

A Geologic History of Earth

i This article is accessible to students only when assigned.

Freckle Level: 8A

Even if you're no expert on geography, chances are you have a good mental image of what the earth looks like today. You can probably picture the seven **continents**: Africa, Antarctica, Asia, Australia, Europe, North America, and South America. Each of these continents has its own distinct climates that vary with the seasons. However, Earth hasn't always looked the way it does now. There used to be only one continent on the entire planet. In addition, Earth's climate has undergone several huge shifts. Our planet is constantly changing and will undoubtedly continue to change in the future.

Pangaea: The Supercontinent

When it first formed, Earth was covered in molten rock that was constantly being bombarded by comets and other foreign bodies. As water accumulated on Earth, some of which came from the ice of falling comets, Earth's outer layer began to cool, forming a solid crust. This crust was and still is constantly changing shape over hundreds of millions of years.

Sometimes, the crust formed continents and **supercontinents**, which joined together and split apart several times. The most recent supercontinent was Pangaea, which existed up until about 200 million years ago when the continents split apart one final time. Pangaea was a single, continuous land mass surrounded by a superocean known as *Panthalassa*.



A diagram showing how Pangaea likely looked

There are several pieces of evidence that support the existence of Pangaea. One of the most obvious is the shape of our continents today. You can see the evidence yourself simply by looking at a map of Earth. If you look closely, you may notice that

Writing

Skills: Argument, Writing Conventions

- Is the existence of Pangaea a reasonable idea? Why or why not?

Vocab

- distinct
- climate
- existence
- theory
- dramatically

Reading

Skills:

- RI.3: Analyzing Connections
- RI.4: Word Meaning & Choice

RI.3: Analyzing Connections

Why do scientists believe that all continents were once together in a supercontinent? Select all that apply.

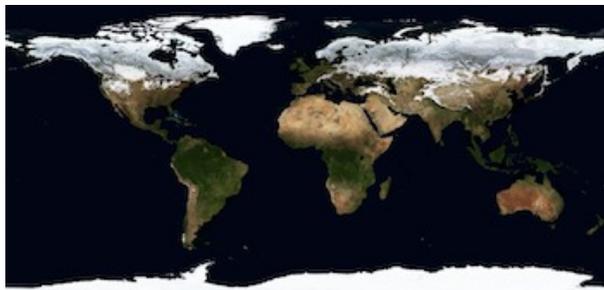
Similar rocks and fossils have been found in today's continents that are very far from each other, showing that they may have been close together at some time.

Scientists have found pictures from a few hundred years ago showing that all continents fit together.

the shapes of the continents seem as though they could fit together like puzzle pieces. This suggests that the continents broke apart from the same landmass.

There is also evidence for Pangaea in the similarity between the geologic record of different continents. For example, coal deposits that seem to share a common source have been found in Pennsylvania, Poland, Great Britain, and Germany. The presence of the same sedimentary rock in all these places suggests that they all used to be much closer together and were likely all part of the same continent.

Finally, the fossil record shows that identical, now-extinct plants existed on continents that are today very far apart. Once again, this record suggests that our continents were not always separate.



Earth's continents

Studying Pangaea has allowed geologists to understand the theory of plate tectonics. According to this theory, Earth's outer shell consists of several different plates, on top of which sit the continents and oceans. These plates move slowly over Earth's mantle, a shell of rock between the earth's crust and core. The movement of these plates explains how continents move over time and how they might have once formed and broken off from supercontinents like Pangaea.

Earth's Changing Climate

Though we often think of climate change as a modern phenomenon, Earth's climate has changed constantly over the past millions of years. The planet goes through a cycle of glacial periods and interglacial periods. We call these glacial periods "ice ages."

During glacial periods, the global climate is much cooler and dryer and ice masses extend far beyond the poles. Sea levels drop dramatically as more and more seawater is added to the earth's icecaps. With lower sea levels, submerged land bridges can appear where there was once ocean, connecting distant continents. Currently, Earth is in an interglacial period, meaning we are between two ice ages. Geologic predictions suggest that Earth will not enter another glacial period for at least another 50,000 years.

If you look at a map of the world today, the continents look like they could fit together like puzzle pieces, indicating they may have fit together like that once.

Pieces of the earth's mantle fit together perfectly like a supercontinent.

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RI.3: Analyzing Connections

How does the earth change during an ice age or a glacial period? Select two ways.

Ice ages and in-between periods are not very different at all.

The air is much more humid and warm, melting a lot of the ice.

The air is much colder and dryer, and more of the oceans and water are frozen into ice masses.

Sea levels are lower, so more land bridges show up that were previously under water.

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RI.4: Word Meaning & Choice

Which of the following statements best describes what a *glacial period* most likely is?

A very warm period of time on the earth

A very cold period of time on the earth, or an ice age



An image of what the earth's ice caps might have looked like during the last ice age

Scientists use many kinds of evidence to study ice ages. One useful method is to study ice cores, samples drilled out from an ice sheet or glacier. These ice cores provide scientists with a wealth of ancient temperature information, allowing them to determine when Earth was experiencing an ice age.

The fossil record also provides evidence of ice ages by showing the migration of ancient animals. During ice ages, these animals had to migrate to warmer, more southern areas to survive. Dating these fossils can tell scientists when long periods of cold temperatures forced these animals south.



A scientist taking an ice sample from a glacier

Today, understanding our Earth's geologic history is more important than ever. Climate change caused by the emission of greenhouse gases is causing our planet to change much faster than before. Understanding Earth's changes—and how life has evolved and survived throughout them—can help us predict what shifts are still to come and how life may adapt in the future.

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A large piece of land covered in ice

A mountain

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RI.4: Word Meaning & Choice

What does the prefix "inter" in the term *interglacial* most likely mean?

in-between

on top of

supporting

before

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