

P5 sci

[Science](#), [Physics](#)



Phase 4 IP School February 5th, 20 The essay aims to address a two-fold objective to wit to explain the continental drift theory by Alfred Wegener; and (2) to relate scientific methods and theory development to the acceptance and resistance of the continental drift theory.

Continental Drift Theory

Alfred Wegener is the German meteorologist largely credited for the foundation of plate tectonics and was the first to present scientific and diligent evidence about continental reconstructions; among of these evidences include the geometric continental reconstructions, the geological match of continuity of structure, and the climate, sediment and the mismatch of sedimentary deposits with latitude (Rogers, 2008). In the last part of the 20th century, modern investigations have led to the evidence of sea-floor spreading or the diversion of ocean floor from the mid-ocean ridges.

Under geometric continental reconstructions evidence, Wegener proposed that the coastline geography of the continents on either side of the Atlantic Ocean have pattern and can be fitted back together like a jigsaw puzzle. Example of which are the coastlines of western Africa and eastern South America (Rogers, 2008). In addition, Wegener reiterated it is the end of the submerged continental shelf that marks the line of the originally joined continents and not the coastline-fit misconception. Geological match and continuity of structure evidence explained how there are similar rock types, succession of strata or igneous bodies which have unique characteristics were found on either side of the ocean.

This evidence was observed in the similarities of the rock strata and

geological structures of the Appalachian and Caledonian mountain belts of eastern USA and northwestern Europe, as well as the Precambrian rocks and geological structures similarity observed between South America and Africa (Rogers, 2008). The third evidence is the climate, sediment and mismatch of sedimentary deposits, which explained that the nature and style of rock weathering and erosion varies among Earth climate belts. This explained why sand dunes are formed in hot, dry deserts, cool and sandstone succession in tropical swamps and river deltas, and boulder clay deposits and U-shaped valleys in ice sheets and glaciers areas (Rogers, 2008). The modern evidence gathered during the latter part of the 20th century, which has made the continental drift theory acceptable, is the sea-floor spreading evidence. Modern geologists had explained the inaccessible ocean floor in Wegener's theory and discovered striped patterns of magnetic polarities at both sides of the ocean and on mid-ocean ridges (Frisch, Meschede & Blakey, 2011).

Scientists and physicists during Wegener's time rejected his idea because the forces suggested by Wegener are too weak to explain the drift of the continents. Furthermore, the lack of strong mechanism to drive continents across the ocean basins' questioned the credibility of the Wegener's continental drift theory, particularly the use of scientific method. During that time, Americans believed that scientific method is empirical, inductive, modest, holding close to the object of study, and is resistant to the impulse of going further (Oreskes, 2003). Derived from the former description, Americans believed that Wegener breached the scientific method because of drawing out the theory first before gathering evidence. Scientist of today

accepted Wegener's theory but used plates instead to describe the division and pattern of relative movement between regions of the Earth surface because modern physicists discovered the sea-floor spreading and the tectonic cycle (Frisch, Meschede & Blakey, 2011). In addition, the process of scientific method and theory development are further improved. The scientific method starts with a question of the object/topic under investigation. Hypothesis is identified and initial experiment is done. Observation and measurement of the initial experiment took place, which led to a new/revised hypothesis. The second set of experiment is now based on the revised hypothesis until it has produced a substantial hypothesis (Chiras, 2010). The scientific method did not only explain the continental drift theory but the natural phenomena and existence of the natural world. These explanation based on facts, observations, and hypothesis are called theories and hold scientifically acceptable principles and broad generalizations regarding natural, physical, and chemical phenomena (Chiras, 2010). Plate tectonics explained the process of continental drift through the behavior of the lithospheric mantle and the asthenosphere, the weak shell and the outermost two layers of the earth's surface. The lithospheric part of the mantle brittles with the asthenosphere while the asthenosphere behaves in a ductile fashion. Continental and oceanic crusts of the rigid plates move on top of ductile mantle causing movements or drifting of the continents (Frisch, Meschede & Blakey, 2011). Oceanic trench formation occurs along plate boundaries, particularly around the Pacific Ring of Fire and the Himalayas trench. It is also where earthquakes, volcanic activity, and mountain building occur because of mid-ocean ridges and in and around

deep-sea trenches. In the plate tectonic sense, the Himalayas Mountains are zones of extreme compression and crucial shortening. Following the principle of isostasy, the less dense, thickened stack of continental crust below the mountain displaced the mantle below which leads to increase in topographical elevation as observed in mountains and Pacific Ring of Fire (Frisch, Meschede & Blakey, 2011).

Renewable energy sources include the wind, thermal solar, tidal and wave power. In assessing the future mix of energy sources, we look at the development of renewable energy sources over the previous decade. Wind power generation has experienced annual growth rates of 30 percent over the last decade. According to modern science, we should not be using non-renewable energy sources (Bergh & Bruinsma, 2008).

Summary

Non-renewable energy sources include fossil fuels and nuclear fuel. Fossil fuels are found in the rocks of the Earth's surface and are scientifically thought to have formed many million years ago by geological processes which act on dead animals and plants. Oil and natural gases which are non-renewable energy sources combine molecules of carbon and hydrogen. Connected to the carbons atoms are hydrogen and oxygen (Bergh & Bruinsma, 2008).

A simple molecule like Methane is the main component of the natural gas. Oil and gas form from the remains of small creatures at the sea bed. It takes millions of years for the sediments to build. The pressure of the layers and heat from below the Earth's crust gradually changes the sediments in to oil and natural gas. All the non-renewable fuel sources produce carbon dioxide

which is a greenhouse gas. Coal which is also a non-renewable energy source is formed from plants which fail to decay completely once they fall in swamps in the tropical climate. The pressure from the layers and heat from the Earth's crust changes the materials to coal (Bergh & Bruinsma, 2008). Oil from the Middle East is increasingly becoming undependable due to the expanding energy demands and depletion of the oil reserves. Non-renewable energy sources like to environmental pollution hence clean and sustainable oil resources such as wind power, biodiesels and nuclear energy should be developed. Scientific technologies have been implemented in harnessing wind power through the use of wind turbines which are turned by wind to produce electricity. Science has offered the knowledge of geothermal power whereby heat from the planet boils a liquid which evaporates turning the turbines which then produce electricity. The method is sustainable since the only cost incurred is the establishment of the geothermal power station. Hydroelectric power which is generated at the bases of dams is renewable and is also a green technology. Biomass technology has enabled the conversion of waste like dead vegetables and cow dug in to a clean energy source (Bergh & Bruinsma, 2008).

Science plays a critical role in decision making since it guides the policy makers in enacting the required legislation and regulatory framework of the particular scientific field. Science also helps in discovery of new methods and technologies which conserve the environment. Science helps in problem solving and dispute resolutions through suggesting efficient technologies which conserve the ecosystem.

References

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