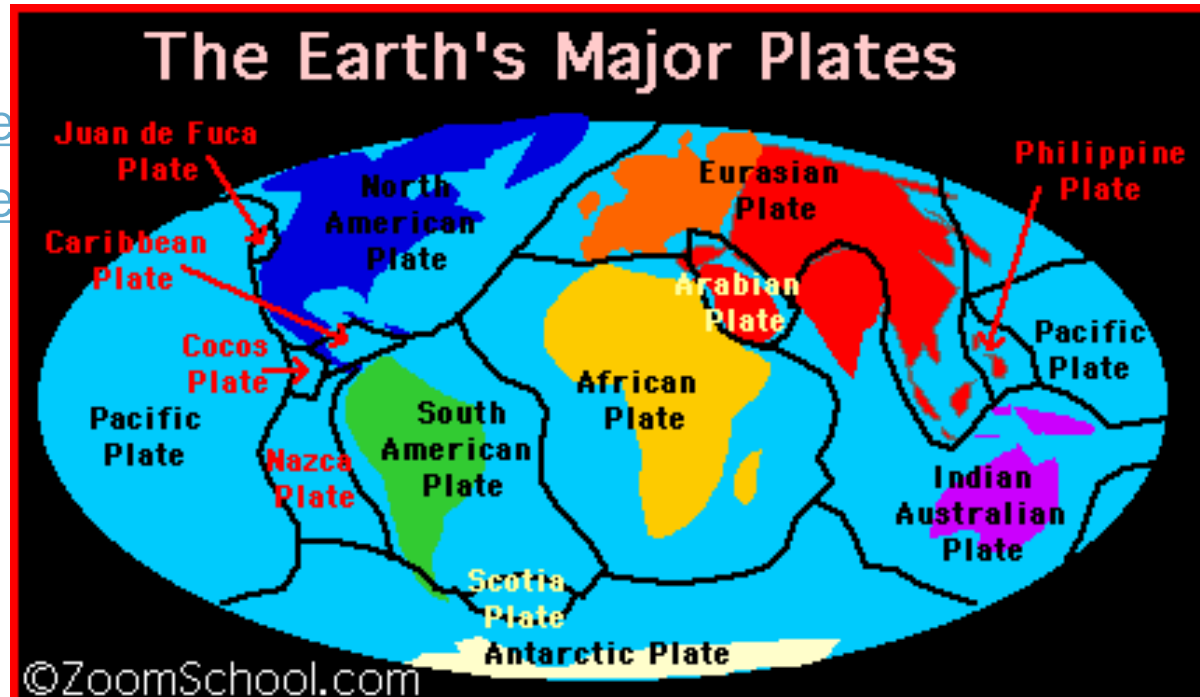


Plate Tectonics (p. 4-5)

- Science has revealed that the earth's crust seems to break into 12 major tectonic plates, and it is along these lines where most *seismic activity* (vibrations of the earth) occurs.
- Look to see the most recent earthquakes across the earth!

- <http://www.iris.edu/se>
- <http://www.iris.edu/se>



Constructive or Destructive?

- ☞ Many types of processes affect the surface of the earth. These processes are **constantly changing** the earth's surface.
- ☞ A *constructive process* is the building up of the earth's surface including deposition, earthquakes, volcanoes, and faults.
 - Root word: “construct” – to build
- ☞ A *destructive process* is the tearing down of the earth's surface including weathering, erosion, impact of organisms, earthquakes, and volcanoes.
 - Root word: “destruct” – to destroy



An Oxymoron??

Think about it:

- ∞ Can something be BOTH constructive and destructive?



VOLCANOES

EQ: How is the earth affected by constructive and destructive forces?



Volcanoes (p.14)

- ∞ A *volcano* is a crack in the earth's crust that allows magma and gases to come to the surface.
- ∞ When a weak spot in the crust forms, molten magma from the mantle can come to the surface.
 - Magma- molten material that is BELOW the crust
 - Lava- molten material that reaches the surface of the earth
- ∞ A volcano is BOTH destructive and constructive because it destroys and burns up everything in its path; then once it cools, it will have made a new layer of cooled rock on the surface.



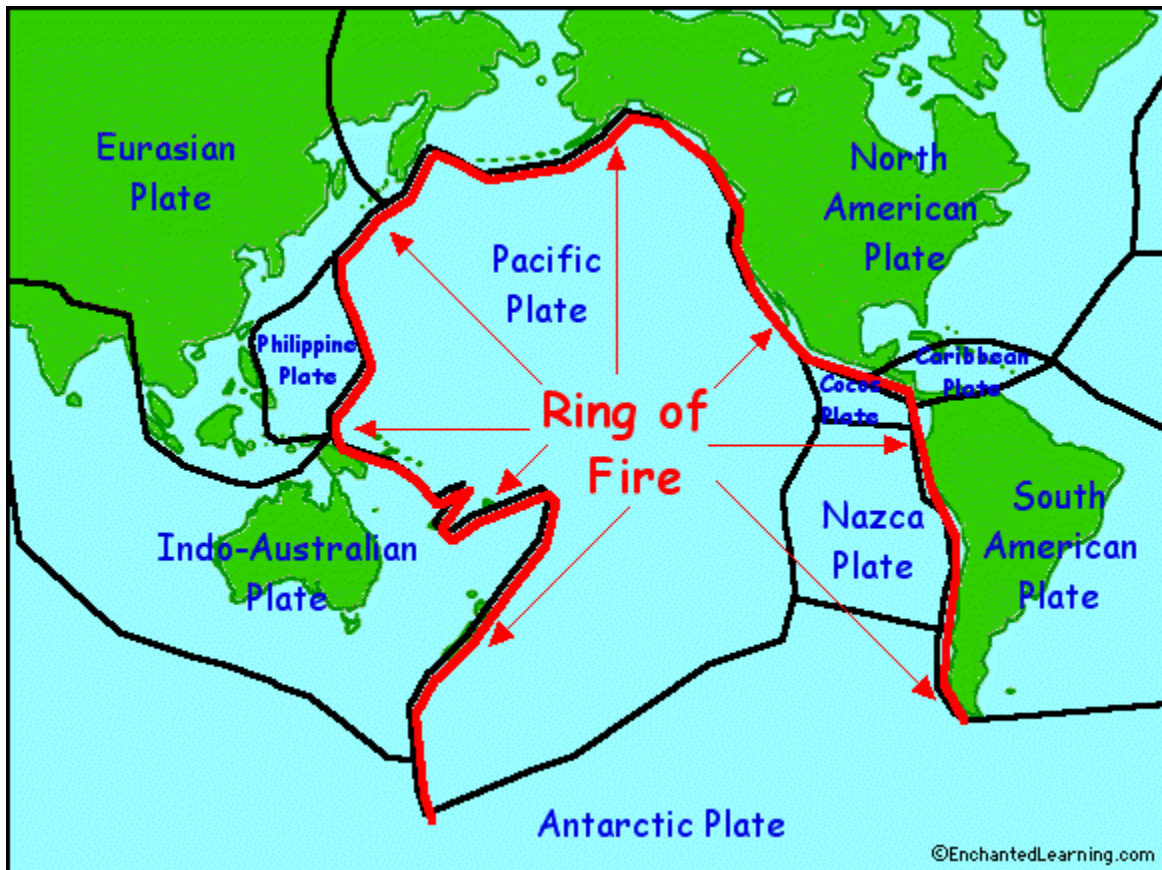
Around the world (p. 17)

- ☞ There are about 600 active volcanoes on earth.
- ☞ An active volcano is one that is currently erupting or has shown signs of erupting in the near future.
- ☞ A dormant volcano is one that “sleeping”. Scientists believe it could one day awaken in the distant future and maybe become active again.
- ☞ An extinct volcano is one that is unlikely to erupt ever again.
- ☞ Click below to see about volcanoes!
- ☞ <http://video.nationalgeographic.com/video/news/west-mata-submarine-volcano-vin?source=relatedvideo>



“Ring of Fire”—an area around the Pacific Ocean where there is high volcanic activity. (p. 15)

Does this look familiar?



Eruptions (p. 17)

- ☞ There are two main types of volcanic eruptions:
 - Quiet Eruptions
 - Explosive Eruptions
- ☞ A quiet eruption is when thin, runny lava is constantly flowing out of a vent. (like Hawaii)
- ☞ <http://video.nationalgeographic.com/video/environment/environment-natural-disasters/volcanoes/volcano-eruptions/>
- ☞ An explosive eruption happens when thick, sticky lava gets stuck in the vent, cools, and builds up pressure . The volcano erupts in an explosion and will sometimes blow its top off.
 - Want to try it!?





Lava from Hawaii

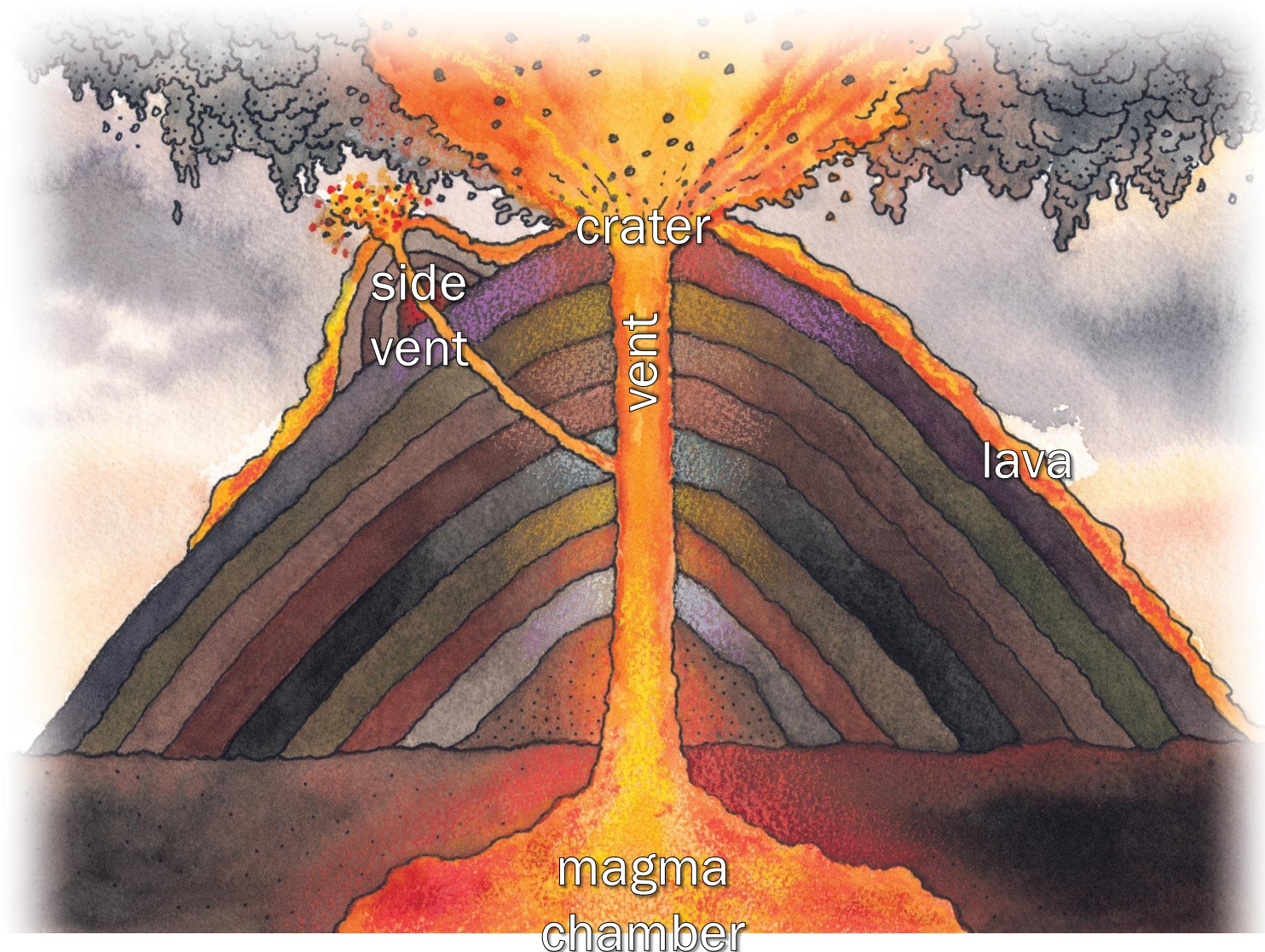
Quiet lava flows slowly.





Explosions happen as well.

Inside a Volcano



Geysers (p.22)

- ✎ Not only lava can explode from the crust; sometimes heat from the earth escapes through geysers.
- ✎ With geysers, underground water is heated past boiling, causing steam bubbles to become trapped.
- ✎ The pressure builds up until an eruption of hot water occurs—like the famous Old Faithful.



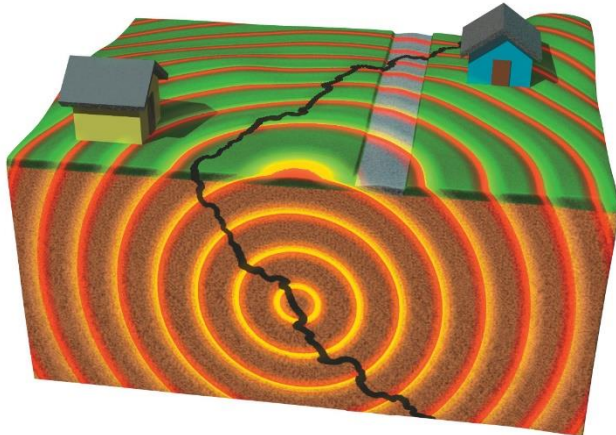
EARTHQUAKES

EQ: How is the earth affected by constructive and destructive forces?



Earthquakes (p.6)

- ☞ Earthquakes (like volcanoes) can be both constructive and destructive.
- ☞ That is because sometimes the earth's crust will be built up, and other times the earth's crust will be destroyed. However, the surface of the earth usually shows destruction after an earthquake.



New Island in Pakistan!



- How? A massive 7.7 earthquake struck a remote area of Pakistan on September 24, 2013.
- How big is it? The island is around 40 feet tall and around 3-400 feet wide!



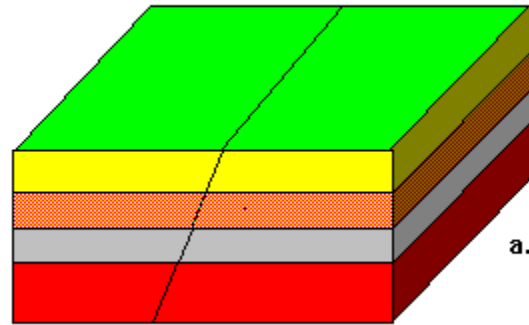
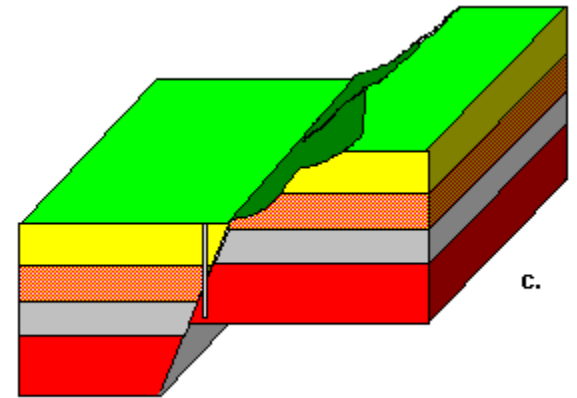
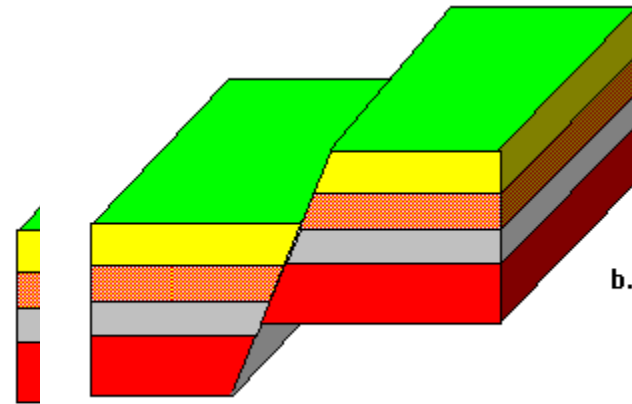
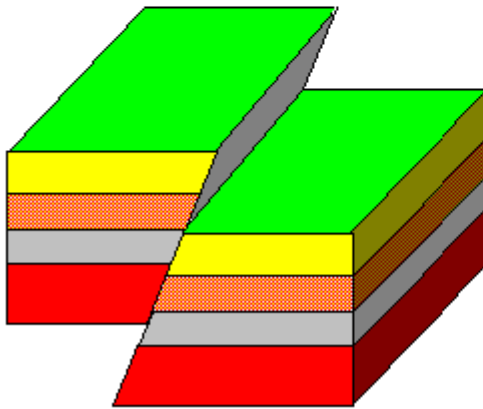
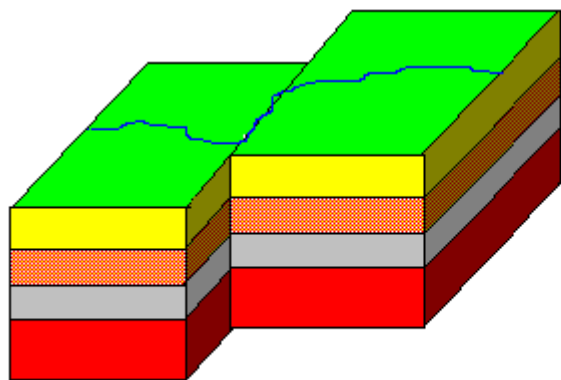
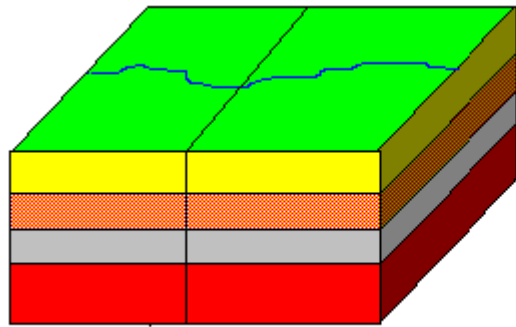
Faults (p. 6-7)

An earthquake will often occur along a *fault* (a deep break or crack in the earth's surface along which rocks can move).

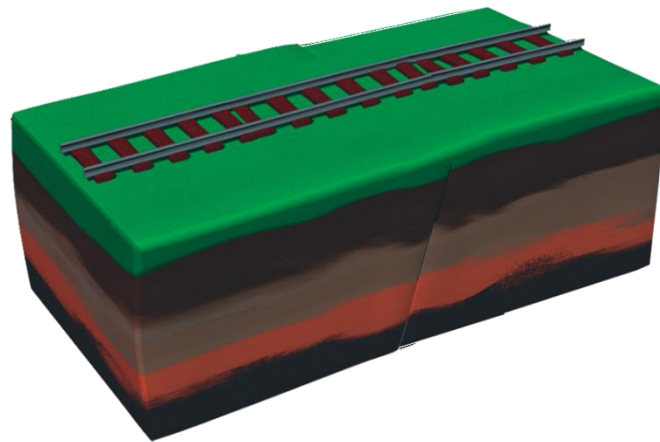


San
Andreas
Fault, CA

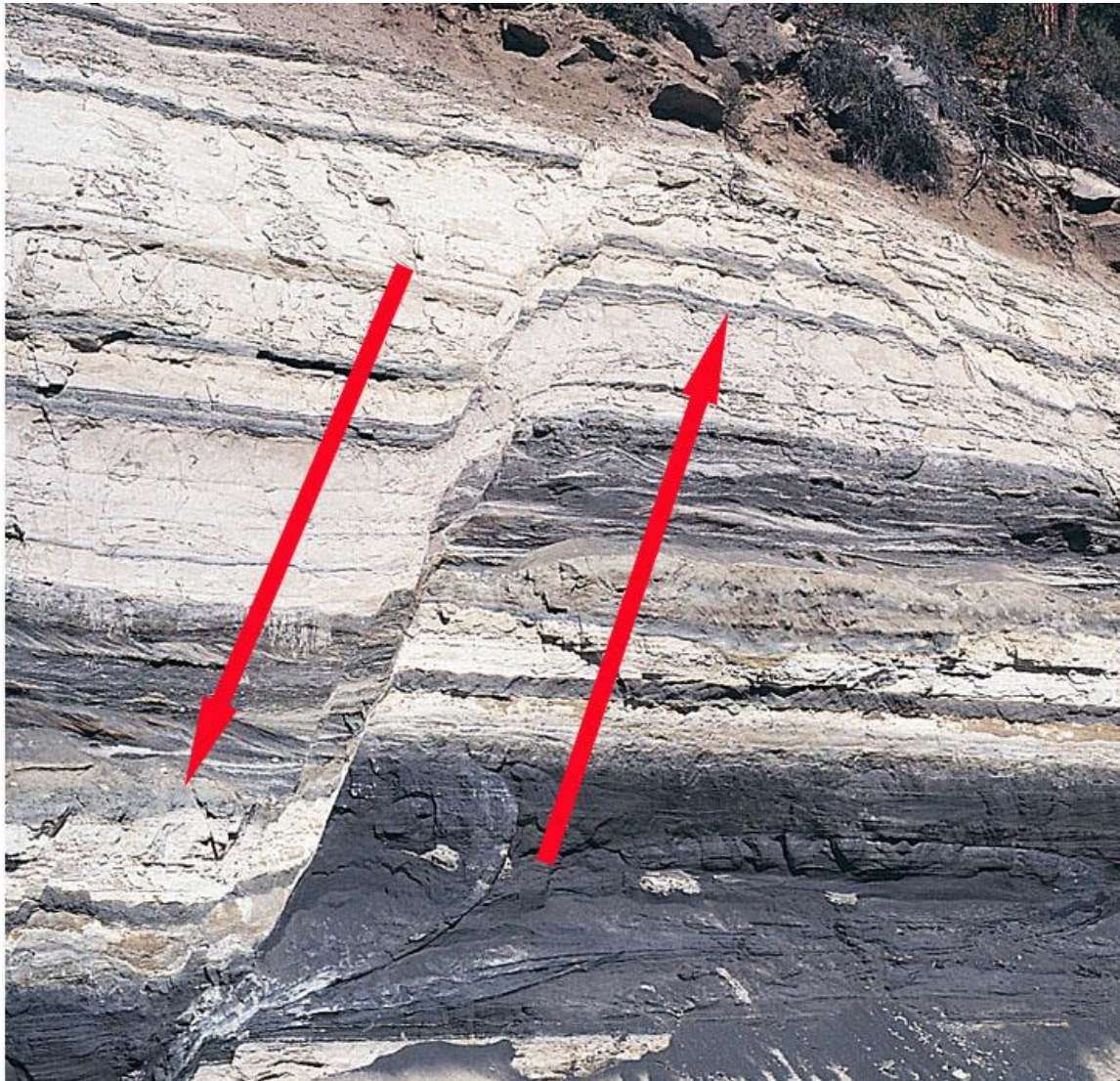
Faults can occur
in a variety of
ways.



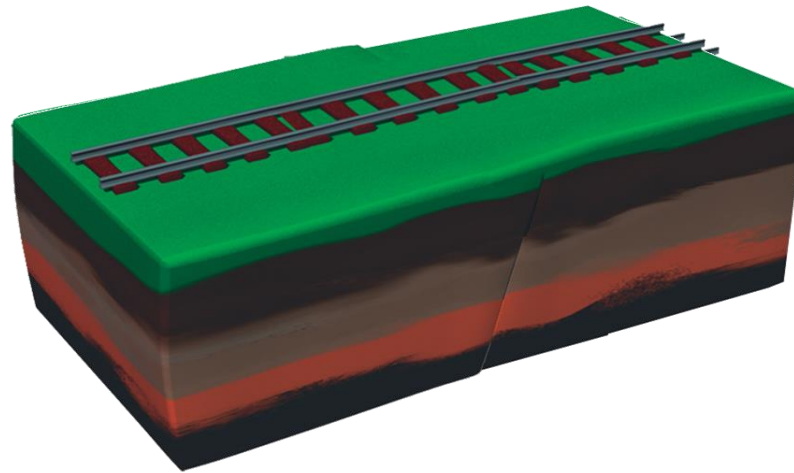
NORMAL FAULT



Normal Fault



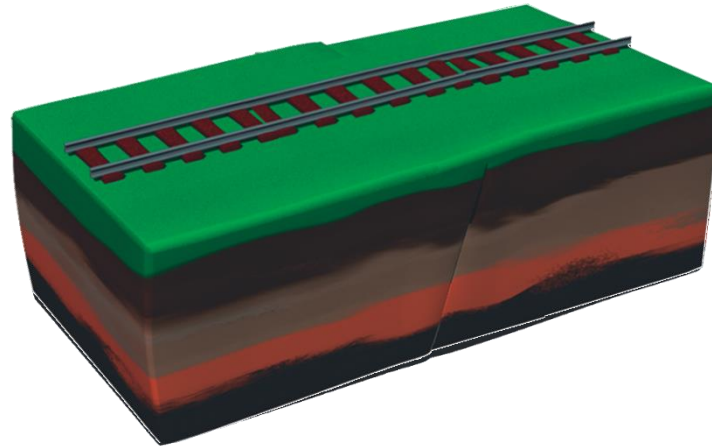
REVERSE FAULT



Reverse Fault



STRIKE-SLIP FAULT



Strike-Slip Fault



Learn about Earthquakes

🌀 <http://viewpure.com/VSgB1IW604?start=0&end=0>

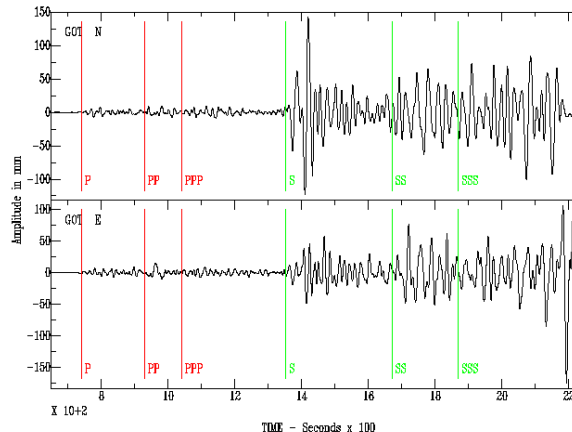
🌀 <http://video.nationalgeographic.com/environment/disasters/earthquake>



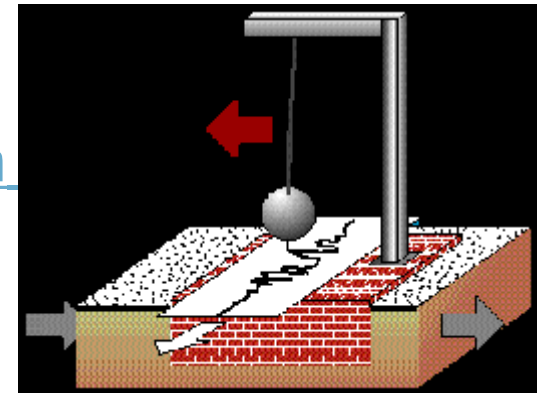
Earthquakes (p. 9)

- ☞ An *earthquake* is underground movements in the earth's crust that may cause change.
- ☞ Earthquakes can range from being unnoticeable to deadly.
- ☞ Scientists measure earthquake magnitude (how strong it is) on the Richter Scale.
- ☞ The Richter Scale ranges from 0-9+ and uses a device called a seismograph to measure earthquakes.
- ☞ A seismograph makes waves on a piece of paper that show how much the earth shakes.

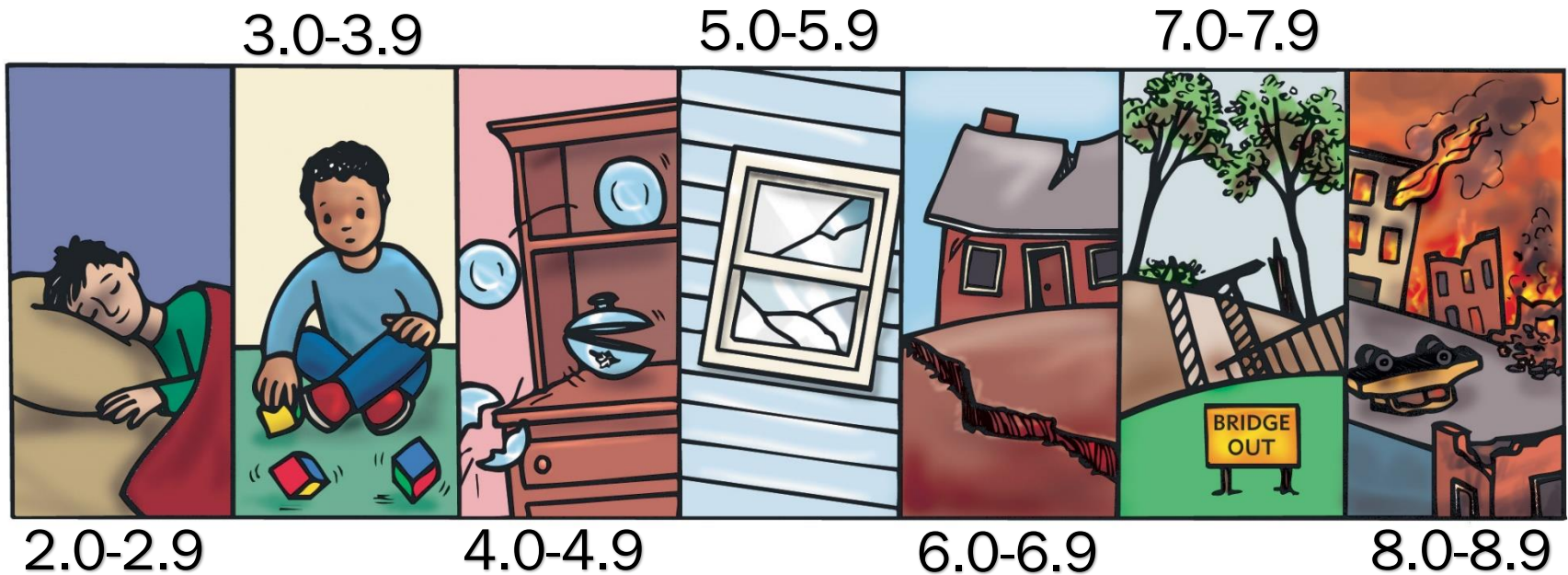
☞ <http://www.iris.edu/animations/8>



tion



The Richter Scale (in pictures)



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

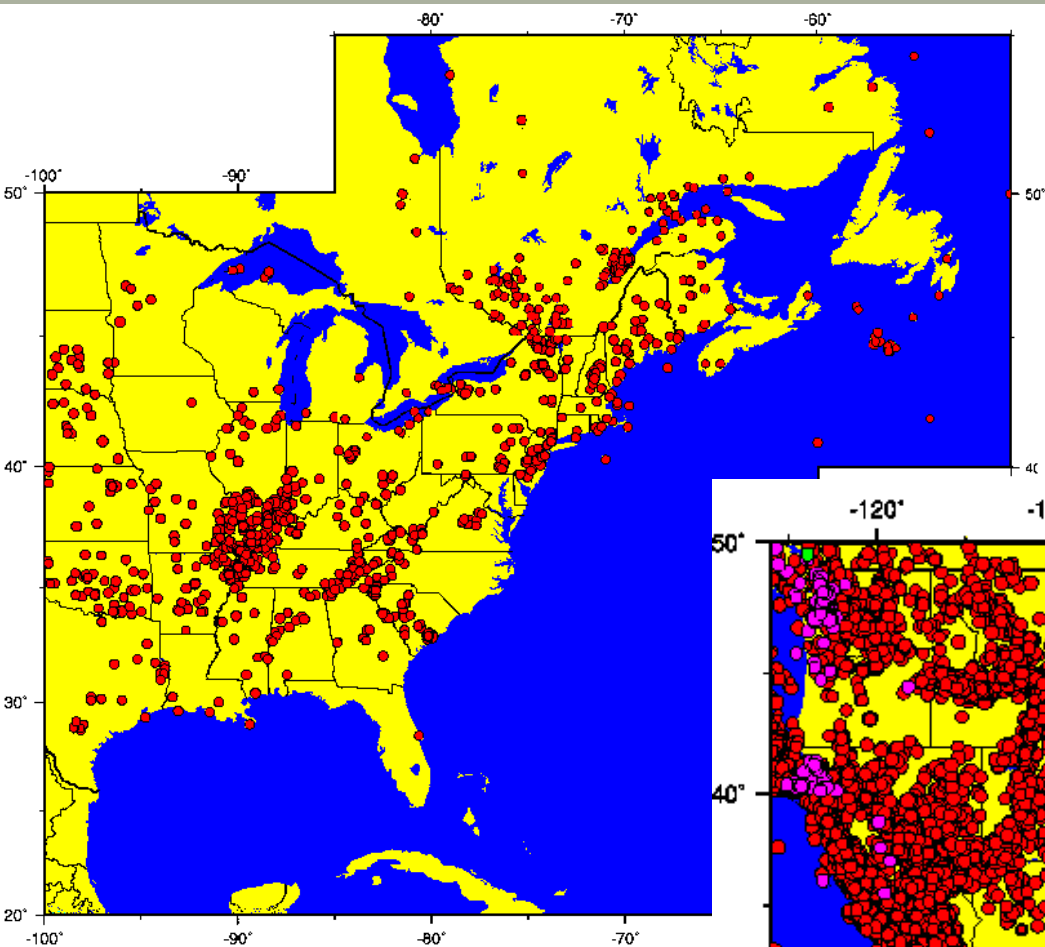
Bridges destroyed, Few structures left standing

9 and over

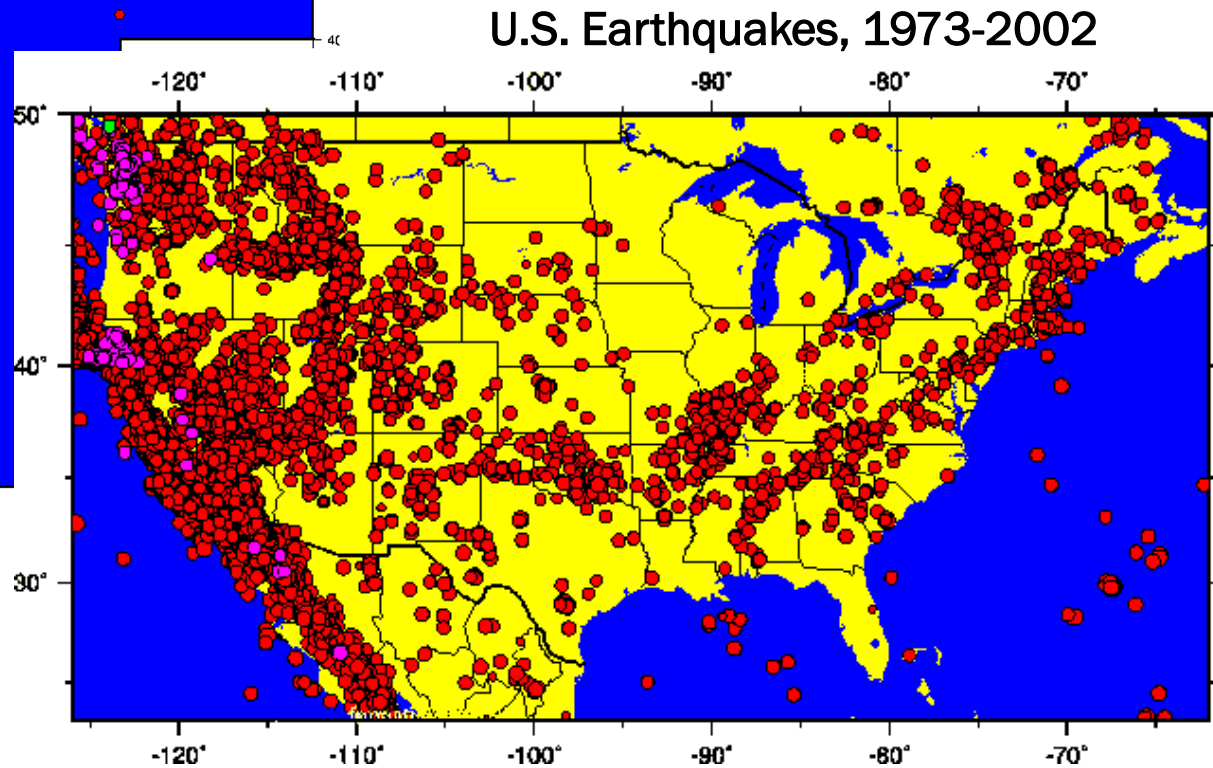


Near-total destruction, waves moving through the earth visible with naked eye

Earthquakes in the U.S.



**Eastern North
America Earthquakes
1534-1994**



U.S. Earthquakes, 1973-2002

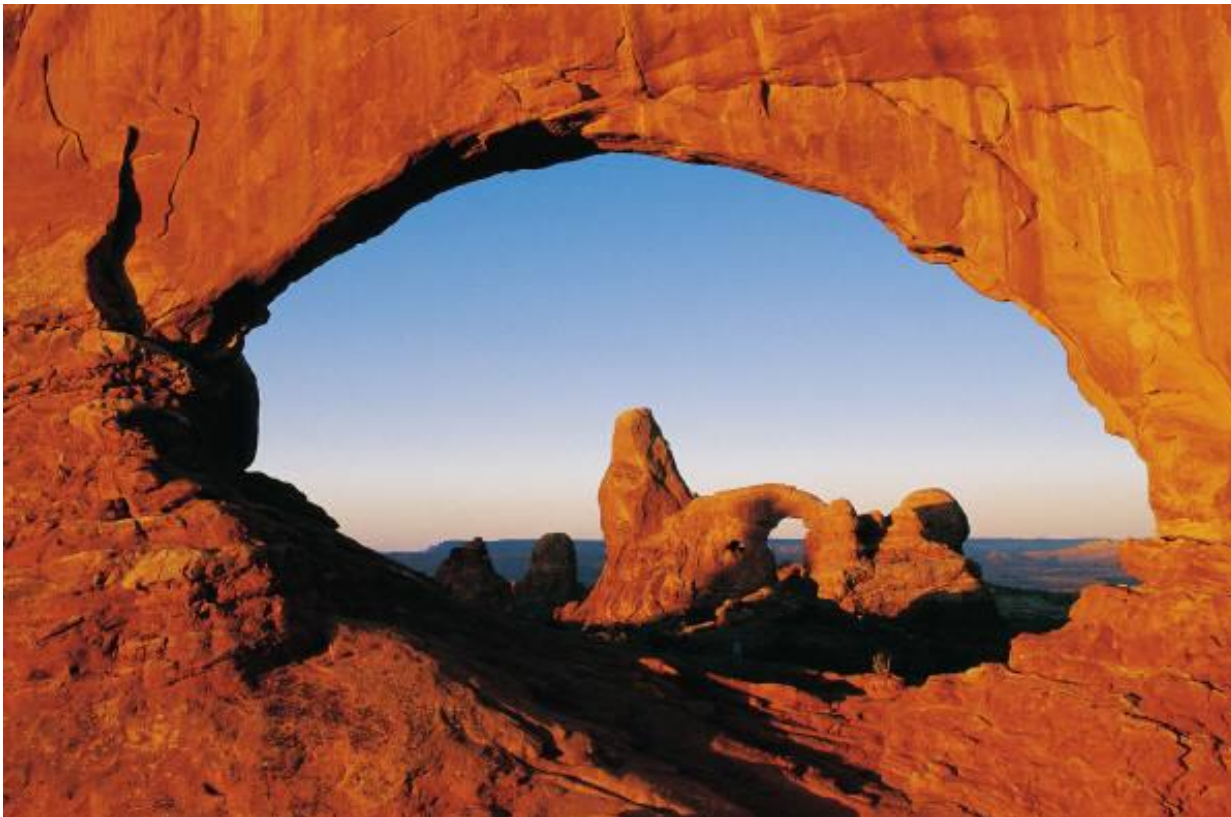
Tsunamis (p. 11)

- ☞ Sometimes, tsunamis occur when an earthquake happens under the water on the ocean floor.
- ☞ A *tsunami* is a large destructive ocean wave caused by an underwater earthquake or another movement of the Earth's surface.



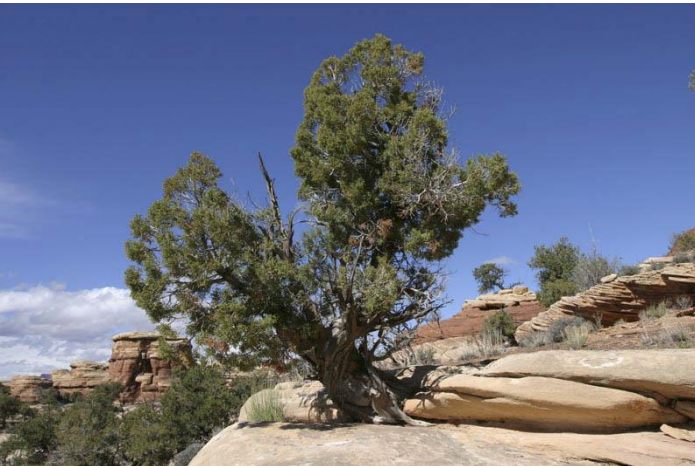
Weathering/Erosion/Deposition

☞ <http://player.discoveryeducation.com/index.cfm?guidAssetId=6B1E329E-5A77-4B36-BFA9-1D307F75441C&blnFromSearch=1&productcode=US>



Weathering

- ☞ *Weathering* is the breakdown, either physical or chemical, of rocks on the earth's surface.
- ☞ There are many types of weathering: wind, water, plants, ice, etc.
- ☞ When these elements come in contact with rocks, they will wear away small pieces.
- ☞ Often, weathering occurs slowly—like with wind.
- ☞ Other times weathering occurs quickly—like with a rock slide.
- ☞ http://www.as.uky.edu/academics/departments_programs/EarthEnvironmentalSciences/EarthEnvironmentalSciences/Educational%20Materials/Documents/elearning/module07swf.swf



Erosion

- ☞ *Erosion* is the movement of soil by water or wind.
- ☞ After weathering turns rocks into smaller pieces or soil, then often erosion takes place and moves the smaller pieces away.
- ☞ Rivers and streams are constantly getting deeper into the crust of the earth. They will continue to slowly move more and more soil and sand downstream.
- ☞ Wind also blows soil and sand around on the earth.
- ☞ Water and wind can work slowly each and every day or quickly in a sudden storm.
- ☞ The geologists of Stone Mountain believe it formed from both volcanic activity under the ground, and then from weathering and erosion of the surrounding soil above ground.



Formation of Stone Mountain



The energy and force from the Earth's interior slowly put the pre-continents of Africa and North America on a collision course.



As they continued to come together, ocean islands smashed into the North American continent.



The continents converged and eventually collided about 300 million years ago. The steady force of the two colliding masses buckled and fractured the Earth, creating the Appalachian Mountain chain to the west.



After a few million years of cooling, Stone Mountain solidified eight to ten miles below the Earth's surface.



Stone Mountain granite is more resistant to erosion than the surrounding countryside. For 285 million years, the eight to ten miles of land above the mountain wore away, leaving Stone Mountain standing almost 800 feet high.



Deposition

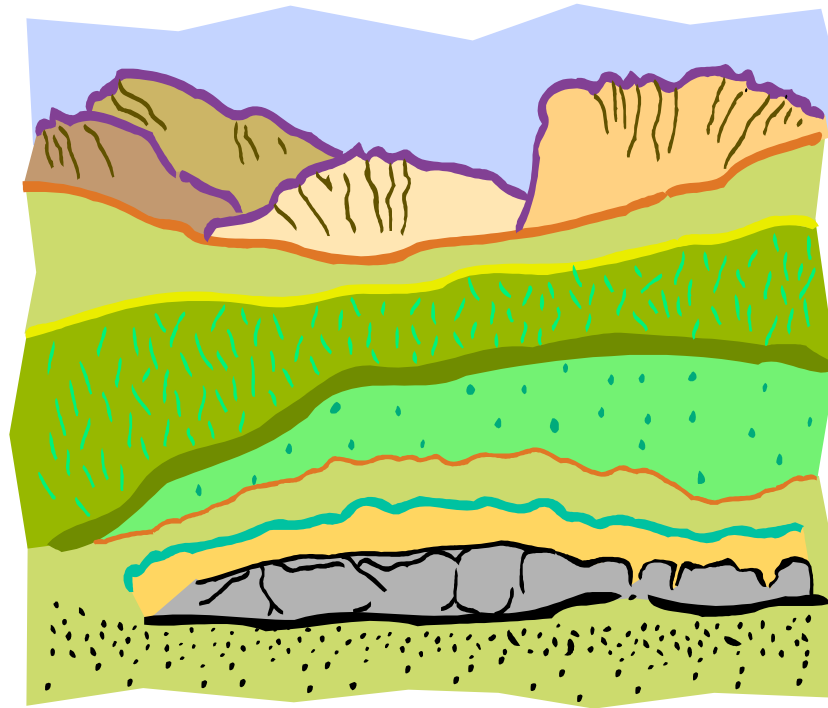
- After soil has eroded, deposition can then occur.
- Deposition* is deposits of material which is added to a landform.
- Some examples:
 - Sand dunes-wind
 - Deltas-water



Constructive Processes

☞ The major constructive processes we learned about were:

- Deposition
- Earthquakes
- Volcanoes
- Faults



Destructive Processes

☞ The destructive processes that we learned about were:

- Erosion (water; wind)
- Weathering
- Earthquakes
- Volcanoes



Human Activity

- ☞ Mankind plays a large role in affecting constructive and destructive processes.
- ☞ Sometimes, we help to stop destructive and constructive forces, and sometimes we accidentally speed them up.
- ☞ One example of how we accidentally sped up a destructive force is a place in Georgia known as Providence Canyon.

☞ <http://link.brightcove.com/services/player/bcpid/427183001?linkId=49>



Providence Canyon

- ☞ Providence Canyon was originally farmland.
- ☞ Farmers in the early 1800s cleared the forest to farm the land.
- ☞ The original forest blocked erosion. However, once the trees and plants were gone, rainwater washed the soil away.
- ☞ By 1850, ditches three to five feet formed in the land.
- ☞ Once these deep ditches formed, this only sped up the rate of erosion, and now we have the beautiful canyons that show today.
- ☞ Even though Providence Canyon is really not supposed to exist, it is one of mankind's most beautiful accidents.





Erosion

- Now, even though Providence Canyon is a marvelous sight, soil erosion that occurs on earth is considered bad by most people.
- The reason for this is because soil is necessary to grow crops and sustain buildings and structures.
- If the soil around your house's foundation erodes away, what would eventually happen to your house?
- This is why houses have gutters. Gutters move water from the roof down a pipe where it can be drained out at a place that will not wash away.





∞ This house is on a hill, and rainwater is eroding away the soil around its foundation.



Ways to SLOW DOWN Erosion...

- ∞ Plant plants!—Plant roots help to hold soil in place to keep it from washing away.



- ∞ Build a Retaining Wall—Retaining walls keep the soil behind it in place.



Ways to SLOW DOWN Erosion...

- ∞ Use Mulch—Mulch protects the soil from wind and water.

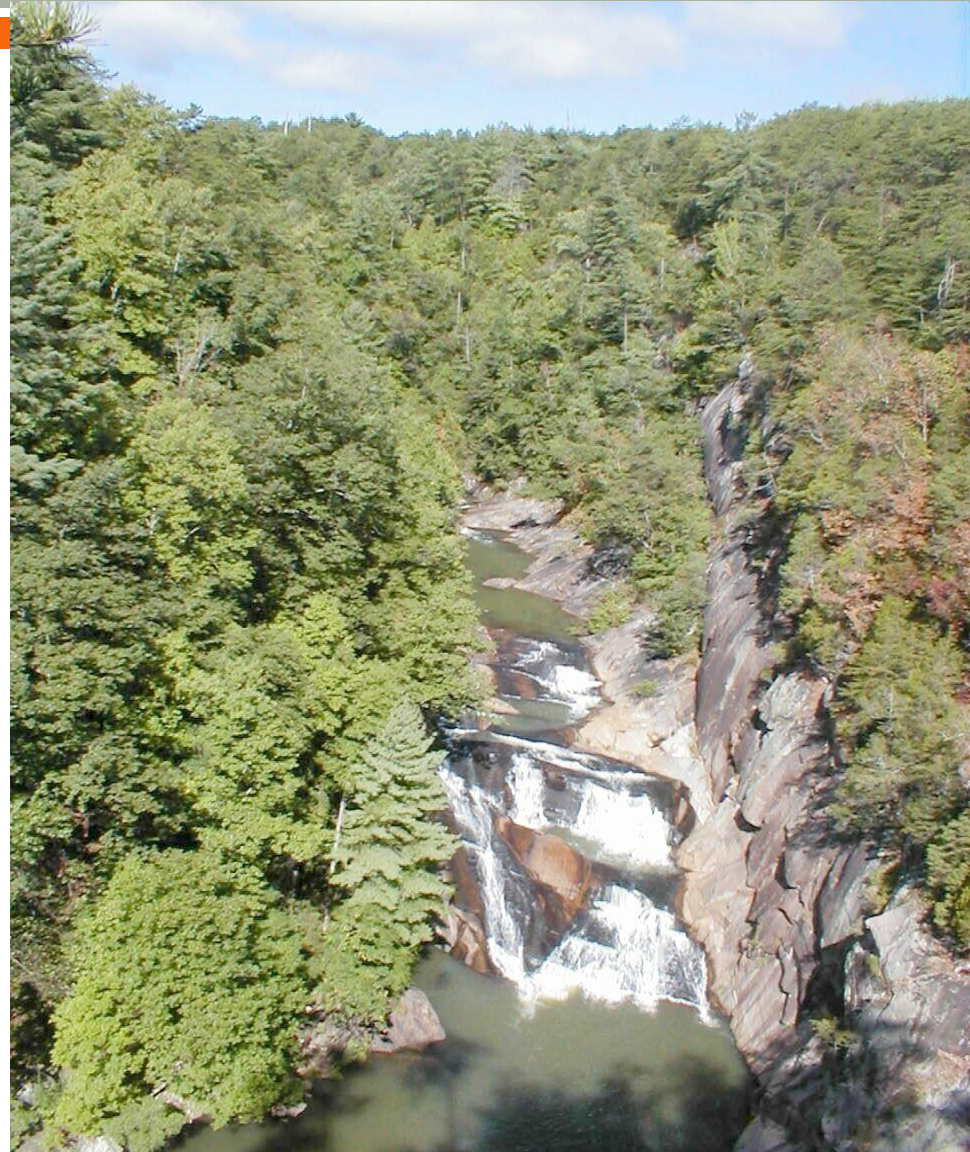


- ∞ Channel the water—Building a channel makes the water flow somewhere else that might not erode as quickly.



Tallulah Gorge

- ∞ Another example of how mankind has affected the earth's surface in Georgia is Tallulah Gorge.
- ∞ Tallulah Gorge is a gorge (rocky canyon) that was carved out of mountain granite by mighty rapids in the Northeast Georgian Mountains.
- ∞ <http://www.gpb.org/georgiatraveler/111-tallulah>



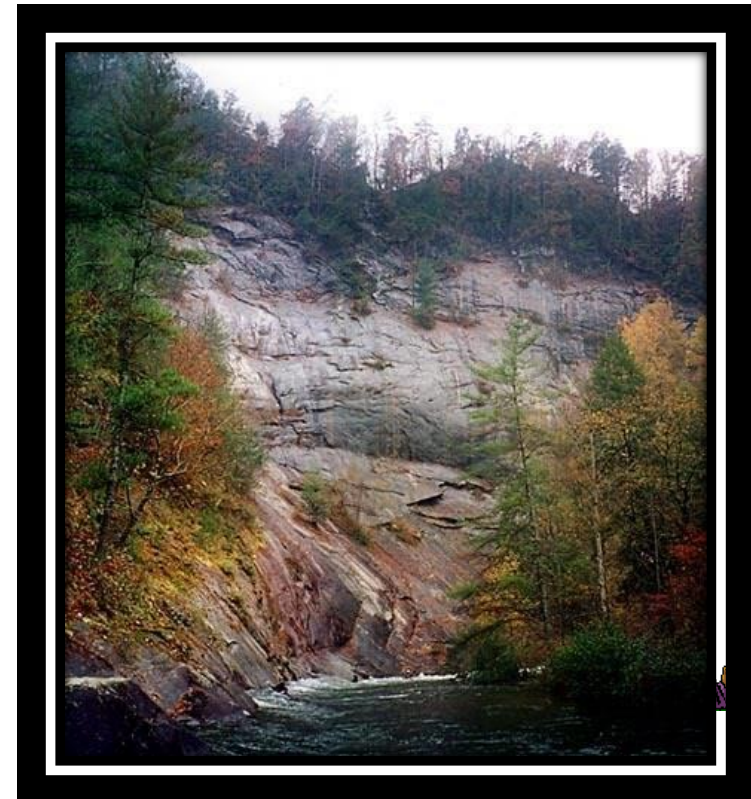
Human Intervention

- ∞ The Tallulah River once had four major waterfalls cascading down through the mountains—L'Eau d'Or, forty-six-foot-tall ; Tempesta, eighty-one feet; Hurricane, ninety-six feet; Oceana, forty-two-feet.
- ∞ The reason the Tallulah gorge was so amazing, was that it cut through solid rock creating massive natural cliffs and observation points that allowed observation of these magnificent waterfalls.
- ∞ In 1913, Georgia Power decided to use the great power of the Tallulah River to generate electricity for much of Northern Georgia (Atlanta included).
- ∞ Once they built the dam, the water no longer raged down the gorge as it once did.
- ∞ The dam is 116 feet tall and 400 feet long.
- ∞ Now, the raging river rapids and mighty waterfalls only rage on select weekends during the year.





- Now that the dam is stopping the rapid flow of water, the raging rapids are not constantly cutting into the rock of the mountain and eroding it away as it once did.
- Hence, we have altered the natural erosion of the Tallulah Gorge... but it was for a good reason.



Georgia's Barrier Islands

☞ In Georgia, there are places that constantly endure change on the earth's surface. They are Georgia's very own Barrier Islands.

☞ <http://www.gpb.org/secre>



What are Barrier Islands?

- ☞ Georgia's Barrier Islands are constantly changing islands along Georgia's coastline that protect it.
- ☞ They form a barrier between the raging ocean and inland.
- ☞ This means they are the first line of defense when an ocean storm comes ashore.
- ☞ They especially run along the eastern coast of North America.
- ☞ Because barrier islands are exposed to so much natural erosion and deposition, they are constantly changing shape, moving, and shifting.



Nature's Effects on Barrier Islands

Barrier islands are constantly changing. They are influenced by the following conditions:

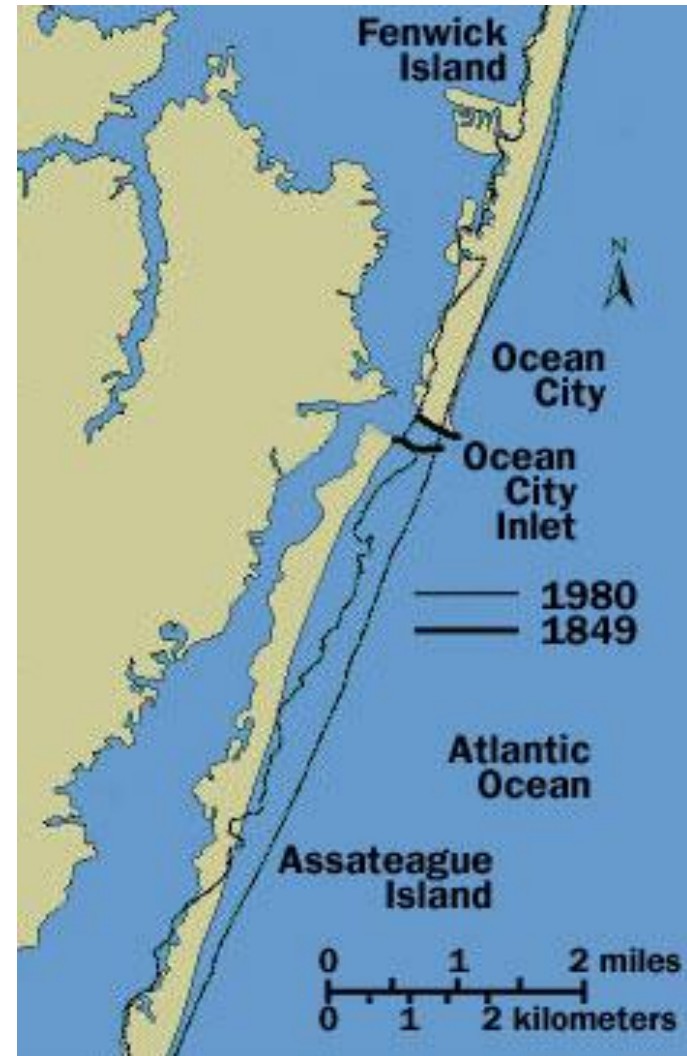
- ☞ **Waves** - Waves continually deposit and remove sediments from the ocean side of the island.
- ☞ **Currents** - Longshore currents that are caused by waves hitting the island at an angle can move the sand from one end of the island to another. For example, the offshore currents along the east coast of the United States tend to remove sand from the northern ends of barrier islands and deposit it at the southern ends.
- ☞ **Tides** - The [tides](#) move sediments into the salt marshes and eventually fill them in. Thus, the sound sides of barrier islands tend to build up as the ocean sides erode.
- ☞ **Winds** - Winds blow sediments from the beaches to help form dunes and into the marshes, which contributes to their build-up.
- ☞ **Sea level changes** - Rising [sea levels](#) tend to push barrier islands toward the mainland.
- ☞ **Storms** - [Hurricanes](#) and other storms have the most dramatic effects on barrier islands by creating overwash areas and eroding beaches as well as other portions of barrier islands.



Ways Human Efforts have Changed Barrier Islands



- ☞ Sometimes we try to stop the erosion of barrier islands, and in doing so we have completely changed the natural shifting of the islands.
- ☞ For example, this island to the left was once where the outline was. It moved inland after humans put up rock walls on the ocean city inlet.
- ☞ By stopping the erosion here, the island began shifting back.
- ☞ The same thing that happened in Maryland could happen to Georgia's Barrier Islands, if we are not careful.



Beach Reclamation

- ☞ One way people try to stop barrier island erosion is to try man-made deposition. They deposit more sand where the sand is washing away.
- ☞ This is known as beach reclamation. However, it is only a temporary fix and is very expensive (costing millions of dollars).
- ☞ Below is a beach in Florida that underwent beach reclamation, but within a year, all that sand (and all that money spent) washed away.



Human Intervention and Recent Technology

- ∞ Scientists have learned how constructive and destructive processes occur, and they are still constantly working to find out ways to predict or control them.
 - Seismographs help scientists study earthquakes and volcanic activity.
 - Erosion control by:
 - Planting plants
 - Building retaining walls
 - Water channeling/storm drains/gutters
 - Building dams
 - Beach reclamation



Watch this!!!

 <http://www.gpb.org/georgiatraveler/111>

