

## Continental Drift Theory

### Overview

German meteorologist **Prof. Alfred Wegener** proposed this theory in **1912**. The first continental portion of the earth was called '**Pangea**', and the oceanic part was called '**Panthalassa**'. Later, a sea called **Tethys** divided Pangea into two parts, namely **Laurentia (Laurasia)** or **Angaraland** to the north and **Gondwanaland** to the south of Tethys.

### Observations

In the continental region of tropical zones, evidence of glaciation was found in the past and in the continental region of colder zones, evidence of tropical climate was found. There were only two possibilities either the climate have changed, or the continents have changed their positions. Wegener ruled out climate change that requires changes in earth's axial alignments, orientation, rotation and movements and rather suggested movements or drifting of continents.

### Theory

He proposed that around 250 million years before the present there was one single vast continent called 'Pangea' surrounded by oceans on all the sides called Panthalassa. He further suggested that the Pangea broke into two parts around 200 million years before present Laurentia or Angaraland and Gondwanaland. After that the continents further broke down and moved to the current position by drifting, he called this drifting as continental drift.

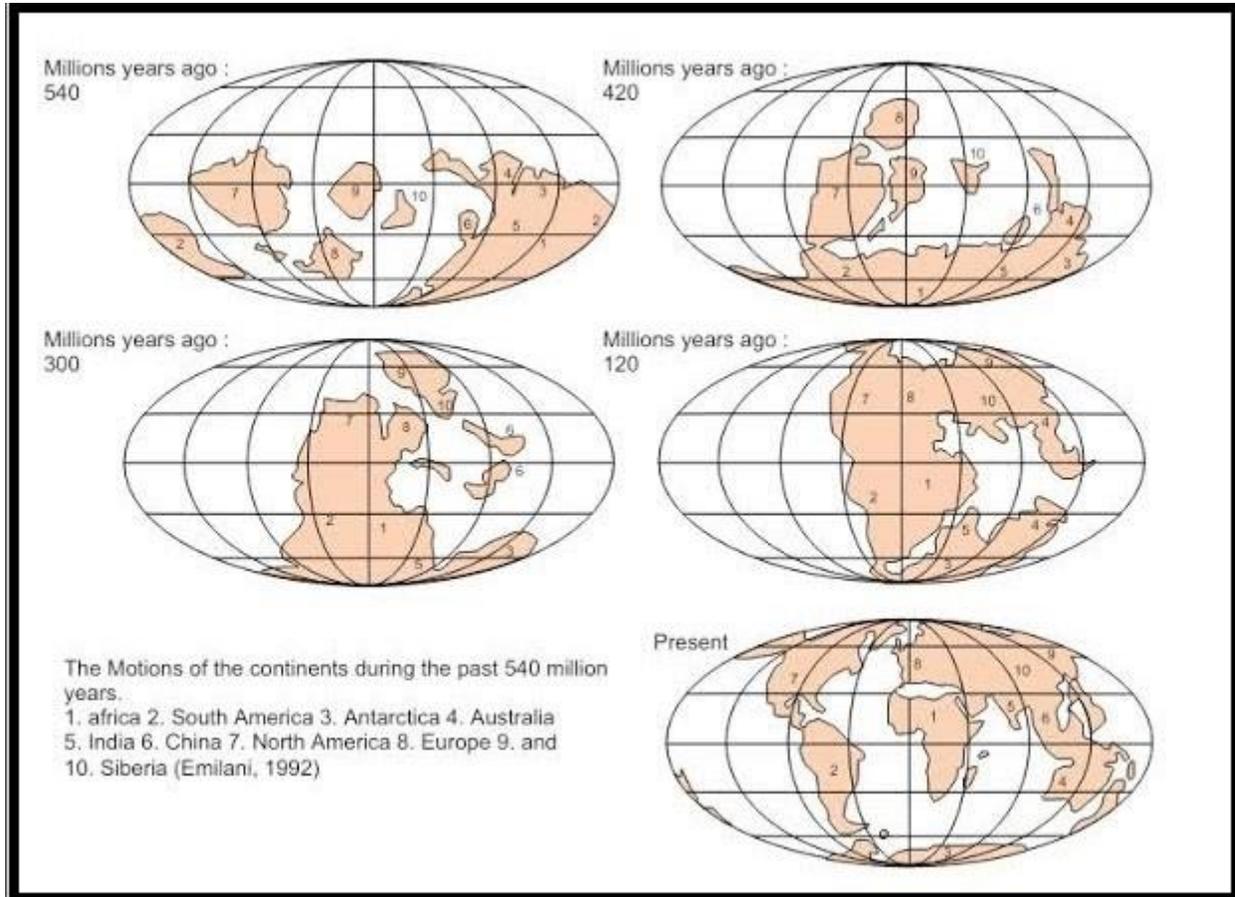


Fig 1. Position of continents through the geological past

Evidence:

1. **Jig-Saw-Fit:** The shorelines of South America and Africa facing each other have a remarkable and unmistakable match. In 1964, after the death of Wegner, Bullard did a similar Jig-Saw-Fit but at a depth of 1,000- fathom lines under the earth. It proved to be quite perfect.
2. Rocks of different continents on the two sides of the oceans had the same age and as well as similar composition: Eg. Brazilian coast and western Africa.
3. **Tillite deposit:** sedimentary deposits formed or brought by glaciers. Wegner said tillite deposits in different continents and different positions at present time, formed when all the continents were joint and located around the south pole.

4. **Placer deposit:** sedimentary of gold on Ghana coast without a source in proximity but the source being found coast in Brazilian coast proves that two continents were together.
5. **Fossil evidence:** fossil remains of Lemur found in India, Madagascar and Africa. This contiguous landmass was called Lemuria. Fossil remains of Mesosaurus (small reptile) found in southern Africa, as well as South America, also proves that the continents were together when animals moved to another continent.
6. **Paleomagnetic evidence:** In different continents, the solidified magma of the past shows that magnetic field for the same time in a different direction, which is not possible. This phenomenon also explains if continents are places as Wegner proposed, then the magnetic field shows the correct direction as per the past proposed direction.

After the evidence given by him, he talked about movements. Movements were in two directions. The first movement was in northward, and its cause was a gravitational and polar fleeing force. Laurentia moved and after that Gondwanaland moved in northward. The second movement was in westward, and north America, South America, Africa shifted towards the west. The forces given as a cause are also the weakness of the theory. The continents do not move because of these forces.

#### Criticism or Weakness:

1. It only talked about the movement of continents stating that the continent floated over the ocean floors like ship floats on the ocean and this is not true.
2. It does not talk about the movement of ocean floors.
3. Reasons for the drift are not right.
4. Wegner did not talk about the condition before the Pangea starting the explanation from only 250 million years before the present.

Later, it was found that there were more such continents and their breaking. Wegner tried to explain every part despite not having suitable reasons.

#### Contribution:

1. This theory was the first comprehensive theory to talk about the drifting of continents.
2. His contribution helped evolved the understanding of the direction of drift and evidence supporting it.
3. It finally led to the development of the theory of Seafloor Spreading and Plate Tectonics.

**Arthur Homes** in 1930 discovered convection and convectioal current in the mantle. The generation of this current is due to radioactive elements causing thermal differences in the mantle portion. This convectioal current was the cause of the movement of the earth crust. It was an explanation for the issue of drift-force, based on which contemporary scientists discarded the continental drift theory.

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