Module 3, Investigation 1: Continental Drift

Introduction

Welcome!

It has taken thousands of years to map the positions of the oceans and continents, and to create the detailed globe you see in Google Earth. But has Earth always looked this way? If it was different in the past, how could we tell?

In this investigation, you will follow in the footsteps of scientists over the past 300 years and explore some key evidence for how our Earth has changed through time. Now that you are familiar with Google Earth, you will be asked to create some graphics in Google Earth that help you analyze the data presented. Have fun!

Check your Google Earth settings!

1. Turn off all Layers except **Borders** and **Labels**.
2. Select Tools > Options > 3D View > Units of Measurement > select **Meters, Kilometers**.
3. Select Tools, > Options > 3D View > Terrain Quality > check "Show terrain" > enter **2** for **Elevation Exaggeration**.
4. Select Tools > Options > 3D View > Show Lat/Long > check **Decimal Degrees**.
5. Select Tools > Options > Touring > check "**Show balloon when waiting at features**".

Folder 1: Geographic Evidence

Geographic Evidence

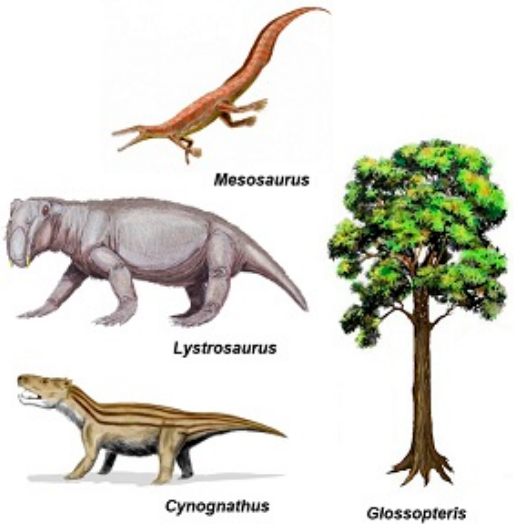
In 1596 a Dutch mapmaker named Abraham Ortelius noted that some of Earth's continents seem to fit together. They look a bit like pieces of a giant jigsaw puzzle. He reasoned that at some time in the past the continents must have been connected. He suggested that earthquakes and floods had separated them over time.

Folder 2: Fossil Evidence

Fossil Evidence

It is easy to see that different continent have different plants and animals. Lions live in Africa. Penguins live in Antarctica. Redwood trees are only found in North America. This is because plants and animals are adapted to different climates, and climate depends on where a place is located on the globe. Imagine if the continents had always been where they are today. You would expect to find different fossils on each continent. Does the fossil evidence support this?

We will now investigate three important animal fossils from the Triassic geologic time period (250 to 200 million years ago (Ma)). These are *Mesosaurus*, *Lystrosaurus*, and *Cynognathus*. We will also look at one plant fossil. It is called *Glossopteris* and is from the Permian period (300 to 250 Ma).



Folder 2: Research

Did They Swim?

You have discovered that some Triassic and Permian fossils have been found on more than one continent. Could it be that these continents were connected during that time? Or, did the plants and animals somehow cross the oceans? You will need to find out more about these organisms in order to decide. Conduct you own research on each of the fossil types, starting with the Wikipedia links below.

Mesosaurus

Lystrosaurus

Cynognathus

Glossopteris

Folder 3: Rock Evidence

Rock Evidence

Earth has many mountain ranges. Each one has unique characteristics. These include the types of rock it is made out of and how those rocks have been deformed over time. The Andes range of South America is 7,000 km long. It is the longest continental mountain range in the World. Geologists have discovered that it was once even longer. It is made of the same rocks as the mountains along the Antarctic Peninsula. These two ranges formed as one during the late Cretaceous and early Tertiary geologic time periods, around 80 to 60 Ma. This is why the Antarctic mountain range was named “Antartandes”.

The same is true for the Kjolen Mountains in Norway and the Appalachians of the eastern United States. These ranges, and many smaller mountains around the North Atlantic, were formed as one mountain range. This happened during the Ordovician and early Devonian geologic time periods, roughly 490-390 Ma.

My Data

Let's Reflect!

You have seen evidence showing how the continents were once connected. This idea was first published by German meteorologist Alfred Wegener in 1915. He called the ancient supercontinent “Pangaea”. Pangaea means “all earth” in Latin. Wegener knew that Earth's rotation would create centrifugal force. He thought that force could push the continents through the oceans over time. He called this theory “Continental Drift”.

The theory was not generally accepted. Most scientists at the time thought that Earth’s crust was solid and could not be moved. The force generated by Earth’s rotation would not be strong enough to move the crust. This scientific problem remained unresolved for the next half century.

Pangaea