

HISTORY OF SCIENCE

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ON THE EDGE OF ETERNITY: The Antiquity of the Earth in Medieval and Early Modern Europe by Ivano Dal Prete. Oxford, UK: Oxford University Press, 2022. 214 pages of text plus 82 pages of notes, a bibliography, an index, and sixteen pages of black-and-white halftones. Hardcover; \$37.99. ISBN: 9780190678890. Kindle; \$25.99. ISBN: 9780190678890.

Ivano Dal Prete is a senior lecturer in the History of Science and Medicine program at Yale University. After receiving his doctorate at the University of Verona, he served as a visiting professor at Columbia, Harvard, and Minnesota before coming to Yale. He has published two prior books in Italian on early modern science and its culture. He is also an amateur astronomer and is the co-discoverer of several asteroids.

On the Edge of Eternity is a helpful and also a disturbing book. Dal Prete's explicit purpose

is to take the first steps toward a new paradigm for the history of deep time in Western culture. It aims to replace the view of a relatively recent discovery of the "abyss" of geological time with one that accounts for the complexity, diversity, and social and cultural significance of pre-modern Earth history. (p. 7)

In the process of his detailed narrative, he demonstrates how an originally multi-perspectival conversation could sadly devolve into polemics and escalating polarization, mimicking (or predicting?) what we have seen during the past century and a half.

Dal Prete carefully lays out the groundwork for his narrative in the first two chapters. Chapter 1, "Footprints in the Dust," concisely introduces classical sources such as Eusebius, Augustine, Avicenna, and Boethius, and their late medieval successors including Albertus Magnus and Thomas Aquinas. Of particular interest was the question of whether the world (today we might think of the material universe) was eternal or had a beginning in time (or with time). The question became highlighted following the translation of Aristotle's major works from Arabic into Latin during the twelfth century and played into the theses of the Fourth Lateran Council and later the controversies at the University of Paris during the thirteenth century. As Aquinas put it, reason could not assess whether the earth was eternal or not, but scripture settled the matter with an absolute beginning in time. However, many aspects of Earth history could be made to mesh with either viewpoint. This provided for a multiplicity of opinions and openings for merging empirical observations with philosophical perspective.

For example, Noah's Flood could be a global catastrophe or a local catastrophe; further, it could be a singular event or one of many, repeatedly forced by hypothesized interchanges of land and water, hinted at in Aristotle's *Meteorologica*.

Chapter 2, "The Medieval Earth," summarizes multiple running debates, extending through the fourteenth century. A problematic issue was the origin of mountains. Erosion of highlands was easily observable, and without a mechanism to raise new highlands, the only result could be the washing of the entirety of the exposed earth into the sea. Thus, without such a mechanism, Earth's age would be constrained. But perhaps Aristotelian or Ptolemaic understandings of Earth's figure and the sea-land boundary could be used to support many cycles of erosion and sedimentation, resulting in new uplifts. Claims for astral influences were yet considered possible by many as well. Dal Prete examines the give-and-take between intellectuals such as Jean Buridan, Albert of Saxony, Pierre d'Ailly, and Dante Alighieri, among others.

Chapter 3, "Vernacular Earths, 1250-1500" broadens attention to the northern Italian Renaissance community of the mercantile class, including artisans and engineers, outside the university faculties. During this period, translations of the classical authors into vernacular dialects became widely available, as well as newer encyclopedic summaries of useful knowledge—for example, mathematics, astronomy/astrology, medicine. Coincidentally, northern Italy developed as a major mining center, which literally opened up fertile material (rocks) for speculation. The nascent science of stratigraphy was developing, two centuries prior to Steno. Dal Prete convincingly argues that Leonardo da Vinci was not a lone predecessor of modern natural science, as is often depicted, but rather "just the most celebrated representative of an extremely rich and variegated tradition" (p. 77). Further, typifying his cultural milieu,

Leonardo's writings do not provide the slightest hint that the idea of a young Earth ever crossed his mind. The Italian artist failed to bring up the problem not because it was too much an issue, but because it was not an issue at all. While his world was expanding horizontally toward other continents and vertically in the underground, the one dimension that did not need to be enlarged was time. (p. 90)

If this book were a novel, Dal Prete would have now laid the detailed foundation for ensuing confusion, conflict, and misrepresentation. Unfortunately, this is not a novel. Things begin to unwind in chapter 4, "A 'Pious' History of the Earth? 1500-1650." Here, Dal Prete

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explicates the creative attempts to formulate a physico-theology for Earth's historical development during the period of the Reformation. Within Reformation-era Protestantism, the principle of *Sola scriptura* settled the question of Earth's possible eternity. Earth had a definite beginning in (linear) time. But *Sola scriptura* could be employed to argue for a face-value interpretation of the genealogies of Genesis, plus a 24-hour-day view of the Creation week, to yield a very compressed Creation account. Reflexively, Counter-Reformation scholars, in their efforts to outdo their Protestant counterparts, often employed the same tactics and principles to take back the "high ground." Their efforts were also responses to the great voyages of discovery, which revealed whole segments of humanity previously unknown to the Christian world. What was the relationship of the inhabitants of the New World to the biblical genealogies? A strict appeal to the Flood of Noah as a singular Earth agent provided an anchor for a lineal descent of the American aboriginal population from Noah and therefore from Adam; they were thus inheritors of the Divine image.

Chapter 5, "The Rise of Diluvialism, 1650–1720," expeditiously covers a lot of territory that will be familiar to many of our readers. During this period, early Earth scientists, including Kircher, de Maillet, Aldrovandi, Scilla, Hooke, Burnet, Woodward, Vallisneri, and others grappled with observations of marine fossils in layered rocks exposed in mountains. They pondered a possible relationship to the Noachian Flood, but derived disparate histories. Some retained a modified Aristotelian Earth, with a protracted history of alterations of land and sea. Some natural historians attempted to meld the rock record with a Noachian Flood in a Newtonian gravity-driven world. Others argued for the strictly miraculous nature of the Flood of Noah, that could not be expected to yield a record in the rocks. But overall, "the idea of a 'Mosaic' natural philosophy met with considerable success, and its influence was profound" (p. 127).

In chapter 6, "The Invention of the History of Deep Time, 1700–1770," Dal Prete examines a diversity of Enlightenment-era historians and philosophers. These vary from Christians (e.g., Leibniz, Calmet) to deists (Voltaire, Buffon) to atheists (de Maillet, Diderot, Boulanger, d'Holbach). Their proposed schemes for cosmic and human prehistory demonstrate varying familiarity with real Earth phenomena, as well as an expansive willingness to speculate beyond the evidence at hand. However, they realized correctly that Earth must be quite old. Unfortunately, the increasingly strident, even vicious, polemics that some of these thinkers offered against the Christian faith engendered a

wide range of popular respondents. And unfortunately, many of these respondents easily seized on diluvialist versions of Earth histories to rebut anti-Creation philosophies. Thus, a century and a half before European and American rationalists invented the "warfare" thesis, a popular perception began to emerge that materialist philosophies often went hand-in-glove with the study of nature.

At this point, Dal Prete returns to Venice and north-eastern mainland Italy, in chapter 7, "Political Fossils, 1740–1800." Italian translations of works of the French materialists began to appear in northern Italy in 1740. Up until this time, there had existed a strong community involvement in natural history pursuits. These included clergy: the priest Giovanni Giacomo Spada is reported to have put together a collection of fossil fishes (from the nearby site of Monte Bolca, famed among modern paleontologists) that was far superior to that of John Woodward. But after 1740, numerous books appeared arguing the diluvialist cause. Fossils were co-opted as evidences for the Flood and a young age of Earth. Dal Prete carefully chronicles how the political and economic elites of the region "elaborated a diluvialist orthodoxy allegedly supported by 'true philosophy' and 'sane science,' which appeared very different from the Earth history many enlightened Catholics conceived only a few decades earlier" (p. 183).

I found this book useful (but disturbing) for three reasons: (1) Dal Prete demonstrates that prior to AD 1700, many serious Christian scholars realized Earth was an old object and saw no theological problem; (2) the classic fairytale of some age-long conflict between Christianity and natural science began to be manufactured during the eighteenth century, long before Draper, White, and others in the later nineteenth century; and (3) Dal Prete demonstrates that the oversimplistic claims and harsh rhetoric of the diluvialists of the seventeenth and eighteenth centuries, provoked by and responding to erudite but self-important atheists, eerily presage the writings of twentieth-century diluvialists. And thus, the magnificence of God's creative activity in deep time is clouded by verbiage. Ouch.

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