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History and Philosophy of Science

10 October 2016

Prominent Viewpoints on the Age of the Earth

The debate concerning the age of the Earth has been ongoing for several generations, but it was especially prominent during the eighteenth and nineteenth centuries. Prior to the eighteenth century, the widely accepted time period for Earth's creation centered around 4004 B.C., which was proposed by James Ussher and was based on the "literal reading of Genesis" (Bowler and Morris 105). In 1749, Georges Louis Leclere, Comte de Buffon published the *Natural History*, which "expanded the old timescale by an order of magnitude" to 70,000 years (110). Although today 70,000 years does not seem to be an accurate timescale, it was, nevertheless, an important direction from a scientific perspective. Catastrophism and uniformitarianism were the two most prominent viewpoints of this period, although Neptunism and Vulcanism also provided competitive ideas. Catastrophism proposed a limited age of the Earth by "invoking violent events" which could change the Earth's landscape "almost instantaneously," while uniformitarianism "ruled out any appeal to unknown causes" and portrayed Earth with an "eternal cycle of slow, gradual changes" (104). Neptunism was an off-branch of the catastrophism movement, which postulated a "retreating ocean theory," (109) while Vulcanism claimed that "central heat" caused Earth's "movements and mountain building" (120). Altogether, although these different points of views contained some erroneous claims, the eighteenth and nineteenth centuries witnessed a series of geological investigations such as the contrasting catastrophism and uniformitarianism, contained an underlying religious perspective, and expanded geological knowledge with the advent of stratigraphy.

Catastrophism played an integral role in geological sciences and the age of the Earth debate. Georges Cuvier, a pioneer of this philosophy, “attributed the sudden extinction of species to catastrophic earth movements and tidal waves” in his *Discourse on the Revolutions of the Surface of the Globe (1812)* (115). Some species were wiped out, while new ones were created. Furthermore, since it allowed natural disasters as a means of molding the Earth’s landscape, catastrophism was utilized as support to “Noah’s flood” as a “real geological event” in the form of the final catastrophe (104). The byproduct of this rationale resulted in misconceptions about catastrophism. They were “ridiculed as religious bigots who manipulated their science” in order to uphold “narrowly defined religious beliefs” (104). Although religion could be supported through catastrophism by the means of attributing a smaller geological timescale, catastrophists had “no interest reducing the age of the earth” or depicting the final catastrophe “as the flood recorded in Genesis” (118). On the contrary, this was only the view of a small conservative faction. In addition to catastrophism, Buffon’s conjecture of a cooling-Earth philosophy resurfaced in this period. Leonce Elie de Beaumont and Constant Prevost supported the cooling-Earth theory, which assumed that the “past episodes of mountain building involved Earth movements on a scale far beyond anything observed in the modern world” (119). Therefore, the “cooling-earth theory” helped provide catastrophism with a “plausible physical mechanism to complement the evidence geologists had for discontinuities in the past” (119). As a whole, although the catastrophists were viewed negatively by the supporters of uniformitarianism, they actually made significant contributions in geological sciences.

James Hutton and Charles Lyell are regarded as the pioneers to uniformitarianism, the competing philosophy to catastrophism. In his *Time’s Arrow, Time’s Cycle (1987)*, Stephen Jay Gould exhibits Lyell’s views by declaring that they “rested on a ‘steady state’ view of the past,”

which stated that the universe always existed (105). Hutton designated the Earth as “eternal, a perpetual motion machine that never ran down” (121). Lyell is credited for reviving “Hutton’s cyclic or steady state model of history” and is known for characterizing uniformitarianism as having “no vestige of a beginning and no prospect of an end” (122). This is contrary to the catastrophists, who did allow for a specific beginning. This ideology made the catastrophists garner support from the religious base, while uniformitarianism became regarded as the accepted scientific view. In addition, central to this philosophy was the “study of observable causes,” known as “actualism” (119). Lyell claimed that the processes witnessed today were unchanged from the unobservable past. Unlike catastrophism, where transformations could occur suddenly, the changes for uniformitarianism were observable, gradual, continuous, and cumulative.

Apart from uniformitarianism and catastrophism, growing interest in the field of stratigraphy generated monumental strides in this investigation. In the seventeenth century Robert Hooke, through the use of the microscope, and Nicholas Steno displayed how fossils, were similar to the ones existing at the time. In addition, Alexandre Brogniart’s work “with the fossil invertebrates” was an important achievement to geological chronology (113). In eighteenth century, rise in mining academies around Europe caused an interest in stratigraphy, science which is “based on the principle of superposition,” where it is assumed “that newer rocks were always laid down on top of existing rocks” (111). Several geologists emerged from this field that made significant contributions to the overall debate. They included Abraham Gottlob Werner, William Smith, Georges Cuvier, Adam Sedwick, Roderick Impey Murchison, and John Phillips. Werner accepted Neptunism and further claimed that the “erosion of the land surface would add a regular sequence of sedimentary rocks,” which would help identify the time period of Earth’s history. Smith and Cuvier pioneered in fossil stratigraphy, “which provided useful

guide in establishing the sequence of rocks” (111). Sedwick and Murchison introduced the Cambrian and Silurian systems, while John Phillips coined the Paleozoic, Mesozoic, and Cenozoic eras. Although many of Werner’s followers believed in Neptunism, Humboldt abandoned Neptunism for fossil identification—namely Jurassic formation which he coined. Although the age of the Earth was not necessarily answered by these geologists, their contributions helped provide a stratigraphical sequential.

Lyell and Hutton attempted to attack their competing theories. Lyell stressed that “both Neptunism and catastrophism were implausible theories supported solely for nonscientific reasons” (118). He accused the catastrophists of invoking “supernatural causes to explain their hypothetical upheavals” and “attacked the evidence used to support the cooling of the earth” because he claimed that “there had been only a fluctuation in climate” (118 and 122). In addition, Hutton dismissed Neptunism and Wernerianism. Hutton differed from Vulcanism because he maintained that the formation of rocks in today’s society have occurred “at the same rate” historically as well (121). This implied that the process had a “perfect cycle,” in which the elevation of new land exactly balanced the destruction of the old surface by erosion” (121). As a whole, not only did Lyell and Hutton pioneer uniformitarianism, their views represented a stark contrast from the other theories of the time.

Although uniformitarianism was a popular view of the time, their “model of the history of geology” has been dramatically altered, “if not rejected” (117). Improvements in the fields of physics and chemistry rejected several claims of uniformitarianism. One of the major inconsistencies of uniformitarianism was that “it assumed that the center of the earth” was hot, but it “denied that the planet cools down” (124). This was contradictory to the laws of thermodynamics. Lord Kelvin proposed the “cooling of hot bodies,” as a means for energy to be

conserved. The same process, therefore, should be in place for Earth—hence, “the earth must cool down” too, which contradicted Lyell’s views (122). Another discontinuity in Lyell and Hutton’s philosophy was their model of the Earth, “in order to rule out speculation, they adopted a ‘cyclic’ model of earth history”, which proclaimed that there was not another “period when things were radically different” (120). Although they criticized catastrophism to be based off of religious views, both Hutton and Lyell had a religious backdrop for the theories because of their belief in a mechanical God. Lyell’s outright attacks against the catastrophists and the Neptunists were not necessarily applicable, as several of the catastrophists helped established the “stratigraphical sequence still accepted today” (118). Lastly, Buckland witnessed the “mud deposits” of a cave to support catastrophism in the form of Noah’s flood, but this was inexplicable by uniformitarianism (118). Altogether, there were several misconceptions and objections to the uniformitarian point of view as analyzed today.

The rise of stratigraphy, emergence of competing geological theories, and religious background of the West witnessed drastic improvements in the debate concerning the age of the Earth. Although several claims of uniformitarianism and catastrophism have been rejected, “modern geology draws on both the uniformitarian and the ‘directionalist’ model of the catastrophists” (120). Advancements in physics and chemistry saw a “reinvigoration of Buffon’s cooling earth theory,” and Kelvin’s calculations extended the Earth’s age to a few hundred million years. Today, due to technological advancements and geological research, it is considered that the Earth came into existence 4.5 billion years ago. Overall, the eighteenth and nineteenth century bridged the gap of understanding Earth’s age, transforming the accepted age of the Earth from 5500 years due to Ussher’s portrayal to 4.5 billion years today.