



Geology is the science that studies rocks and the physical, chemical, and biological changes that have happened or are happening on the earth.



Have you ever wished that you could visit a planet? One where you could go out and explore, without having to wear a space suit?

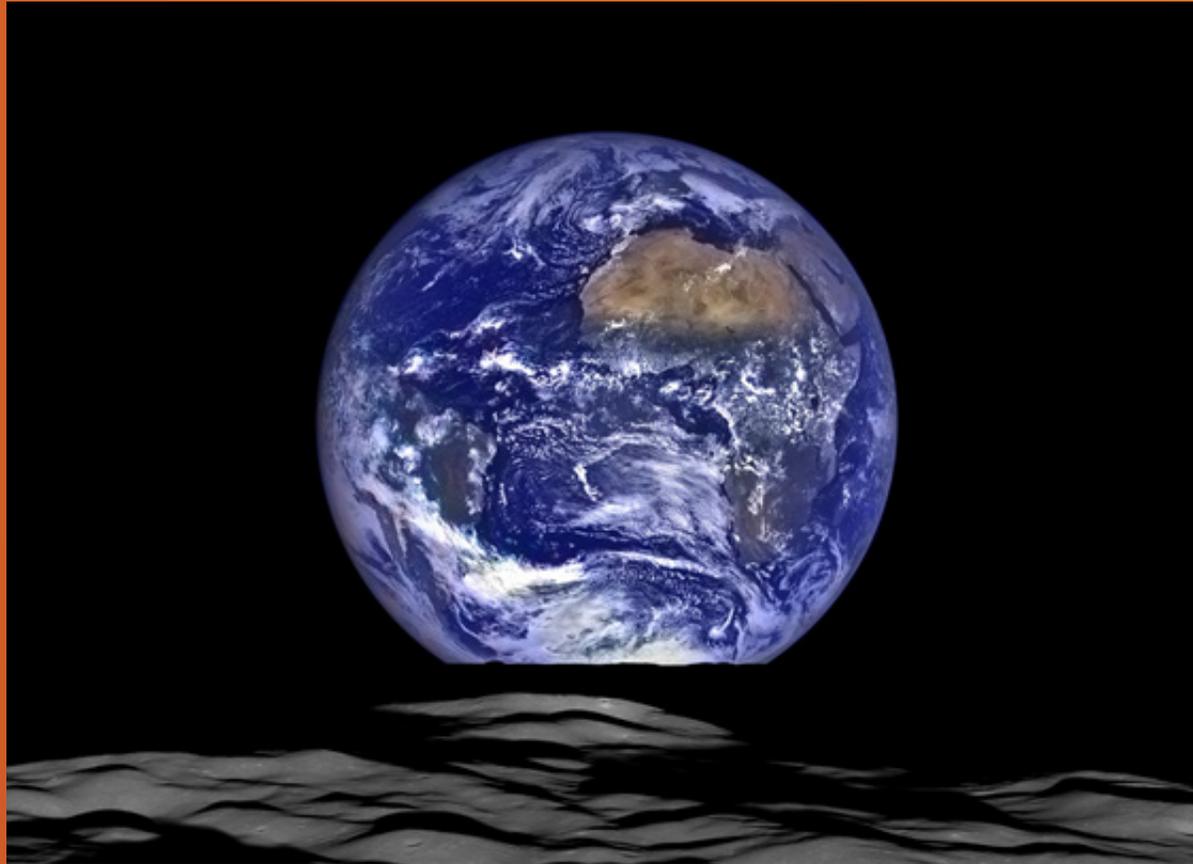


You can! You live on the planet Earth. Can you identify Earth? Here is a hint—it's the 3rd planet away from the sun, and it's blue. Now you know!

What does Earth look like from the moon?



Do you know why the Earth looks blue and white? Earth is the water planet!  
The white clouds are made of water vapor in the atmosphere. The blue is  
from the oceans.

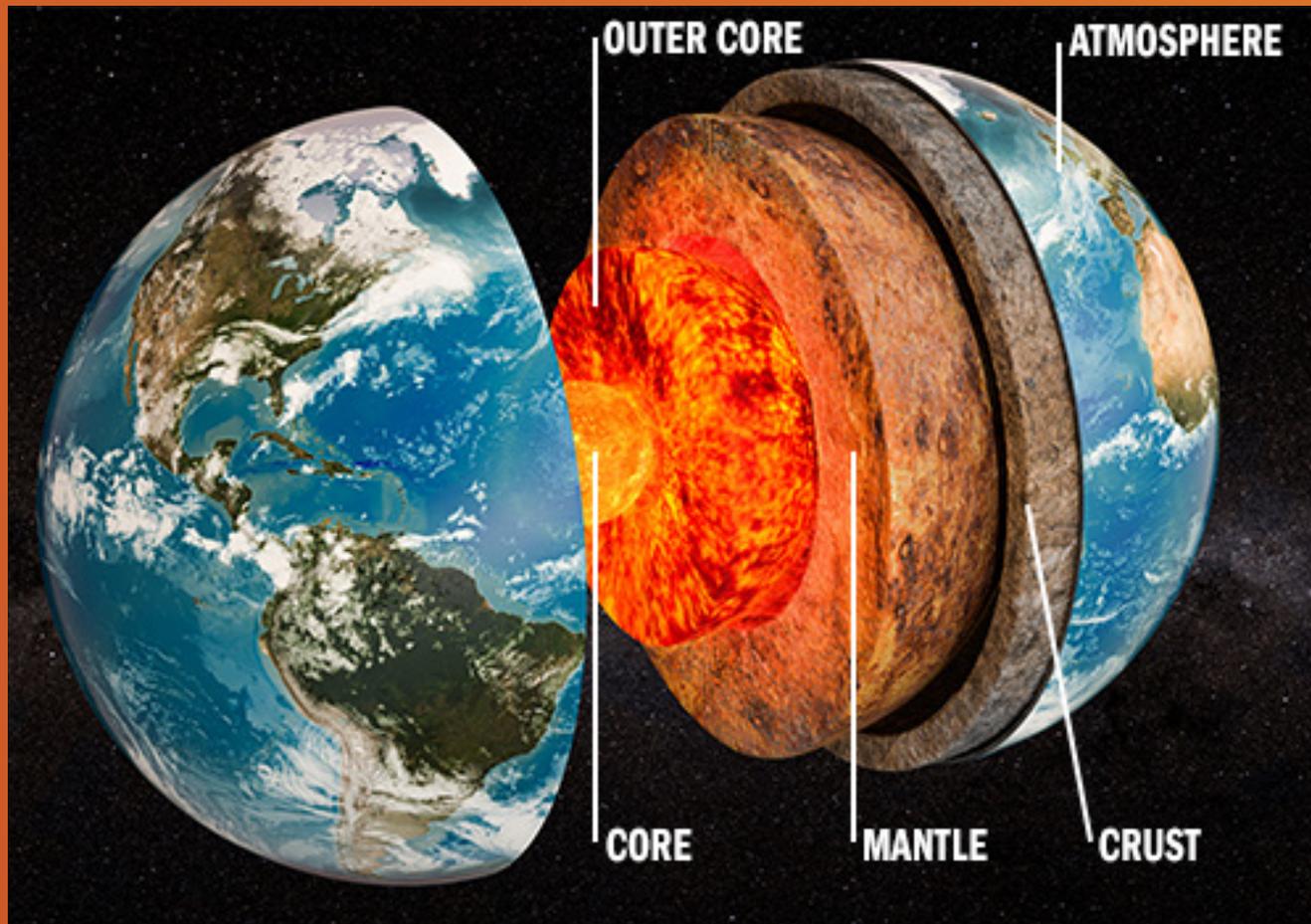


You can see land from the moon, too!

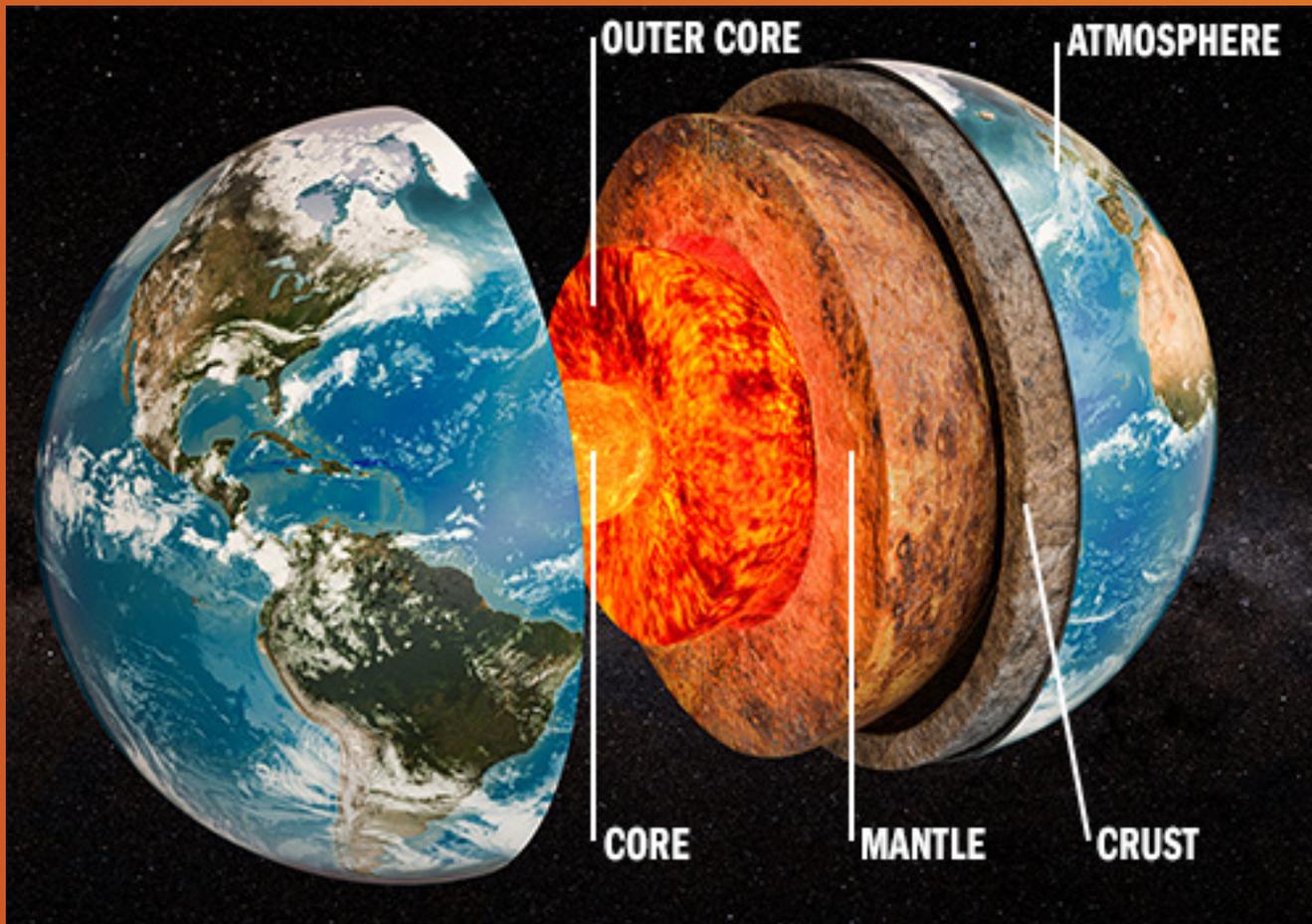
Land is what sticks up above the ocean surface, and is divided into landmasses called continents. Continents are further broken up by mountains, valleys, deserts, rivers and lakes. We live on continents.

What continent do you live on? Do you know what continent you are looking at in this photo of the Earth from the moon? Yes, it's Africa!

What does the inside of the Earth look like?



Below the atmosphere, is the outside of the Earth, called the crust - like a loaf of bread! The crust is the land that forms continents and the bottom of the ocean. The crust is nearly 50 miles thick!



Below the crust is a zone called the mantle. The mantle is a thick layer of hot rock under high pressure that rocks float on and move. This is called plate tectonics. Under the mantle is the core. The core of the earth is very hot, almost as hot as the sun's surface:

10,800 degrees Fahrenheit.

Did you know the Earth's crust moves? This is called plate tectonics.

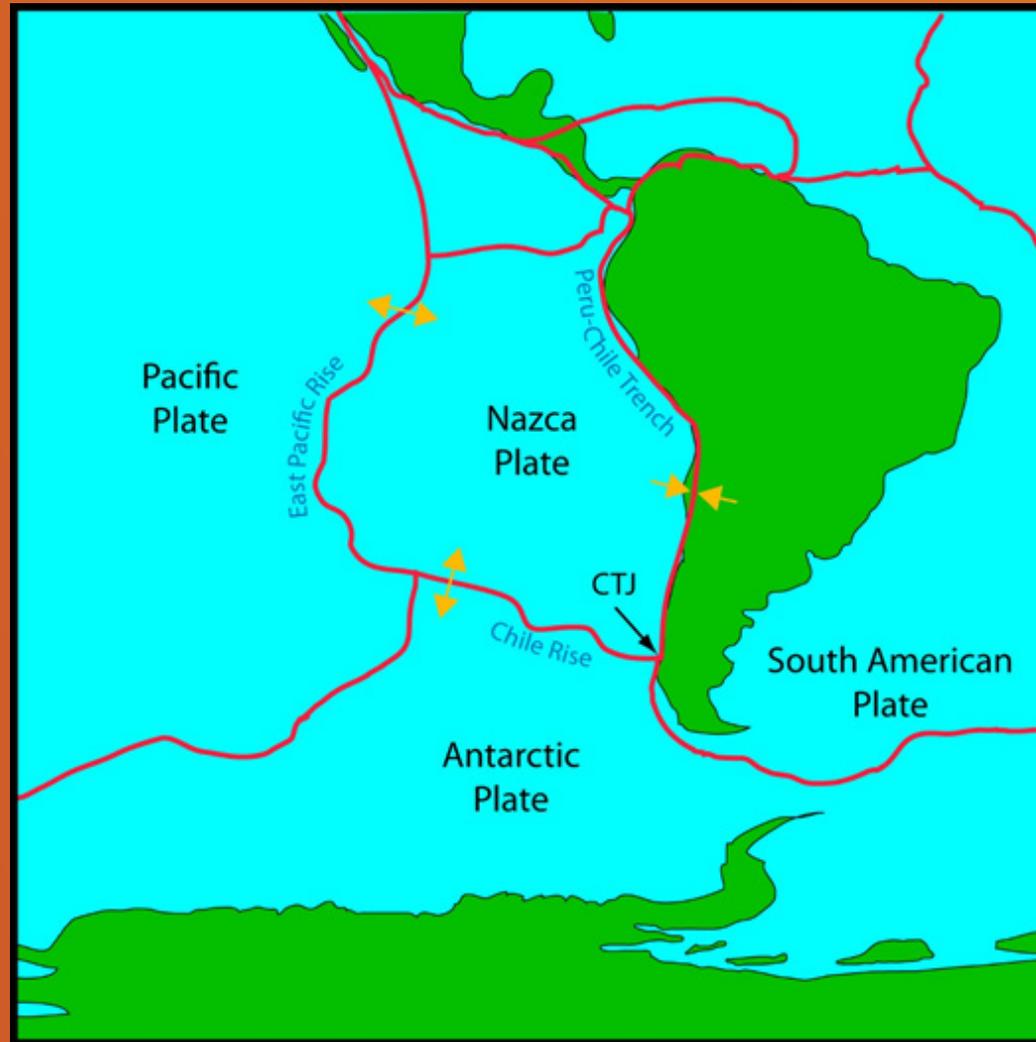
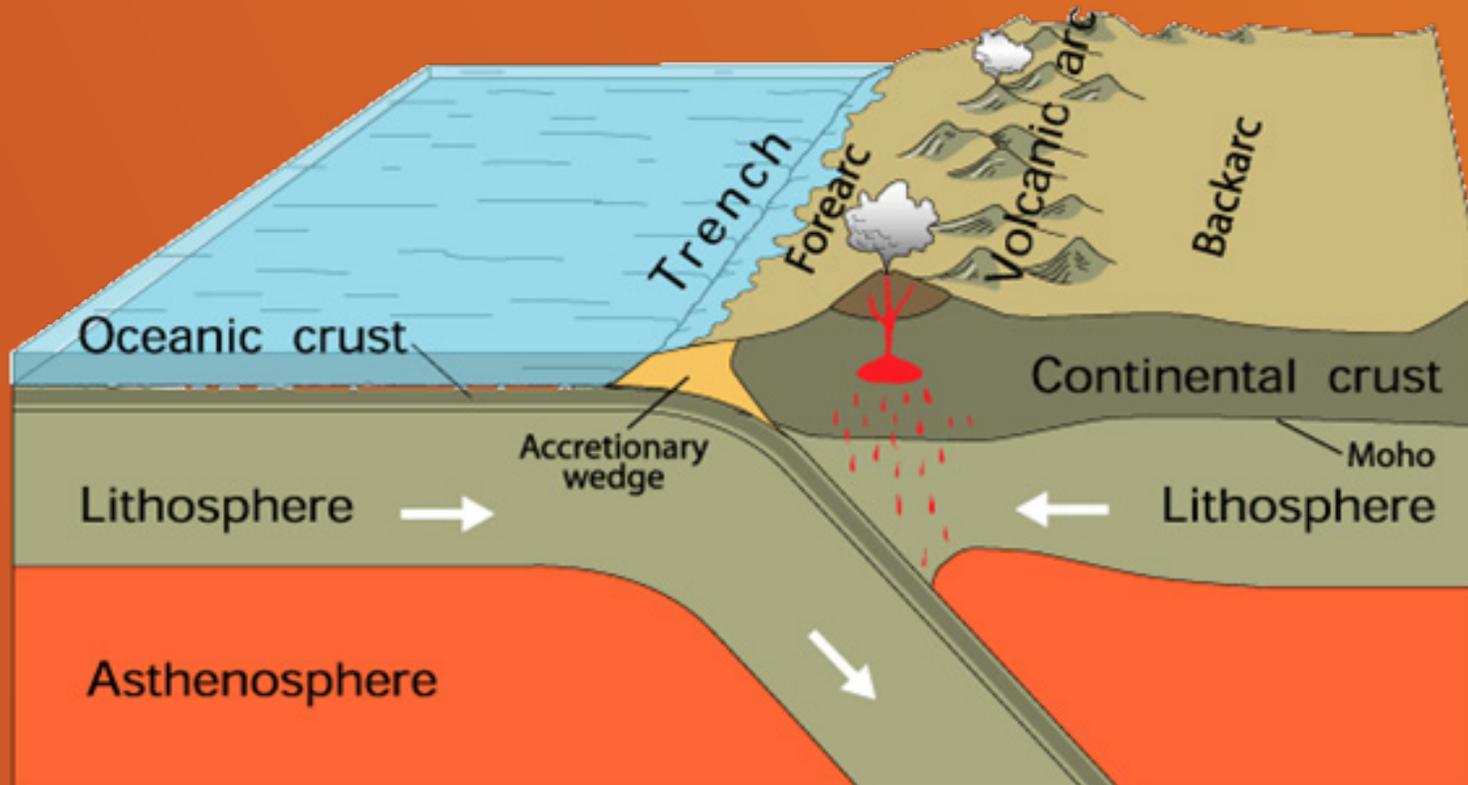
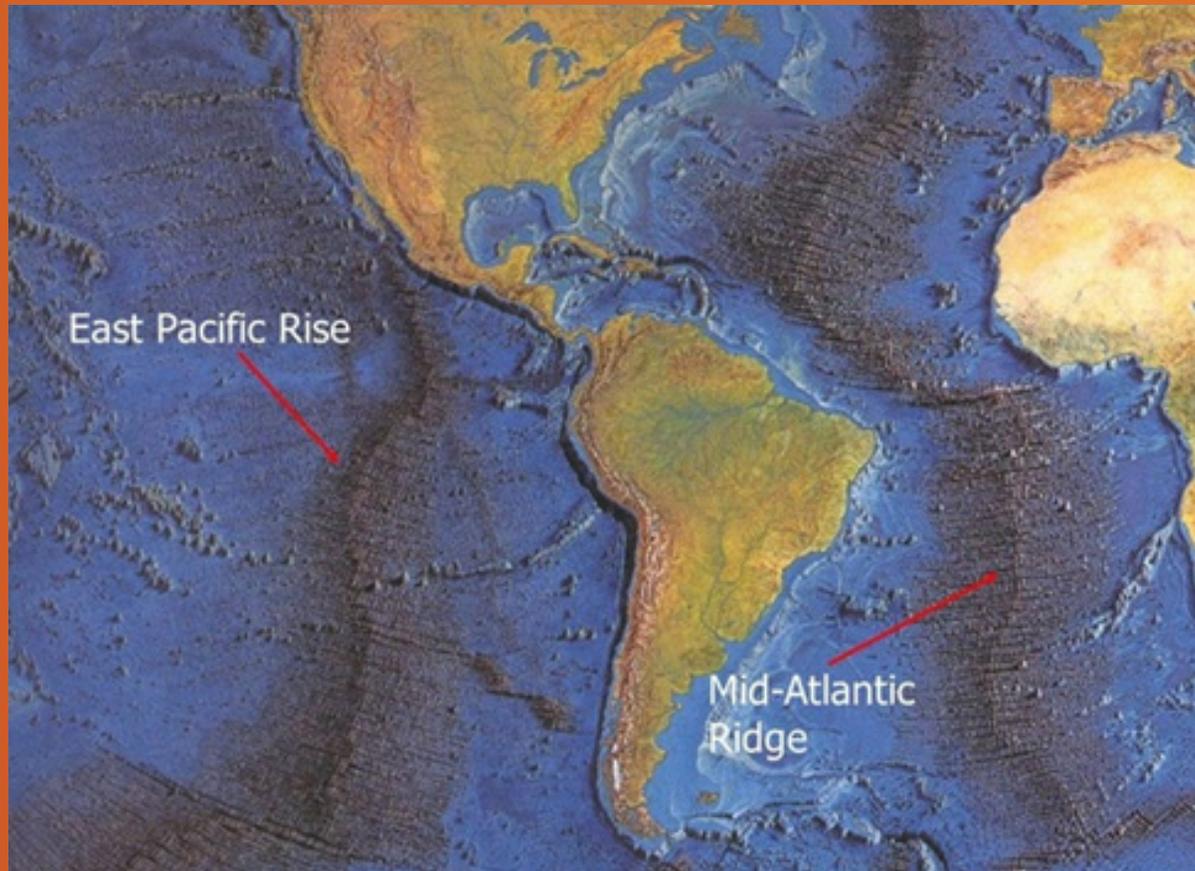


Plate tectonics are when parts of the Earth's crust move and collide with other plates. These collisions form mountains and volcanoes and are why we have earthquakes. The red lines in the image above outline some of Earth's plates. The yellow arrows show the direction the Nazca Plate is moving against other plates.

When one plate collides with and sinks below another plate, that's called a subduction zone. This is what a subduction zone would look like if you could look underground with X-ray vision.

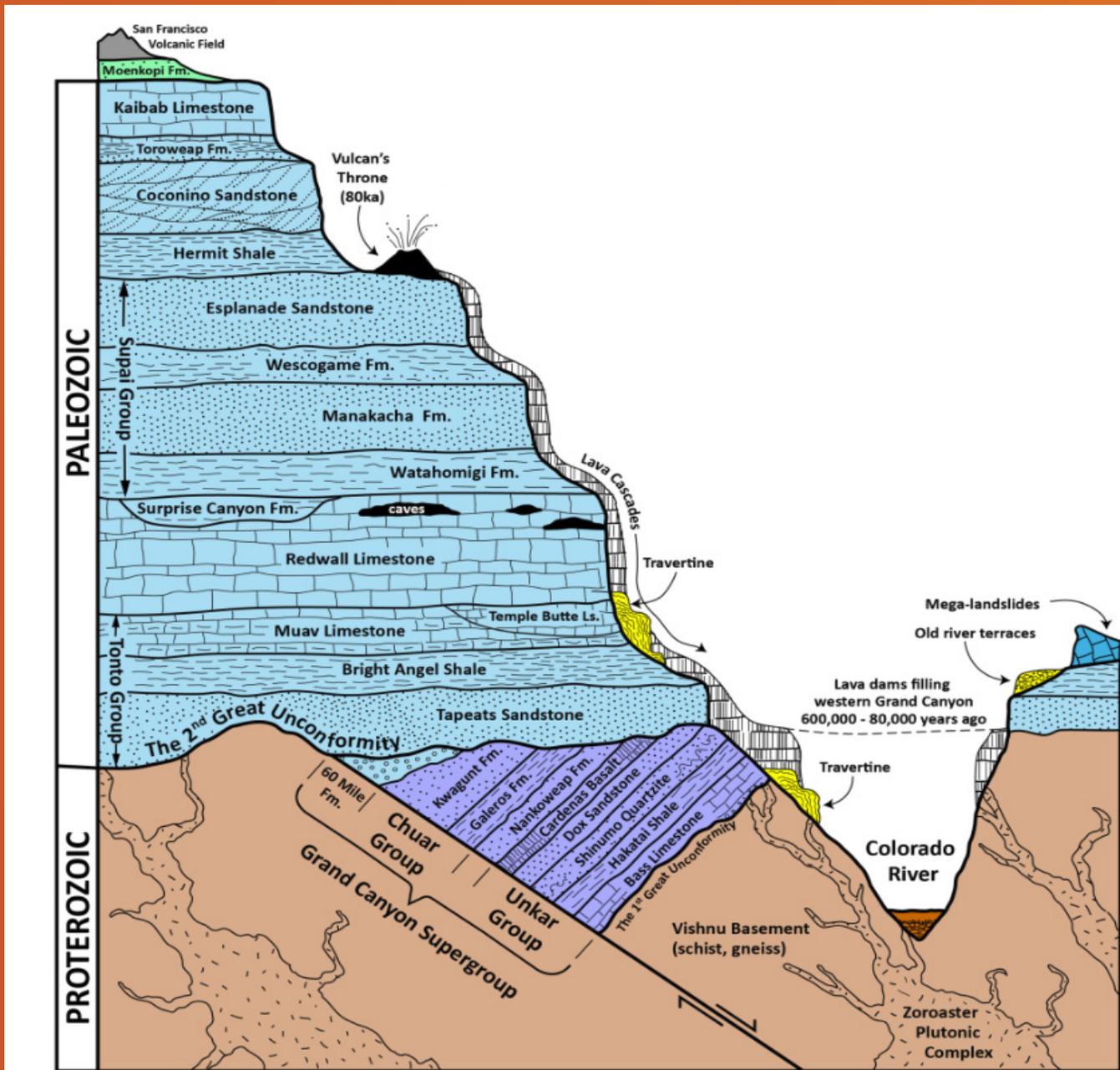


Volcanoes and earthquakes form from subduction zones along the edge of a continent. We have volcanoes and earthquakes here in Washington and Oregon, so is there a subduction zone off our coast? Yes, there is!



The ocean plates spread; where they spread from is called the spreading zone. Some of the highest mountain ranges in the world are very deep under the oceans' surface. Can you see where the mountain ranges are?

Have you heard of the Grand Canyon? It's a canyon of the Colorado River.



The Grand Canyon is located in Arizona and borders parts of Utah and Nevada. It was created by the land being up-lifted by plate tectonics (remember what that is - the plates collide and cause the land to lift up).

# **TYPES OF ROCKS**

<b>IGNEOUS</b>		<b>SEDIMENTARY</b>		<b>METAMORPHIC</b>		
 Granite	 Scoria	 Sandstone	 Limestone	 Marble	 Slate	
 Pumice	 Obsidian	 Shale	 Conglomerate	 Gypsum	 Quartzite	 Gneiss

The Grand Canyon is a mile deep and shows the different geologic layers and rocks. All the different rock types are represented in the face of the canyon - sedimentary, igneous, and metamorphic.

Fossils are really cool. They are the remains of animals that have been preserved in rock. They can be full skeletons, teeth, bone fragments, or impressions of shells, feathers, or fur.



Tyrannosaurus lived on earth between 83.6 - 66 million years ago. Dinosaurs as a species were on the planet from about 230 million years ago - 66 million years ago. Wow, I didn't know that dinosaurs were here for 146.4 million years before tyrannosaurus evolved.

There are dinosaur fossils in the Grand Canyon. If you found a dinosaur fossil, how old do you think the rock around it would have to be?



There are many types of fossils, not just dinosaurs. Many fossils are from ancient sea creatures. In fact, the first land animal didn't show up until between 374-359 million years ago. It was a transitional species, between fish and terrestrial animal, called an Ichthyostega. Here is what it looked like!

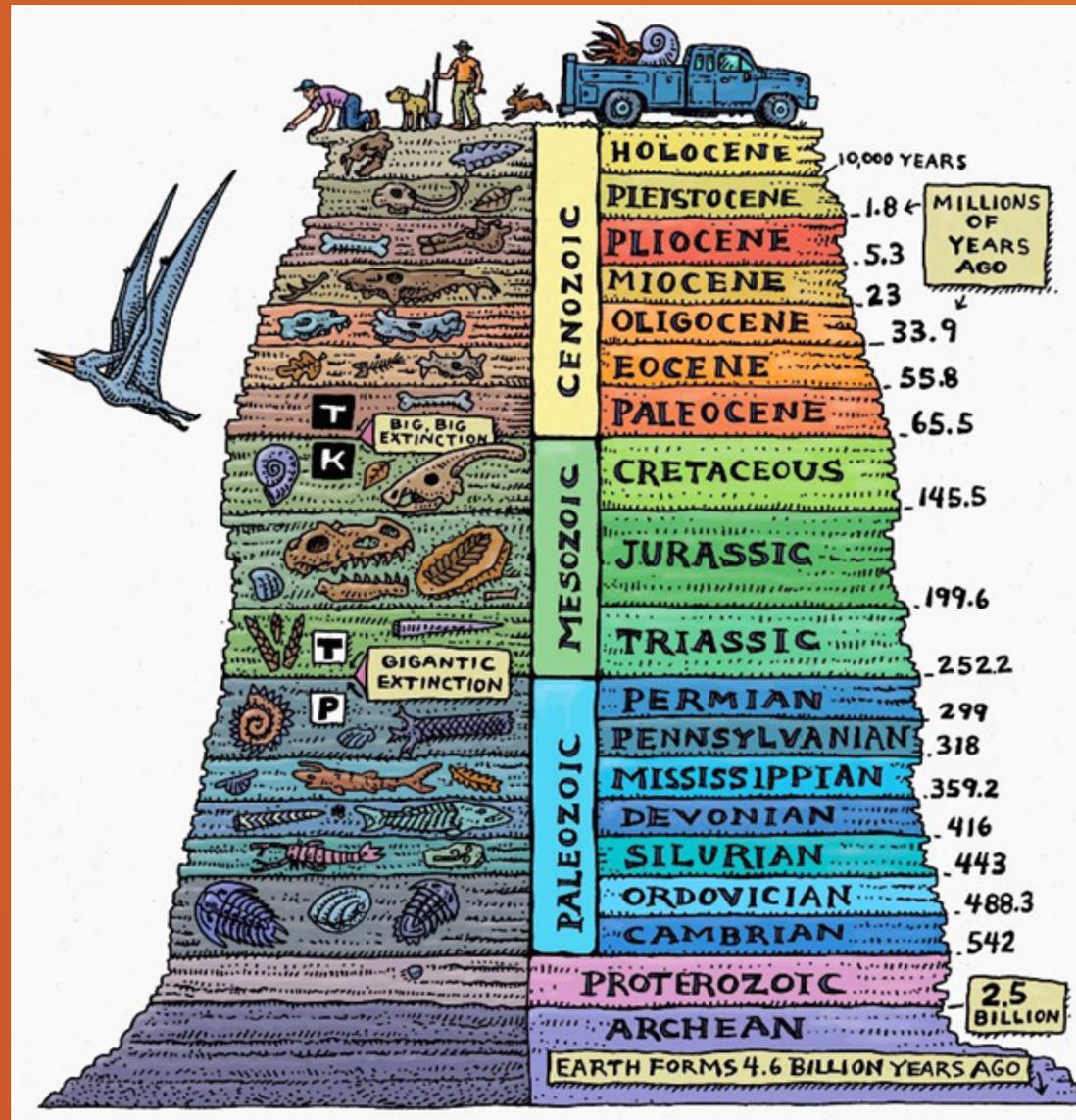
Scientists estimate that the Earth is 4.543 billion years old.  
That's a lot of birthdays!

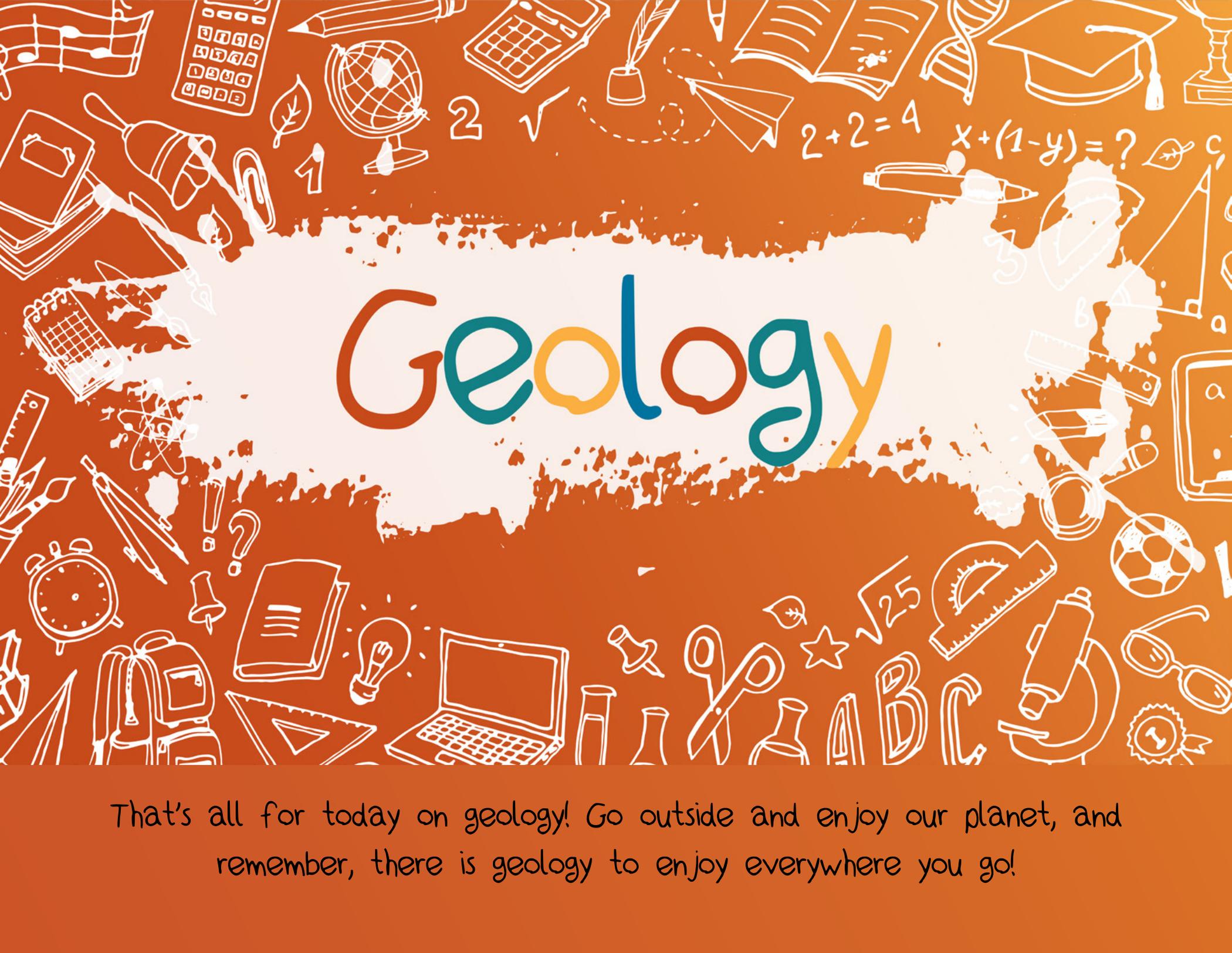


The oldest rock in the Grand Canyon is way down at the bottom of the canyon where the Colorado River is—it's called the Vishnu schist. In case you are wondering, schist is a metamorphic rock. It was formed very deep in the Earth. Stratigraphy is the study of the layering of rock.

Unless turned over by plate tectonics or dug up by humans, the youngest rocks are generally at the top, and the oldest are at the bottom. The rock at the top of the Grand Canyon is the Kaibab limestone. It's about 250 million years old. The rock at the bottom of the canyon is over 16 times older than the rock at the rim. But even so, 250 million years is a long time!

Below is what is called the geologic time scale. You can see when different animals lived and when some went extinct. People have only occupied the planet for a relatively short period of time.





# Geology

That's all for today on geology! Go outside and enjoy our planet, and remember, there is geology to enjoy everywhere you go!