Plate tectonics: Earth's continents do not stay still

By Phillip Heron, The Conversation, adapted by Newsela staff on 12.01.17
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A sign marking where the San Andreas fault line crosses in California. Photo from Flickr.

The land below our feet is slowly moving.

Crazy, right? Scientists didn't know this until 1966. Before that, they thought land was stuck in place.

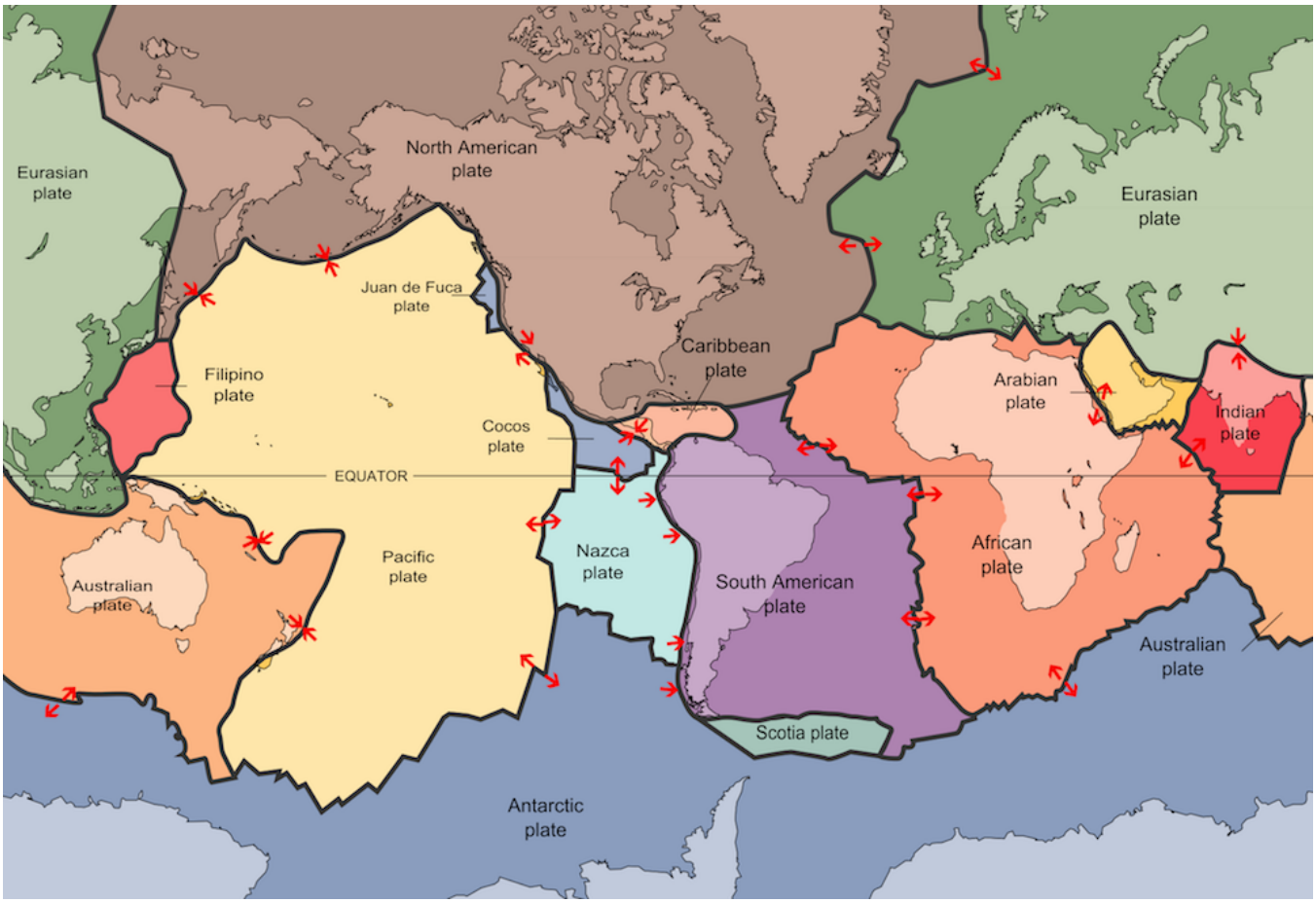
Earth's land and oceans are constantly moving over our planet’s surface. This is known as plate tectonics. Land moving below us causes earthquakes and helps create mountains.

Scientists are still learning about where the surface of our planet has been and where it’s going.

Evidence For The Theory

In 1912, German scientist Alfred Wegener noted that the Earth's current landmasses, or continents, could fit together like a jigsaw puzzle. By looking at fossil records, Wegener realized that similar animal groups once lived together in faraway places. This could mean continents drifted apart from each other. He couldn't fully explain it, so most other geologists dismissed his ideas.

In 1966, J. Tuzo Wilson found the missing link: The Atlantic Ocean had opened and closed at least once before. In that process, it swept up pieces of land with it. He found that parts of New England and Canada were once part of Europe. Parts of Norway and Scotland were once part of America.



How Plate Tectonics Works

The Earth is made up of many layers. The top part is the crust. Just beneath that is the mantle. Together, these make up the “plates” in plate tectonics. We now know there are 15 major plates that cover the planet’s surface. They move about as fast as our fingernails grow.

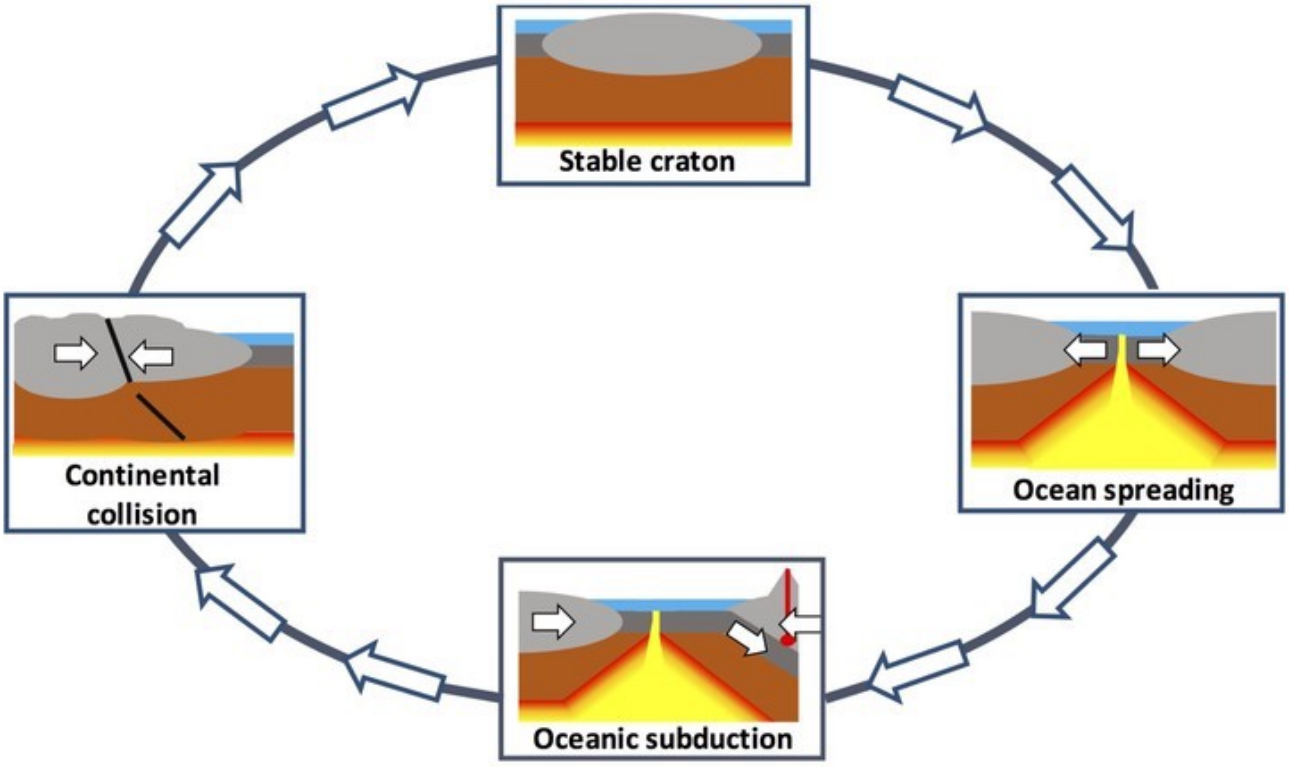
Today, we know that no ocean is more than 200 million years old. The oceans’ opening and closing process explains how the Earth’s surface changes.

A continent breaks up when hot molten rock inside Earth changes its flow. The flow of molten rock changes the direction plates move. This is how South America broke away from Africa.

Then, the continent drifted away. The sea floor spread out, and the Atlantic Ocean was formed.

In fact, the Atlantic is still opening. It is generating new plate material in the middle of the ocean. This makes the distance from New York to London a few inches longer each year.

Oceans close when their plates sink beneath another. Geologists call this subduction. Off the Pacific Northwest coast of the United States, the ocean is slipping under the continent and into the mantle. In slow motion, it is creating Mount St. Helens and the Cascade mountain range.



Plates can also simply rub up against each other. This usually causes large earthquakes.

Gone But Not Forgotten

Recently, scientists have used new technology to more clearly look below the surface of the Earth. Many scars and scratches have been found. These are left over from when continents bumped into each other a very long time ago.

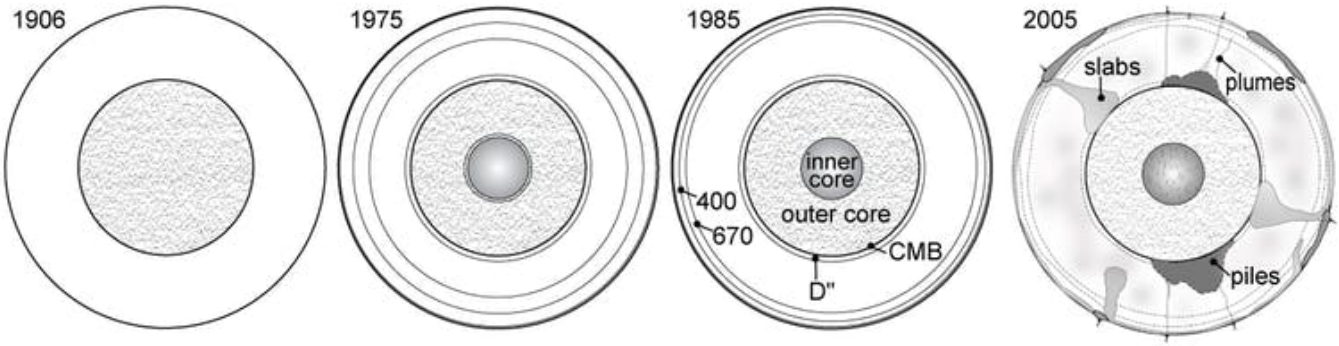
There may be hidden activity going on under our feet. These plates are more than 20 miles below us. If they suddenly started moving again, they would cause devastating events.

Mysterious Blobs 1,800 Miles Down

New technology also shows two “blobs” at the boundary of Earth’s core and mantle. They are full of chemicals. These blobs may trace back to our planet’s formation.

These hot, dense piles of material are 1,800 miles beneath Africa and the Pacific. They're difficult to study, and nobody knows where they came from or what they do. These blobs sometimes interact with the cold ocean floor. When this happens, they generate hot bunches of mantle and blob material. This causes super-volcanoes at the surface of Earth.

Does the movement of these plates control how the piles behave? Or are the strange blobs actually controlling what we see at the surface? Do they release hot material to break apart continents?



Answers to these questions could change everything we know about plate tectonics.

Plate Tectonics In Other Times And Places

How did plate tectonics even begin? Scientists still don't know.

The early Earth was much hotter inside than it is today, and plate tectonics worked differently. The world would have looked and worked much differently back then.

So far, amazingly, Earth is the only planet we know of that has plate tectonics.

Soon, we may be able to use what we know about plate tectonics to learn about other planets.

Incredibly, a planet's ability to host living things is always linked to plate tectonics. Venus, for example, has no moving plates. Because of this, its air is 96 percent carbon dioxide, which makes life impossible.

On Earth, subduction helps push carbon dioxide down into the planet's interior. It stays out of the atmosphere this way.

It took 3 billion years of plate tectonic processes to get the right carbon balance for life on Earth.

A Theory Works Now, But What's In The Future?

Scientists now believe that every tectonic movement may lastingly affect the planet.

Life here would be very different if plate tectonics changed. For one thing, if those continent-sized chemical blobs moved, they'd cause super-volcanoes, covering the sky in ash for years.

It’s hard to understand what our future holds if we don’t understand our beginning. By discovering the secrets of our past, we may be able to predict the motion of our plate tectonic future.

Philip Heron is a scientist studying Earth's movements at the University of Toronto in Canada.

Quiz

1 Read the following paragraph from the section "Mysterious Blobs 1,800 Miles Down."

> *These hot, dense piles of material are 1,800 miles beneath Africa and the Pacific. They're difficult to study, and nobody knows where they came from or what they do. These blobs sometimes interact with the cold ocean floor. When this happens, they generate hot bunches of mantle and blob material. This causes super-volcanoes at the surface of Earth.*

Which of the following BEST describes the structure of the paragraph?

(A) cause and effect

(B) question and answer

(C) sequence of events

(D) compare and contrast

2 The section "Evidence For The Theory" is organized using chronological order.

WHY do you think the author chose to organize the section that way?

(A) to answer questions about how the plate tectonic process works

(B) to present a timeline of important plate tectonics discoveries

(C) to show how much more scientists have to learn about plate tectonics

(D) to describe how J. Tuzo Wilson discovered that the continents had drifted apart

3 Read the section "How Plate Tectonics Works" and examine the first image in that section.

HOW does the image help the reader understand plate tectonics?

(A) It explains how plate tectonics helped the Atlantic Ocean form.

(B) It shows the 15 tectonic plates and how they are moving.

(C) It illustrates the many layers of Earth that were formed by plate tectonics.

(D) It highlights how plates move together to form mountains.

4 Use the information and the image in the section "Mysterious Blobs 1,800 Miles Down" to select the TRUE statement.

(A) The blobs at the boundary of Earth's core and mantle didn't appear until 2005.

(B) The core of the Earth got smaller between 1906 and 1975.

(C) The mysterious blobs caused the inside of the Earth to shift.

(D) Scientists are using technology to learn more about the inside of the Earth.