

Petroleum Geologists and the History of the Principle of Uniformitarianism

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Abstract

This presentation reviews the history of uniformitarian ideas and investigates their proponents and dissenters from the Ancient Greeks to the geoscientists of the twenty-first century. In particular, it focuses on the role of petroleum geologists in highlighting the shortcomings inherent in the principle of uniformitarianism as understood by Hutton and Lyell.

Geology is beset by the task of having to interpret or reconstruct the past on the basis of meagre evidence in the present. Since at least the late eighteenth century the key assumption in this undertaking has been that Earth history can be explained in terms of natural forces operating today and that it is the result of slow gradual development rather than catastrophic events. Although this principle, most familiarly expressed as "the present is the key to the past", is supposedly foundational to geology, it has been routinely criticised from various quarters, with some of its most strident critics being petroleum geologists.

A review of the subject of uniformitarianism in the literature on petroleum geology turns up numerous critical phrases such as "The doctrine of uniformitarianism has been grossly overemphasized", "Uniformitarianism is a Dangerous Doctrine" and "Is uniformitarianism necessary?" Limitations highlighted include the failure to account for rare events such as the rapid and unobserved deposition of turbidites and high-energy mega floods. These anomalies recall earlier inconsistencies with Lyell's uniformitarianism such as the widespread recent glaciations discovered in the nineteenth century. The "dangerous" element within too strict a conception of uniformitarianism is that geological explanations that do not invoke gradual processes may be rejected even though they may be correct.

Lyell's original principle of uniformity has been analysed by Rudwick and by Gould and has been found to comprise distinct components with different shades of meaning. Of these, only "uniformity of process", which equates to the more recent concept of "actualism", is still considered valid. Streamlining the principle of uniformitarianism into this definition addresses many of the problems that petroleum geologists have identified, though the biases introduced by pervasive gaps in the stratigraphic record and by the sparse geographic distribution of sedimentary basins throughout geological time remain as challenges to using the present as an analogue for the past.