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Major difference between catastrophism and uniformitarianism

Charles Lyell used these images of the tower of the semi-buried Church of Eccles in later editions of *Principles of Geology* to show how powerful a power erosion could be, even without catastrophes. Left, the tower in 1839. Right, the tower in 1862. Image courtesy of Pocumtuck Valley Memorial Association Library. For the idea that Earth-like planets have been influenced in the past by ephemeral, violent galaxy-wide events, see Neoppoostrophism. The theory that the Earth is largely shaped by sudden, momentary, violent events, possibly global in size Catastrophism is the theory that the Earth is largely shaped by sudden, momentary, violent events, possibly global in size. [1] This is in contrast to uniformitarianism (sometimes described as gradualism), in which slow upward changes, such as erosion, led all earth geological properties. The proponents of uniformitarianism were of the party that the present was the key to the past, and that all geological processes (such as erosion) were in the past as they can now be observed. Since the early disputes, a more inclusive and integrated view of geological events has developed, in which the scientific consensus accepts that there were a number of catastrophic events in the geological past, but these were explained as extreme examples of natural processes that may occur. Proponents of catastrophism suggested that the geological eras had ended with violent and sudden natural disasters such as major floods and the rapid formation of large mountain ranges. Plants and animals living in the parts of the world where such events took place were abruptly replaced by the new forms whose fossils determined the geological layers. Some catastrophists tried to relate at least one such change to the Biblical record of Noah's flood. The concept was first popularized by early 19th-century French scientist Georges Cuvier, who suggested that new life forms had moved from other areas after the local floods, and avoided religious or metaphysical speculation in his scientific writings. [2] [3] History Geology and Biblical Beliefs Editorial: History of Geology in the early development of geology, efforts were made in a predominantly Christian Western society to reconcile biblical stories of creation and universal flood with new concepts about the processes that had shaped the Earth. The discovery of other ancient flood myths was taken as an explanation as explaining why the flood story in methods with surprising frequency among the Greeks were explained, an example that is plutarch account of the Ogygian flood. [4] Cuvier and natural theologians Further information: Alternatives to Darwinism The main scientific advocate of catastrophism in the early nineteenth century was the French anatomist and paleontologist Georges Cuvier. His motivation was to explain the patterns extinction and fauna succession that he and others were observing in the fossil record. Although he did speculate that the catastrophe responsible for the most recent extinction in Eurasia may have been the result of the flooding of low-lying areas by the sea, he has no reference whatsoever to Noah's deluge. [2] Nor did he ever refer to divine creation as a mechanism by which the repopulation occurred after the extinction event. In fact Cuvier, influenced by the ideas of the Enlightenment and the intellectual climate of the French revolution, avoided religious or metaphysical speculation in his scientific writings. [3] Cuvier also believed that the stratigraphic record indicated that there had been several of these revolutions, which he saw as recurring natural events, amid long intervals of stability during the history of life on earth. This made him believe that the Earth was several million years old. [5] By contrast, in Britain, where natural theology was influential in the early nineteenth century, a group of geologists including William Buckland and Robert Jameson interpreted Cuvier's work differently. Cuvier had written an introduction to a collection of his papers on fossil quadruplets, discussing his ideas of catastrophic extinction. Jameson translated Cuvier's introduction into English and published it under the title *Theory of the Earth*. He added extensive editorial notes to the translation, explicitly linking the latest news of Cuvier's revolutions to the biblical flood. The resulting essay was very influential in the English-speaking world. [6] Buckland spent much of his early career trying to demonstrate the reality of the biblical flood using geological evidence. He often cited Cuvier's work, although Cuvier had proposed a flood of limited geographic size and extended duration, while Buckland, to be consistent with the biblical record, advocated a universal flood of short-lived. [7] Eventually, Buckland left flood geology in favor of the glaciation theory advocated by Louis Agassiz, after a visit to the Alps where Agassiz demonstrated the effects of glaciation at first hand. Due to the influence of Jameson, Buckland, and other proponents of natural theology, the nineteenth-century debate about catastrophism took much stronger religious overtones in Britain than elsewhere in Europe. [8] The rise of uniformitarianism in geology Uniformitarian explanations for the formation of sedimentary rock and an understanding of the immense piece of geological time, or as the concept came to be known deep time, were found in writing of Hutton, sometimes known as the father of geology, in the late 18th century. The geologist Charles Lyell built on Hutton's ideas during the first half of the 19th century and amassed observations to support the uniformit idea that earth earth was formed by the same geological processes that could be observed gradually over an immense period of time in the current act. Lyell presented his ideas in the influential three-volume work, *Principles of Geology*, published in the 1830s, which challenged theories of geological cataclysms proposed by proponents of catastrophism such as Cuvier and Buckland. [9] From around 1850 to 1980, most geologists endorsed uniformitarianism (The present is the key to the past) and gradualism (geological change occurs slowly over long periods of time) and rejected the idea that catastrophic events such as earthquakes, volcanic eruptions, or floods of much greater power than those observed at the present time, played any significant role in the formation of the Earth's surface. Instead, they believed that the Earth had been formed by the long-term action of forces such as volcanism, earthquakes, erosion and sedimentation, which could still be observed in action today. In part, the rejection of geologists was fostered by their impression that the catastrophists of the early nineteenth century believed that God was directly involved in determining the history of the earth. Some of the theories of catastrophism in the nineteenth and early twentieth centuries were linked to religion and catastrophic origins were sometimes considered miraculous rather than natural events. [10] The rise of uniformitarianism made the introduction of a new catastrophe theory very difficult. In 1923, J Harlen Bretz published an article about the channelled crusts formed by the Missoula Glacier Lake in Washington State, USA. Bretz encountered resistance to his theories of the geology institution of the day, kicking off a 40-year debate. Bretz was awarded the Penrose Medal in 1979; the Geological Society of America's highest award. [11] Immanuel Velikovsky's views Editorial: Velikovskysism In the fifties propounded Immanuel Velikovsky catastrophism in several popular books. He speculated that the planet Venus is a former comet that was cast from Jupiter and then made two catastrophically close passes through Earth 3,500 years ago, 52 years apart, and later interacted with Mars, which then had a series of near-collisions with Earth that ended in 687 BC before settling into its current orbit. Velikovsky used this to explain the biblical plagues of Egypt, the biblical reference to the Sun standing still for a day (Joshua 10:12 & 13, explained by changes in the rotation of the Earth), and the sinking of Atlantis. Scientists vigorously rejected Velikovsky's suspicions. [12] application Neocatastrophism is the explanation of sudden extinctions in the paleontological record by high magnitude, low frequency events (such as asteroid effects, super-volcanic eruptions, supernova gamma ray bursts, etc.), as opposed to the more common geomorphological thought that those low magnitude, high-frequency events. [13] Luis Alvarez impact event hypothesis Main article: Cretaceous-Paleogene extinction event Over the past 25 years, a scientifically based catastrophism has gained broad acceptance regarding certain events in the distant past. A boost for this change came from the publication of a historical article by Walter and Luis Alvarez in 1980. This newspaper suggested that a 10 kilometer (6.2 mile) asteroid struck Earth 66 million years ago at the end of the Cretaceous. The impact wiped out about 70% of all species, including the dinosaurs, leaving the Cretaceous-Paleogene boundary (K-T boundary). In 1990, a 180-kilometer-long crater marking the impact in Chicxulub on Mexico's Yucatán Peninsula was identified. Since then, the debate over the extinction of the dinosaurs and other mass extinction events centered on whether the extinction mechanism was the asteroid impact, widespread volcanism (occurring about at the same time), or any other mechanism or combination. Most of the proposed mechanisms are catastrophic in nature. The observation of the Shoemaker-Levy 9 cometary collision with Jupiter illustrated that catastrophic events occur as natural events. Comparison with uniformitritism One of the main differences between catastrophism and uniformitritism is that uniformitritism requires the adoption of huge timelines, whereas catastrophism does not. Today, most geologists combine cataclysmic and uniformitritistic viewpoints, from the standpoint that Earth's history is a slow, gradual story characterized by the occasional natural catastrophic events that have influenced The Earth and its inhabitants. [14] Moon-formation Main article: Giant impact theory Modern theories also suggest that the earth's anomaly large moon was catastrophically formed. In a paper published in Icarus in 1975, William K. Hartmann and Donald R. Davis suggested that a catastrophic near-miss by a large planetesimal early in the formation of the Earth about 4.5 billion years ago blew up rocky debris, remelted the Earth and formed the moon, thus declaring the moon less dense and lacking an iron core. [15] The impact theory has some errors; some computer simulations show the formation of a ring or multiple moons after the collision, and elements are not quite the same between the Earth and the moon. [16] [17] [18] See also Alternatives to evolution by natural selection Flood basalt Glacial lake eruption flood History of geology History of paleontology Megatsunami Pensée (Immanuel Velikovsky Reconsidered) Interrupted balance Supervolcano Volcanic Winter Zanclean Flood References ^ Turney, C.S.M.; Brown, H. (2007). Catastrophic early Holocene sea level rise, human migration and the Neolithic transition in Europe. *Quaternary Science Reviews*. 26 (17–18): 2036–2041. 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