genetic information and heredity, are made of connected nucleotide monomers. Similarly, proteins are vital polymer catalysts that are made by combining monomer amino acids. Such modern biological constructions were unlikely to have been present on the early Earth.

Despite this, many researchers have tried to demonstrate that RNA, or something similar, turned up spontaneously between 3 billion and 4 billion years ago. Physicist and biochemist Walter Gilbert suggested in 1986 that life began with the spontaneous generation of an RNA that could copy itself: the 'RNA world'. The advantage of this idea is that the formation of just one polymer would be all that was needed to get life started. The disadvantage is that such an event would be staggeringly improbable.

"The advantage of the 'RNA world' idea is that one polymer would be all that was needed to get life started."

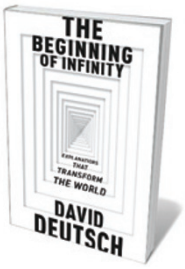
Nucleotides, for example, are not encountered in nature beyond organisms or laboratory synthesis. To construct RNA, high concentrations of four select nucleotides would be needed in the same location, with others being excluded. If this is the prerequisite for life, then it is an unusual phenomenon, rare in the Universe. As an alternative, other scientists (myself included) have suggested that life started without the presence of polymers; that instead, heredity and catalysis began with monomers.

Deamer's thesis diverges from the standard RNA-world concept. He focuses not on the generation of a naked RNA-like polymer, but on the formation of a simple cell-like compartment, or vesicle. Modern cells are enclosed by a complex fatty membrane, which prevents leakage. Vesicles with similar properties have been formed in the lab from certain fatty acids. Deamer holds that the spontaneous formation of vesicles, into which RNA could be incorporated, was a crucial step in life's origin. Unfortunately, his theory retains the improbable generation of self-replicating polymers such as RNA.

Nevertheless, Deamer's insight deflates the synthetic proofs put forward in numerous papers supporting the RNA world. He ends *First Life* by calling for the construction of a new set of biochemical simulators that match more closely the conditions on the early Earth. Unfortunately, the chemicals that he suggests for inclusion are drawn from modern biology, not from ancient geochemistry. We should let nature inform us, rather than pasting our ideas onto her. ■

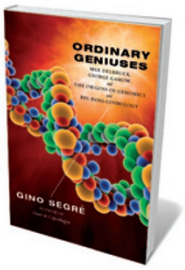
Robert Shapiro *was professor emeritus of chemistry at New York University. Sadly he passed away on 15 June 2011, shortly after completing this review.*

Books in brief



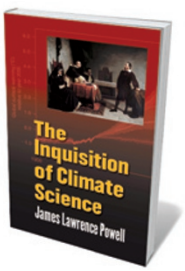
The Beginning of Infinity: Explanations That Transform the World
David Deutsch ALLEN LANE *496 pp. £25 (2011)*
Scientific explanations have an infinite scope and are ever-adaptable, argues quantum computation expert David Deutsch in his latest book, which is sure to provoke many philosophers of science. Since the Enlightenment of the eighteenth century, the scientific method has allowed us to continually describe, assess and reconfigure ideas about the Universe, in a virtuous cycle that Deutsch sees as boundless. Everything is within the reach of reason, he claims, from free will to creativity and the laws of nature. It is our duty to seek the best explanations, he says.

The Sorcerers and Their Apprentices: How the Digital Magicians of the MIT Media Lab Are Creating the Innovative Technologies That Will Transform Our Lives
Frank Moss CROWN *272 pp. $27.50 (2011)*
Frank Moss, a former director of the Media Lab at the Massachusetts Institute of Technology (MIT) in Cambridge, reflects on five years at the helm of this innovative institution. Through tales of the people who worked on such imaginative projects as the development of child-safe air bags and Lego robots, he highlights the Media Lab's ethos of creative freedom, serendipitous discovery and porous disciplinary boundaries.



Ordinary Geniuses: Max Delbrück, George Gamow, and the Origins of Genomics and Big Bang Cosmology
Gino Segrè VIKING *352 pp. $27.95 (2011)*
Genetics and cosmology owe their origins to two physicists, Max Delbrück and George Gamow, respectively. In this insightful double biography, theoretical physicist Gino Segrè portrays them as exemplary yet ordinary scientists who overcame personal struggles to work on big questions. He describes how Delbrück's flight from Nazi Germany turned him towards biology; and how Gamow's escape from Stalinist Russia to the United States led to him working on the hydrogen bomb and the formation of elements in the Big Bang.

Future Science: Essays from the Cutting Edge
Edited by Max Brockman VINTAGE *272 pp. $15.95 (2011)*
In a sequel to *What's Next?* (Vintage, 2009), editor Max Brockman's latest collection of essays showcases the cutting-edge research of 19 leading young scientists — only a few of whom have written for a general audience before. Contributions include discussions of the biology of antiviral immunity by virologist William McEwan; the physical impact of social rejection by neuroscientist Naomi Eisenberger; the physics of infinity, discussed by physicist Anthony Aguirre; and the role of huge data sets in society by computer scientist Jon Kleinberg.



The Inquisition of Climate Science
James Lawrence Powell COLUMBIA UNIVERSITY PRESS *272 pp. $27.95 (2011)*
Geologist James Powell exposes the tactics of climate-change deniers in his latest book. Arguing that the current attempt to undermine trust in climate research is the most egregious attack on science in history, he examines the movement and its protagonists. He points out the rhetorical tricks, lack of credentials and industry backing of many deniers, their unwillingness to present alternative theories, and historical precedents of resistance to scientific evidence.