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World of Earth Science | Uniformitarianism

The concept of uniformitarianism is commonly oversimplified in geological textbooks as "the present is a guide to interpreting the past" (or words to that effect). This explanation, however, is not correct about the true meaning of uniformitarianism. In order to understand uniformitarianism, one must examine its roots in the Enlightenment era (c. 1750–1850) and how the term has been distorted in meaning since that time.

[Geology](#) is a historical science, yet the phenomena and processes studied by geologists operated under non-historical natural systems that are independent of the time in which they operated. It is clear from the insights of one of geology's founding fathers of the Enlightenment era, James Hutton (1726–1797), that he understood this fact very well. In *Theory of the Earth* (1795), he stated: "In examining things present, we have data from which to reason with regard to what has been; and, from what has actually been, we have data for concluding with regard to that which is to happen thereafter." With his book, Hutton popularized the notion of "examining things present...with regard to what has been," but gave the concept no specific name. Hutton did not use the term uniformitarianism and used the word 'uniformity' only rarely.

Charles Lyell (1797–1875), one of geology's founding fathers from later in the Enlightenment era, wrote about the subject matter of uniformitarianism (but did not use that specific term) in his widely read text, *Principles of Geology* (1830). Partly in response to strident criticism that his notions about geology did not conform to Biblical edicts about supernatural catastrophic events, Lyell developed a much more radical and extreme view of the subject matter of the "uniformity of nature." Careful reading of what Lyell laid out in his discussion of the "uniformity of nature" shows that he embraced both the concept of Hutton, which can be summarized as a uniformity of known causes or processes throughout time, and his own separate view that there must be a uniformity of process rates. The latter, more radical aspect of Lyell's "uniformity of nature" was intended to be a statement of general principle to counter the catastrophist interpretations of the past set forth by geologists of the day who were more inclined to look to the scriptures for their geological interpretations. In Lyell's view, a strong notion of uniformity of rates precluded divine (i.e., catastrophic) intervention.

In 1837, the name uniformitarianism was coined by William Whewell (1794–1866) as a term meant to convey Hutton's sense of order and regularity in the operation of nature and Lyell's sense that there was a uniformity of rates of geological processes through time. It is Whewell's definition that became the most common definition of uniformitarianism.

Lyell's work was influential, and he succeeded in imbuing generations of geologists with the notion of a dual foundation for "uniformity of nature." This dual foundation encompassed both uniformity of causes and uniformity of intensity. The former view is more commonly called actualism today, and the latter, gradualism. In large part, the presence of Lyell's strongly

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defended gradualism succeeded in freeing nineteenth century geology from the firm grasp of Biblical preconception and allowed it to develop as a free, legitimate science.

One of the most elegant statements about (what is now called) actualism was made by John Playfair in his book, *Illustrations of the Huttonian Theory* (1802). He said: "Amid all the revolutions of the globe the economy of Nature has been uniform, and her laws are the only thing that have resisted the general movement. The [rivers](#) and the rocks, the seas, and the continents have been changed in all their parts; but the laws which describe those changes, and the rules to which they are subject, have remained invariably the same." Actualism is not unique to geology, as it is really a basic and broad scientific concept of many fields. Even though Playfair mentions laws, it is, of course, nature herself that is constant, not laws, which have been written by people in order to try to predict nature.

The other side of Lyell's "uniformity of nature," i.e., gradualism, has no such elegant prose behind it. It has been referred to in inglorious terms by some of the leading minds of our time as "false and stifling to hypothesis formation," "a blatant lie," and "a superfluous term...best confined to the past history of geology." In other words, gradualism is no longer considered a valid idea.

Because uniformitarianism has this historical component of uniformity of process rates (i.e., gradualism), many writers have advocated its elimination from the geological vocabulary. Others argue that it should be retained, but with careful notation about its historical meaning. Some writers ignore this historical debate and continue to tout the term uniformitarianism as the most basic principle of geology. The range of misguided meanings of this term from some recent geology texts includes definitions that span the gamut from something near the nineteenth century meaning to the assumption that Earth is very old, to the logical method of geologic investigation.

Careful analysis of geological texts and recent scientific articles shows that there are at least 12 basic fallacies about uniformitarianism, which are perpetuated by some writers. These are:

1. Uniformitarianism is unique to geology;
2. Uniformitarianism was first discussed by James Hutton;
3. Uniformitarianism was named by Lyell, who gave us its modern meaning;
4. Uniformitarianism is the same as actualism, and should be renamed actualism;
5. Uniformitarianism holds that only processes that are currently active could have occurred in the geologic past;
6. Uniformitarianism holds that rates and intensities of geologic processes are constant through time;
7. Uniformitarianism holds that only non-catastrophic or gradual processes have operated during geologic time;
8. Uniformitarianism holds that Earth's conditions have changed little over geologic time;
9. Uniformitarianism holds that the earth is very old;



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10. Uniformitarianism is a testable hypothesis, theory, or law;
11. Uniformitarianism applies to the past only as far back as present conditions have existed on the earth's surface;
12. Uniformitarianism holds only that the governing laws of nature are constant through **space** and geologic time.

In the historical analysis of uniformitarianism above, we have seen how these 12 common conceptions are false and misleading. Most scientists argue that uniformitarianism should be kept in its proper historical perspective in the future, and that a more specific term like actualism might supplant uniformitarianism in places where the word is meant to convey strictly the modern concept of uniformity of causes.

See also [Geologic time](#); [Stratigraphy](#)

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