Unit 2: Plate Tectonics

The Big EQ:

Essential Question: How does the constant movement of lithospheric plates cause major geological events on the earth's surface?

Standard:

S6E5e. Recognize that lithospheric plates constantly move and cause major geological events on the earth's surface.

Resource: Textbook Chapter 3

Activating Strategy

Watch Ice Age: Scrat Continental Crack Up

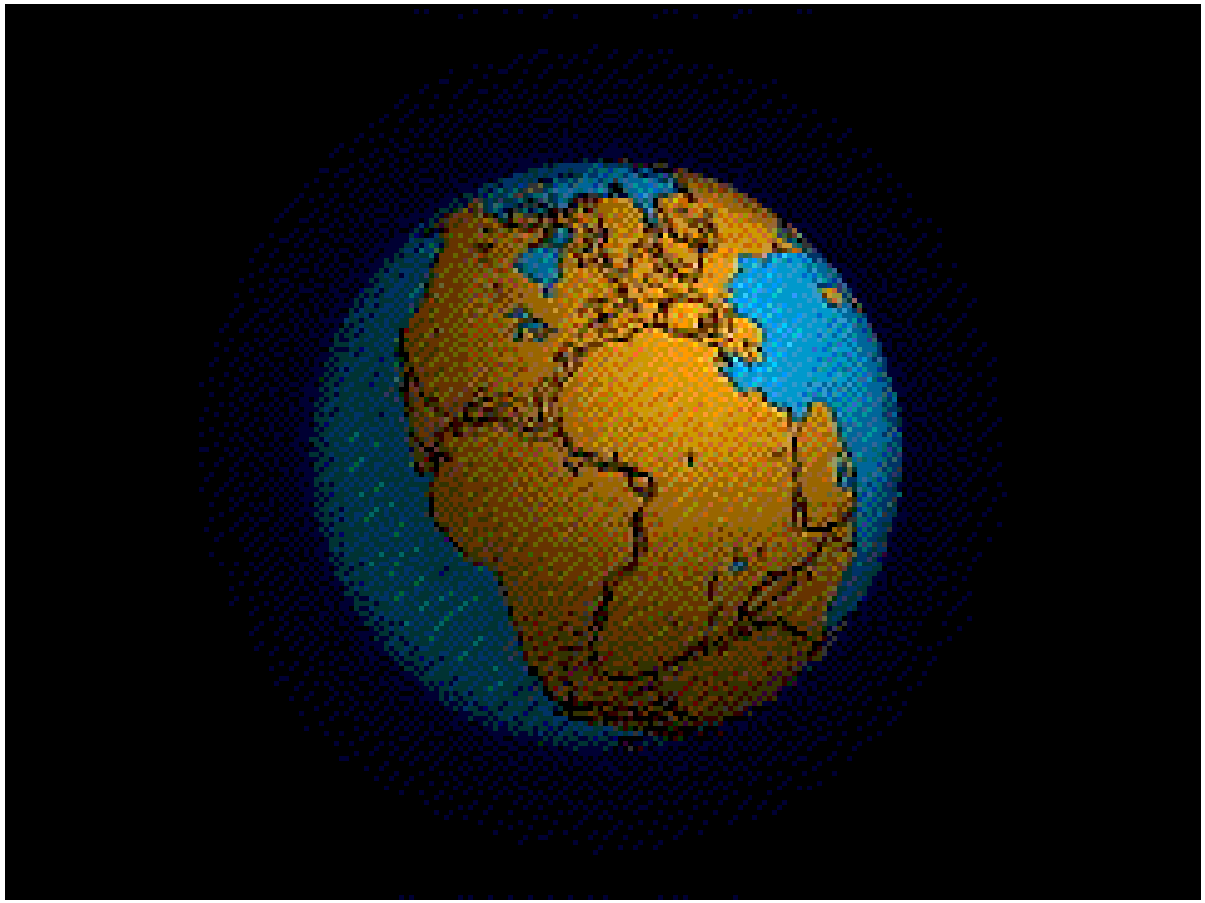
https://safeshare.tv/x/ss57f18d1419350

video clip and have students either answer individually or with a partner the following questions:

(1) Which part(s) of Scrat's adventure is accurate?

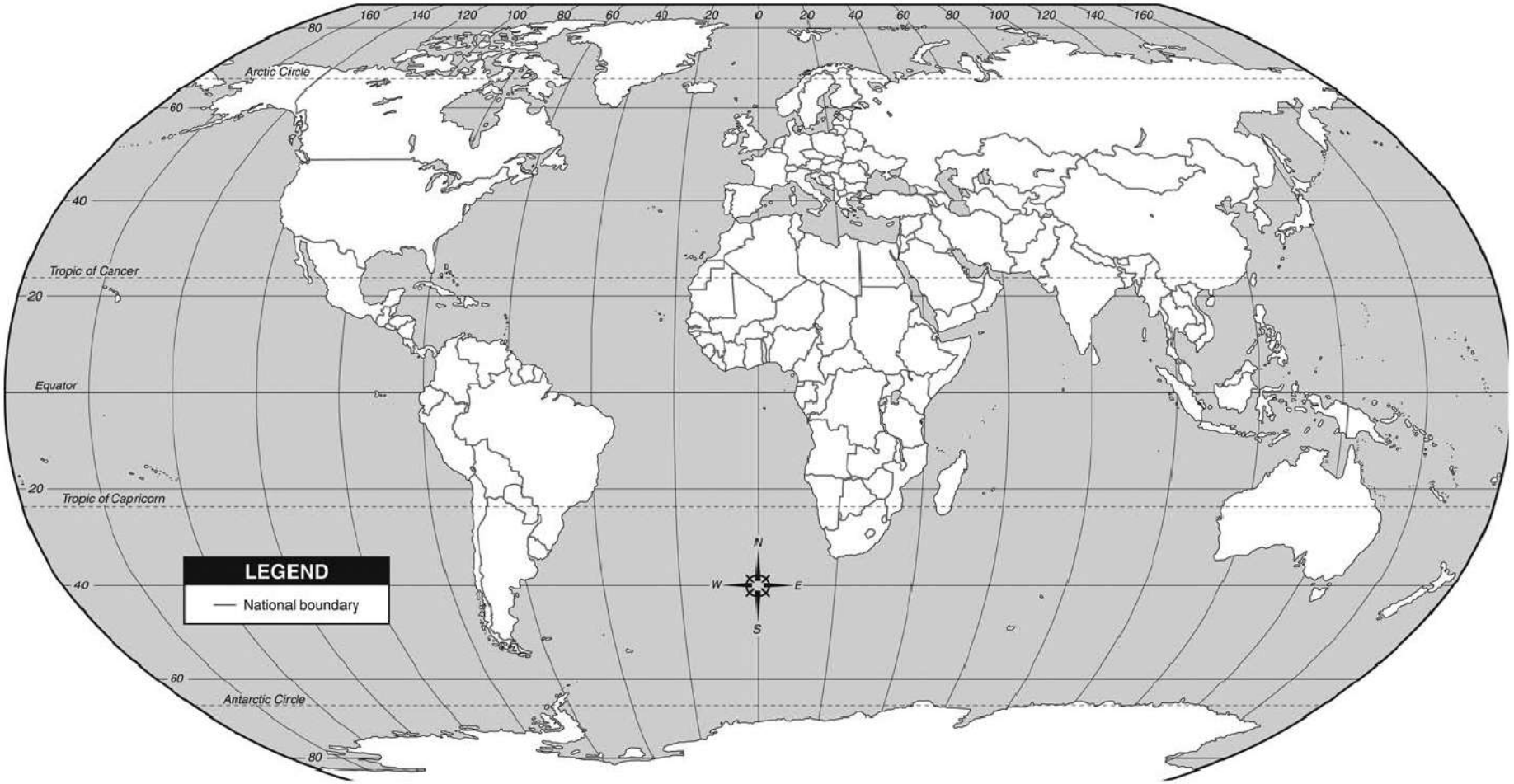
(2) Which part(s) of Scrat's adventure is not accurate?

Can you identify the continents that were once part of ***Pangaea***?

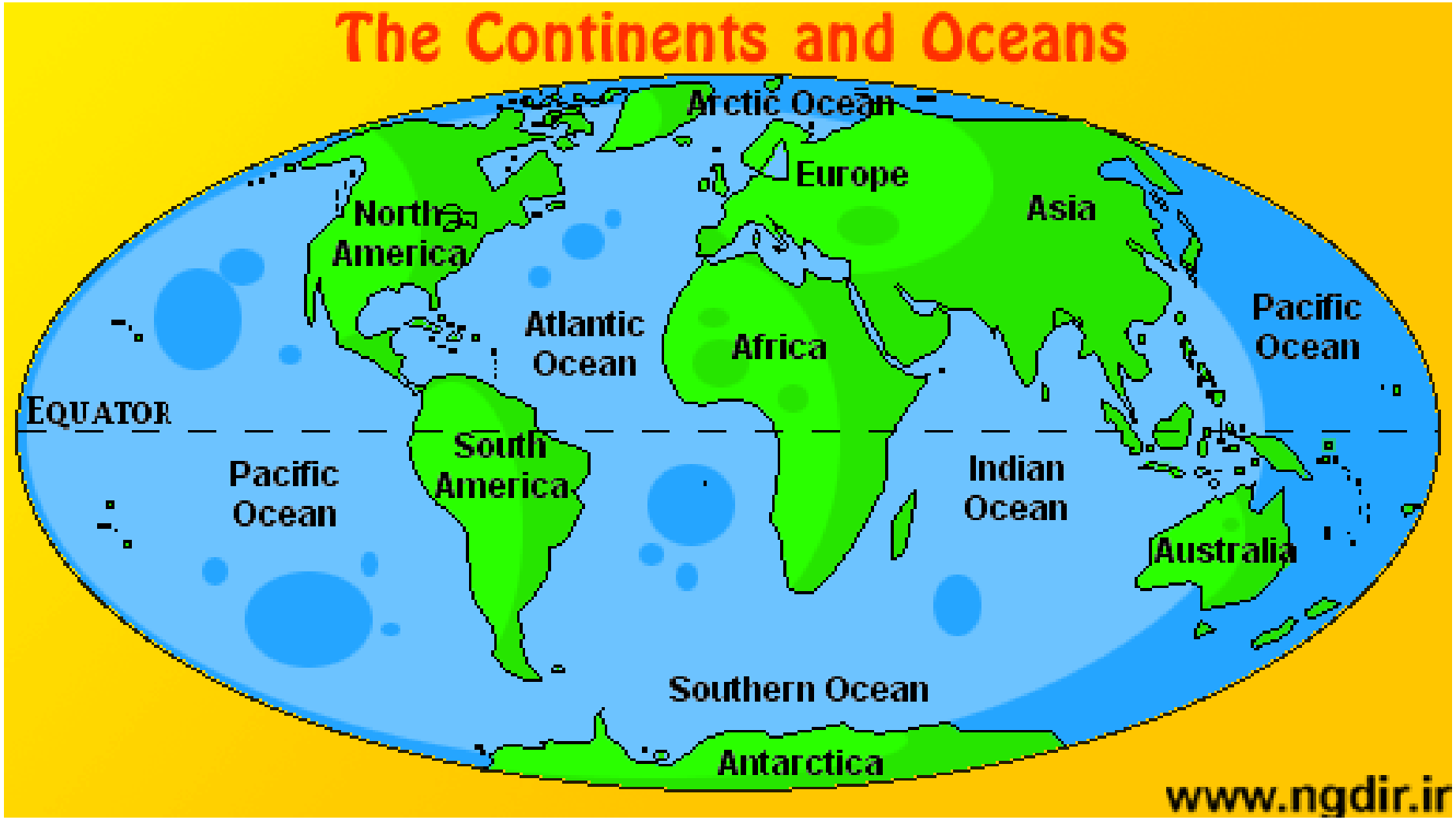


- Let's find out…

How does our world look now?
Label the oceans & continents on *your* map.



How did you do?



Quick Summary Quiz

- Which ocean would you cross if you left the eastern coast of North America and travelled to Europe?

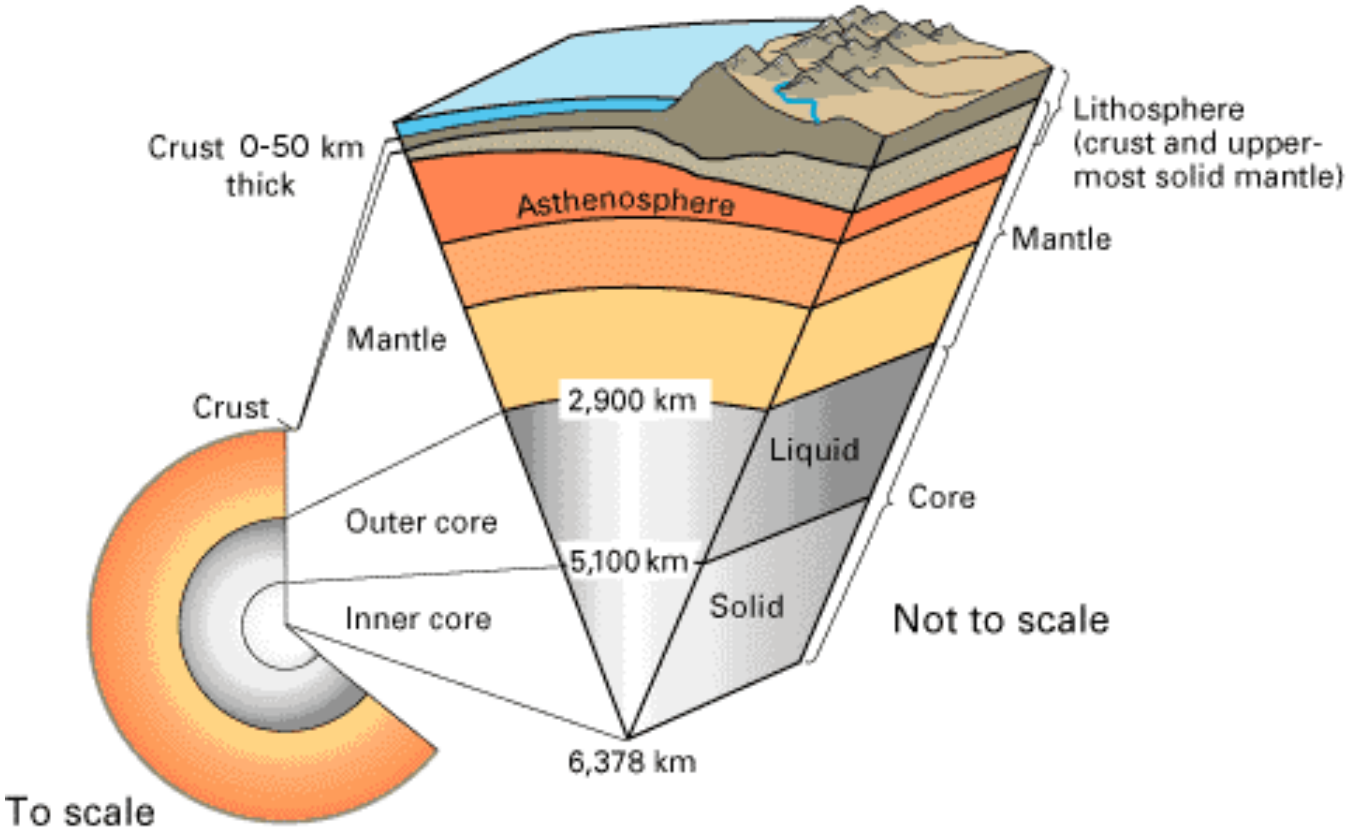
- Which ocean is just north of Antarctica?

- Over which ocean would you travel if you left northern Canada and went towards the North Pole?

So, plates move. What makes this happen?

- To understand we need to review Earth's layers.

→



How do scientists know about Earth's interior?

- You would have to travel over 1,600km to reach Earth's center…*Impossible*!

- Scientists called **Geologists** use 2 types of evidence to learn about the inside of Earth:
  - ***Rock samples***
  - ***Seismic waves***

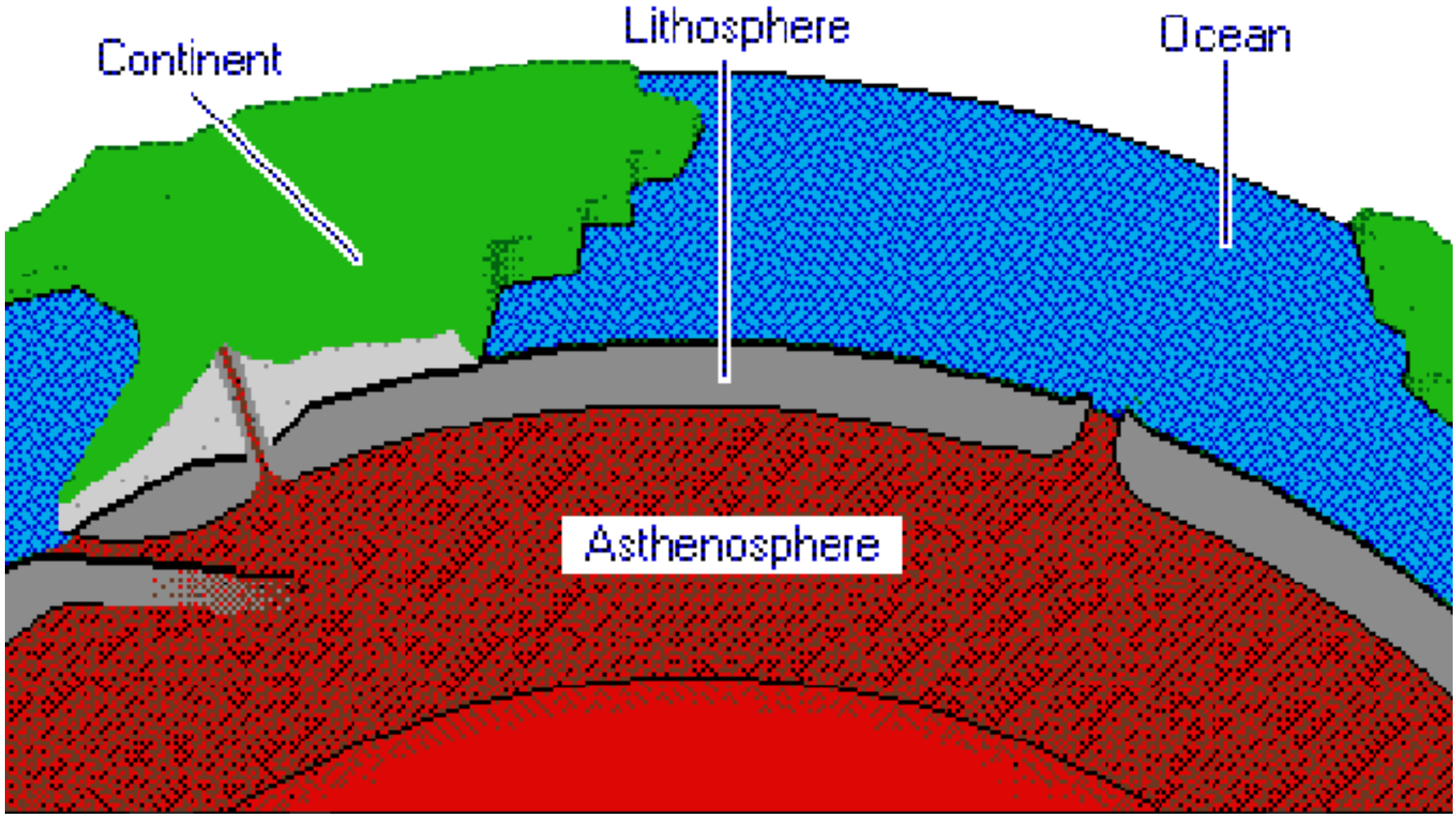
Remember the ***Lithosphere***?

It is made of the earth's crust & the upper portion of the mantle.

This upper mantle is less dense than the mantle underneath, so it is able to "float" on the mantle below.

The mantle just below the lithosphere is called the ***Asthenosphere***.

The asthenosphere has a plastic like, slowly flowing consistency, and it carries the lithosphere

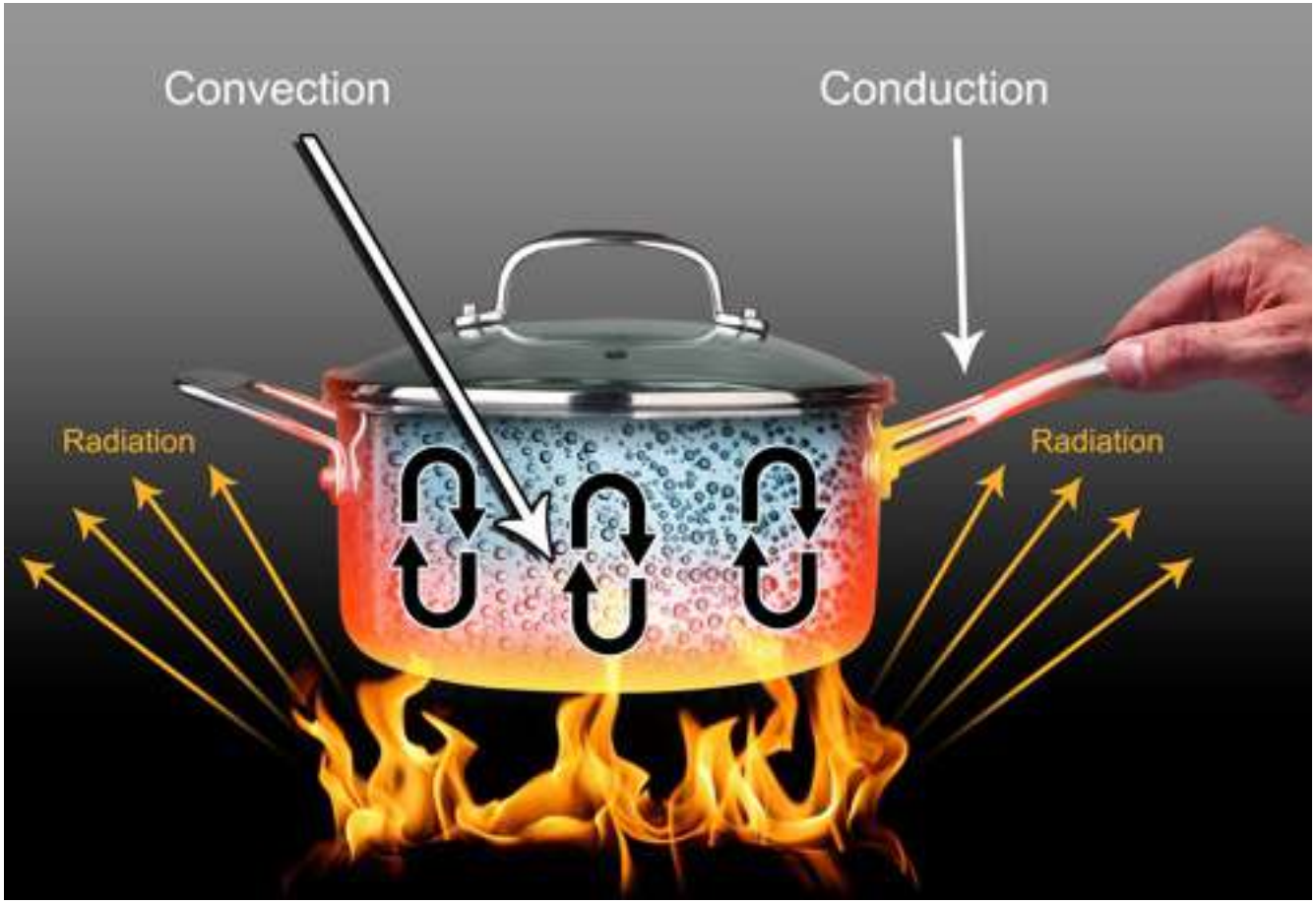

Continent
Lithosphere
Ocean
Asthenosphere

To understand how the lithospheric plates move we need to know how the *core's heat can warm the mantle and make it move*

Remember: Heat moves from a warmer area to a cooler area

3 Types of Heat Transfer

(ways that heat moves)



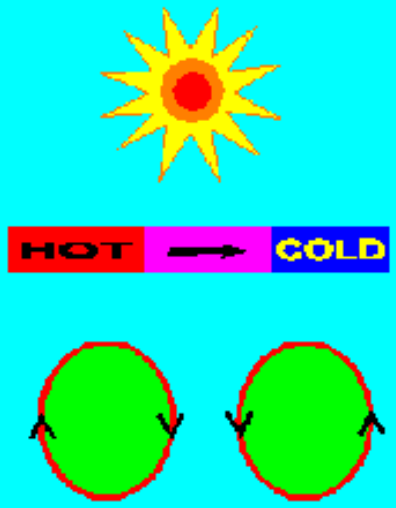
- Radiation
- Conduction
- Convection

Radiation:
Heat transfers through space
EX: warmth from the sun, warmth from a fire

Conduction:
Heat transfers by touching (within a material or between materials)
EX: metal spoon heats up when left in hot pot of soup, walking on hot sand burns your feet

Convection:
Heat transfers by movement of currents in liquids & gases; caused by differences in temp & density
EX: Convection currents in mantle, noodles rising & falling when heating up as you're cooking

METHODS OF TRANSFER OF THERMAL ENERGY

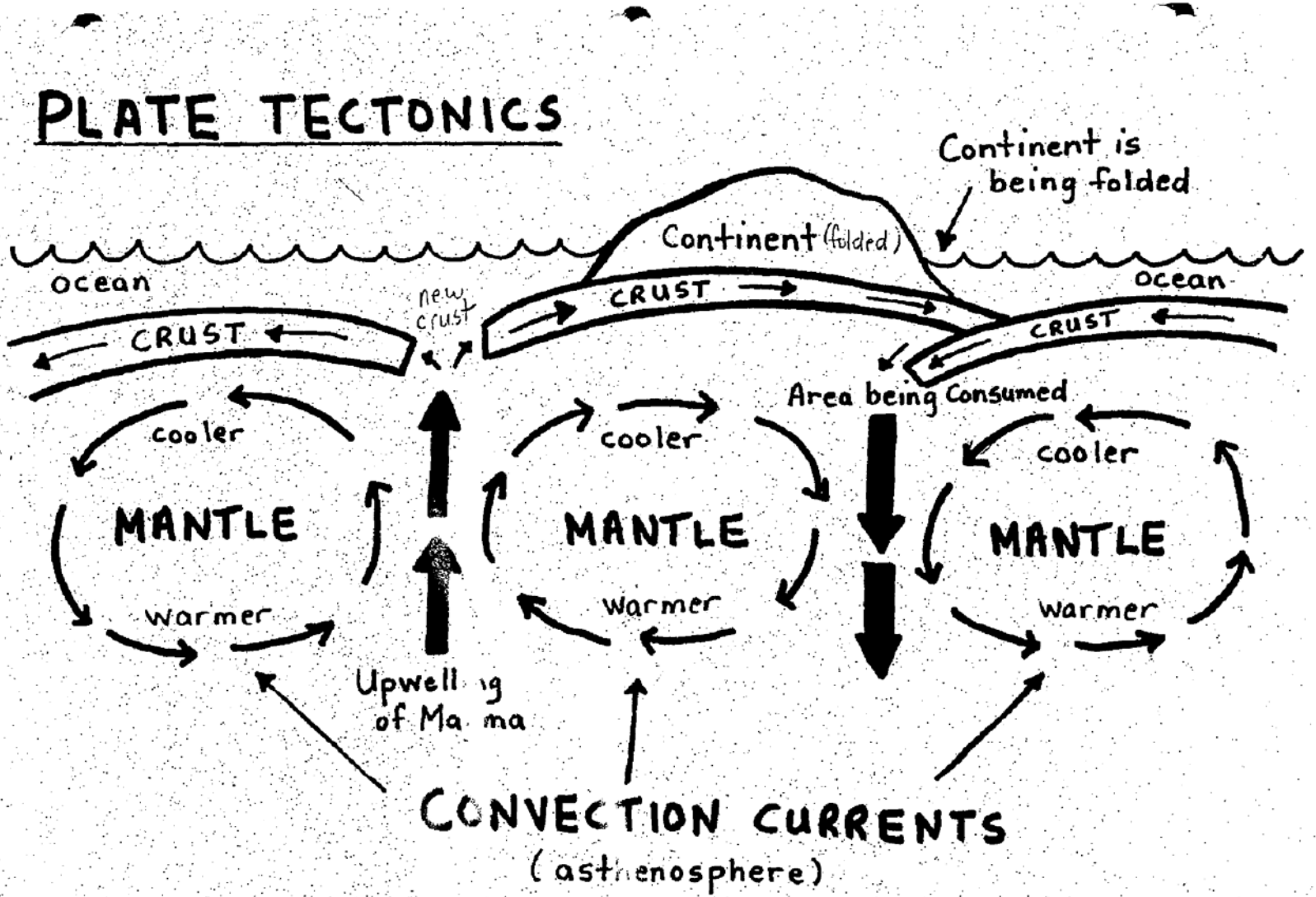


Radiation

Conduction

Convection

Which method of heat transfer causes the plate movement?



The core heats the mantle

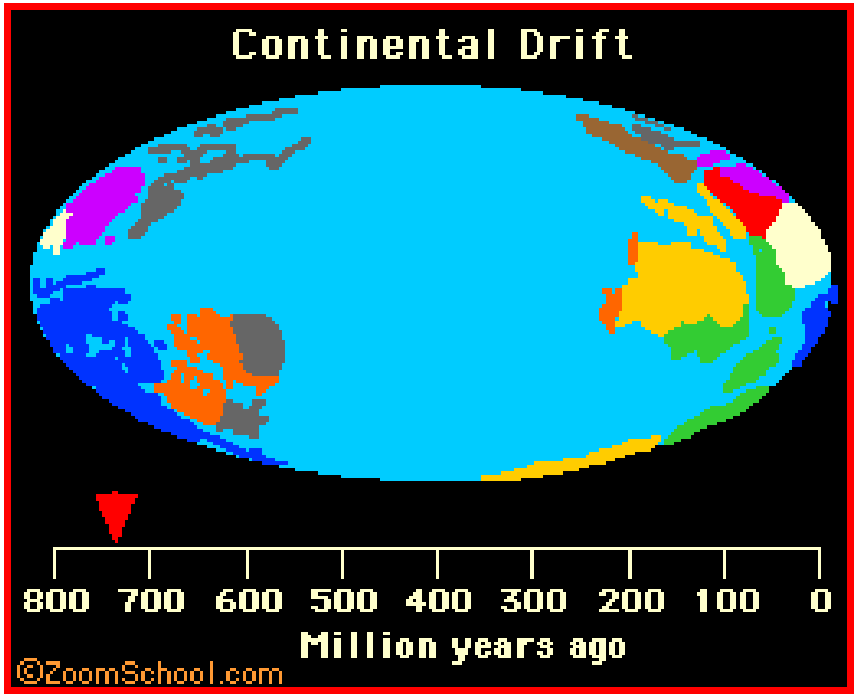
Quick Summary Quiz

- Where does the heat come from that moves the molten mantle rock?
- Why does mantle rock begin to sink back towards the lower mantle from the area closest to the crust?
- What would be different/happen if the core cooled down?

Lithospheric Plate Movement

- Heat from the core causes **Convection Currents** in the mantle to move the lithospheric plates.

- Movement of lithospheric plates is called ***Plate Tectonics*** (but it wasn't always called this)



What was once called the theory of ***continental drift,*** (where it was thought that only the continents moved) is now the theory of plate tectonics where it includes the moving sea floor, too.

Alfred **W**  **er**

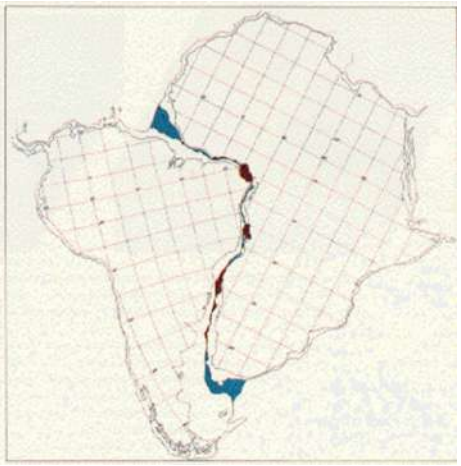
(vay-gu *hypothesized* that the contin vere once joined together as Pangaea 300 million years ago, and had drifted apart

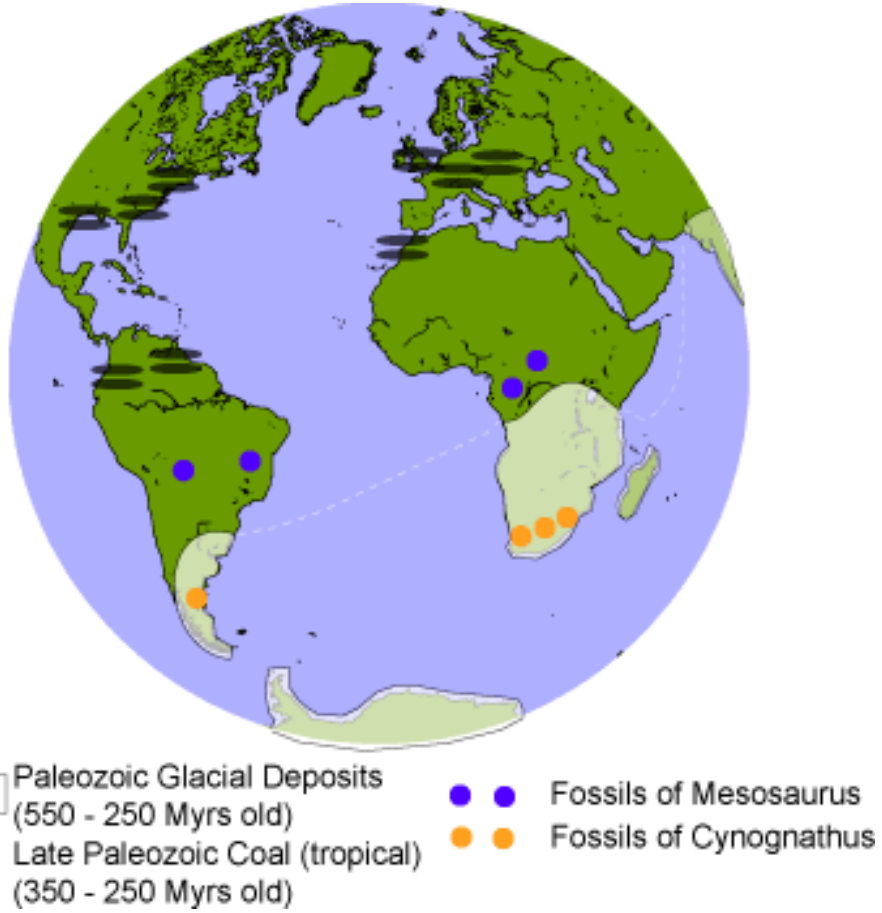
What was his research and evidence?

Wegener's Info:

Land features:

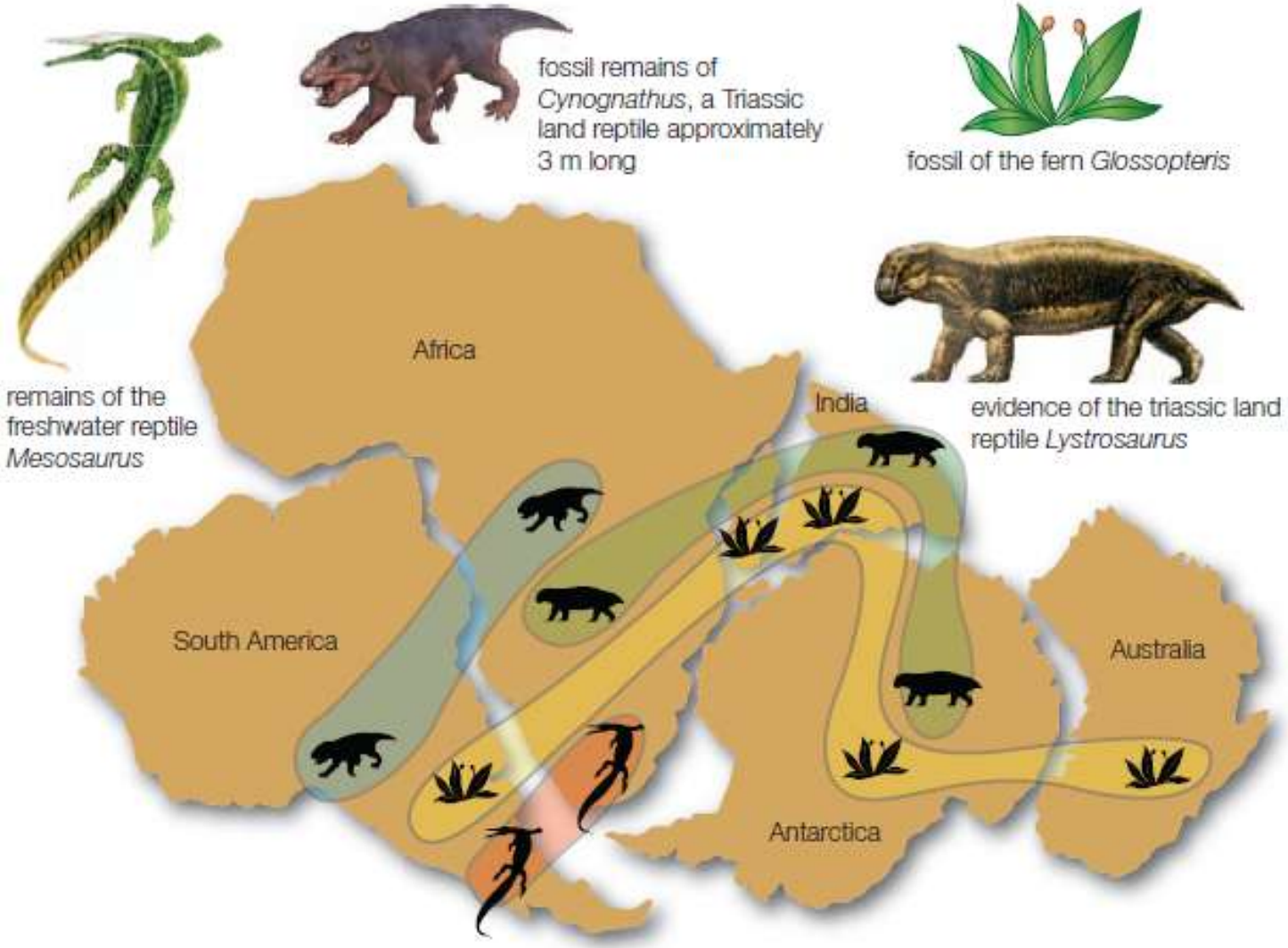
- continents fit together like a puzzle
- with mountain ranges matching up on S. America & Africa
- And coal fields matching up in Europe & N. America





Use the picture below to show you where to draw in matching mountain ranges on the coastlines of separate continents like S. America & Africa

Fossil Evidence: On your map draw in land fossils found on different continents…
they could not swim across the oceans!



Climate Evidence:

Fossils of tropical plants, similar to this fern, are found in cold areas on an island in the Arctic Ocean.

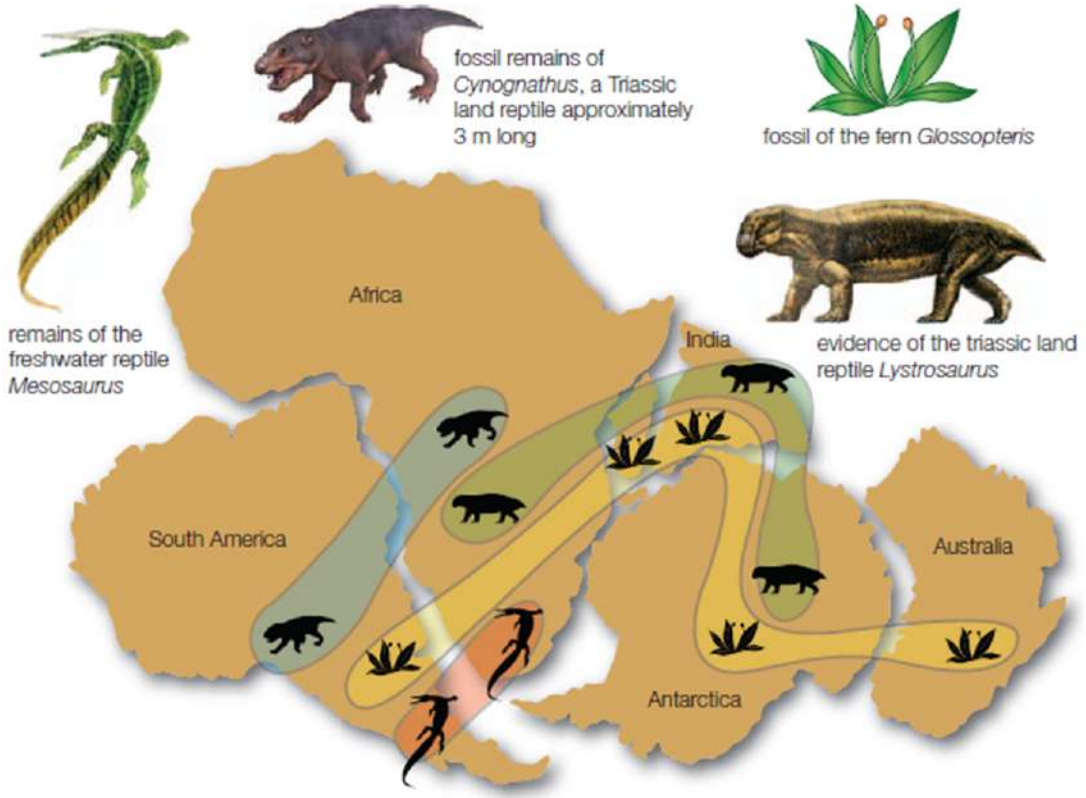
Is it warm in the Arctic now?

Deep scratches in rock show that South Africa's climate was once much colder as the area was covered in glaciers!

Are there glaciers in S. Africa now?

According to Wegener and the evidence, the plates must have moved over time.

- Draw in fern-like fossils in Antarctica on your map →



Quick Summary Quiz

- What evidence did Wegener use to explain plate movement?
  - 1.
  - 2.
  - 3.

- Do you think it was easy to convince people that his theories were true? Why/Why not?

Sea-Floor Spreading

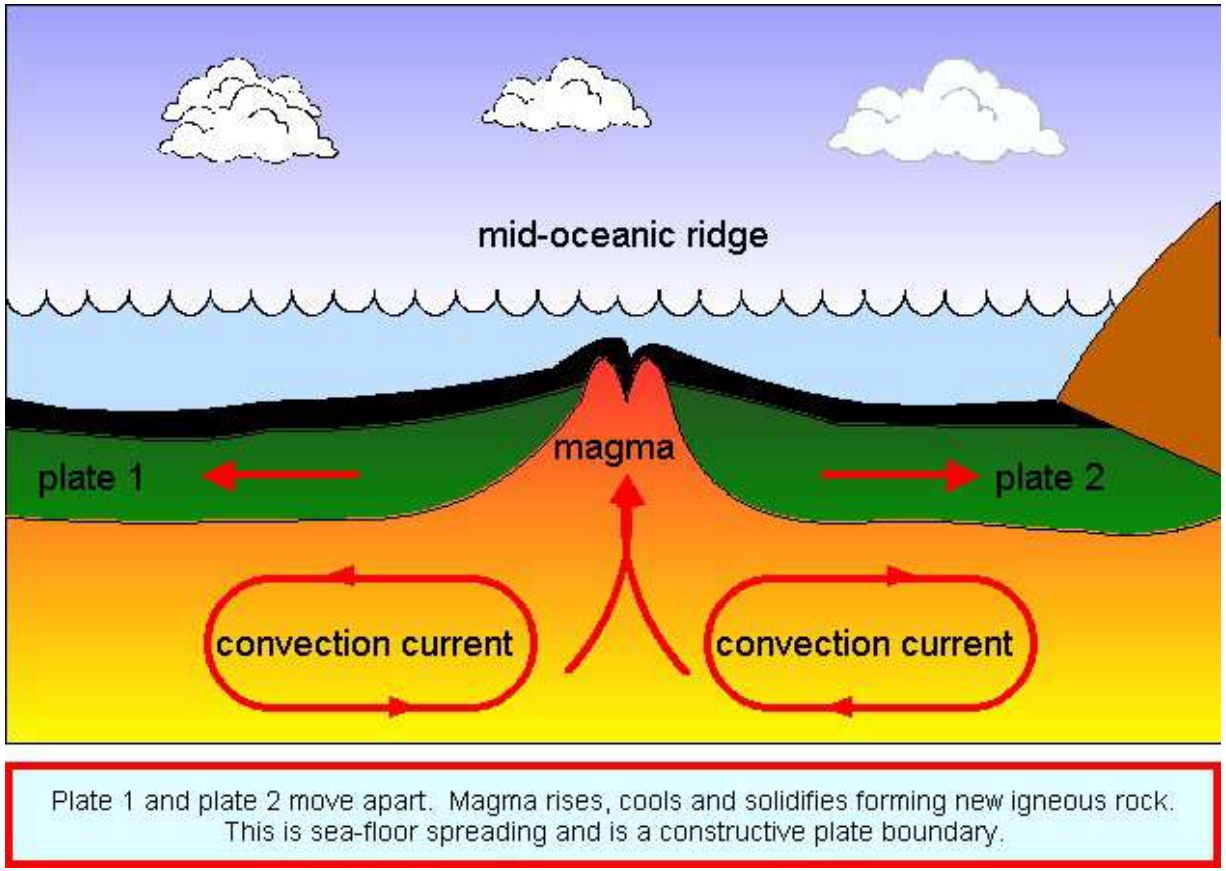
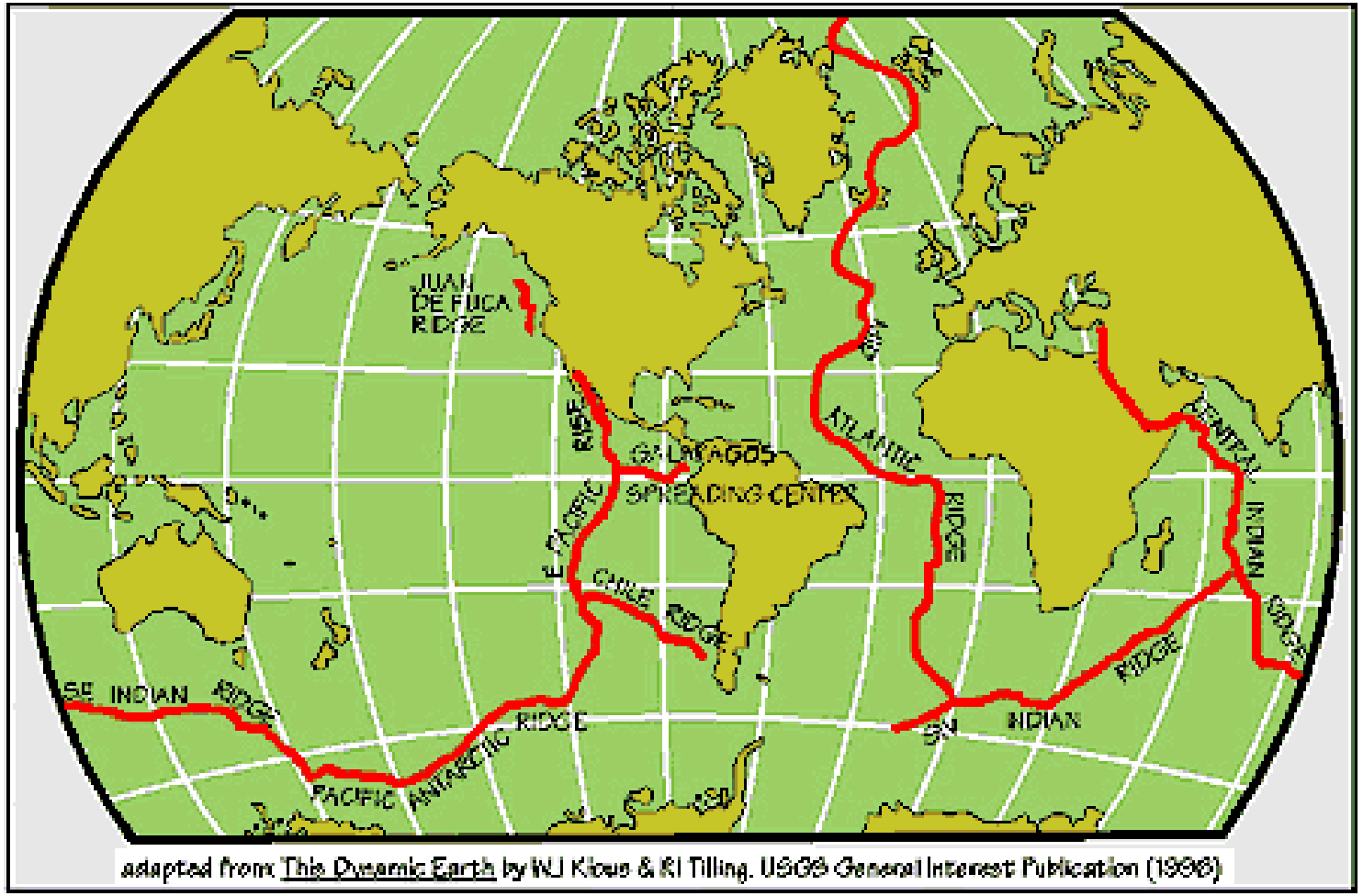


Plate 1 and plate 2 move apart. Magma rises, cools and solidifies forming new igneous rock. This is sea-floor spreading and is a constructive plate boundary.

- Not only do the continental plates move, but the oceanic plates move too.
- Ocean areas where plates spread apart are called MID-OCEAN RIDGES.

Draw the Mid-Ocean Ridge on your map.



- Mid-Ocean Ridges are found winding around the Earth in all oceans.
- They look like mountain ranges.
- Most stay under the surface of the water.
- Iceland is one area of the mountain range that rises above the surface of the North Atlantic Ocean

- *What happens when plates move apart??? Magma/lava rises up!*
- *What kind of rock would form??? Be specific!*

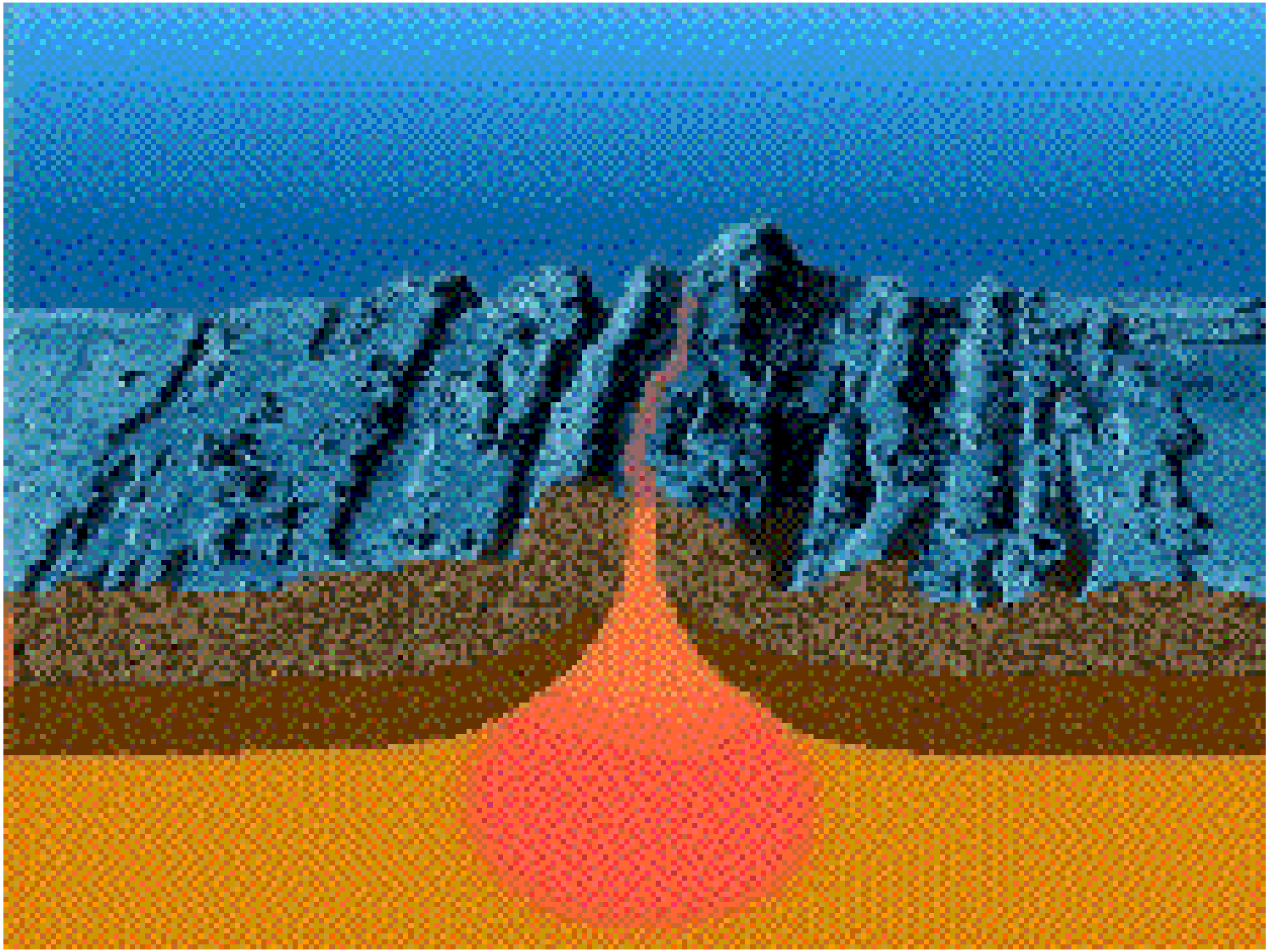
Iceland: A cool place to get warm!

- Geothermal activity (heat from inside Earth's mantle) offers warm swimming & volcanic activity!

Sea-Floor Spreading research

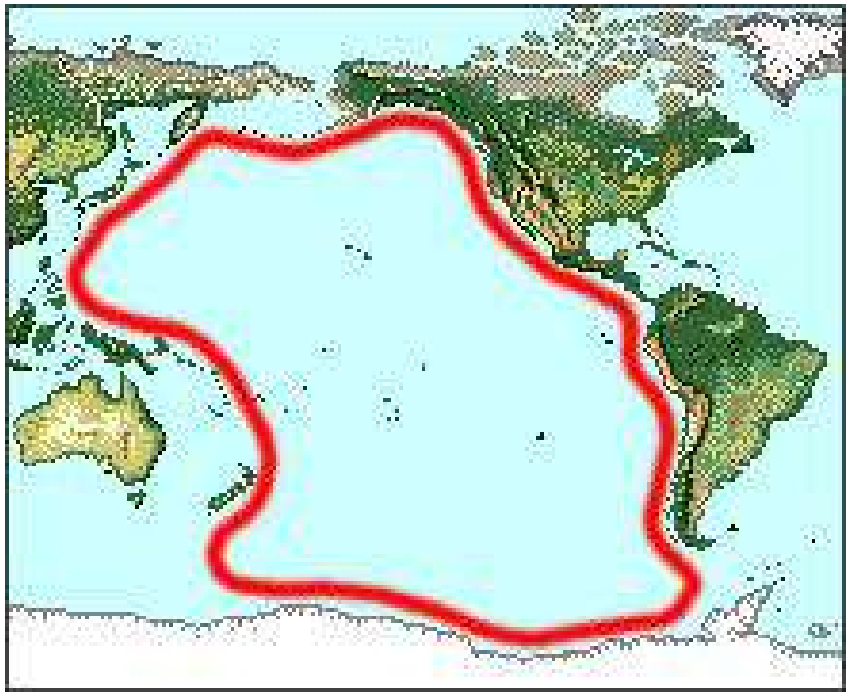
- Harry Hess, an American geologist, was a scientist who studied mid-ocean ridges.
- He confirmed what Wegener thought…the continents DID move!
- He found out new crust forms close to the mid-ocean ridge, adding new ocean floor!

Here's what you might see if the process of sea-floor spreading was sped up…



Around the Pacific Ocean is an area that has many volcanoes.

- It is called the RING of FIRE
- We will discuss volcanoes a little later…
- Draw the Ring of Fire on your map.



- The next part of our unit shows exactly how the plates move and what happens when they do…GET READY!

- Until then, lets check to see what you've learned so far…

Summary Quiz:

- What was Wegener's super continent called?
- Which type of heat transfer causes the plates to move?
- How did Hess' Sea-Floor Spreading show that Wegener was correct about Plate Tectonics?