

Auvergne and on Etna, of Agassiz in the Swiss glaciers, and of Conybeare and de la Bèche on the shore of Lyme Regis. He carefully examines the interweaving of individual positions and collective debates, of publications and their reception in the scientific community as well as in the public. He also unfolds the institutional, political, social, religious and economic contexts in which they took shape: the impact of the political events of 1830 on the shaping of French geological institutions; the economic issues linked to coal mining and how they were involved in the British efforts to establish a stratigraphy of the Secondary era; the importance of religious issues in geological discussions, such as debates over the notion of 'Diluvium', from Buckland to Conybeare and Sedgwick. Rudwick devotes his last three chapters to glacial theory, the abandonment of reference to the biblical deluge and the introduction of contingency into thinking about the earth and its history.

As he addresses the debates which flourished all through the period, Rudwick refuses to adopt traditional dichotomies (catastrophism versus uniformitarianism, transformism versus fixism, creationism versus materialism) generally used by science historians, which he claims render neither the complexity of issues nor the subtlety of individual positions. Thus religious thinkers such as Sedgwick and Agassiz were able to accept the notion of life's progress, while the anti-clerical Lyell long denied it, supporting, after Hutton, the idea of a cyclical return in the history of the earth and of life.

The question of the antiquity of man is another focus. Rudwick brings new insights to the pioneering efforts in this area by analysing a number of rarely read primary sources, including works by Christol, Marcel de Serres, Tournal and Schmerling. He surprisingly omits the picturesque figure of Jacques Boucher de Perthes, a French customs officer and president of the Société d'émulation d'Abbeville, whose field explorations in the Lower Valley of the Somme river started in 1842, and who was later to play a crucial role in the international recognition of 'fossil man'. Another notable omission, among so many pages devoted to stratigraphic palaeontology and geology, is Alcide d'Orbigny, a disciple of Cuvier whose major works in palaeontological stratigraphy started in the early 1840s and, if mainly published near the end of the decade, certainly belonged to the epistemic configuration depicted here.

For almost forty years, Martin Rudwick has demonstrated remarkable intellectual agility, not only in 'reinventing himself' (such as from a professional palaeontologist into a science historian), but also in renewing thoroughly a whole domain of studies. *Worlds before Adam* is at once an important synthesis, a brilliant essay which bestows an immense scholarship upon an original and well-carried argument, and an elegantly written and composed book as pleasant to read as a novel. It will also stand as a reference book, easy to consult by anyone professionally or personally interested in geology and palaeontology and their historical and epistemological implications. With summaries at the end of each chapter, internal references between the different parts, detailed footnotes on scientific issues at stake in the debates, 157 carefully reproduced plates and a good index, the volume is an excellent instrument of inquiry. But far from being an encyclopedic summa, it is also a profoundly personal work which radiates the world and personality of its author, one of the most learned and incisive minds in our profession.

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DAVID N. LIVINGSTONE, *Adam's Ancestors: Race, Religion, and the Politics of Human Origins*. Baltimore: Johns Hopkins University Press, 2008. Pp. x+301. ISBN 978-0-8018-8813-7. £23.50 (hardback).
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It is not often that one reads a book that discusses both the sixteenth-century Spanish human rights advocate Bartholomé de Las Casas and the twentieth-century American neo-Nazi Richard

Butler, but David Livingstone's latest monograph does just that. Livingstone offers a history of pre-Adamism – the idea that human beings inhabited the earth before Adam and that the descendants of these pre-Adamic ancestors may still occupy the planet. In telling pre-Adamism's story, including its engagements with race, religion and the science of human evolution, Livingstone covers a millennium of theology, natural philosophy, geography, ethnography and anthropology. So even-handed is his synthetic treatment that all readers are doubtless going to learn much and come away impressed.

In the 1920s the Canadian creationist George McCready Price succinctly summarized the centrality of Adam and the issue of human origins for those who hold the account presented in Genesis to be literally true: 'No Adam, No Fall; No Fall, No Atonement; No Atonement, No Savior' went his oft-quoted syllogism. Without a historical Adam, there would be no original sin and no reason for the atoning death of Christ. Thus the very foundation of Christianity would be removed. Yet it was obvious to many readers of Genesis that there were problems with the narrative if read literally – one such problem being the question of the origin of Cain's wife and why Cain feared for his life after being banished by God. Could it have been that there were humans who were not descendants of Adam?

Livingstone begins his account by outlining three further issues that raised problems for the historicity of the Genesis account of creation. The first of these was the increasing availability of non-Judaeo-Christian accounts that clearly were of ancient origin yet went against claims made in the canonical texts. The second was the presence of 'monstrous races' as detailed by Pliny, Strabo and Herodotus, and the problematic relationship of these races to humans. If these existed – and few doubted the fact – were they human, and therefore needing to be baptized? Lastly, and relatedly, there was the issue of the inhabitants of the New World. If they were human – and thus in need of baptism – how did they fit into a scheme that saw all humans as descendants of Shem, Ham or Japheth? Equally as important, how did they end up on the other side of the world? Indeed the possibility of extraterrestrial life – as raised by Giordano Bruno and Tomasso Campanella – only exacerbated these problems. These were serious questions that worried the best minds of the early modern period.

A French theologian, Isaac La Peyrère, offered one solution in 1655 in his work *Prae-Adamitae*. The work's English subtitle gave a clue to La Peyrère's methods: *A Discourse Upon the Twelfth, Thirteenth, and Fourteenth Verses of the Fifth Chapter of the Epistle of the Apostle Paul to the Romans. By Which Are Prov'd, That Men were Created before Adam*. La Peyrère used scriptural exegesis and non-Christian sources to argue for a polygenism that was not tainted with racial inequality. La Peyrère's claims went beyond simple advocacy of plural origins for humans; he argued that the Scriptures were fallible human transcriptions, that Moses was not the sole author of the Pentateuch, that the Noachian Flood was localized, and that Adam was only the father of the Jews. Of course this early form of biblical criticism could not go unpunished, and La Peyrère was forced to recant his views. As Livingstone notes, this recantation did not, however, prevent the pre-Adamite theory from having significant impact on future thought in relation to the origin of humans.

A major portion of Livingstone's account is taken up with the question of how individuals – whether creationist or evolutionist, believer or infidel – wrestled with pre-Adamism and its manifest consequences. It is impossible to summarize the rich vein that he successfully mines. Despite the idea being favoured by atheists and unbelievers who sought to undermine Scripture, pre-Adamism became equally deployed as a means to preserve scriptural reliability when faced with such criticism. Interpretation could allow for two origins of humans as recounted in Genesis, the first of the human species and the second of Adam, who was thus seen as father of the Jews (or, in certain readings, of Caucasians or Aryans). Ethnographers in the nineteenth century were divided between polygenism and monogenism, the former receiving support from the creationist

Louis Agassiz and the racist writings of Samuel Morton, Josiah Nott and George Gliddon, the latter ultimately underpinned by Darwin's work. Pre-Adamism thus fed into the rhetoric of antebellum America and became as important politically as it was theologically. In opposition to the claims of many modern anti-evolutionists, Livingstone makes it clear that many apologists for slavery (and racial inequality) sought support not in the writings of Darwin but in Scripture, some going as far as to claim that Eve's sin was one of miscegenation with a black pre-Adamite.

The amazing scope of *Adam's Ancestors* contributes to its appeal, and it can be highly recommended both for its sweeping synthesis and for the nature of the questions it raises in the mind of the reader. Knowing already about, for example, Agassiz, Thomas Chalmers, Hugh Miller, George Pye Smith, Robert Chambers and St George Jackson Mivart, I was pleasantly surprised to encounter these theologically diverse individuals here, often in unexpected contexts. Historians of other eras are likely to have similar encounters.

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JESSICA RISKIN (ed.), *Genesis Redux: Essays in the History and Philosophy of Artificial Life*. Chicago and London: University of Chicago Press, 2007. Pp. xvii + 389. ISBN 978-0-226-72081-4. £16.00, \$25.00 (paperback).

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You might think, as I did, that research on artificial life is a relatively recent endeavour – a feature of the age of science fiction, contemporary with research on artificial intelligence. But *Genesis Redux* reveals otherwise. Growing out of a workshop at Stanford, the seventeen essays collected by Jessica Riskin draw on examples from ancient, early modern and modern science to show that people have been trying to create and re-create life for a very long time.

Several of the essays are about automata, or self-moving robotic machines designed as animals or humans. Anthony Grafton, for example, describes automata in fifteenth-century Italy, and in particular a devil automaton designed by the engineer Giovanni Fontana. Elizabeth King writes about a figure of a Franciscan monk built in the sixteenth century and designed to pray perpetually. Scott Maisano discusses a legendary seventeenth-century automaton designed by Descartes, along the way highlighting references to bodily machines in *Hamlet* and *The Winter's Tale*. Adelheid Voskuhl investigates the context of two eighteenth-century female automata designed to play keyboard musical instruments. Norton Wise situates automata of the nineteenth century – often female, black, magicians or acrobats – in their socioeconomic contexts.

One of the richest essays is Elliot Sober's account of debates about sex ratios in the eighteenth century. Was the existence of stable sex ratios at birth evidence for an intelligent, divine designer? Sober's excellent discussion is itself almost worth the price of the book. However, it is also one of the least relevant to the overall theme; studying sex ratios is not studying artificial life, unless by 'artificial' one means not only created by humans but also created by God. Sober makes a spirited case for the view that the sex ratio debate of the eighteenth century 'provides an interesting case study of the problem of whether we should regard living things as artifacts or as the result of mindless natural processes' (p. 132). It is nevertheless hard to shake the feeling that whether living organisms are artfully created or naturally developed is not, strictly speaking, a question bearing on artificial life.

If some of the essays stray from the main topic, is there nevertheless a unitary point of view here? Riskin thinks so. The cover of the volume is a close-up of the hands of God and Adam in Michelangelo's Sistine Chapel ceiling; their fingers point at each other, and are close, but they do not quite touch. For Riskin, the gap between their fingers is a symbol of what she sees as a gap in the conception of life as composed of merely mechanical, material elements. She calls this the 'Sistine Gap', and claims that the essays in the volume share the anti-reductionist view that there