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# In the beginning: How geology taught us to think deep


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- **Book information**
- ***Earth's Deep History: How it was discovered and why it matters*** by Martin J. S. Rudwick
- Published by: University of Chicago Press
- Price: $30

Deep past: Lower Antelope Canyon, Navajo Tribal Lands, Arizona *(Image: Ralph Lee Hopkins/National Geographic Creative)*

***Imagining Deep Time**, National Academy of Sciences, Washington DC, until 15 January 2015*

*A new book and exhibition explain how geology has taken us from an unchanging Earth to the knowledge that the rocks are shifting under our feet*

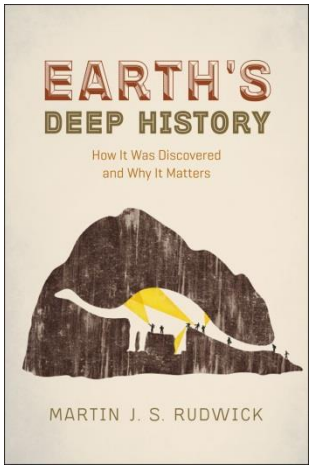
IN 1650, James Ussher, archbishop of Armagh, Ireland, published a book in which he stated that the Creation occurred on 23 October, 4004 BC. Other scholars disagreed, some dating the world to as early as 4103. Isaac Newton eventually weighed in with a later date, 3988.

All were some way off. The modern estimate is that the Earth is 4.5 billion years old, provoking scientifically educated audiences to scoff at the literalism of those chronologists. Historian Martin J. S. Rudwick, however, believes Ussher and the rest deserve respect.

In *Earth's Deep History*, he argues compellingly that biblical chronologies mark the origin of geology and are important in understanding the subject today. Chronology was a sophisticated field in the 17th century, a multidisciplinary endeavour to produce a timeline of world history. As Rudwick writes, the Bible was one source among many, important because it was believed to be the only available textual record of "the beginning".

One task facing chronologists was to reconcile scripture with other evidence, such as coins and monuments. An important consequence was that material evidence came to be seen as authoritative in its own right, a means of discovering aspects of history for which no textual records existed.

Scholars realised that "nature might, metaphorically, have its own antiquities". Fossil shells could supplement scriptural sources; more radically, they could reveal Earth's own history.




That might not seem groundbreaking, but Rudwick is skilled at elucidating pre-modern ways of thinking. As he writes, "the natural world was... taken to have been a stable backdrop throughout human history. That nature might have had its own dramatic action began to seem plausible only when the ideas and methods of historians were transposed into the natural world, from culture into nature."

Much of *Earth's Deep History* is concerned with the ramifications of this. Once the idea of terrestrial history was established, the age of the world could be investigated in ways Ussher never imagined. For example, strata were no longer seen as structural attributes of an immutable Earth. Instead, they were deposited over time, serving as a terrestrial "archive".

Of course, it was easier to conjure a metaphor than to act on it. As Rudwick explains, Earth's archive could be read in multiple ways. Most "men of science" agreed the planet was millions of years old, yet the actual age could be inferred only by estimating the rate of stratification – and that raised more profound questions. Were strata steadily created, or was the process more capricious?

The former position was most powerfully argued by the 19th-century geologist Charles Lyell, who believed that the world was a steady-state system of deposition and erosion, and past geological processes were analogous to those observed in the present. The latter notion, that Earth's past was erratic, emerged from fossil research by Georges Cuvier, revealing the world had gone through several mass extinctions.

Rudwick credits Lyell with giving geologists "a better appreciation of the power of present processes, acting over vast spans of deep time", but is wary of Lyell's theorising. He prefers Cuvier's observations because the extinctions belong to Earth's history, whereas Lyell's steady-state model was posited as a universal law – and Rudwick insists that geology is a historical science. Like human history, Earth's history is "highly contingent throughout, and therefore utterly unpredictable even in retrospect".

Rudwick's book is authoritative and riveting, and its historical breadth is bound to make geology exciting for readers from both sciences and humanities. As it happens, one of his previous books,*Bursting the Limits of Time*, helped inspire an exhibition now on at the National Academy of Sciences in Washington DC.

Imagining Deep Time showcases contemporary artists seeking to embody the "deep time" of geology and cosmology through painting, sculpture and photography. It lacks coherence, but there are standout works such as Jonathon Wells's *Boston Basin*, a composite photo showing a thin sliver of Boston skyline above millions of years of strata. The proportions alone capture the grandeur of geology, the depth of history Rudwick evokes.

In one respect only is *Earth's Deep History* a little shallow. Ironically, Rudwick's strength as a historian undermines his arguments about the nature of geology. Drawing a contrast between geology and physics, Rudwick insists on a "distinction between establishing historical realities and finding causal explanations". His version of geology is unconcerned with causality because he deems causality hopelessly out of reach for sciences mired in contingency.

However, his fine analysis of geology's roots shows how keenly historians work to find causal explanations, and how worthwhile such explanations can be. Whatever other similarities they have, history and geology at least share the virtue of being explanatory.

*This article appeared in print under the headline "The birth of geology"* ***Jonathon Keats*** *is an experimental philosopher and conceptual artist*