On the Move

A Lesson in Plate Tectonics

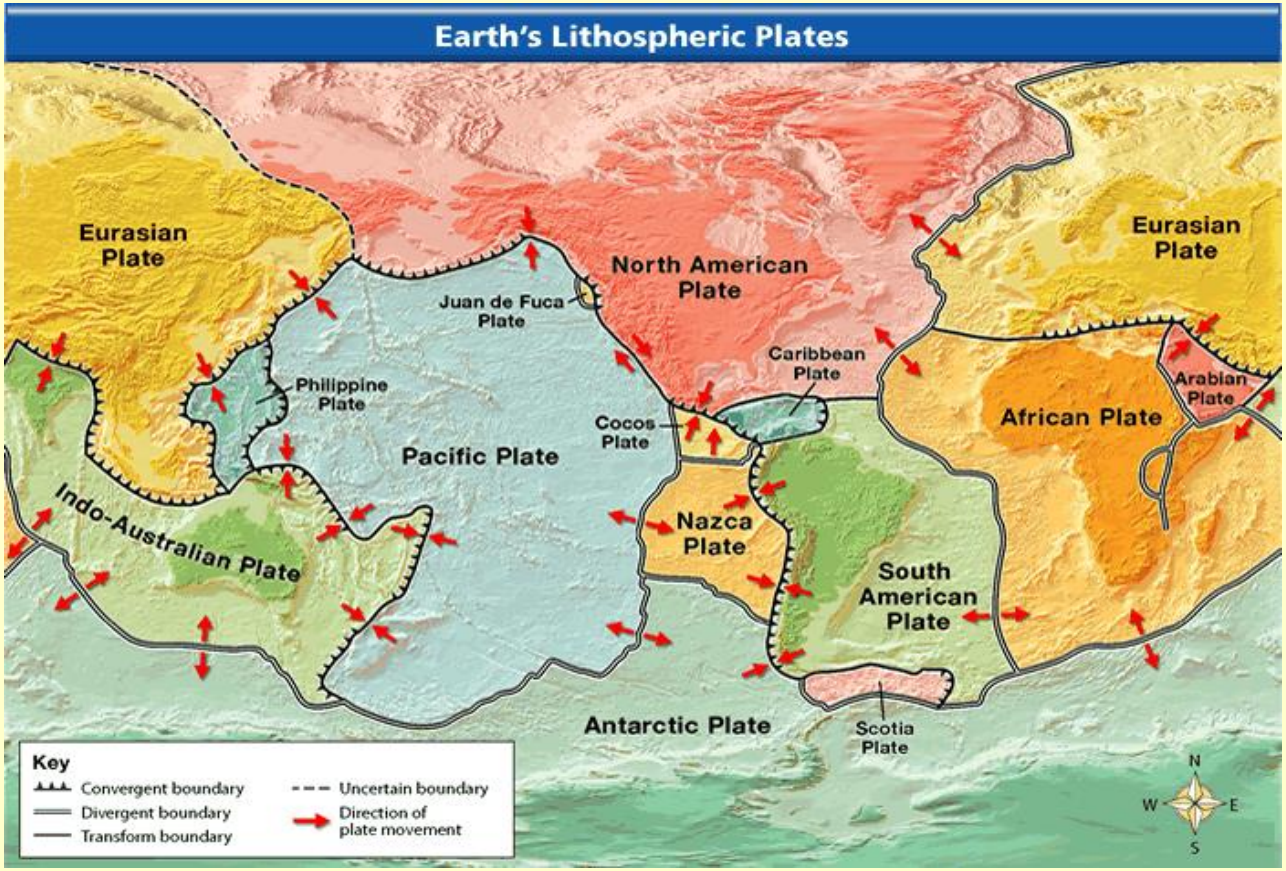
Background Convergent Divergent Transform

How Our Earth Shapes Itself

- Plate Tectonics: A Global Impact

  http://oceanexplorer.noaa.gov/edu/learning/player/lesson01.html

The Earth's Plates

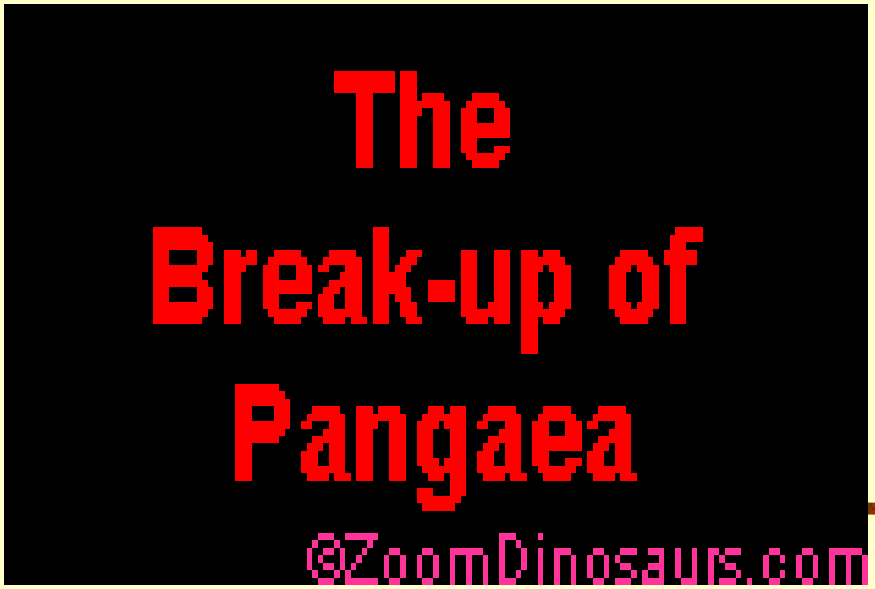


Types of plate regions:

- There are two categories of plate regions:
  - **Oceanic plate region**: an area of the plate under the ocean.
    - Example: Pacific Plate
  - **Continental plate region**: an area of the plate under the continents.
    - Example: Arabian Plate
  - Many plates contain **both oceanic and continental regions.**
    - Example: North American Plate

The Theory of Plate Tectonics

- The **Theory of Plate Tectonics** states that the Earth's plates are moving because of convection currents in the asthenosphere.
- This is the reason for the break up of Pangaea.



Convection Currents

- **Convection currents** in the asthenosphere are the driving force for all plate movements.

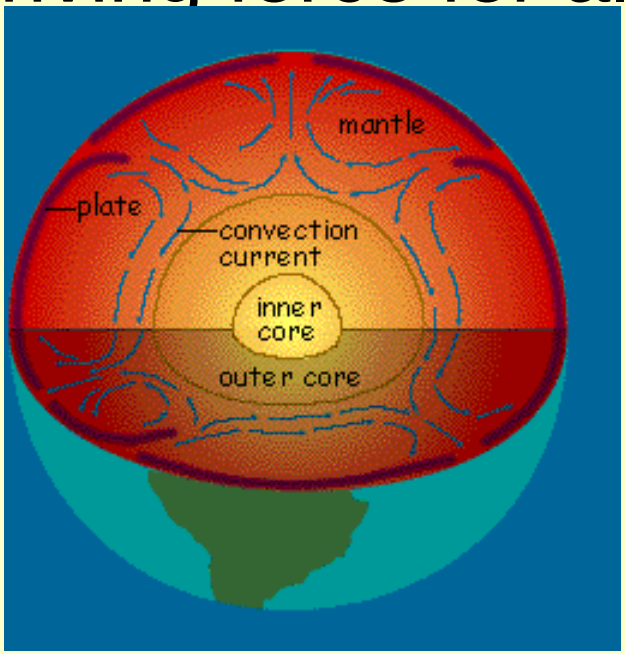
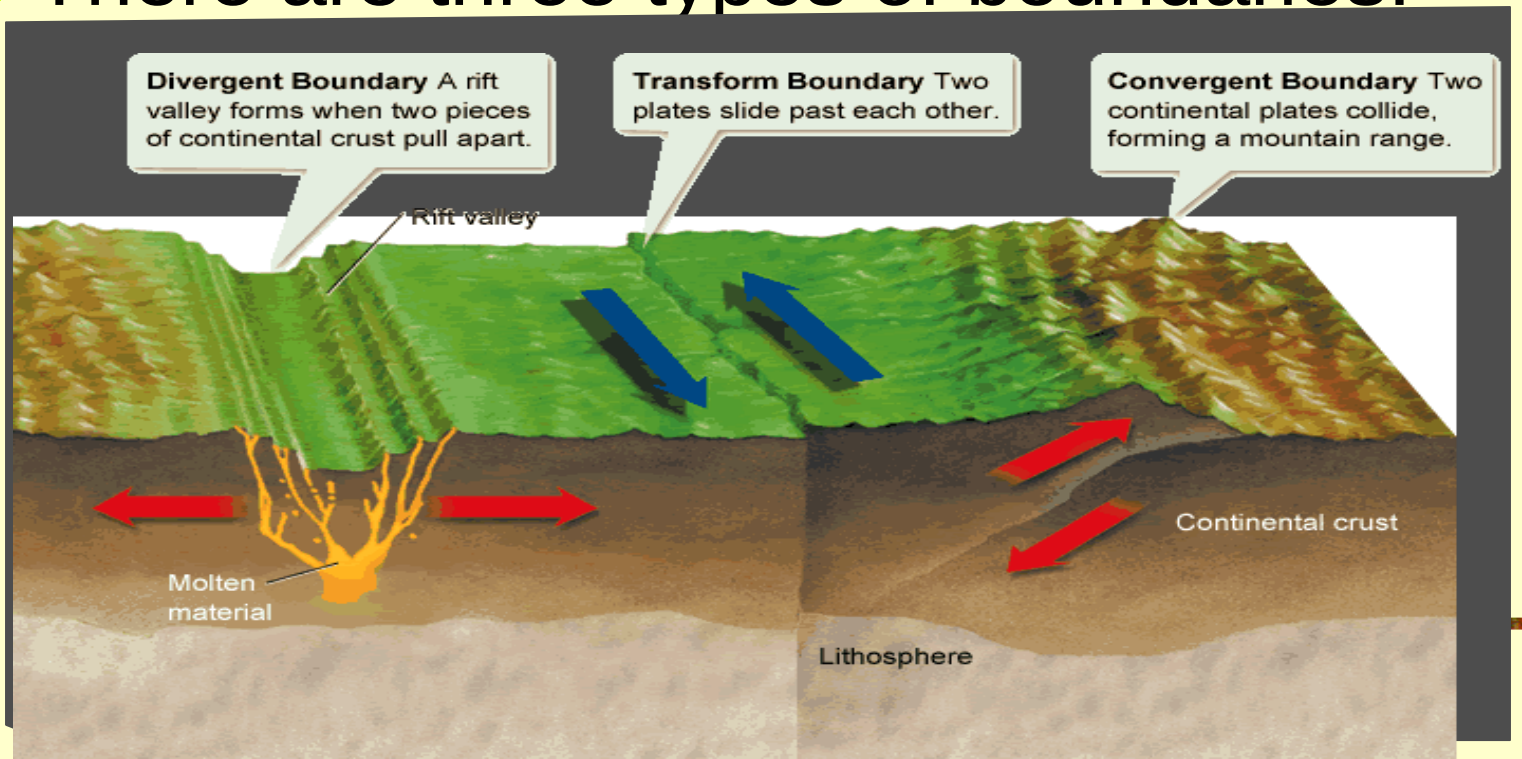


Plate Boundaries

- The place where two plates meet is called a **plate boundary**.
- There are three types of boundaries:



A Stressful Situation

- Plate Boundaries are very unstable. They are constantly moving.
  - This movement causes stress on the Earth's crust! Sometimes, the stress builds and an earthquake occurs.
  - These boundaries push or pull the Earth so much that it causes cracks to form in the crust called **faults**!

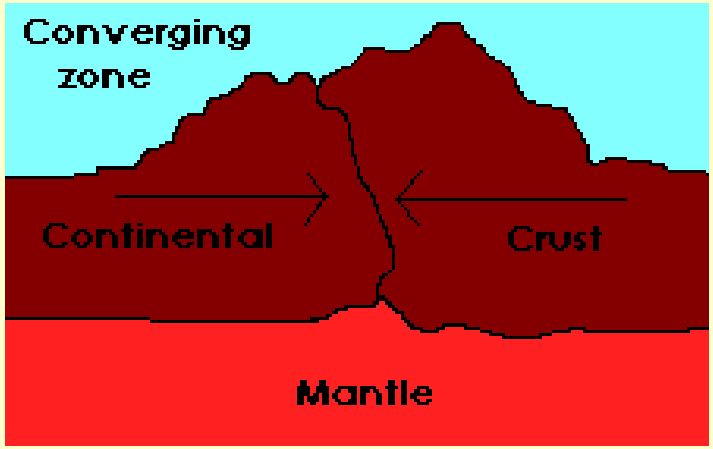
Convergent Boundaries

Convergent Boundary

CONVERGENT BOUNDARY

What movement occurs:

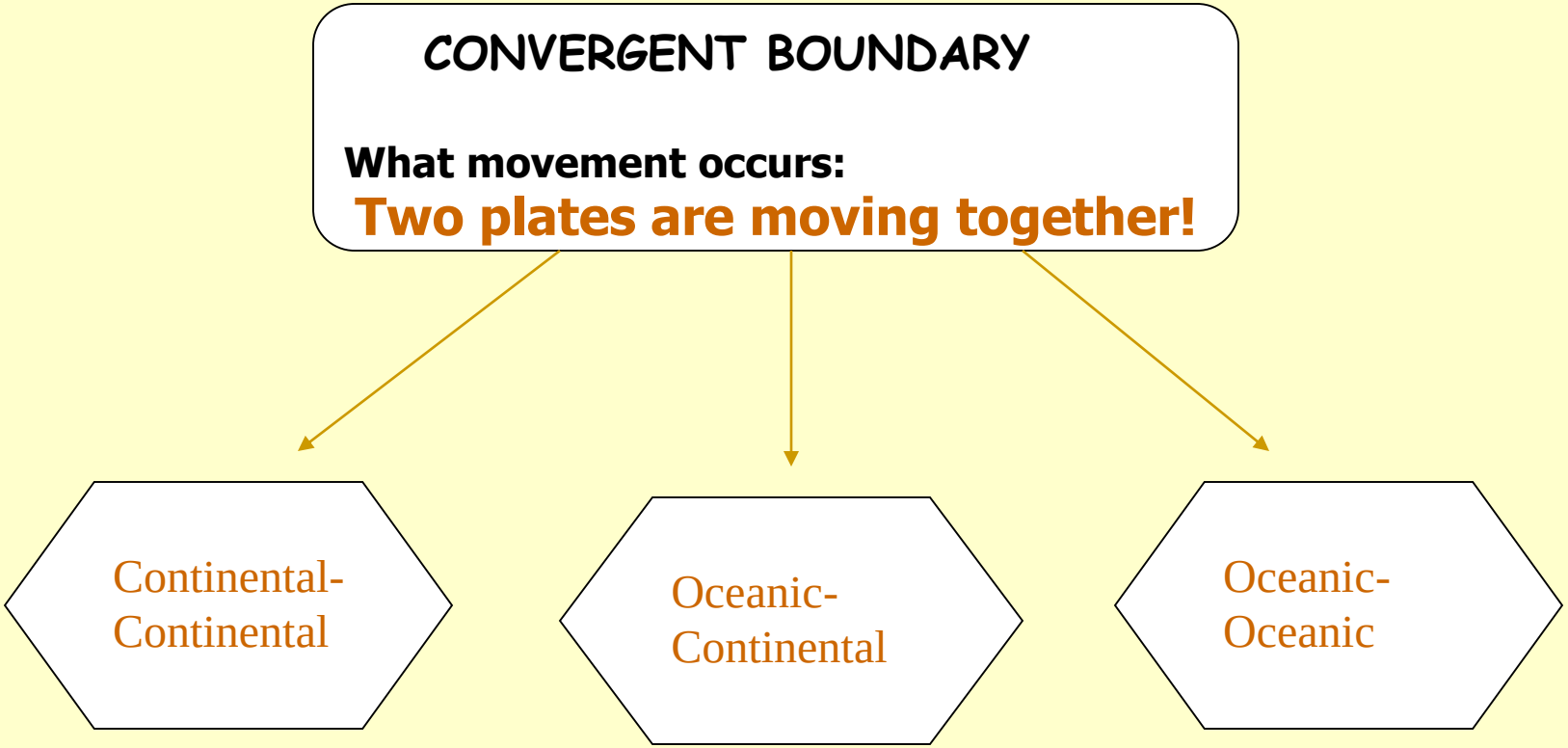
Two plates are moving together!



Convergent Boundaries

- There are three types of Convergent Boundaries based upon the types of plate regions that are moving together:
  - Continental-Continental
  - Oceanic-Continental
  - Oceanic-Oceanic

Our Web So Far:



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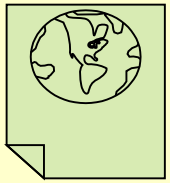
Add to the web!



TYPE OF FAULT:

REVERSE

CONVERGENT BOUNDARY

What movement occurs:

Two plates are moving together!

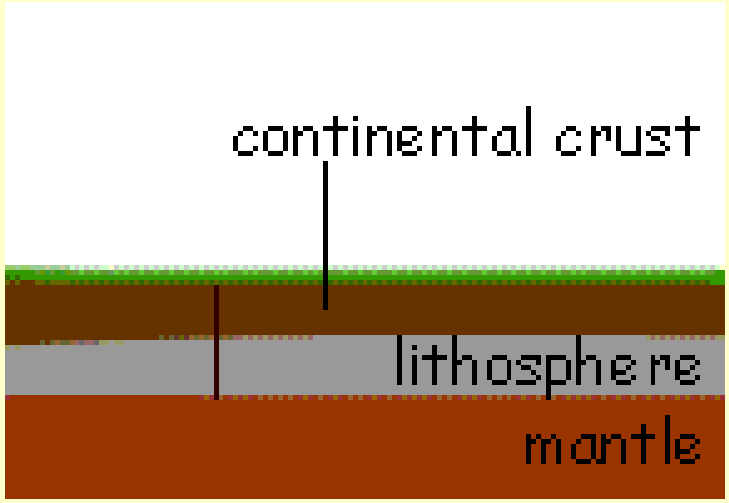
Continental-Continental

Oceanic-Continental

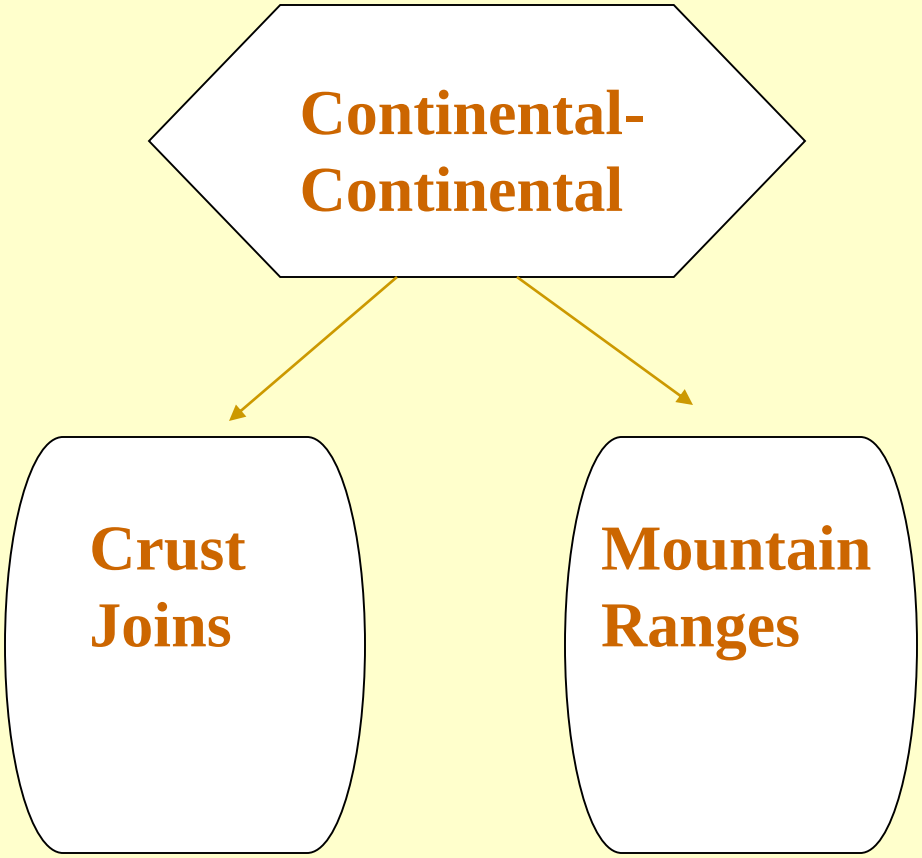
Oceanic-Oceanic

Continental-Continental Convergent

- When two continental plates move together, the **crust joins** and **mountain ranges** are formed.



Time to add to the Web!

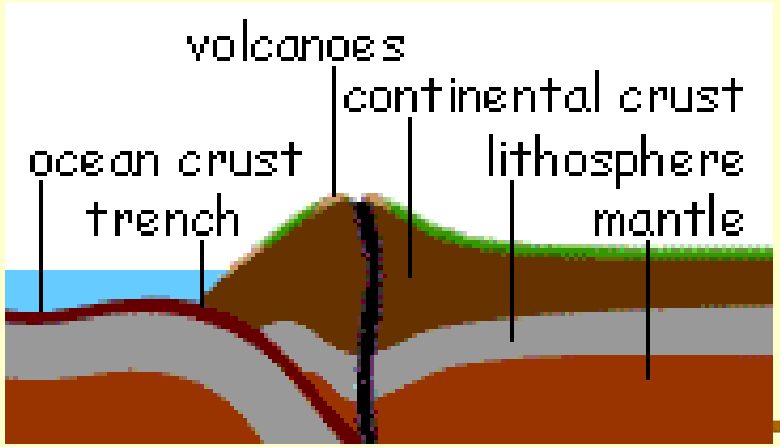


Real World Example!

- This is what happened when the Indian Plate crashed into the Eurasian Plate: The Himalayan Mountains were formed.

Oceanic-Continental Convergent

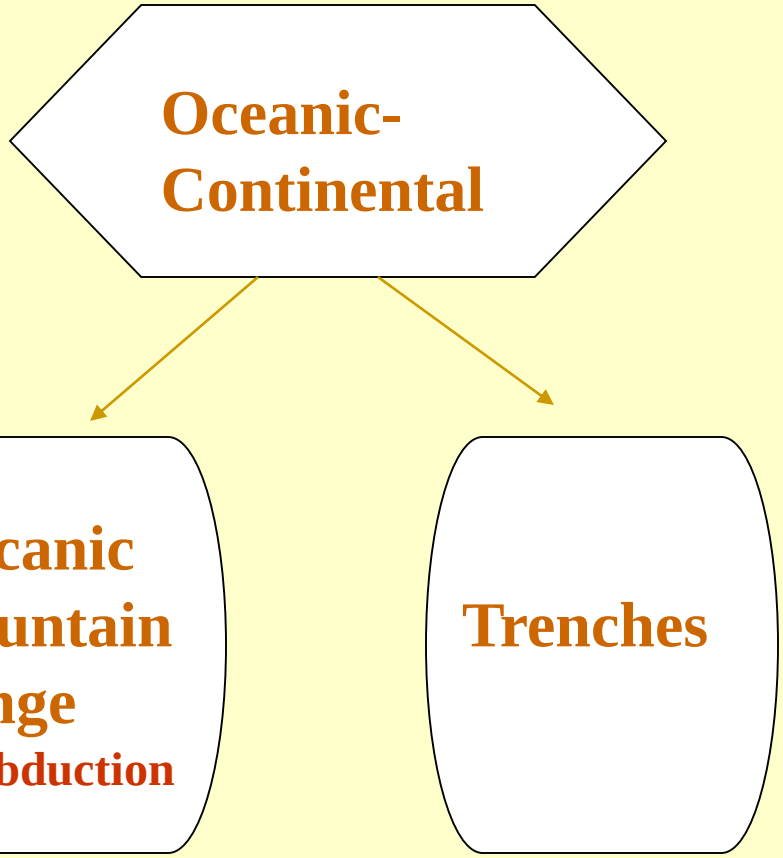
- When an oceanic plate region converges with a continental plate region, **subduction** occurs causing **volcanic mountain ranges** and **ocean trenches** to form.



What is Subduction?

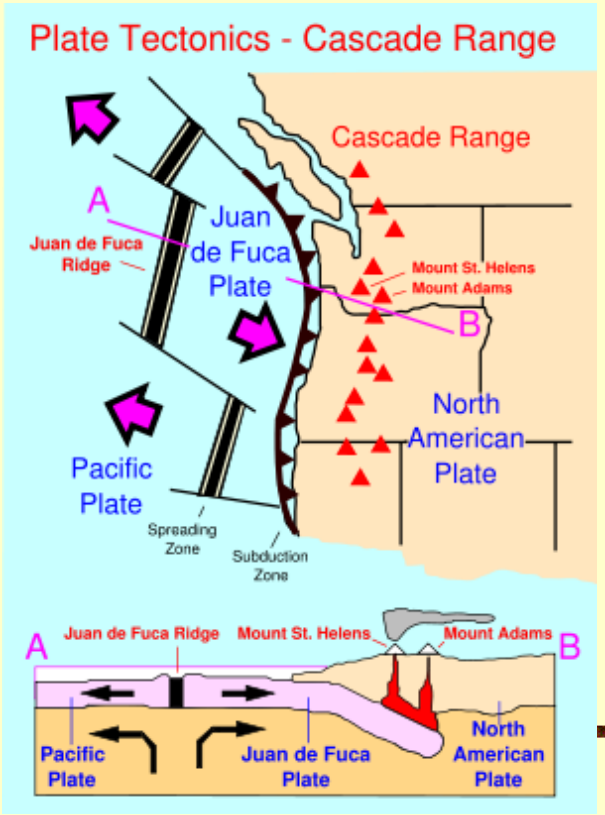
- **Subduction** occurs when the more dense oceanic plate region slides underneath the less dense continental plate region.
  - The region of the oceanic plate dips into the asthenosphere and begins to melt creating volcanoes.
  - The trench forms parallel to the volcanic mountain range.

Time to add to the Web!



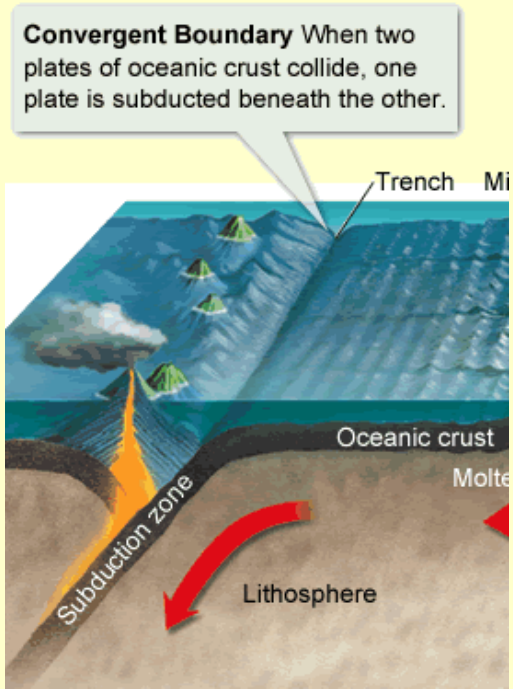
Real World Example!

- Subduction occurred when the Juan de Fuca Plate converged with the North American Plate: Mount Saint Helens was formed.



Oceanic-Oceanic Convergent

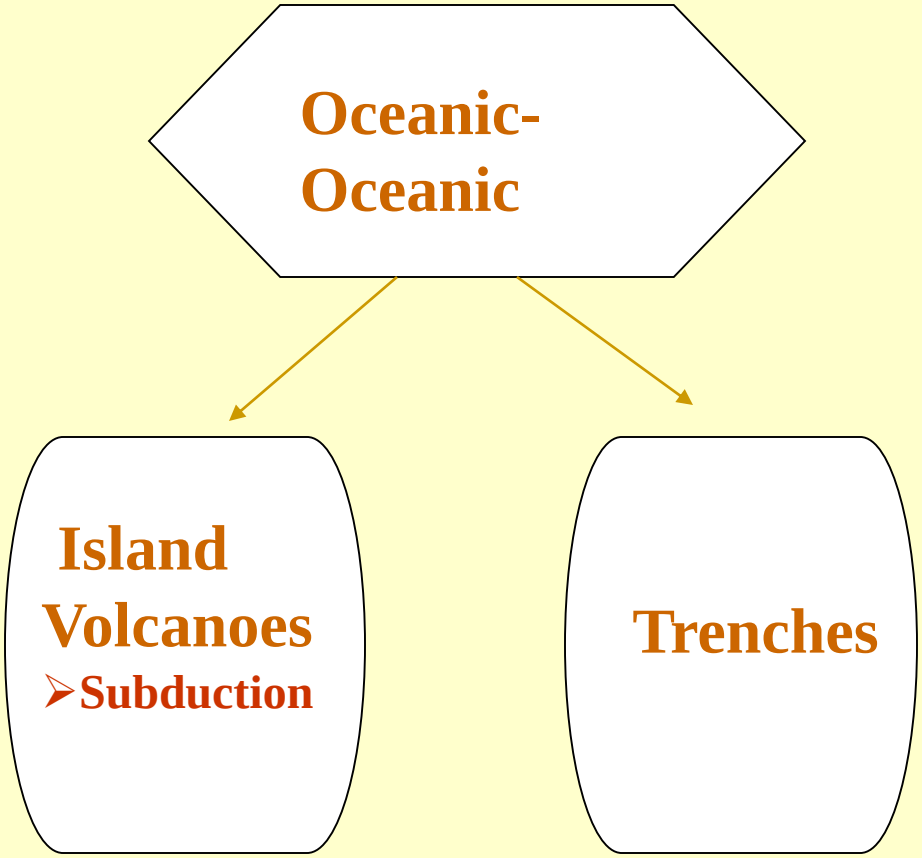
- When an oceanic plate region converges with another oceanic plate region, **subduction** occurs causing **volcanic islands** and **ocean trenches** to form.



Remember Subduction!

- In this type of boundary, **subduction** occurs when the more dense oceanic plate region slides underneath the less dense oceanic plate region.

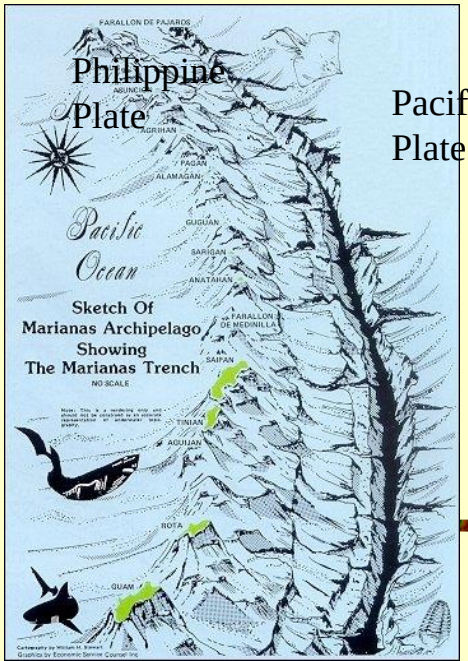
Time to add to the Web!



Real World Example!

- This is what occurred when the more dense Pacific Plate was subducted underneath the less dense Philippine Plate: The Marianas Trench and Marianas Islands were formed.


November 21, 1996



STOP

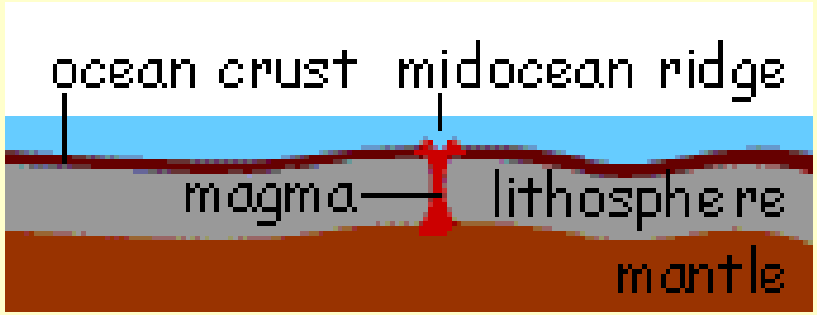
Divergent Boundaries

Divergent Boundary

DIVERGENT BOUNDARY

What movement occurs:

Two plates are moving apart!



Divergent Boundaries

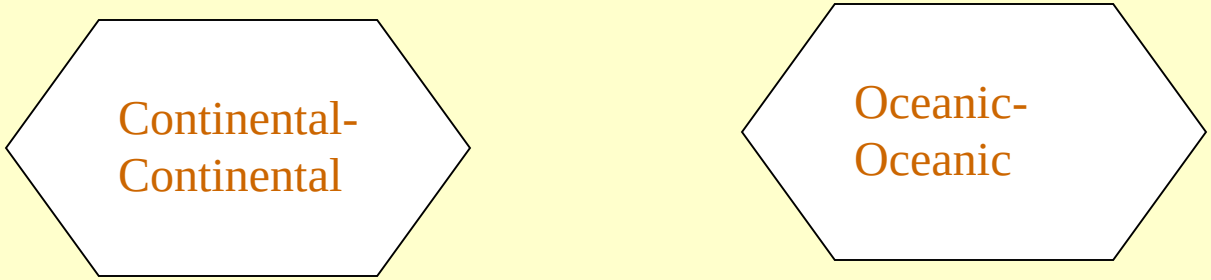
- There are two types of Divergent Boundaries based upon the types of plate regions that are moving apart:
  - Continental-Continental
  - Oceanic-Oceanic

Our Web So Far:

DIVERGENT BOUNDARY

What movement occurs:

Two plates are moving apart!



A Stressful Situation

- Plate Boundaries are very unstable. They are constantly moving.
  - This movement causes stress on the Earth's crust! Sometimes, the stress builds and an earthquake occurs.
  - These boundaries push or pull the Earth so much that it causes cracks to form in the crust called **faults**!

Add to the web!

DIVERGENT BOUNDARY

What movement occurs:

Two plates are moving apart!

TYPE OF FAULT:

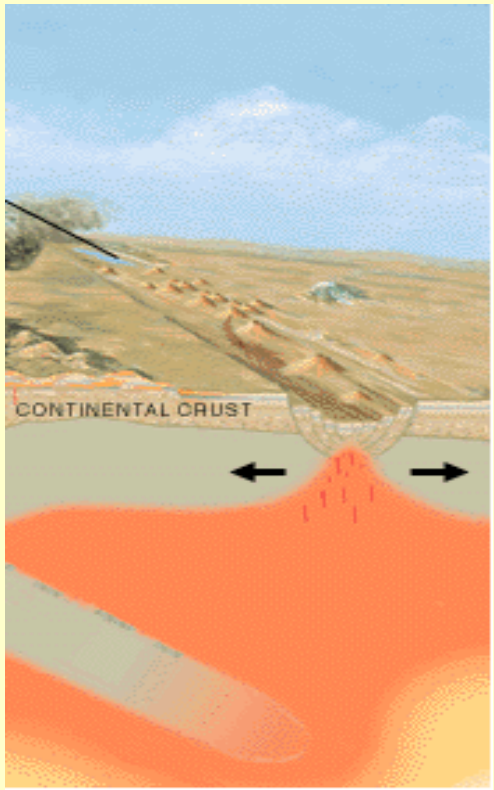
NORMAL

Continental-Continental

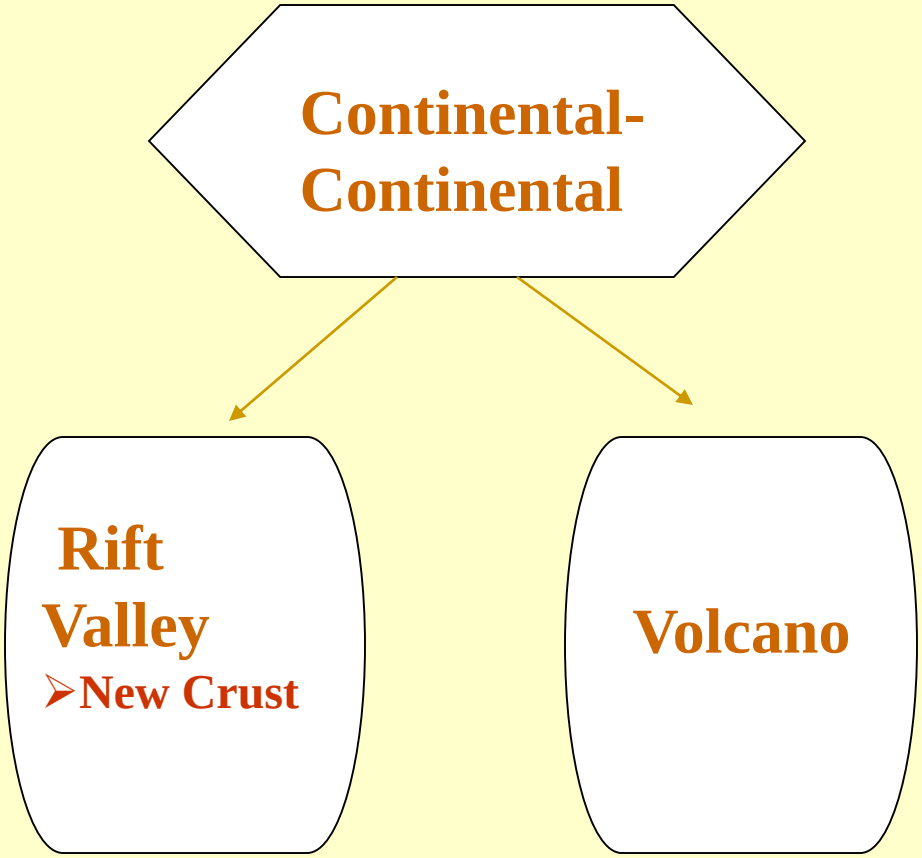
Oceanic-Oceanic

Continental-Continental Divergent

- When two continental plate regions move apart, a **rift valley** and **volcanoes** are formed.

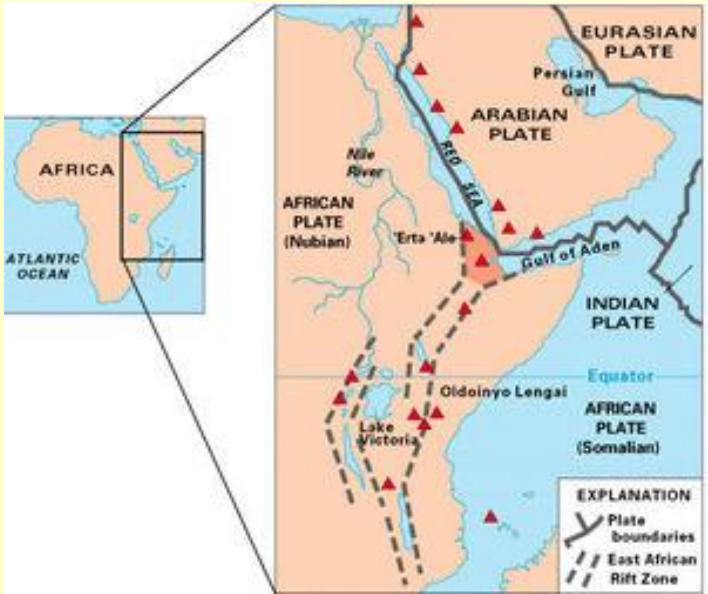


Time to add to the Web!



Real World Example!

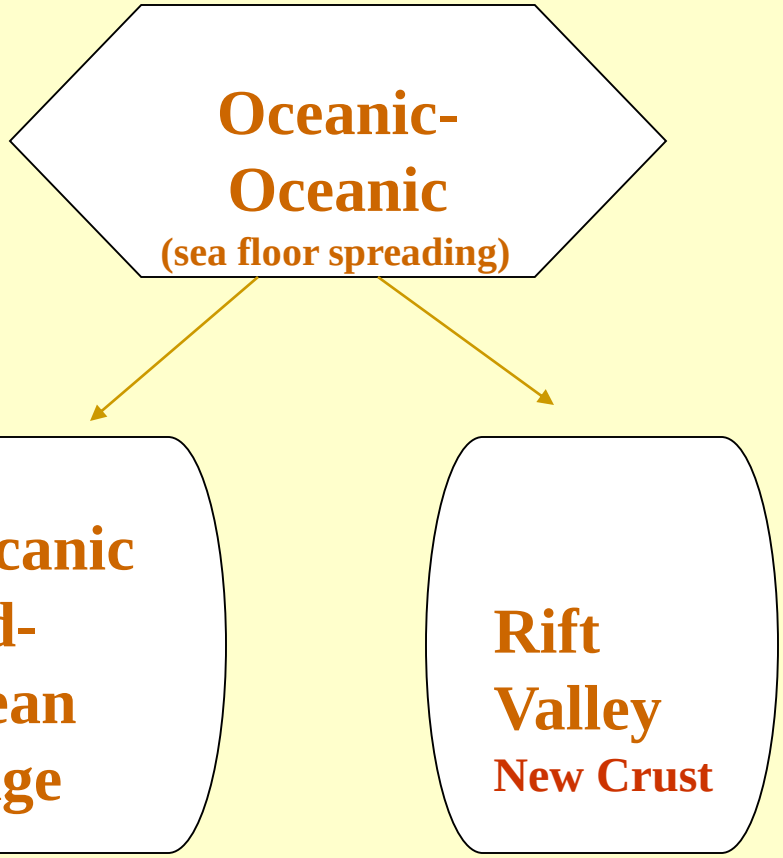
- This is what is occurring as the Arabian Plate is diverging from the African Plate: The African Rift Valley was formed.
  - Scientists believe that eventually water from nearby oceans will flood in and form a new ocean!



Oceanic-Oceanic Divergent

- When two oceanic plate regions diverge, a **volcanic mid-ocean ridge** and **rift valley** are formed.

Time to add to the Web!

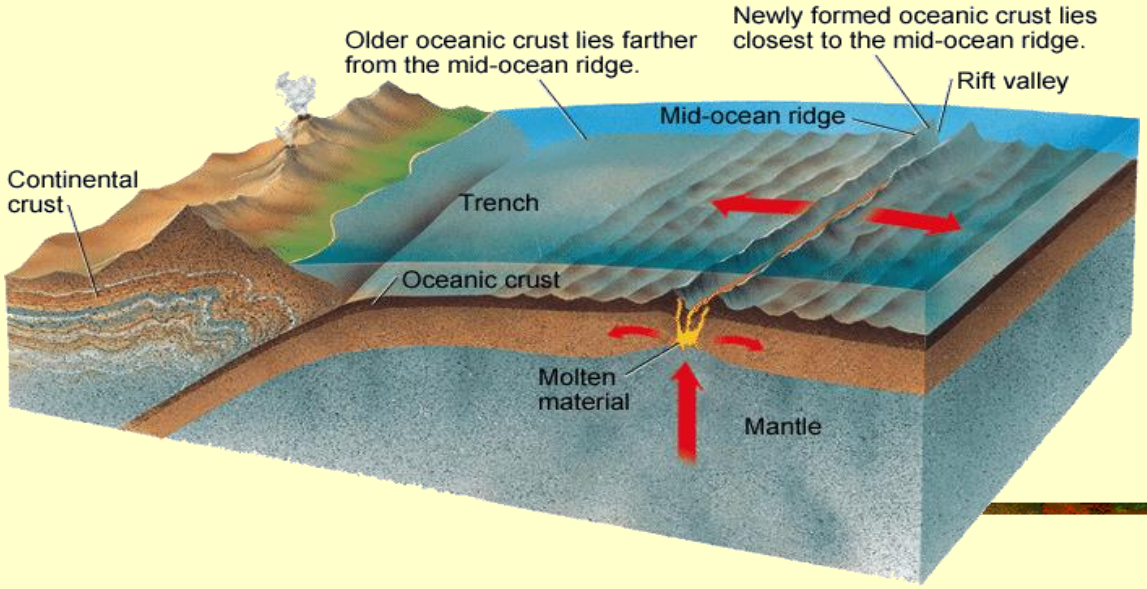


Real World Example!

- This is what is occurring where the North American Plate and the Eurasian Plate are diverging: The Mid-Atlantic Ridge and Krafla Volcano(in Iceland) were formed.
  - The Atlantic Ocean is constantly growing!

Putting it all Together!

- At divergent boundaries, crust is created!
- At convergent boundaries, crust is destroyed!
- The overall Earth stays the same! ☺



STOP

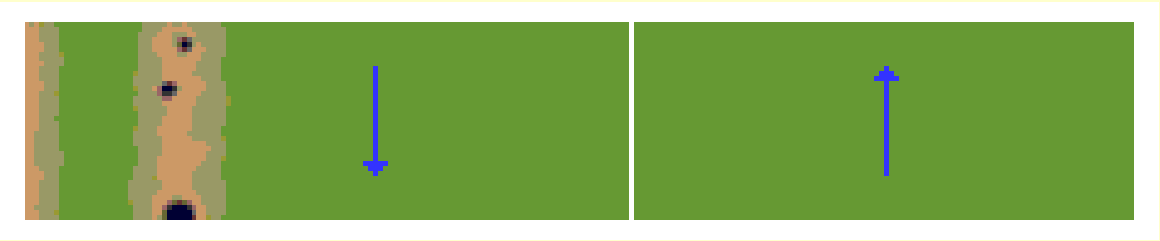
Transform Boundaries

Transform Boundary

TRANSFORM BOUNDARY

What movement occurs:

Two plates are sliding!



Transform Boundaries

- ***Can happen at ANY 2 plate regions!***
  - ***O-O***
  - ***C-C***
  - ***O-C***

Our Web So Far:

TRANSFORM BOUNDARY

What movement occurs:

Two plates are sliding!

ANY TWO PLATES!

A Stressful Situation

- Plate Boundaries are very unstable. They are constantly moving.
  - This movement causes stress on the Earth's crust! Sometimes, the stress builds and an earthquake occurs.
  - These boundaries push or pull the Earth so much that it causes cracks to form in the crust called **faults**!

Add to the web!

TRANSFORM BOUNDARY

What movement occurs:
Two plates are sliding!

TYPE OF FAULT:

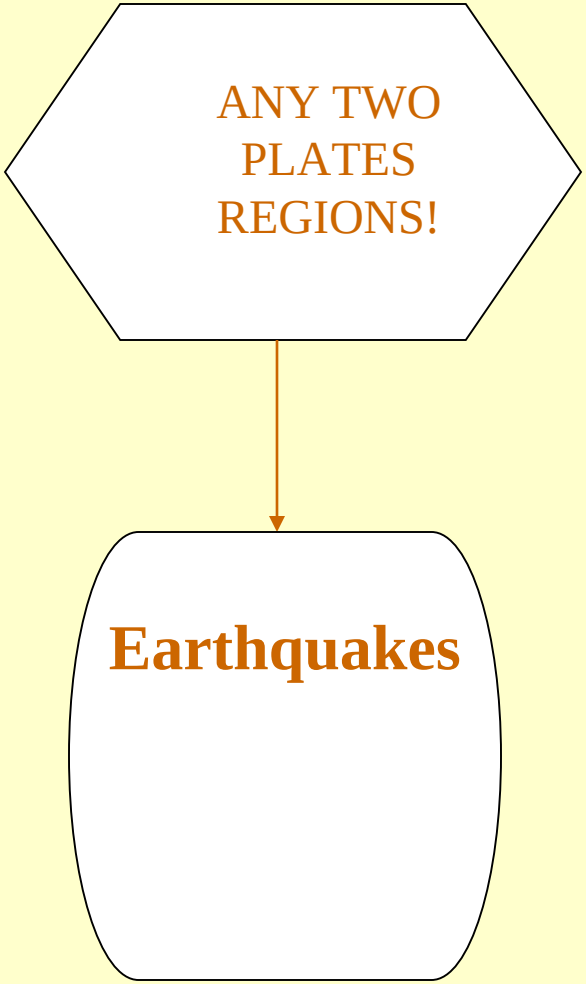
STRIKE-SLIP

ANY TWO PLATES REGIONS!

Transform Boundaries

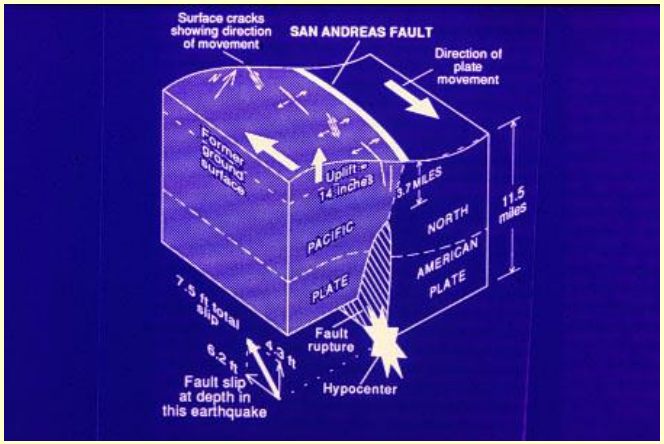
- At a transform boundary, **earthquakes** occur as stress is released and the rocks of the crust shift.

Add to the Web!



Real World Example

- This is what happens frequently in California at the San Andreas fault.
  - The famous 1989 earthquake in California measured 7.5 on the Richter Scale!



Wrapping it Up – All At Once

- Plate Tectonics: Lesson

http://oceanexplorer.noaa.gov/edu/learning/player/lesson01.html

Faults

A Stressful Situation

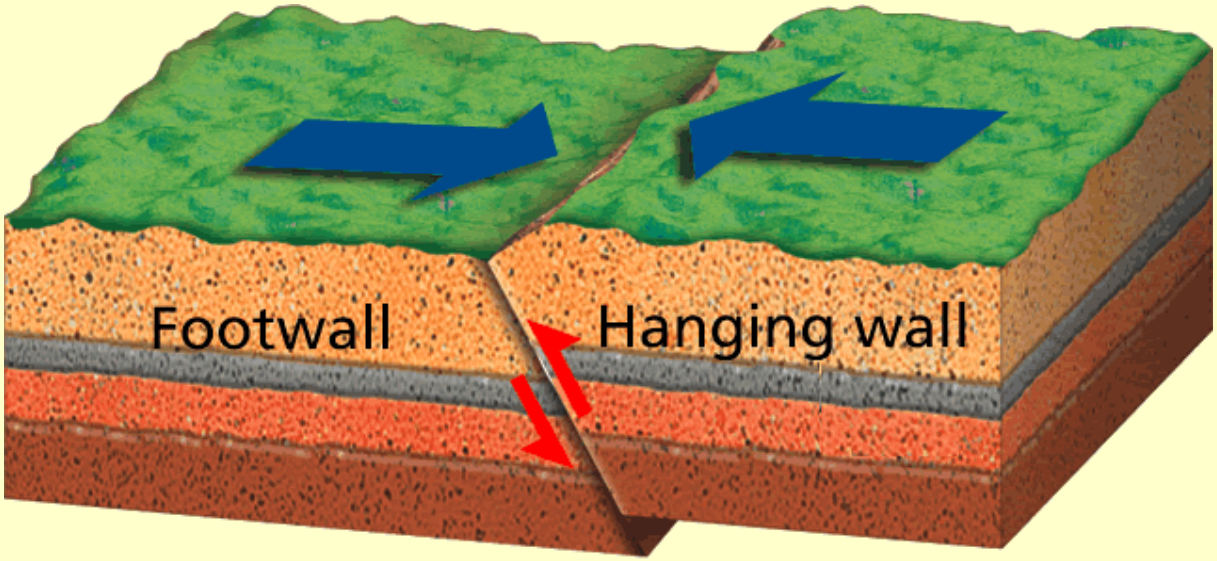
- Plate Boundaries are very unstable. They are constantly moving.
  - This movement causes stress on the Earth's crust! Sometimes, the stress builds and an earthquake occurs.
  - These boundaries push or pull the Earth so much that it causes cracks to form in the crust called **faults**!

Faults

- **Faults** are breaks in the rock of the crust where rock surfaces slip past each other.
  - Rocks are put under stress
  - Rocks “give in” to the stress by breaking
  - The breaks, or cracks, are called “faults”

Reverse Faults

- Compression in Earth's crust pushes rock together, causing reverse faults.



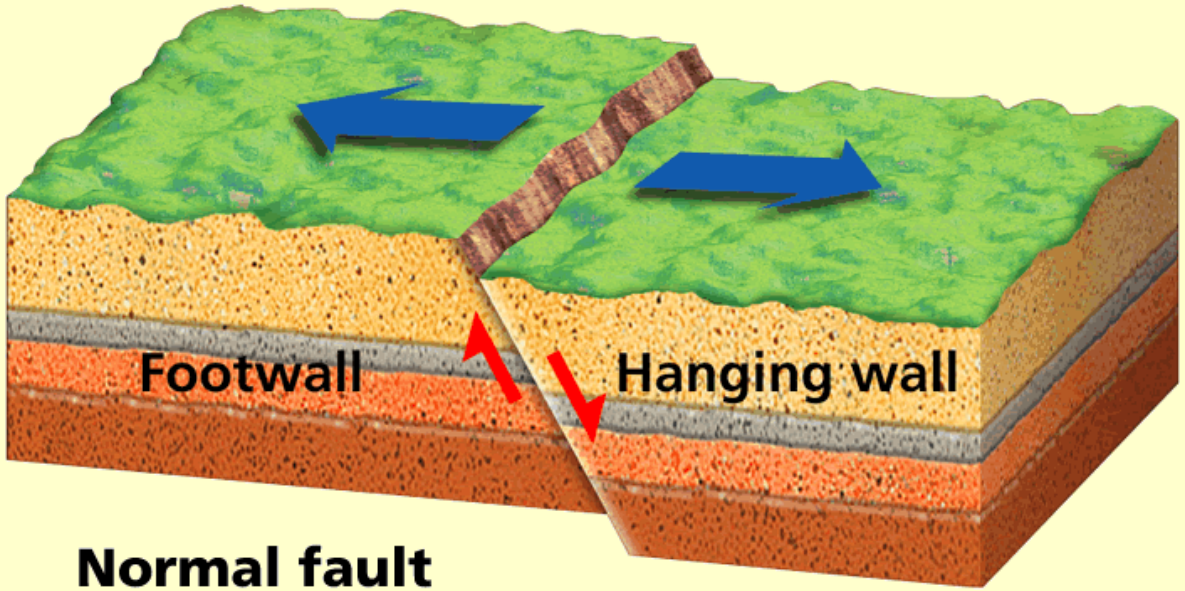
Reverse fault
In a reverse fault, the hanging wall moves up relative to the footwall.

Reverse Faults

- Occur at convergent boundaries
- The rock of the crust is pushed together
- In **reverse faults**, compression causes the hanging wall (the higher piece of land) to slide up over the footwall (the lower piece of land).
- Parts of the northern Rocky Mountains were made this way!

Normal Fault

- Tension in Earth's crust pulls rock apart, causing normal faults.



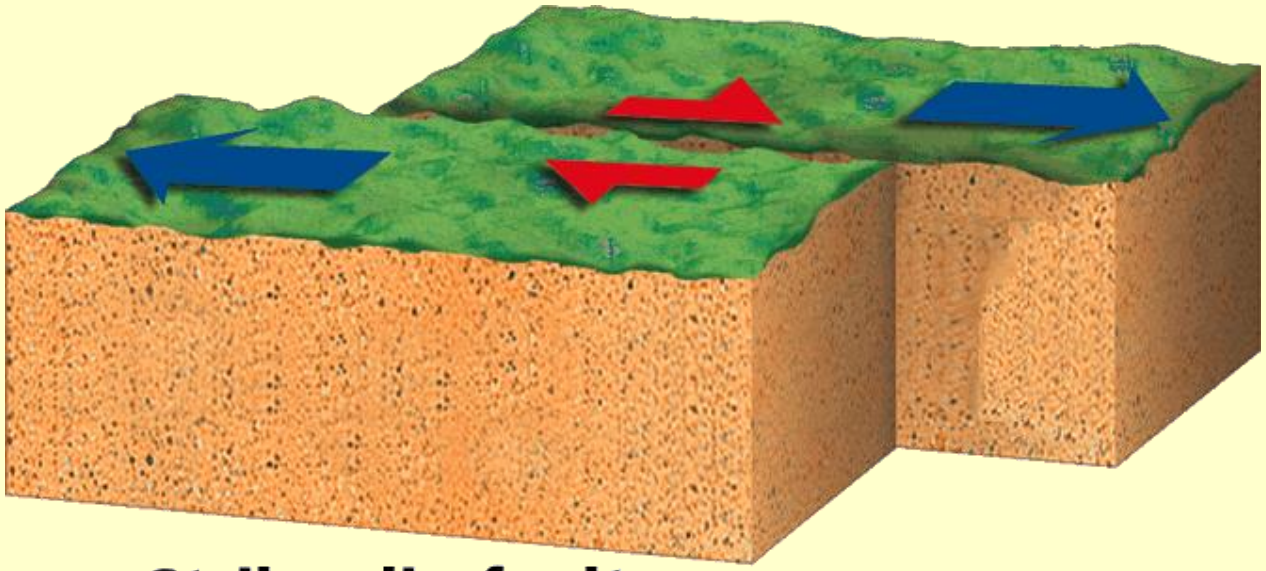
Normal fault
In a normal fault, the hanging wall slips down relative to the footwall.

Normal Faults

- Occur at divergent boundaries
- The rock of the crust is pulled apart
- In **normal faults**, tension causes the hanging wall (the higher piece of land) to slip down toward the footwall (the lower piece of land).
- The Rio Grande rift valley in New Mexico was formed this way!

Strike-Slip Fault

- In a strike-slip fault, the rocks on either side of the fault slip past each other sideways, with no up and down motion.



Strike-slip fault
Rocks on either side of a strike-slip fault slip past each other.

Strike-slip Fault

- Occur at transform boundaries
- Are caused by the sliding motions between the two plates
- In strike-slip faults, the rocks on either side of the fault slip sideways past each other.
- This is how the San Andreas fault in California was formed!