

Frontispiece from *Museum Wormianum* (1655) by antiquary Ole Worm, showing his cabinet of curiosities — a collection of fossils and other natural artefacts.

HISTORY OF SCIENCE

# Pursuing the primordial

Ted Nield ponders a history of how European science came to grasp Earth's age.

Three things annoy Martin Rudwick about how the history of Earth science is portrayed. He scorns monoglot provincialism, caricatures that pit science against religion — and hero-worship. So I hope he forgives the fact that in 1977, at 21, I made a pilgrimage to London to hear him speak at the Geological Society, and to ask him to autograph my copy of his *Living and Fossil Brachiopods* (Humanities Press, 1970).

Rudwick had just switched from studying palaeontology and functional morphology — which uses engineering principles to make sense of the sometimes perplexing three-dimensional geometry of fossil skeletons — to the history of science. In this he has forged a second, even more distinguished career. Because the subject is also an enthusiasm of mine, I have followed his work with an appreciation that remains undimmed after reading his latest book, *Earth's Deep History*.

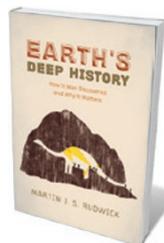
This traces the origin of historical science in the seventeenth century, when the things

we see around us in nature came to be seen as 'monuments', pregnant with historical meaning, like archaeological relics. With his talent for encapsulating pre-modern mindsets, Rudwick deftly explains how ideas of natural history were embedded in cultural history. He concentrates on thinking in the late eighteenth century, not only in Anglophone countries but, crucially, also in mainland Europe — especially France. The book's premise, which has been used before by Rudwick and others (including the late evolutionary biologist Stephen Jay Gould), is that humanity's discovery of Earth's immense age is a step in science's progressive removal of humans from the

centre of things. First our planet was relegated to mere third rock from the Sun; then humans were transformed from the pinnacle of God's creation into twigs on an evolutionary bush.

Rudwick's early brachiopod book drew on material originally expounded in papers, and in this respect *Earth's Deep History* is its cousin. In 2005 and 2008, respectively, Rudwick published his magisterial tomes *Bursting the Limits of Time* and *Worlds Before Adam* (both University of Chicago Press). These burst the limits of my briefcase and contributed to my upper-body strength. It is therefore welcome that their arguments have been condensed into a more portable account of the human appreciation of time. Unlike many authors (including Charles Darwin) whose big books were conceived as 'sketches' for never-completed longer works, Rudwick has sensibly done things the right way round.

Beginning with Irish Archbishop James Ussher's 1650 publication of a chronology suggesting that the world began on



**Earth's Deep History: How it Was Discovered and Why it Matters**  
MARTIN J. S. RUDWICK  
University of Chicago Press: 2014.

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23 October 4004 BC, Rudwick shows how, by the eighteenth century, Western culture had long accepted that Earth had been around for millennia. Ussher was not alone: Isaac Newton played the same game, suggesting a date of 3988 BC. Rudwick is at pains to emphasize that Ussher was a serious chronologist who

**“The image of emergent science heroically struggling against obscurantist religion is a fiction.”**

did not deserve his post-Darwinian ridicule. What these chronologies show is that humanity was at that time assumed by all to have been part of the Universe from its inception.

Rudwick goes on to reveal how natural philosophers such as Jean-André Deluc and Johann Jakob Scheuchzer in Switzerland arrived at a truer picture. In attempting to reconcile scriptural and other textual evidence with that slowly emerging from nature's monuments, they came to realize that Earth had had a long prehistoric existence for which there was no documentary evidence. Yet far from being stifled by what had gone before, they were profoundly aided by the work of traditional, historical and antiquarian scholars working in the Judaeo-Christian tradition. The image of emergent science heroically struggling against obscurantist religion is a fiction conjured by post-Darwinian revisionism and militant atheists, Rudwick insists.

Later natural philosophers, reading nature as innately historical, saw further. For Darwin, species were not finished objects in neat taxonomic boxes; they represented the cut ends of historical threads, linking all to the origin of life. Most people today would categorize Darwin as a biologist, but his view of species derived from his geologist's instinct that all things embody a historical narrative. The realization that much of Earth's history was not just prehistoric but prehuman gave birth to what we now call deep time. The book concludes with a relatively breezy scamper through the subsequent history of Earth science, taking in the 1960s and 70s arrival of its grand unifying theory, plate tectonics.

Reading Rudwick's prose is a pleasure, but this is not a 'popular' book. Rudwick provides little human interest behind the names, so if these do not already conjure up real human beings with lives and idiosyncrasies, he offers scant help. Indeed, he has few good words to say about the stylistic compromises of popular histories. I find this a trifle ungracious. Superior art, for all its academic shortcomings, engages more minds than the diligent knight on his charger of scholarship ever will. ■

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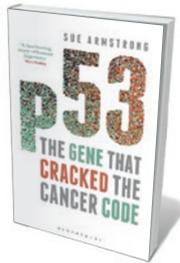
## Books in brief



### The Singular Universe and the Reality of Time

Roberto Mangabeira Unger and Lee Smolin CAMBRIDGE UNIVERSITY PRESS (2014)

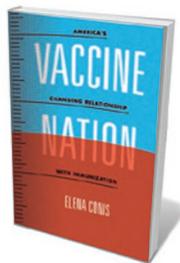
The poor fit between relativity and the quantum impedes our understanding of the Universe. Now philosopher Roberto Unger and theoretical physicist Lee Smolin propose a new model resting on three assumptions: time is real; mathematics is a limited tool; and there is only one Universe at a time. Smolin's is the briefer, arguably more focused section of this hefty explication, setting out clear agendas for research into quantum foundations, explanations for the 'arrow of time' and other parts of this puzzle.



### p53: The Gene that Cracked the Cancer Code

Sue Armstrong SIGMA (2014)

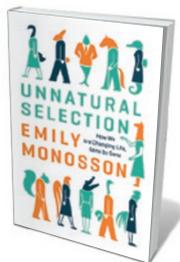
As science writer Sue Armstrong reveals in this succinct, accessible study, humanity's genetic bulwark against cancer, *p53*, has featured in more than 70,000 papers since its 1979 discovery. Armstrong traces how the tumour-suppressor gene has effectively enhanced our knowledge of cancer and inspired treatments, interweaving the science with stories of patients and pathologists. Most vivid are the quotidian triumphs and disappointments of 'lab lifers' such as Michel Kress, one of the gene's several independent discoverers, and Galina Selivanova, working on a drug that restores function in mutant *p53*.



### Vaccine Nation: America's Changing Relationship with Immunization

Elena Conis UNIVERSITY OF CHICAGO PRESS (2014)

In the 1960s afterglow of broad success in defeating polio and smallpox, the US public embraced vaccination. Yet by 2009, debate was raging over its risks, even as some 90% of toddlers were being vaccinated against a raft of diseases. Historian Elena Conis analyses the shifts in official and public thinking on immunization as initiatives by presidents from John F. Kennedy onwards drove waves of mass vaccination. As she reveals, each new vaccine has prompted a radical reevaluation of the disease it targeted.



### Unnatural Selection: How We Are Changing Life, Gene by Gene

Emily Monosson ISLAND (2014)

“We beat life back with our drugs, pesticides and pollutants, but life responds.” So writes environmental toxicologist Emily Monosson in this examination of rapid evolution driven by artificial poisons. Her tour takes in antibiotic-resistant staph bacteria, herbicide-resistant agricultural weeds, DDT-resistant bedbugs and the blue crabs of Piles Creek, New Jersey. Living in a soup of pollutants including mercury and hydrocarbons, these decapodal survivors display altered behaviours as well as resistance. Monosson ends with a thought-provoking look at epigenetics — evolution “beyond selection”.



### Virtuous Violence: Hurting and Killing to Create, Sustain, End, and Honor Social Relationships

Alan Page Fiske and Tage Shakti Rai CAMBRIDGE UNIVERSITY PRESS (2014)

Can murder or self-harm be seen as moral? Anthropologists Alan Fiske and Tage Rai argue that many who commit violent acts are motivated by feelings of moral rightness aimed at regulating social relationships. Despite the provocative title, the findings can seem commonsensical. From Mafia murders prompted by *omertà* (their code of honour) to god-appeasing sacrifice, moral justification for violent acts seems a near-constant in human behaviour. **Barbara Kiser**