

Chapter 4: Distribution of Oceans and Continents

Class: XI **Geography**

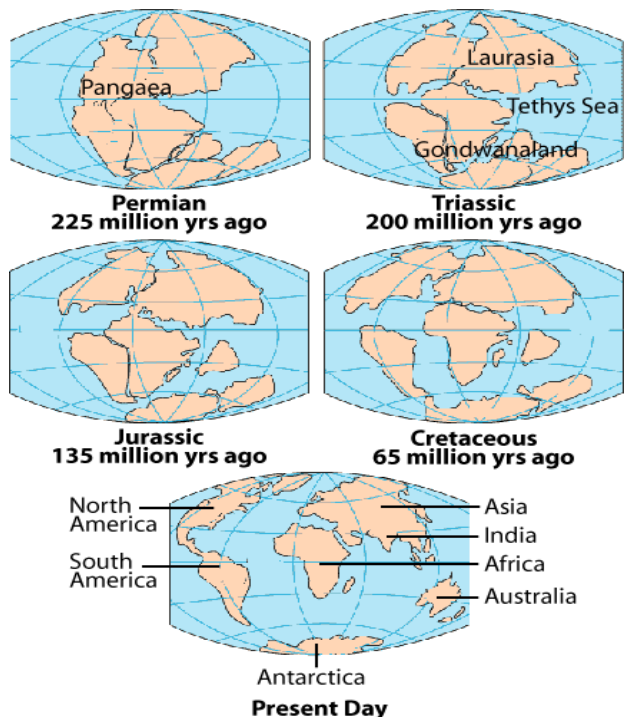


Figure: Pangea-The super Continent

Continental Drift Theory

- Continental drift theory was proposed by Alfred Wegener in 1912. He was a German meteorologist.
- But before Wegner, such a possibility was first put forward by Abraham Ortelius-a Dutch map maker in 1596.
- The theory deals with the distribution of the oceans and the continents.
- According to Wegener's Continental Drift theory, all the continents were one single continental mass-called a Super Continent – Pangaea (means all earth) and a Mega Ocean surrounded this supercontinent. The mega ocean was called Panthalassa (means all water)

- According to this theory, the supercontinent-Pangaea, began to split around 200 million years ago.
- Pangaea first split into two large continental landmasses known as Laurasia and Gondwanaland. Laurasia formed the northern and Gondwanaland formed the southern components of the supercontinent.



- Later, Gondwanaland and Laurasia continued to break into several smaller continents that exist today.

Evidences in Support of the Continental Drift Theory

1. The Matching of Continents (Jig-Saw-Fit)

- The coastlines of South America and Africa fronting each other have a remarkable and unique match.
- In 1964, Bullard created a map using a computer program to find the right fit of the Atlantic margin and it proved to be quiet.

Criticism:

- Coastlines are a temporary feature and are liable to change.
- Several other combinations of fitting in of unrelated landforms could be attempted.
- Continental Drift Theory shifts India's position too much to the south, distorting its relationship with the Mediterranean Sea and the Alps.
- The mountains do not always exhibit geological affinity.



Figure: Jig-Saw-fit

2. Rocks of the Same Age across the Oceans

- The radiometric dating methods have helped in correlating the formation of rocks present in different continents across the ocean.
- The ancient rocks belts in the coast of Brazil match with those found in Western Africa.
- The old marine deposits found in the coasts of South America and Africa belong to the Jurassic Age. This implies that the ocean never existed before that time.

Criticism:

Rocks of the same age and similar characteristics are found in other parts of the world too.

3. Tillite Deposits

- It is the sedimentary rock made from

glacier deposits.

- The Gondwana system of sediments are found in India, Africa, Falkland Island, Madagascar, Antarctica and Australia- all were previously part of Gondwana.
- Overall resemblance demonstrates that these landmasses had remarkably similar histories.
- The glacial tillite gives clear evidence of paleoclimates and the drifting of continents.

4. Placer Deposits

Rich placer deposits of gold are found on the Ghana coast (West Africa) but the source (gold-bearing veins) are in Brazil, and it is obvious that the gold deposits of Ghana are derived from the Brazil plateau when the two continents lay side by side.

5. Distribution of Fossils

- The observations that Lemurs occur in India, Africa and Madagascar led to the theory of a landmass named "Lemuria" connecting these 3 landmasses.
- Mesosaurus was a tiny reptile adapted to shallow brackish water.
- The skeletons of these creatures are found in the Iruver formations of Brazil and Southern Cape Province of South Africa.

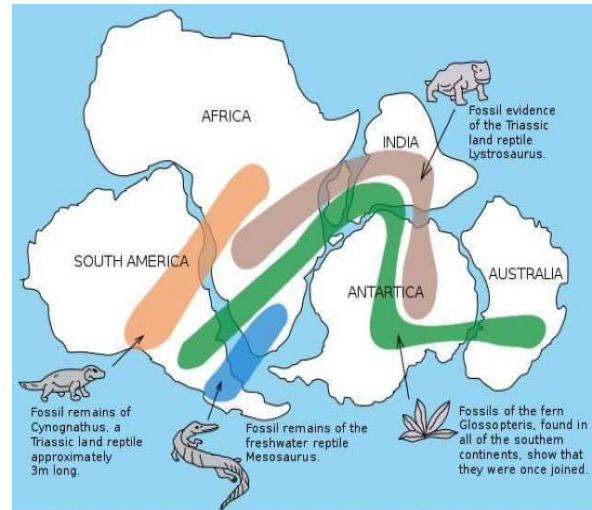


Figure: Distribution of Fossils

Forces for Drifting

- According to Wegener, the drift was in two directions-equator wards and west wards.
- Wegener suggested two forces that were responsible for the drifting of the continents- (a) tidal force and (b) pole-fleeing force.
- The polar-fleeing force relates to the rotation of the earth. Due to this force, the continents moved towards the equator.
- **Criticism: Poles may have shifted, not necessarily the continents.**
- The second force that was proposed by Wegener- the tidal force-is due to the attraction of the moon and the sun that develops tides in oceanic water. The continents moved towards west due to tidal currents because of the earth's motion (earth rotates from west to east, so tidal currents act from

east to west, according to Wegener).

theory that laid a strong foundation for the concepts of seafloor spreading and plate tectonics.

- **Criticism:** *This is illogical because to be able to cause a drift of such a magnitude, tides will have to be millions of times stronger.*
- *Wegener believed that these forces would become effective when applied over many million years. But most of the scholars considered these forces to be totally insufficient.*

Drawbacks of Continental Drift Theory

- *Wegener failed to explain why the drift began only in Mesozoic era and not before.*
- *The theory doesn't consider oceans.*
- *Proofs heavily depend on assumptions that are generalistic.*
- *Forces like buoyancy, tidal currents and the gravity are too weak to be able to move continents.*
- *Modern theories such as Plate Tectonics accept the existence of Pangaea and related landmasses but give a very different explanation to the causes of drift.*

- **Significance/Conclusion**

Though most of the scholars consider Wegener's theory of Continental drift scientifically unsound on various grounds, but it has been a significant milestone in the study of tectonics. It is Wegener's