

BOOK REVIEW

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TIME'S ARROW, TIME'S CYCLE: Myth and Metaphor in the Discovery of Geological Time by Stephen Jay Gould. Harvard University Press, 1987.

Man has been here 32,000 years. That it took a hundred million years to prepare the world for him is proof that that is what it was done for. I suppose it is, I dunno. If the Eiffel Tower were now representing the world's age, the skin of paint on the pinnacle-knob at its summit would represent man's share of that age: and anybody would perceive that that skin was what the tower was built for. I reckon they would, I dunno.

—Mark Twain

LAST SPRING, WHILE I was teaching at Northeast Missouri State University, I enrolled in a historical geology course. I had been adding to—and transporting—a rock collection for several years, and I decided it was time to learn something about those rocks and the forces which shaped the landscape. What I also learned about in that course—more vividly than ever before—was time, geological time, or (as John McPhee refers to it) “deep time.”

Stephen Jay Gould's book *Time's Arrow, Time's Cycle* is an analysis of the history of this concept, the people and cultural forces that shaped our understanding of geological time. Published in 1987, it is not Gould's most recent book, but its subject matter seems to make such considerations incidental. Gould sets out to re-write history (the “cardboard history” of textbooks), to set aright the false account of geology's greatest contribution and the minds that struggled to understand and describe it. In order to do so, he follows

the limited and unfashionable method of *explication des textes*. This work is a close analysis of the central logic in the first three editions of three seminal documents in the history of geology. I do not maintain that such a myopic procedure can substitute for true history, . . . still, I see some value in the venerable method of *explication*. The social and psychological sources of a text are manifold—the reasons why it exists at all, and why it espouses one view of the world rather than another. (16-17)

As a framework for reading these three texts, Thomas Burnet's *Sacred History of the Earth* (1680-1690), James Hutton's *Theory of the Earth* (1795), and Charles Lyell's *Principles of Geology* (1830-1833), Gould relies upon the dichotomy of linear and circular visions of time: time's arrow and time's cycle. "Time's arrow is the intelligibility of distinct and irreversible events, while time's cycle is the intelligibility of timeless order and lawlike structure" (15-16).

In the opening pages of his book, Gould quotes Freud concerning the "outrages upon its naive self-love" that humanity has endured at the hands of science. According to Freud, the first was the Galilean revolution: earth is not at the center of our universe. The second was the Darwinian: humans are descended from the animal world. While Freud would claim that he is responsible for the third outrage (that we don't possess rational minds), Gould asserts otherwise. Freud omitted the discovery of time as "an almost incomprehensible immensity, with human habitation restricted to a millimicrosecond at the very end" (1-2).

Understanding geologic time requires more than simply memorizing the names of eras and epochs. Gould writes,

Deep time is so alien that we can really only comprehend it as a metaphor. And so we do in all our pedagogy. We tout the geologic mile (with human history occupying the last few inches); or the cosmic calendar (with *Homo sapiens* appearing but a few moments before "Auld Lang Syne"). . . . John McPhee has provided the most striking metaphor of all (in *Basin and Range*): Consider the earth's history as the old measure of the English yard, the distance from the king's nose to the tip of his outstretched hand. One stroke of a nail file on his middle finger erases human history.(3)

Time's arrow and time's cycle are the dichotomous metaphors that Burnet, Hutton, and Lyell wrestled with to understand geological time, not—as textbooks would have us believe—science/religion, observation/speculation, or uniformity/catastrophe. To understand their works, then, we must begin by understanding the myths and metaphors that shaped those works. We must understand them from their cultural context, not our own.

His analysis of these three scientists and their scientific "method" allows Gould to make an even more important point. In correcting the mis-information surrounding them, he can debunk some of the scientific mythology present today:

Scientists are not robotic inducing machines that infer structures of explanation only from regularities observed in natural phenomena. . . . Scientists are human beings, immersed in culture, and struggling with all the curious tools of inference that mind permits—from metaphor and analogy to . . . flights of fruitful imagination. . . . Objective minds do not exist outside culture, so we must make the best of our ineluctable embedding. (6-7)

Having clearly stated his purpose and method at the outset, Gould

proceeds—in an obviously linear fashion—to analyze one by one the texts and authors which helped form our modern understanding of time.

Burnet (the textbook villain of geology) gains Gould's respect for integrating time's arrow and cycle and for resisting "miraculous intervention" as an explanation for physical occurrences. Burnet insisted that natural causes must be found; to do otherwise would be "to cut the knot when we cannot loose it" (29).

James Hutton (the textbook hero and "father of modern geology") doesn't fare as well in Gould's book. Hutton held the belief that the earth is a "machine . . . constructed as a stable abode for life" (74). His treatise was not shaped by empiricism and field work, but by this metaphor which demanded a regular and repeating process capable of counteracting the effects of erosion. But Hutton's belief in mechanical perfection paradoxically denied history.

Finally, Gould turns to Lyell, and debunks another textbook hero. Lyell was not an empiricist either; he was, however, a brilliant writer and rhetorician, "self-made in cardboard," who rescued Hutton's theory from the morass of poor writing. Gould tells us in a footnote that "rhetoric" is "a term that I use, by the way, in the literal, not the pejorative, sense" (107). I'm not certain that I believe his disclaimer; two dozen pages later he describes Lyell's *Principles of Geology* as "awash in rhetoric" (132). Lyell did correct Hutton's ahistorical view of time, but he persisted in denying progress. In addition, Lyell created a persistent confusion among geologists by including multiple, and in some cases, controversial meanings under the single label "uniformity." In accepting some, scientists inadvertently accepted the others. In fact, writes Gould,

It shall always be one of my greatest satisfactions that, as a teeny neophyte scholar alone in a little Ohio college, I noted this central confusion at the same time as a major revisionist movement to reassess Lyell's cardboard history was brewing among professional historians. (118)

That was in 1965, and in Gould's first published paper. Twenty years later, Gould himself appears in the role of the brilliant rhetorician. I understand that some of his scientific colleagues are beginning to grumble.

Hutton and Lyell both erred by embracing one metaphor (time's cycle) and excluding the other (time's arrow). Gould convincingly demonstrates that both are necessary in order for us to understand deep time and to make sense of the earth's history and record. The arrow and the circle "do not blend, but dwell together in tension and fruitful interaction" (200). But *Time's Arrow*, *Time's Cycle* also demonstrates the need for science to confront its own past honestly.

Why does it matter? What harm is a bit of heroic folderol about an illusory past, especially if it makes us feel good about the progress of science? I would argue that we misrepresent history at our peril as *practicing* scientific researchers. If we . . . enshrine one narrow version as true *a priori* . . . we lose the possibility of weighing reasonable alternatives. If we buy the simplistic idea . . . then we will never understand how fact and theory interact with social context, and we will never grasp the biases in our own thinking. (114-115)

The immensity of time is not a comforting thought, but then, neither is illusion.

Though I may never completely comprehend the vast stretches of time recorded in even my simple rock collection, I can see far more than I once did. A tiny crinoid, the preserved fragment of a sea lily stem, now reveals an ocean which once blanketed these Midwestern landscapes.