

James Hutton

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Hutton as painted by Sir Henry Raeburn

Born	14 June 1726 Edinburgh, Scotland
Died	26 March 1797
Citizenship	British
Known for	Plutonism; Deep time
Scientific career	
Fields	Geology

Siccar Point, [Berwickshire](#). The rugged point shows gently sloping beds of 345 million year old [Devonian](#) Old Red [Sandstone](#) above vertical beds of 425 million year old [Silurian greywacke](#). This was one of the sites which Hutton discussed.

James Hutton MD ([Edinburgh](#), (14 June 1726 – 26 March 1797) was a Scottish [geologist](#), [physician](#), [naturalist](#), [chemist](#) and [experimental farmer](#).

Hutton studied in medicine, but never practised it. Instead, he did scientific research, helped to start a chemical industry, and farmed his estate. He is one of the founders of modern [geology](#).^{[1][2]} He saw the [Earth](#) as the product of natural forces. What could be seen happening today, over long periods of time, could produce what we see in the [rocks](#).

His book on the [Theory of the Earth](#) set out theories of geology and [geologic time](#).^[3] These ideas supported the theories of [plutonism](#) and [uniformitarianism](#).

Theory of rock formations

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Hutton hit on a variety of ideas to explain the rock [strata](#) he saw around him. According to Playfair he "was in no haste to publish his theory; for he was one of those who are much more delighted with the contemplation of truth, than with the praise of having discovered it".

After some 25 years of work,^[4] his *Theory of the Earth* was read to meetings of the [Royal Society of Edinburgh](#) in 1785.

Hutton later read an abstract of his *Concerning the system of the Earth, its duration and stability* on 4 July 1785,^[5] which he had printed and circulated privately.^[6] In it, he outlined his theory as follows;

"The solid parts of the present land appear in general, to have been composed of the productions of the sea, and of other materials similar to those now found upon the shores. Hence we find reason to conclude: 1st, That the land on which we rest is not simple and original, but that it is a composition, and had been formed by the operation of second causes.

2nd, That before the present land was made, there had subsisted a world composed of sea and land, in which were tides and currents, with such operations at the bottom of the sea as now take place. And,

Lastly, That while the present land was forming at the bottom of the ocean, the former land maintained plants and animals; at least the sea was then inhabited by animals, in a similar manner as it is at present. Hence we are led to conclude, that the greater part of our land, if not the whole had been produced by operations natural to this globe; but that in order to make this land a permanent body, resisting the operations of the waters, two things had been required;

1st, The consolidation of masses formed by collections of loose or incoherent materials;

2ndly, The elevation of those consolidated masses from the bottom of the sea, the place where they were collected, to the stations in which they now remain above the level of the ocean".

Anticipation of natural selection

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In Hutton's less well-known work is a remarkable anticipation of the idea of [natural selection](#). As always with Hutton, the idea is almost hidden in the complex language:

"...if an organised body is not in the situation and circumstances best adapted to its sustenance and propagation, then, in conceiving an indefinite variety among the individuals of that species, we must be assured, that, on the one hand, those which depart most from the best adapted constitution, will be the most liable to perish, while, on the other hand, those organised bodies, which most approach to the best constitution for the present circumstances, will be best adapted to continue, in preserving themselves and multiplying the individuals of their race".- *Investigation of the Principles of Knowledge*, volume 2. ^[7]

The same "principle of variation" would influence "every species of plant, whether growing in a forest or a meadow". He came to his ideas as the result of experiments in [plant](#) and [animal breeding](#), some of which he outlined in an unpublished manuscript, the *Elements of Agriculture*. He distinguished between [heritable variation](#) as the result of breeding, and non-heritable variations caused by environmental differences such as soil and climate. ^[7]

Progress of his ideas

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Hutton's [prose](#) hindered his theories.^[8] [John Playfair](#) in 1802 restated of Hutton's geological ideas (though not his thoughts on [evolution](#)).^[9] [Charles Lyell](#) in the 1830s popularised the idea of an infinitely repeating cycle (of the [erosion](#) of rocks and the building up of [sediment](#)). Lyell believed in gradual change, and thought even Hutton gave too much credit to catastrophic changes.

Lyell's books had widespread influence, not least on the up and coming young geologist [Charles Darwin](#) who read them with enthusiasm during his voyage on the *Beagle*. [William Whewell](#) coined the term [uniformitarianism](#) to describe Lyell's version of the ideas. This was in contrast with [catastrophism](#), the idea that the rocks recorded a series of catastrophes followed by repopulation by a new range of species. Over time there was a convergence between these views, but Lyell's description of the development of geological ideas led to a belief that uniformitarianism had triumphed.

Works

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- 1785. *Abstract of a dissertation read in the Royal Society of Edinburgh, upon the seventh of March, and fourth of April, MDCCLXXXV, Concerning the System of the Earth, Its Duration, and Stability.* Edinburgh. 30pp.
- 1788. *The theory of rain.* Transactions of the Royal Society of Edinburgh, vol. 1, Part 2, pp. 41–86.
- 1788. *Theory of the Earth; or an investigation of the laws observable in the composition, dissolution, and restoration of land upon the Globe.* Transactions of the Royal Society of Edinburgh, vol. 1, Part 2, pp. 209–304.
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- 1794. *An investigation of the principles of knowledge and of the progress of reason, from sense to science and philosophy.* Edinburgh: Strahan & Cadell.
- 1795. *Theory of the Earth; with proofs and illustrations.* Edinburgh: Creech. 2 vols.
- 1797. *Elements of Agriculture.* Unpublished manuscript.
- 1899. *Theory of the Earth; with proofs and illustrations, vol III,* Edited by Sir Archibald Geikie. Geological Society, Burlington House, London.

References

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1. ↑ ["Millennial Plaques: James Hutton". University of Edinburgh](#). Archived from [the original](#) on 2007-11-01. Retrieved 2011-01-07.
2. ↑ David Denby (11 October 2004). ["Northern Lights: How modern life emerged from eighteenth-century Edinburgh"](#). *The New Yorker*. Review of James Buchan's *Crowded with genius* (Capital of the Mind in the UK). "In 1770, James Hutton, an [experimental farmer](#) and the owner of a [sal ammoniac](#) works, began poking into the peculiar shapes and textures of the [Salisbury Crags](#), the looming, irregular rock formations in [Edinburgh](#). Hutton noticed something astonishing—[fossilized](#) fish remains embedded in the rock. The remains suggested that [volcanic activity](#) had raised the mass from some depth in the sea. In 1785, he delivered a lecture to the [Royal Society of Edinburgh](#), which included the remarkable statement that "with respect to human observation, this world has neither a beginning nor an end." Coolly discarding Biblical accounts of creation, the book that he eventually published, *The Theory of the Earth*, helped establish the foundations of modern [geology](#)."
3. ↑ [American Museum of Natural History](#) (2000). ["James Hutton: the founder of modern geology"](#). *Earth: Inside and Out*. "The result, therefore, of this physical enquiry," Hutton concluded, "is that we find no vestige of a beginning, no prospect of an end."
4. ↑ ["The Theory of the Earth"](#). James Hutton.org. Archived from [the original](#) on 2008-03-27. Retrieved 2008-04-11.
5. ↑ [Theory of the Earth Archived](#) 2003-07-29 at the [Wayback Machine](#) full text (1788 version)
6. ↑ [Concerning the system of the Earth Archived](#) 2008-09-07 at the [Wayback Machine](#) abstract
7. ↑ [7.0 7.1](#) Paul N. Pearson (16 October 2003). ["In retrospect"](#). *nature.com*.
8. ↑ Geikie, Archibald (1897). [The Founders of Geology](#). London: Macmillan and Company. p. 166.
9. ↑ Playfair, John 1802. Illustrations of the Huttonian Theory of the Earth. Edinburgh. Playfair added an important observation of his own: that [glaciers](#) can transport great quantities of rock.

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