

Continental Drift Theory

The possibility of drifting of continent was first suggested by French scholar Antonio Snider in 1858. Main purpose of his drift hypothesis was to explain similarity of fossils of coal seams of carboniferous period in N.A & Europe. In 1910 F.B Taylor invoked the hypothesis of 'horizontal displacement of continent' to explain the problem of origin of folded mountains of tertiary period i.e N-S arrangement of Rockies & Andes of the western margin of N.A & S.A & west-east extent of Alpine mts.

Alfred Wegener, the German meteorologist propounded the Continental Drift Theory in 1912. This concept he elaborated in his book 'Die Entstehung der Kontinente & Ozeane' which was translated in English in 1924. Main problem which he wanted to explain was -

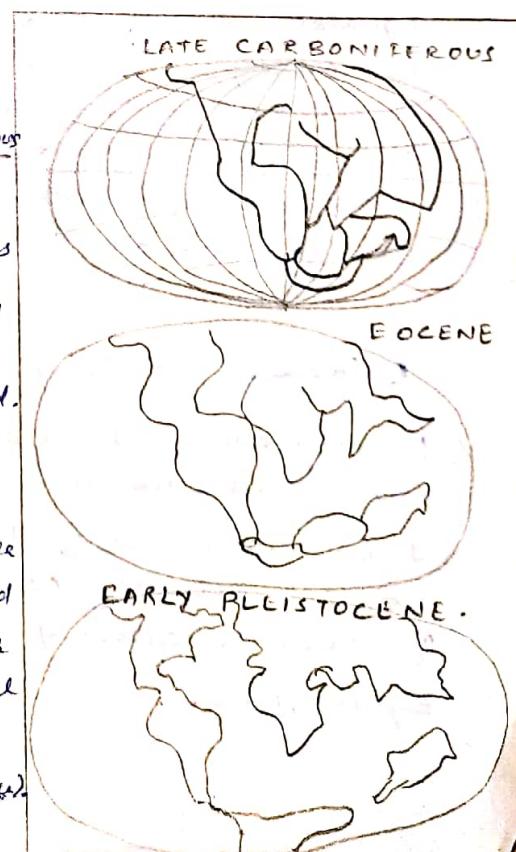
Change of climates in geological past. There were large scale changes in climates in geological past as occurrence of coal in ^{Point} cool mid latitude ^{indicates hot & humid} ~~carboniferous times~~ climate & dense forest ^{thus} in carboniferous times.

Wegener opted that climatic zones remained stationary & landmasses might have been displaced & drifted.

Wegener followed Eduard Suess & believed three layers of earth - Sial (outer), Sima (intermediate) & Nife (inner) & Sial floating on Sima.

Pangea & its Disintegration

Wegener postulated that in Carboniferous period all continents were joined together & formed one huge landmass called Pangea. Australia, Antarctica, Peninsular India, Africa, S.A formed southern block called Gondwanaland. N.A, Europe, Asia formed northern block called Laurasia. Two blocks were separated by shallow inland sea called Tethys. Pangea was surrounded on all sides by an extensive water mass called Panthalassa or Primeval Pacific Ocean. South Pole was near present Durban (near Natal in South Africa).



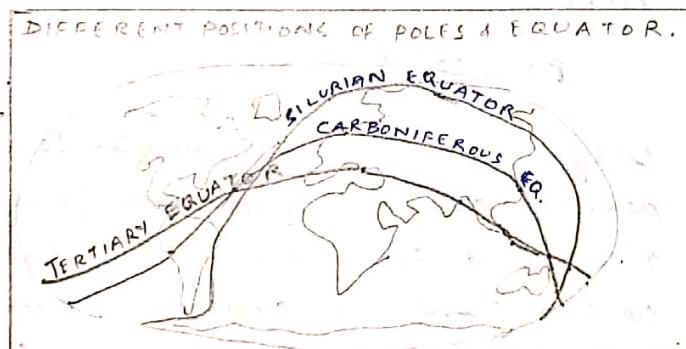
Pangea started breaking up in carboniferous period & started floating over Sina due to differential gravitational force. Continents drifted in 2 directions:-

1. Equatorward movement - It was due to gravitational differential force & force of buoyancy. Africa & Eurasia were pushed closer & tethys marine deposit in between was raised up in form of fold mountains extending from pyrenees, Alps, Atlas mt, to Himalayas. Peninsular India & Africa separated from Antarctica & Australia & portion of Panthalassa got converted into Indian ocean. Wegener describes drift of continents from poles as Polflucht or flight from the poles.

2. westward movement - caused by tidal force of the sun & the moon. N.A & S.A got separated from Europe & Africa respectively & Atlantic ocean came into existence. Andes & Rocky mts formed due to westward drift of Americas & resistance offered by ocean floor, between these two fragments was left behind to form islands of West Indies.

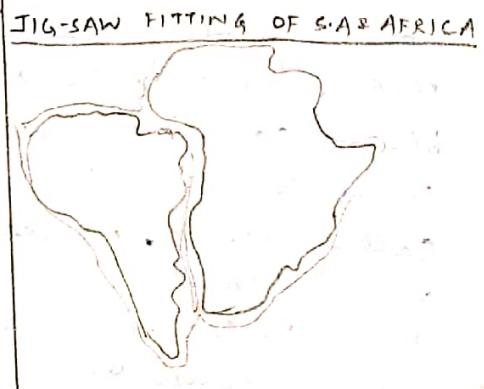
Phase of disruption of Pangea is called 'opening of the tethys'. Gondwanaland was disrupted during cretaceous period, westward drift of N.A during Tertiary period. North Atlantic ocean formed during pleistocene period. Remaining portion of Panthalassa became Pacific ocean. Drifting continued till plioceane period.

Equator was located north of Norway in Silurian period. Passed through London during Carboniferous period & through Alpine mts in Tertiary period.



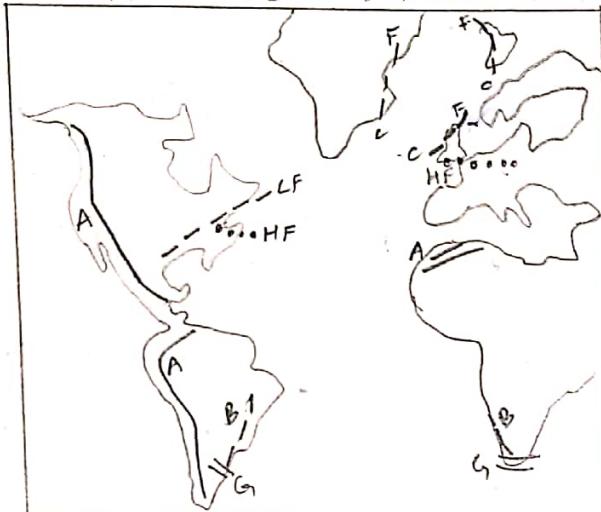
Evidences in Support of the theory

- 1.) Geographical similarity b/w eastern coast of S.A & western coast of Africa & Eastern coast of N.A & western coast of Europe called Jigsaw fit of opposing coast of Atlantic ocean by Wegener.



2.) Geological similarities - Appalachian mts continue their trend in Hercynian mts of S.W. Ireland, Wales & Central Europe.

Geographical & geological similarity b/w opposite coast of Atlantic Ocean.



CF - Caledonian mts, HF - Hercynian mts.

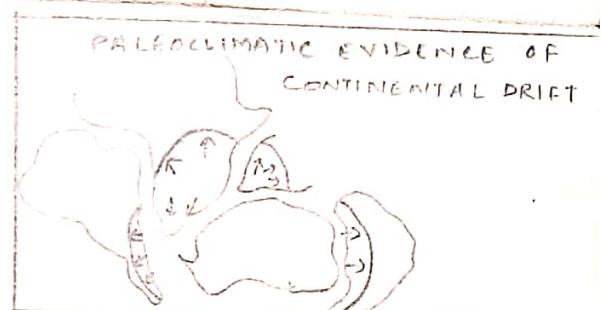
A - Alpine Fold mts, B - Braziliades

G - Gondwananides.

Trend of Caledonian mts of N.E. is S-W to N-E and disappear in Ireland & Scotland in same direction. Opposing coasts in Brazil & South Africa has even greater resemblance.

3.) Paleoclimatic evidences -

Layers of glacial deposits, stiations, grooved marks are found in tropical regions of South Africa, S.A., Australia & India (Tachir).



4.) Fossil evidences - Mesosaurus, aquatic reptile are found

in South America & S. Africa only & not widely distributed.

Glossoptris, fossil fern grow in sub-polar climate are found in S. America, Africa, India, Antarctica, Australia. Coal is found in present cool climate of USA, Britain.

Reassembly of Gondwanaland with some paleontological evidence



Criticism

- 1.) Tidal force required for westward drift must be ten thousand million times more than present & such a force would stop rotation of earth within one year. Gravitational force & force of buoyancy are also not adequate & if so enormous cause concentrations of continents near equator.
- 2.) Wegener says sial is floating over sima without any friction offered by sima but later described forceful resistance offered to westward movement of continent to cause fold & build mt system.
- 3.) Both the coasts of Atlantic ocean cannot be completely refitted. Tig-saw fit cannot be validated.
- 4.) Direction & chronological sequence of displacement of continents is not elaborated. Some questions are unanswered as what kept Pangea together till its disruption in mesozoic era.

Though most point of Wegener's theory was rejected its central theme of 'horizontal displacement' was retained. Postulation of plate tectonic theory after 1960 is result of continental drift theory of Wegener.

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