Wegeners theory of continental drift essay

Science, Geology

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Introduction

In the scientific world, many radical scientific principles go through a tumultuous progression before the scientific community accepts them. This was the case with the continental drift theory, a landmark theory in geology. When it was proposed, the scientific community received the continental drift theory with ridicule. However, with time, the theory underwent a series of reinforcement from accumulating evidence in support of the theory. In the end, it emerged as the greatest geological principle of all time. The continental drift theory was the brainchild of Alfred Wegener. Alfred Wegener was a German meteorologist born in 1980. He acquired a PhD in astronomy from the University of Berlin in 1904. Other than pioneering the use of air balloons for weather forecasting, Alfred Wegener left a legacy for developing the continental drift theory

Continental drift hypothesis

According to the continental drift theory, the current earth continents formed a single landmass. This landmass split over time into smaller continents. These continents started drifting apart relative to each other. As they drifted apart, they formed the continents, as we know them today. Water filled the spaces between the continents to form oceans.

Continental drift theory explained

The continental drift theory hypothesized that the current continents of the world initially formed a single landmass known as Pangaea, a term derived from a Greek words that means all land. A water body known as Panthalassa, a term derived from a Greek word that means all oceans, surrounded Pangaea. This supercontinent then broke into smaller landmasses that drifted slowly from each other to their current positions in millions of years. At first, Pangaea broke into two landmasses in the past 200 million years. These were Laurasia on the northern side and Gondwanaland (Gondwana) to the south (Mason, 1989). Between the two landmasses, there was a vast body of water known as the Tethys Sea. After a few million years, Laurasia split up to form North America, Eurasia and Greenland. On the other hand, Gondwana split up to form Antarctica, Australia, Africa, South America and India. The current world continents as we know them took shape 150 million years ago, a time known as the Jurassic period.

Evidence supporting the continental drift theory

This hypothesis relied on four pieces of circumstantial evidence for support. The first evidence was the jigsaw fit of the continents. The edges of the current continents fit into each other as if they were part of a jigsaw puzzle. The continental drift theory suggested that the fitting of the South America and Africa continents suggested that the two landmasses were part of a single landmass initially. As they drifted apart, their boundaries remained unchanged and this is apparent from the pattern of fit of the margins of these continents.

The other evidence that the continental drift relied on was the distribution of fossils. There was the discovery of fossils of the reptile Mesosaurus in Africa and in South America (Mason, 1989). Since the Mesosaurus was not a good swimmer, it would not have been possible for it to swim across the Atlantic. If the Mesosaurus were a good swimmer, its fossils would have showed up all over the world. The theory hypothesized that the two continents were initially a single landmass and when they broke apart, they drifted with part of the Mesosaurus population hence explaining the presence of the Mesosaurus fossils only in Africa and South America (Mason, 1989).

In addition to this, the continental drift theory also depended on the geological evidence. The theory acknowledged that the finding of the same geologic formations in continents separated by thousands of miles. This was evidence that these continents were part of a single mass and as they drifted apart, they retained their permanent geological characteristics. In support of the theory, Wegener observed the strata arrangement and composition of the coalfields in Western Europe and Northern America was similar. In addition to this, mountain ranges of the same geological age and rock types existed on both sides of the Atlantic Ocean. In addition, the Karroo geologic strata in South Africa and Santa Catarina rocks in Brazil have the same geological characteristics though separated by thousands of miles. This was evidence that the mountain ranges were part of a continuous geological mountain range before the separation.

The other evidence that suggested that the continental drift actually occurs was the climatologic evidence in the distribution of the glacial deposits across the world. Glacial striations are telltale signs of areas previously covered by glacial ice sheets. They are parallel furrows formed on the surface, which are parallel in the direction of flow of the glacier (Mason, 1989). These striations are the result of erosion of the surface by the load, especially boulders, carried by the glaciers. In support of the continental drift theory, it was established that South Africa, India, Australia and South America all experienced glaciations at the same time. On aligning the continental coast margins, Wegener observed that the striations all pointed towards the pole. This is proof that they were initially a single land mass that broke into the current continents. As they drifted apart towards the tropics, the climatic conditions became warmer leading to the melting of the glaciers and the exposure of the underlying striations.

Resistance from the science community

The scientific community did not accept the continental drift theory. The main cause of the rejection was the failure of the theory to explain the mechanism of the continental drift that led to the drifting of the continents apart. The scientific community felt that most of the evidence presented was circumstantial and not accompanied by empirical scientific proof. The continental drift theory did not account for the type and nature of the forces that led to the drifting of the continents apart. On the other side, the existing scientific models attributed the geographical distribution of the continents to isostatic adjustments to compensate for the moving glaciers. Scientific findings backed the isostatic adjustment model making it more popular among the scientific community, especially among the American scientific community, compared to the continental drift theory. Some members of the scientific community felt that the earth was younger than the model proposed in the continental drift theory had suggested.

In addition to the vagueness of the continental rift theory on the mechanism of the drift, the scientific community rejected the continental drift theory since it did not agree with the existing scientific understanding of the formation of the continents. Other scientifically backed theories disputed most of the evidence used to support the continental drift theory. For instance, while the continental drift theory suggested that the existence of similar fossils in continents miles apart was due to continental drifts, scientists during the time believed that there were land bridges that connected the separate continents facilitating the movement of the animals across the geographical divide. Other scientists attributed the finding of the temperate species fossils in the arctic regions to be due to the presence of warm ocean currents. The scientific consensus was against the continental drift theory.

In addition to the vagueness on the mechanism causing the drift, the scientific community due to lack of geological credentials of Alfred Wegener also rejected the continental drift theory. Wegner suffered the same predicament as Galileo suffered in the hands of the religious leaders (Mason, 1989). His field of expertise was meteorology. Therefore, the scientific community treated him as someone who had wondered away from his field of expertise (Mason, 1989). Scientific authority in matters regarding geology was a preserve of only those professionals involved in geology. Therefore, the scientific community did not pay attention to the continental drift theory due to lack of geological credentials of the scientist who developed it. Despite the widespread rejection in the scientific realm, some few scientists in the field of geology supported the continental drift theory. The most notable support was from a South African geologist Alexander Du Toit. He agreed with the fossil evidence o of the continental drift theory. He was involved in extensive study of the fossil evidence especially the comparison of the fossil records from South Africa and South America. Another notable supporter of the continental drift theory was a Swiss geologist known as Émile Argand who agreed with the collision of the continental plates during drift as the best explanation for the formation of the Swiss Alps. The support of the continental drift theory increased after the death of Alfred Wegener with the emergence of new technology and evidence to support his continental drift theory.

Shift in the scientific community thinking

The developer of the continental drift theory Alfred Wegener died before realizing the acceptance of his theory by the scientific community. Most of the members of the geological community treated his theory with ridicule for lack of solid factual backing. However, in the 1950’s and 1960’s, there was the emergence of new data and insight to the movement of the continents. Prior to this period, the geologists had mostly concentrated on the continental geology and ignored the oceanic geology.

Before Wegener died, he came up with a new evidence and insight to the theory of continental drift. The new concept known as sea floor spreading showed that the youngest ocean floor was at the ocean ridges. At these points, the oceanic plates were drifting away from each other and magma filled the cracks to form new strata of oceanic floor. The concept of sea floor spreading brought new insight to the scientific community and shifted the scientific understanding of the movement of the continents from isostatic adjustments to plate tectonic movements.

Additional studies of the sea floor including deep sea drilling proved that the oceanic crust increased with age moving away from the mid-ocean ridges. This proved that the continents were drifting relative to each other with time. In addition to deep sea drilling, paleomagnetic studies added to the evidence in support of the continental drift theory. Lastly, seismological mapping of the ocean floor revealed patterns that showed that the continents had initially been together but had drifted apart with time. Therefore, the study of the ocean floor was instrumental in the changing of the perspective of the scientific community towards the continental drift theory. Sadly, Wegener was not alive to see the acceptance of the continental drift theory.

Conclusion

The continental drift theory picked traction in the 1960’s after the emergence of new convincing evidence and scientific backing. The extensive study of the ocean floor spreading resulted in the emergence of new insight to the continental drift theory. The patterns in the spreading of the ocean floor showed that the rocks on the sea floor close to the mid-ocean ridges was younger in age compared to the ones further away from the mid ocean ridges. This led to the birth of an advanced version of the continental drift theory known as the plate tectonic theory.

Today, it is common knowledge that the continental crust and the oceanic crust that float over the mantle form the earth’s crust. Conventional currents in the mantle are responsible for the movement of the crust, the continental drift that the Wegener theory of continental drift attempted to explain. In the present day, Wegener’s continental drift theory is recognized as the origin of the modern plate tectonic theory.

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