Name:

Section:

Instructions: Read an informational Text below and describe how Pangaea look like.

Alfred Wegener's supercontinent was also known as the protocontinent, which means "the first continent." He called it *Pangaea* (from Greek pan meaning all and ***gaea*** meaning lands.) All the earth's water formed one large ocean, which he called Panthalassa (from Greek pan meaning all and ***thalassa*** meaning sea). He believed that Pangaea was intact until about 300 million years ago, when it began to break up and drift apart into their present locations and separations.

The northern part of **Pangaea** was called *Laurasia*, while the southern part was called *Gondwanaland*. Laurasia was an ancient continental mass that included what we know today as North America, Europe, and Northern Asia. It broke up about 66 to 30 million years ago. Gondwana was the ancient continent in the south that broke up about 180 million years into land masses known today as Africa, South America, Australia, Antarctica, the Indian subcontinent, and the Arabian Peninsula. Between Laurasia and Gondwanaland was this ancient ocean called **Tethys**.

Activity 2:

Instruction: Describe how Pangaea looked like. Provide reasons why it changes to the present feature. Write your descriptions and reason/s in the boxes below.

How does ***Pagaea*** look like?

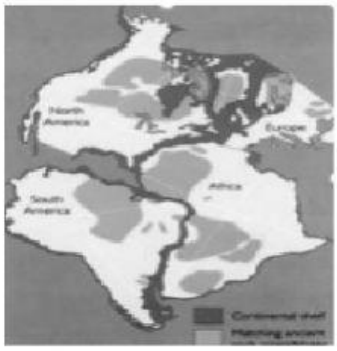
State your reasons why it changes to the present feature.

Activity 3: Article Reading (Asynchronous 2)

Instructions: Students will read an article about the evidences for Wegener's Theory.

What were the evidences for Wegener's Theory?

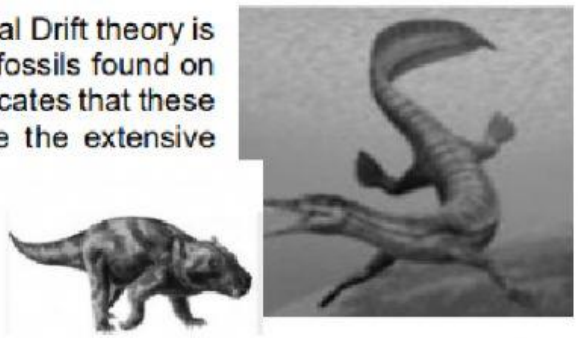
Alfred Wegener collected diverse pieces of evidence to support his theory, including geological "fit" and fossil evidence. It is important to know that the following specific fossil evidence was not brought up by Wegener to support his theory. Wegener himself did not collect the fossils but he called attention to the idea of using these scientific documents stating there were fossils of species present in separate continents in order to support his claim.



Geological "fit" evidence is the matching of large-scale geological features on different continents. It has been noted that the coastlines of South America and West Africa seem to match up, however more particularly the terrains of separate continents conform as well. Examples include: the Appalachian Mountains of eastern North America linked with the Scottish Highlands, the familiar rock strata of the Karroo system of South Africa matched correctly with the Santa Catarina system in Brazil, and the Brazil and Ghana mountain ranges agreeing over the Atlantic Ocean.

Evidence from Fossils

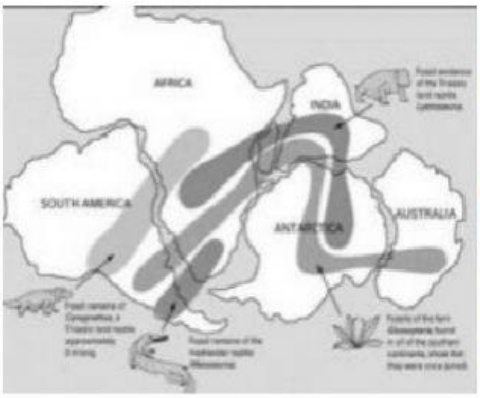
Another important piece of evidence in the Continental Drift theory is the fossil relevance. There are various examples of fossils found on separate continents and in no other regions. This indicates that these continents had to be once joined together because the extensive oceans between these land masses act as a type of barrier for fossil transfer. Four fossil examples include: the Mesosaurus, Cynognathus, Lystrosaurus, and Glossopteris.



The Mesosaurus is known to have been a type of reptile, similar to the modern crocodile, which propelled itself through water with its long hind legs and limber tail. It lived during the early Permian period (286 to 258 million years ago) and its remains are found solely in South Africa and Eastern South America. Now if the continents were in still their present positions, there is no possibility that the Mesosaurus would have the capability to swim across such a large body of ocean as the Atlantic because it was a coastal animal. The now extinct Cynognathus, which translates to "dog jaw", was a mammal- like reptile. Roaming the terrains during the Triassic period (250 to 240 million years ago), the Cynognathus was as large as a modern wolf. Its fossils are found only in South Africa and South America. As a land dominant species, the Cynognathus would not have been capable of migrating across the Atlantic.

The Lystrosaurus, which translates to "shovel reptile," is thought to have been an herbivore with a stout build like a pig. It is approximated that it grew up to one meter in length and was relatively dominant on land during the early Triassic period (250 million years ago). Lystrosaurus fossils are only found in Antarctica, India, and South Africa. Similar to the land dwelling Cynognathus, the Lystrosaurus would have not had the swimming capability to traverse any ocean.

Possibly the most important fossil evidence found is the plant, Glossopteris. Known as a woody, seed bearing tree, the Glossopteris is named after the Greek description for tongue due to its tongue shaped leaves and is the largest genus of the extinct descendant of seed ferns. Reaching as tall as 30 meters, the Glossopteris emerged during the early Permian period (299 million years ago) and became the dominant land plant species until the end of the Permian. The Glossopteris fossil is found in Australia, Antarctica, India, South Africa, and South America—all the southern continents. Now, the Glossopteris seed is known to be large and bulky and therefore could not have drifted or flown across the oceans to a separate continent. Therefore, the continents must have been joined at least one point in time in order to maintain the Glossopteris' wide range across the southern continents.



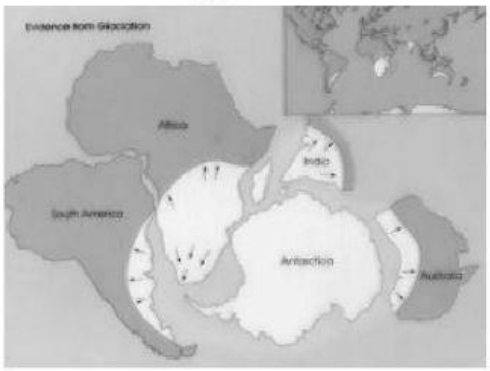
If the continents of the Southern Hemisphere are put together, the distribution of these four fossil types form continuous patterns across continental boundaries. Of course, possible explanations are brought to attention. One explanation is the species could have migrated via a land bridge or swam to the other continents. However, a land bridge is not applicable due to the differences in densities between the continents and oceans floor and violation of the isostasy concept. Moreover, swimming as a possibility is foolish due to the lack of formidable swimming capabilities to travel across such an extensive body of water like the Atlantic. An additional resolution is that the species could have merely evolved separately on the other continents. Undoubtedly, this interpretation is in complete disagreement with Darwin's evolution theory.

Evidence from Climate Mismatches

Wegener also made use of climate mismatches as evidence. The discovery of fossil of tropical plants in the form of coal deposits in Antarctica is a mismatch that can be explained by continental drift. Wegener concluded that this frozen continent must have been situated closer to the equator, where the climate is warm enough for growth of lush and swampy vegetation. The presence of fossils of the Glossopteris in present-day polar regions, and the occurrence of glacial deposits in present-day arid Africa, such as the Vaal River valley of South Africa, are climate mismatches that can be explained by Wegener's theory.

Evidence from Glaciers

Glaciers are huge, extensive masses of ice that covered much of the earth's surface during the ice ages. Glaciers leave marks on the surface, especially as they slowly creep. These marks called **glacial grooves** or **striations** are carved into the bedrock. Grooves will be similar on continents that shared glaciers. Today, glaciers are found nearer the poles, but these grooves and rock marks are now found on continents near the equator. It means that the glaciers covered most of the supercontinent. Wegener believed that the glacial ice was centered on the



southern continents. Striations formed by the scraping of glaciers over the land surface indicated that the Africa and South America had been closed together at the time of this ancient ice age. The same scraping patterns of glaciers can be found along the coast of South America and South Africa.

Evidence from Rocks

Alfred Wegener found identical rocks of the same type and age on both sides of the Atlantic Ocean. To Wegener, these rocks had formed in the same place but were separated when the land moved apart. The order, arrangement and structure of the rock layers (rock strata) in areas of South Africa are also similar to the rock strata in certain places in Brazil.

Evidence from Mountain Ranges

Wegener also studied mountain ranges on the opposite sides of the Atlantic Ocean. Rock types, rock ages, and rock structures matched. The Appalachian Mountains in the Eastern side of North America are similar to the Mountain Ranges in Greenland, Ireland, Scotland, and Norway. Wegener believed that these mountains were one mountain range that had been split apart by the drifting continents.

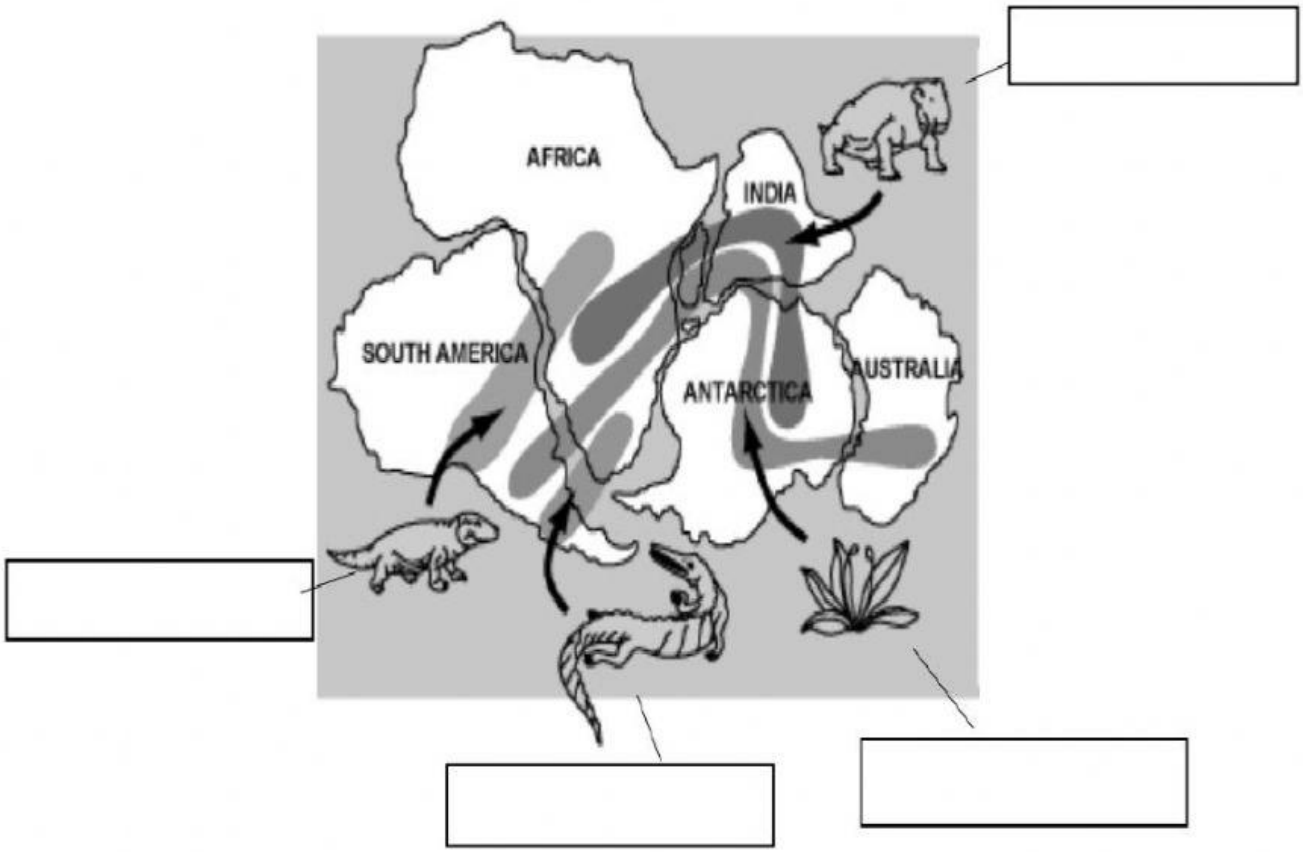
Locating Fossils: Identify the fossils (Glossopteris, Mesosaurus, Cynognathus, and Lystrosaurus) found in each area.

a. *Glossopteris* is found in South America, India, Australia, and Antarctica.

b. *Mesosaurus* is found in the southern tips of South America and Africa.

c. *Cynognathus* is found in the middle regions of South America and Africa.

d. *Lystrosaurus* is found in India, Antarctica, and Africa.



Question: Are fossils, rocks, and land features considered as proof or evidences?