

Introduction to Plate Tectonics!

Today we are going to focus
on the crust of the earth,
and how it moves and
changes



National Geographic

- <http://education.nationalgeographic.com/media/plate-tectonics/>
- Share with the person next to you at your table what you found interesting in the video.

Vocabulary

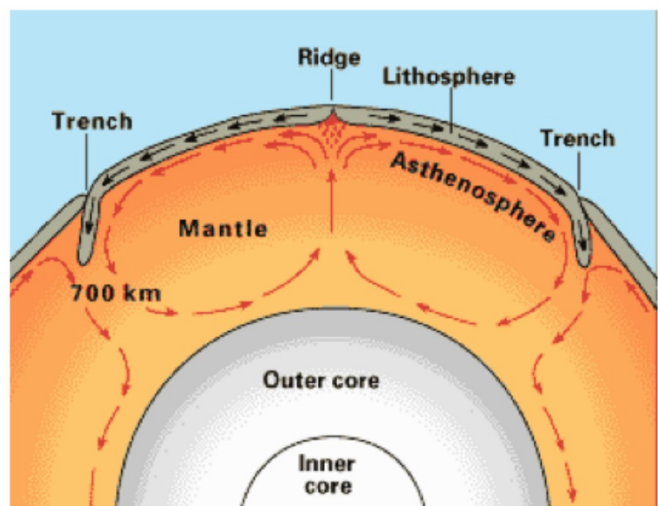
- The video had several terms that might be new. In your notebook, title the next available page “Vocabulary”, and let's take a look at some of the terms.
- Plate Tectonics: The way the Earth's crust moves.
- Mid-Ocean Ridge: ridges that cross the ocean floor, and are areas where the crust is growing.
- Tharp- Heezen map: The most complete map of the ocean floor, that backed up the theory of plate tectonics.
- Lithosphere: Earth's hard outer layer.
- Asthenosphere: The molten layer of the mantle.
- Plate Boundaries: The edges of plates, most of which are under water.

Vocabulary Continued

- Divergent Plate Boundary: Where two plates are moving away from each other
- Convergent Plate Boundary: Where two plates are colliding with each other.
- Mid-Ocean Ridge: a divergent plate boundary where new continental crust forms.
- Subduction: The process where one plate slides underneath another plate.

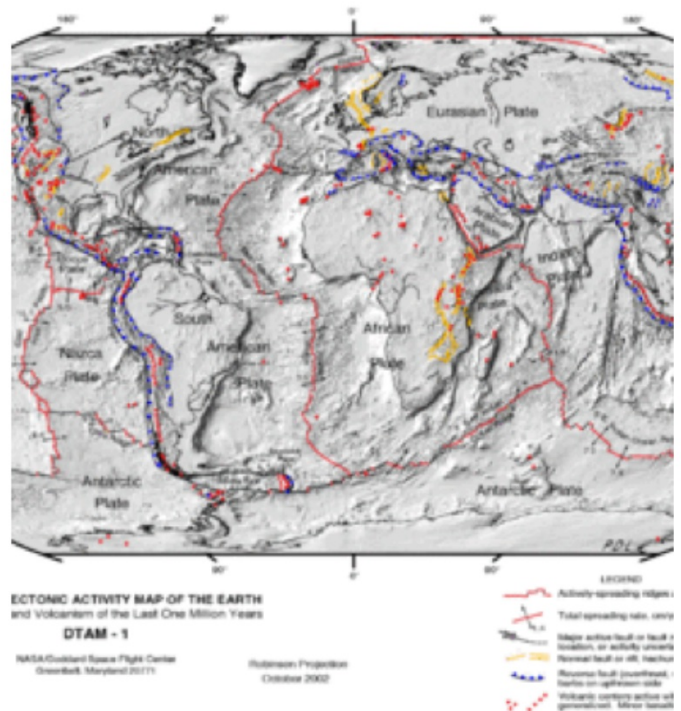
But Why?!

- Why aren't the plates stationary? Why do they move?
- <https://www.youtube.com/watch?v=ryrXAGY1dmE>



Ways that Plates Move

- Over the next couple of days, we are going to take a look at the different ways that plates move. We will start off with an overview, and then take a closer look at each one.
- But first, What are some things that you remember from yesterday? Be sure to raise your hand!



Guided Notes

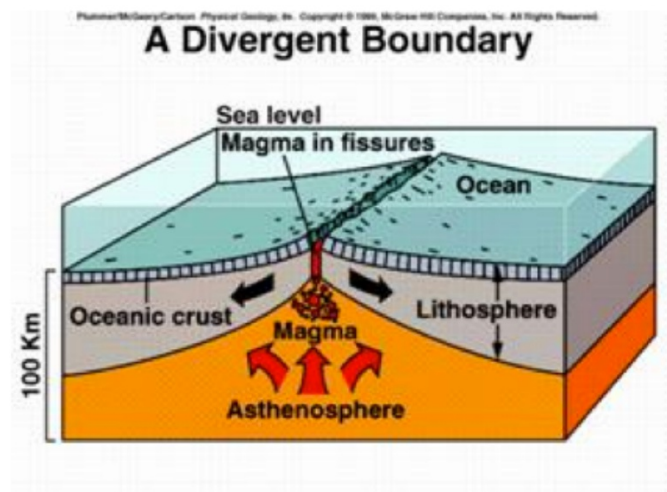
- In a moment, you'll receive a guided notes sheet. Instead of writing your own notes, with guided notes, you just need to fill in the blanks and listen carefully.
- https://www.youtube.com/watch?v=0mWQs1_L3fA

Divergent Plate Boundaries

- Divergent plate boundaries are areas where the crust is moving apart.
 - As the crust moves apart, magma fills in the space, erupts and new crust is formed as the lava cools.
 - There are a few places on land where this is happening, but it mostly happens along ocean ridges, underneath the oceans.

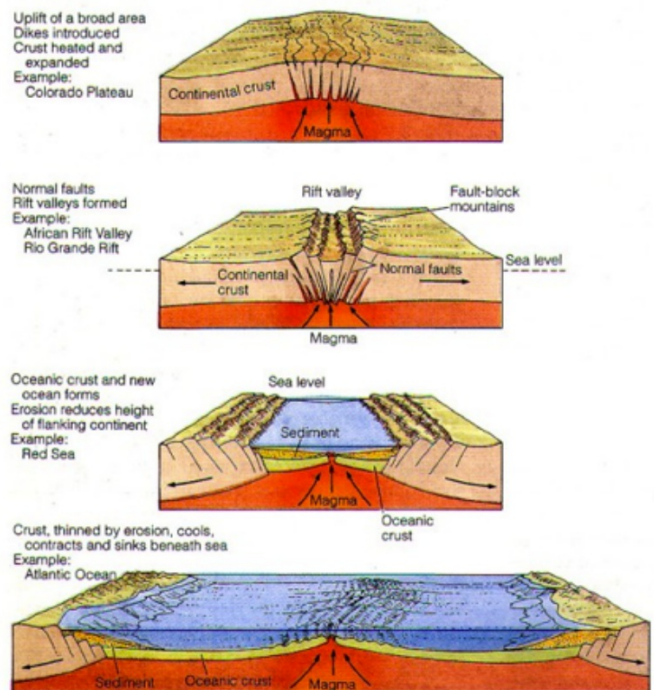
Divergent Plate Boundaries

- Some specific areas where this is happening:
 - East Africa
 - The middle of the Atlantic Ocean



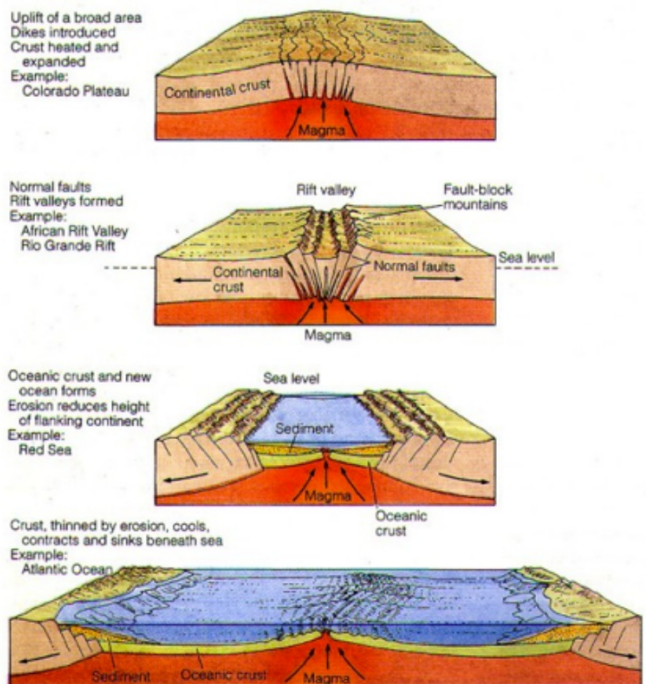
Divergent Plate Boundaries: How it Happens

- Stage 1: Heat and magma force the Earth up, as the crust heats and expands, sometimes creating a dome on the surface.
- Stage 2: The crust stretches, causing some of the earth to fall, creating a rift, or a lower part in the earth. This can trap sediment and water, creating a new lake or ocean.
- Stage 3: If the rifting continues, the continent splits apart, and a new seafloor forms. A modern example of this is the Red Sea, located between Africa and the Arabian Peninsula.
- Stage 4: If spreading continues, a wider ocean can form, which happened to create the Atlantic Ocean.



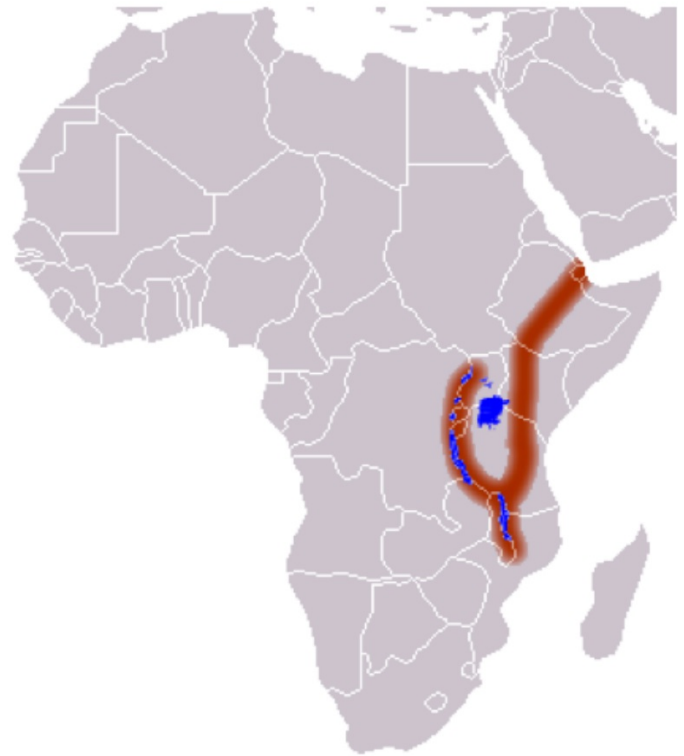
Divergent plate boundaries

- In a moment, you'll receive a copy of the diagram to the right.
- Paste this into your Science notebook with the heading "Divergent Plate Boundary"



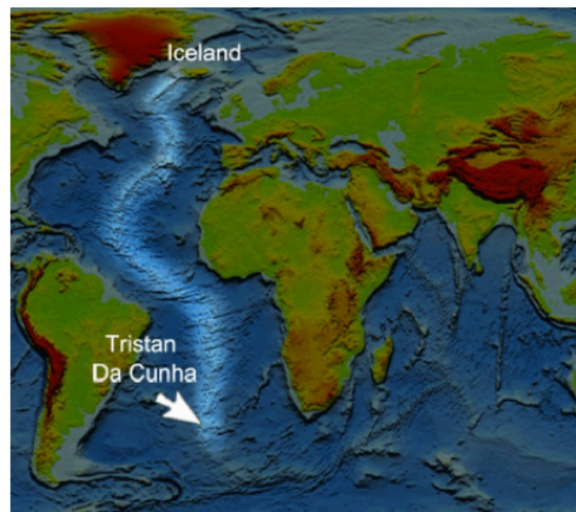
Where in the world does this occur?

- The East African Rift, between Eastern African and the Arabian Peninsula.
- <https://www.youtube.com/watch?v=w7Y2R4KBwvo>
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Where in the World does this occur?

- The Mid Atlantic ridge, right in the middle of the Atlantic Ocean.

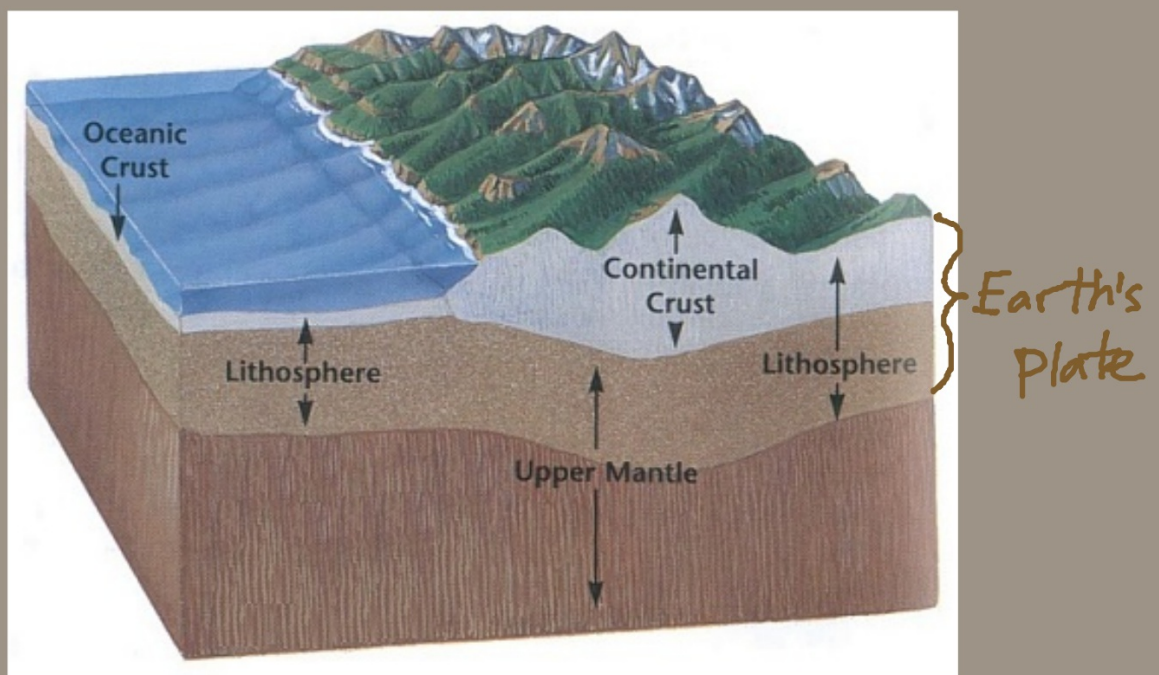


THEORY OF PLATE TECTONICS

A Quick Review:

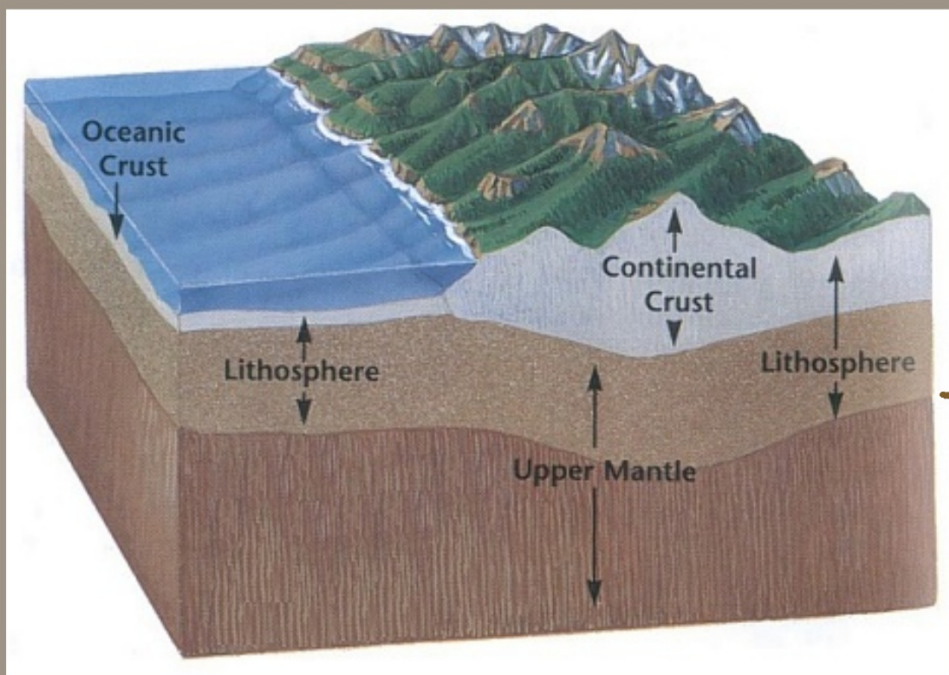
- Wegener's Continental Drift Theory: The continents move over the seafloor
- Hess's Seafloor Spreading Theory: At midocean ridges, new seafloor is growing. This growth pushes away the seafloor on both sides of the rift.

COMPOSITION OF EARTH'S PLATES

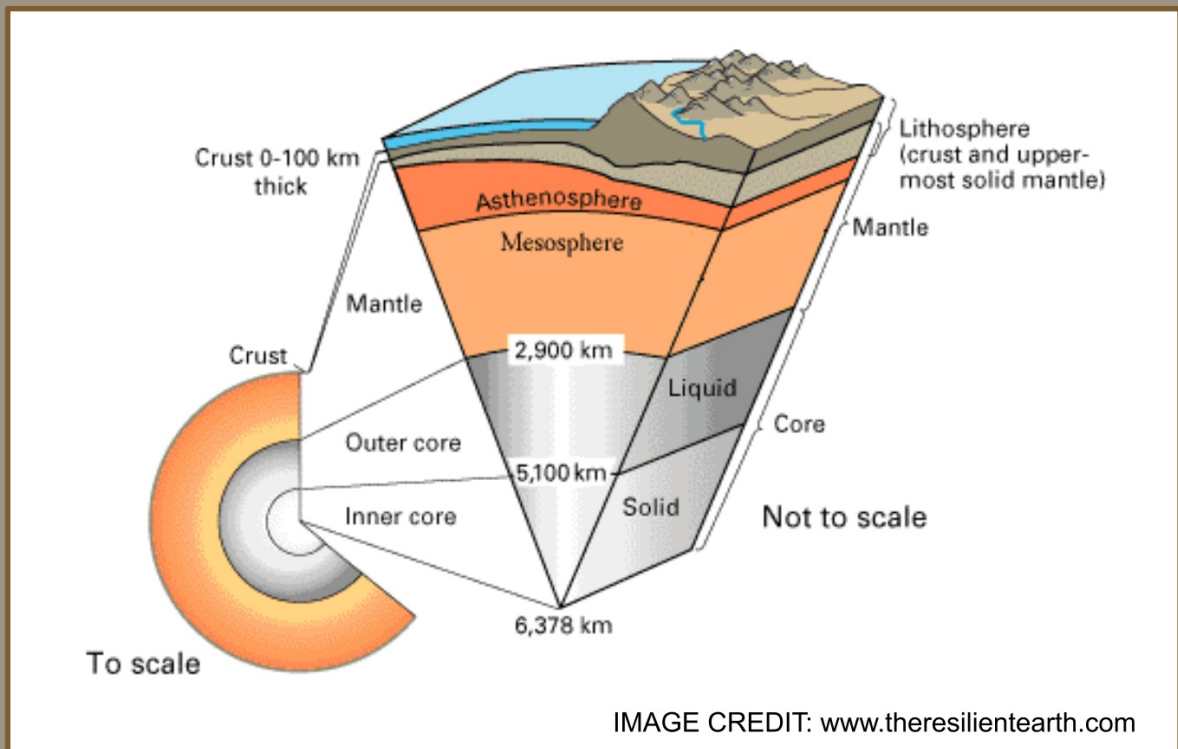


- Plates are made of the crust and a part of the upper mantle.
- Earth's plates are also called the lithosphere.
- It is about 100 km (62 miles).

Created by Carlos Kaukahi Severson, 201

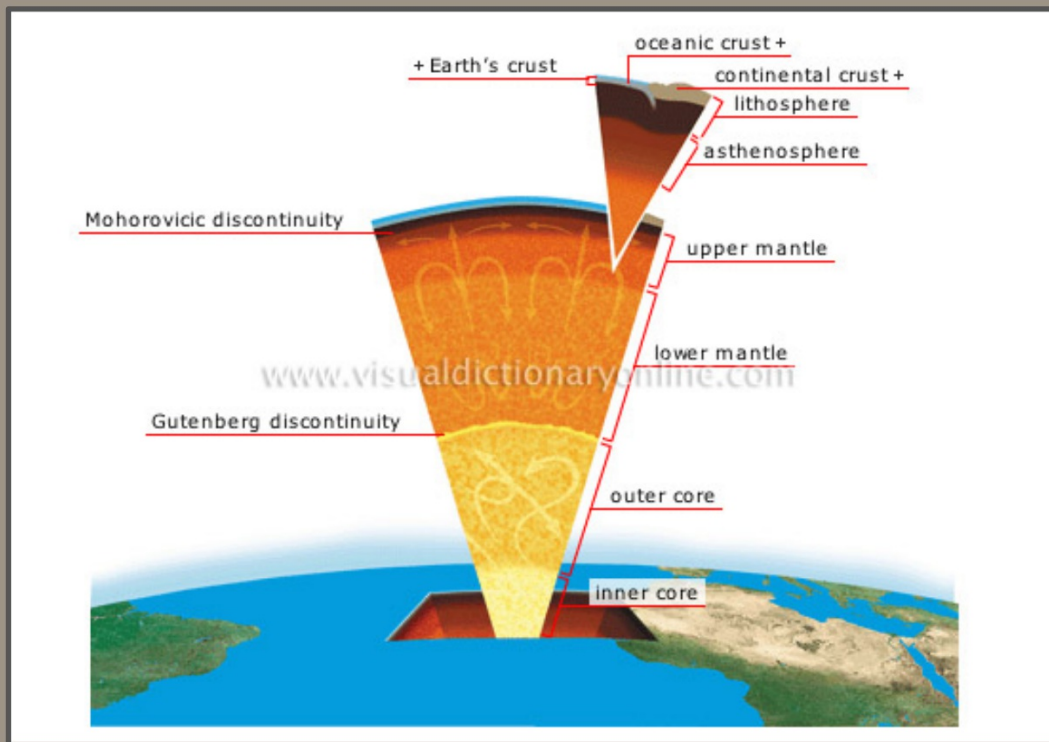


The rigid lithosphere floats on a plastic-like layer called the asthenosphere, which is made of molten rock.



You know all about this by now, right?

Here's a different look at the wedge of the Earth.



VOCABULARY

Rift:

- a rift is an opening made by cracking or splitting

Ridge:

- a ridge is a range of hills or mountains

Valley:

- a valley is a stretched out depression (like a canyon)
- It is the low area between mountains

EXAMPLE OF A VALLEY

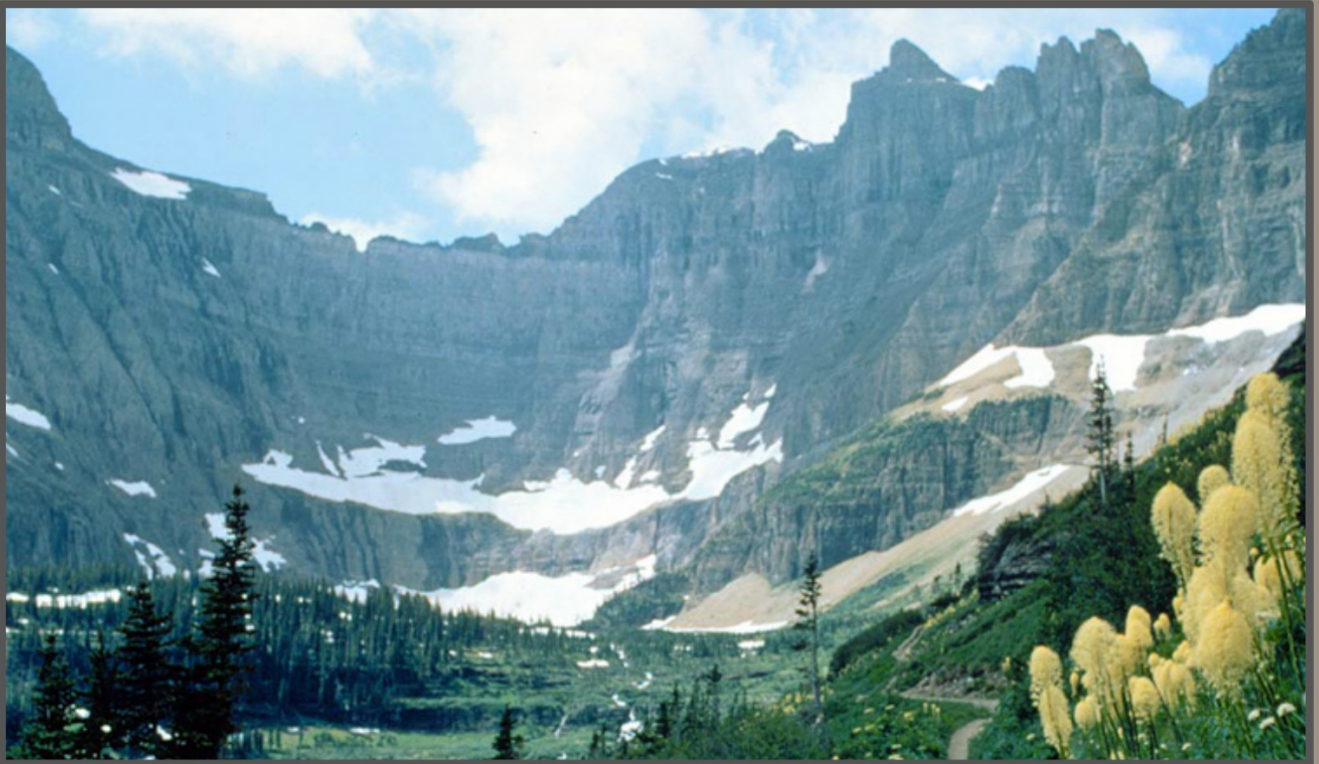


Image Credit: www.EOEarth.com

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EXAMPLE OF A RIDGE

The ridge of a mountain is like its spine,
but it's not just the tips



Image Credit: www.winddrinkers.c

VOCABULARY

boundaries are where two or more plates meet.

Divergent boundaries

- occurs when two plates move apart

Convergent boundaries

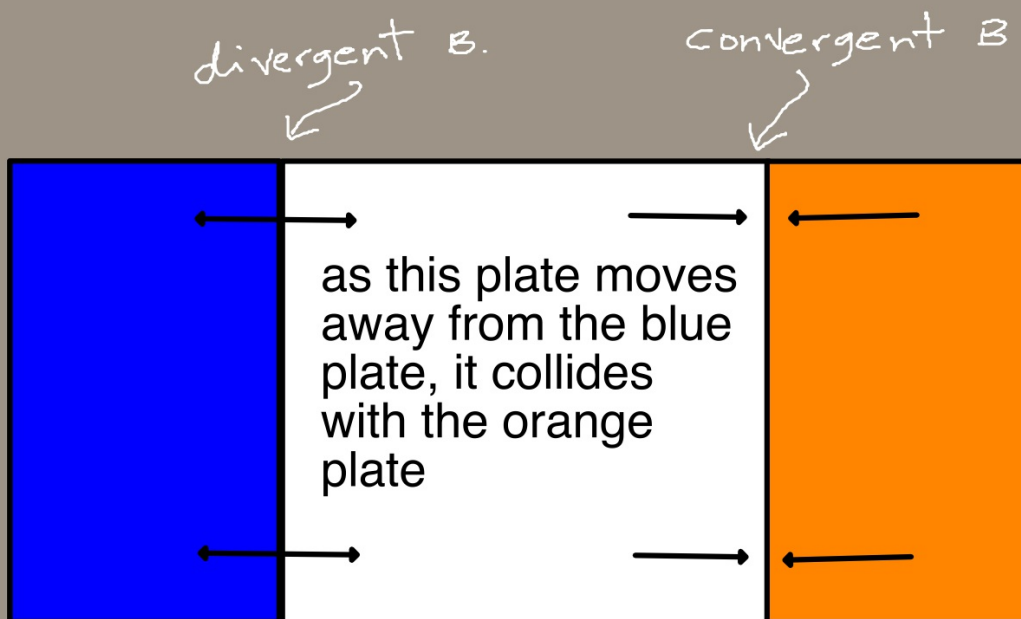
- occurs when two plates collide

Transform boundaries

- occurs when two plates slide past / grind on each other

ACTIVITIES OCCUR AT PLATE BOUNDARIES

- A movement in one boundary will force a change at another boundary.



These are the different types of stress a plate can undergo

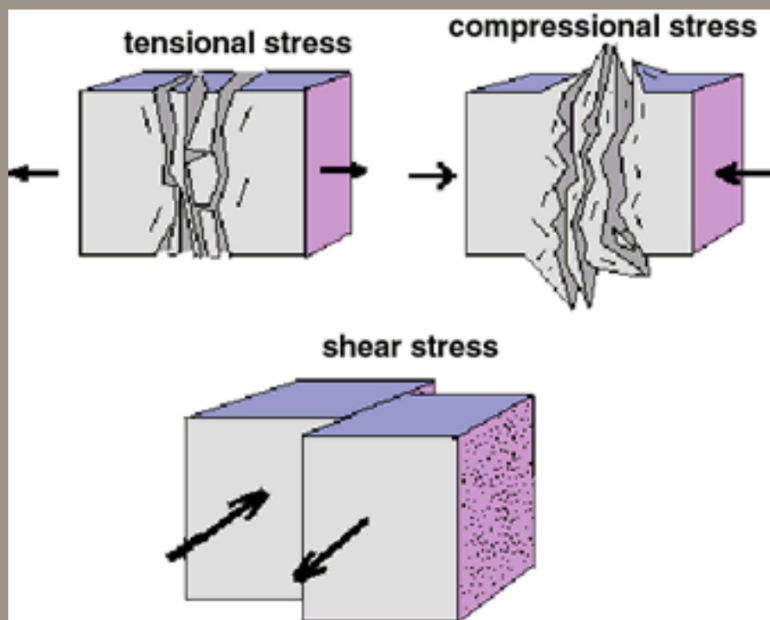


Image Credit: www.teachengineering.com.

DIVERGENT BOUNDARIES OCCUR WHEN PLATES MOVE APART.

Plates can diverge under an ocean or under continents

- rising magma forces the two plates apart causing a rift
- If the rift is between two oceanic plates, mid-ocean ridges are formed (remember seafloor spreading)
- If the rift is between two continental plates, rift valleys are formed

FORMATION OF MID-OCEAN RIDGES

1. magma rises and pushes through the rifts
2. it piles up high and cools enough to form ridges
3. as the plates diverge, the rocks sink as they cool completely
4. smaller ridges are left
5. the ridge at the rift is always the highest because that's where fresh lava is emerging and cooling

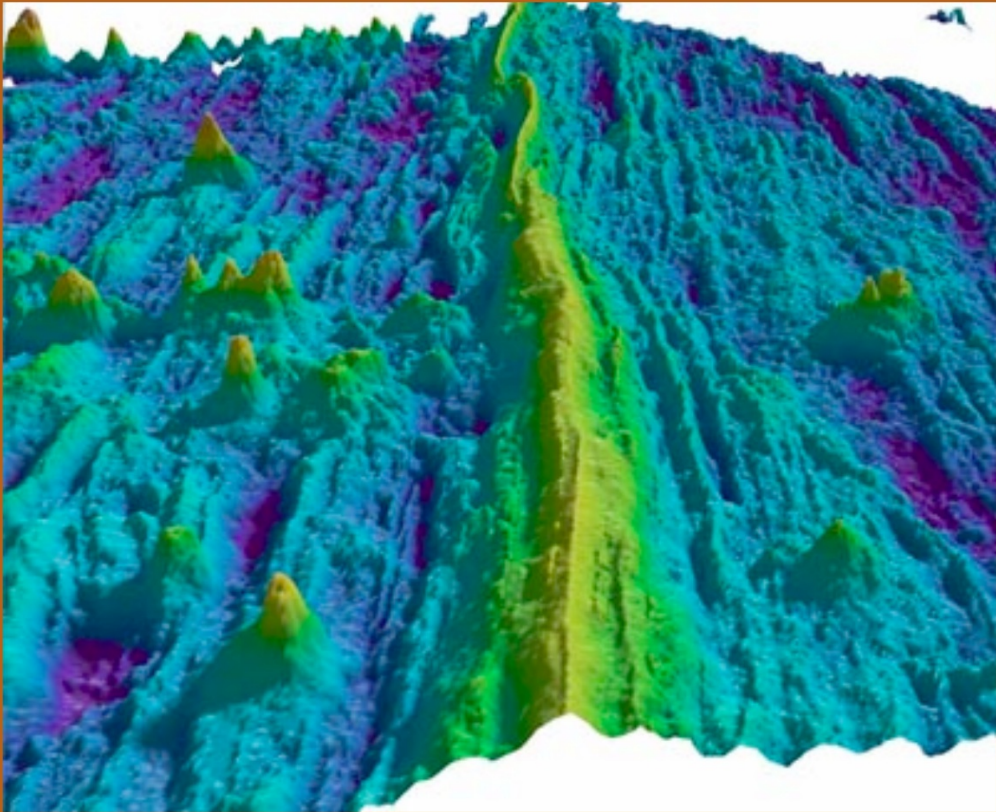


Image Credit: <http://oceansjsu.cc>

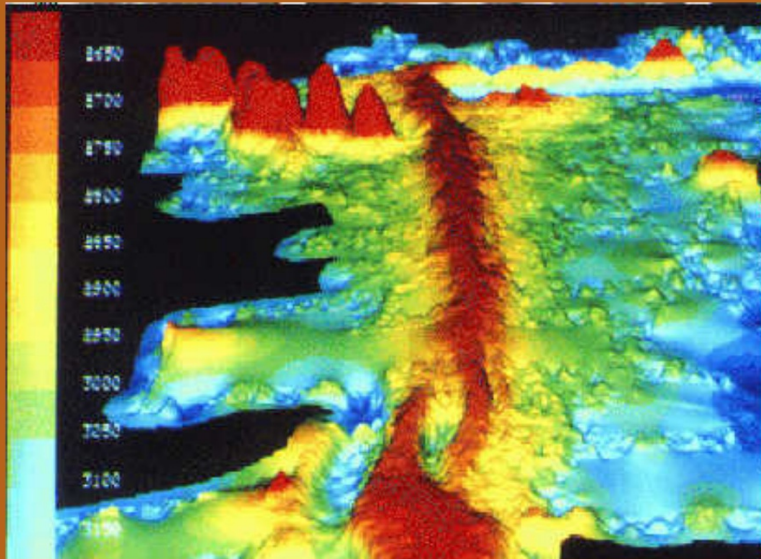


Image Credit: <http://oceansjsu.cc>

FORMATION OF RIFT VALLEYS

1. Magma rises and pushes plates apart
2. The continental crust and lithosphere get stretched
3. As it stretches, it collapses or sinks, forming valleys
4. Lava doesn't breach the surface because of how thick the crust and lithosphere are
5. Over time, these valleys fill with water to form rivers and seas and oceans
6. When it becomes thin enough, lava can breach the surface

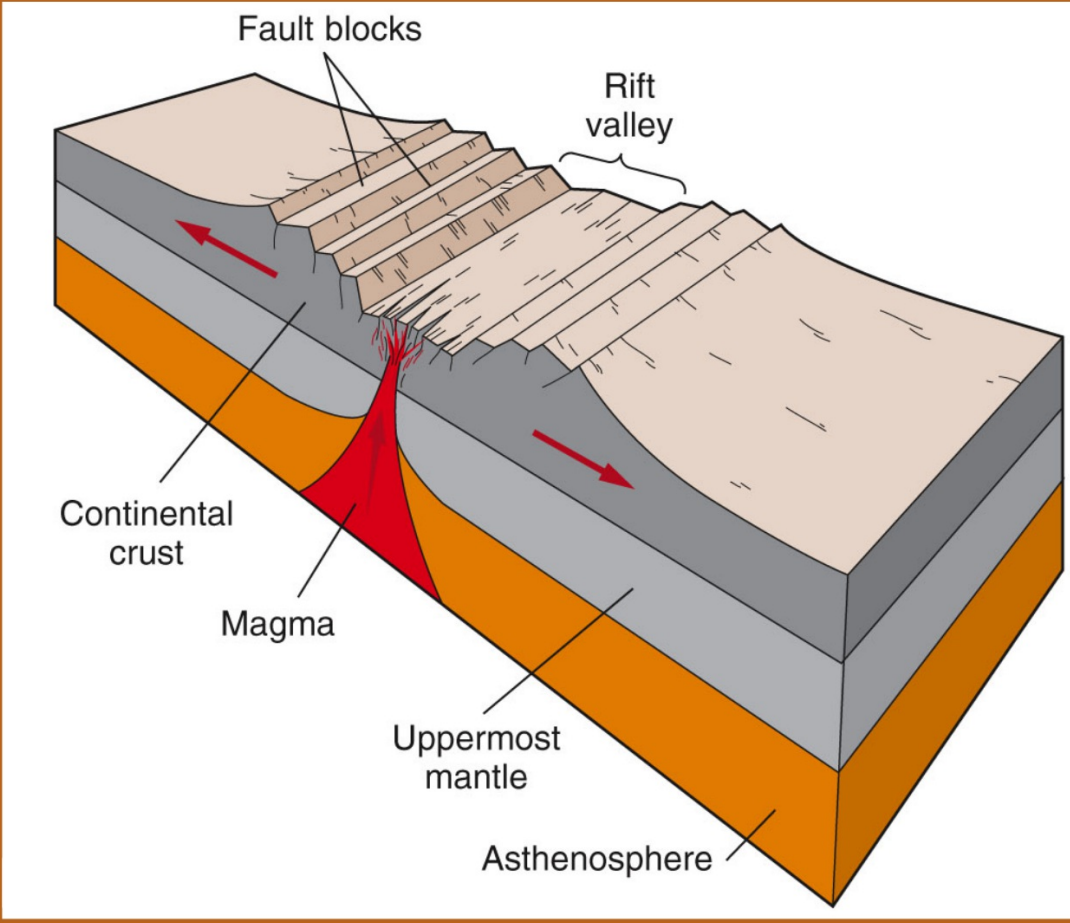
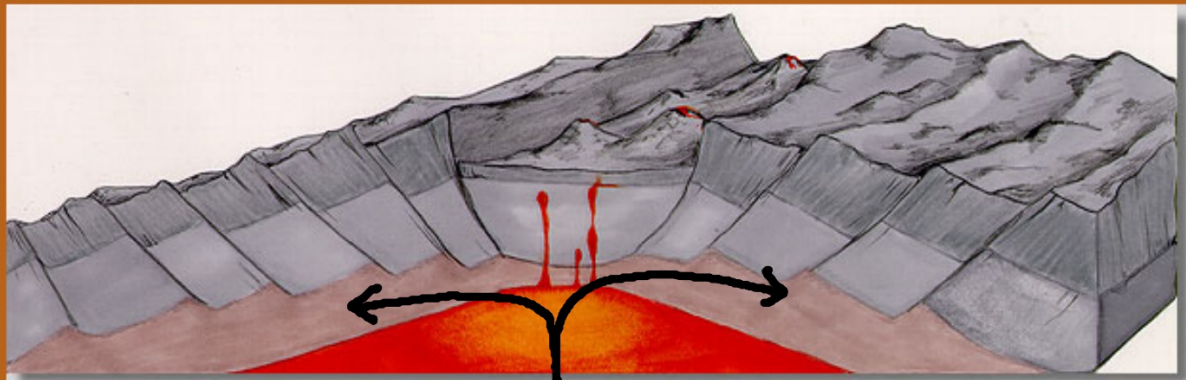


Image Credit: www.geogrfy.n

This diagram shows how large slabs of rock sink at the time of fault formation.

Image Credit: www.marinebio.n



Rising hot
magma

Iceland's rift valley

Image Credit: www.geology.iupui.edu



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PROCESS WHAT YOU'VE LEARNED:

- When rising magma forces two plates apart, what does it form?

It forms a rift.

- If this occurs under the ocean, what feature is formed?

A ridge, or mid-ocean ridge is formed.

- If this occurs under a continent, what feature is formed?

A rift valley is formed.

PROCESS WHAT YOU'VE LEARNED: HOW ARE RIFT VALLEYS FORMED?

1. Magma rises and pushes plates apart
2. The continental crust and lithosphere gets stretched
3. As it stretches, it sinks forming valleys
4. Water often fills in the valleys
5. Lava doesn't breach the surface because of how thick the crust and lithosphere are
6. When it becomes thin enough, lava can breach the surface

PROCESS WHAT YOU'VE LEARNED: How are mid-ocean ridges formed?

1. magma rises and pushes through through the rifts
2. it cools enough to form ridges
3. as the plates diverge, the rock cools completely and sinks
4. smaller ridges are left
5. the ridge at the rift is always the highest because that's where fresh lava is emerging and cooling

Why do ridges form under water but valleys form on land?

(A Good Essay Question)

- oceanic crust is thin, so magma breaches the surface and cools to form ridges
- continental crust is thick, so magma doesn't breach the surface
 - as rising magma spreads the plates apart, the continental crust is thinned
 - the thinned crust collapses / sinks and forms valleys

One of the Himalayas many peaks



Image Credit: wwigf.fuw.edu.p

CONTINENTAL COLLISION

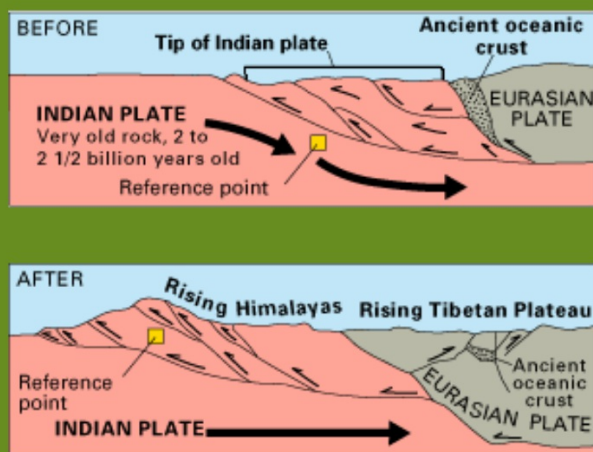


Image Credit: <http://pubs.usgs.gov>

Two plates are colliding here, the Indian (pink) and the Eurasian (brown) plate.

Notice that the Indian plate is getting crushed upwards by the Eurasian plate.

Discussion: Why do you think the Indian plate is crushed while the Eurasian plate remains uncrushed?