Book Reviews


Lavine is an associate professor of Philosophy at Columbia University. In this book, he tries to explain the meaning of infinity in the set theory invented by German mathematician Georg Cantor.

Lavine shows that the common story about the history of the infinite is not true. The common story is that formal axiom systems were developed to salvage Cantor's naive theory from paradoxes, and Cantor's set theory does not correspond to our intuition about collections. It was not the product of idealization, but of the failure of an attempted idealization. Contrary to this common story, Lavine shows that the set theory developed by Cantor and Zermelo is connected to a kind of idealization from human experience much like the theories of natural numbers or Euclidean geometry are.

When Cantor created the original set theory in the 1880s, it was neither naive nor subject to paradoxes. He tried to clarify the foundation of calculus. The idea was a coherent one that sets are collections which can be counted. Bertrand Russell was the inventor of the naive set theory which ran into paradoxes. In Chapters 2-5, Lavine describes in considerable detail the correct historical sketch from ancient times to modern with three purposes: (1) to counter the harmful influence of the common account on many philosophers of mathematics that our intuitions are seriously defective and the axioms of mathematics are arbitrary and historically determined; (2) to show that the clear and universal intuitions definitely lead to Cantorian infinite; and (3) to make clearer the nature of intuition.

In Chapter 6, Lavine surveys some accounts of mathematical knowledge of the infinite that attempt to show how it can come out of experience. These accounts begin with a theory of knowledge and try to fit mathematics to it. Intuitionism, various forms of formalism, and Hilbert's finitist philosophy of mathematics are discussed.

Lavine describes the views of Godel, Quine, and Putnam in chapter 7. They begin with mathematics and try to fit a theory of knowledge to it. Lavine concludes that none of them could solve the problem of the infinite because they could not explain the source of our intuitions concerning the Cantorian infinite.

In Chapter 8, Lavine proposes that the source of our intuitions concerning the Cantorian infinite is our expe-
rience of the indefinitely large. Here he makes use of a mathematical theory of the indefinitely large developed by Jan Mycielski. Cantor understood his theory as drawing an analogy between the finite and the infinite; we can understand Cantor as extrapolating from the indefinitely large to the indefinitely large.

Blending history, philosophy, mathematics, and logic, Lavine explains with clarity how the infinite, a subject so remote from our finite experience, can be an indispensable tool for working mathematicians. He successfully shows that the infinite in the set theory does relate to our intuition, hence it is comprehensible. He points out that mathematical infinity is just an extrapolation from the concept of indefinitely large.

This is an interesting work which presents a new and demystifying way of understanding the mathematical infinite. His explanation puts Cantor's infinite as Aristotelian potential infinite. He does not discuss the infinite in the metaphysical sense which is Aristotelian actual infinite.

Reviewed by T. Timothy Chen, National Cancer Institute, Bethesda, MD 20892.


If you do not know much about Albert Einstein, but would like to, this book is a good place to start. It has all you need: a chronology with biographical information, a family tree, answers to questions most frequently asked, a bibliography, key word and subject indices, and primary source documentation. In addition, Princeton University physicist Freeman Dyson writes a revealing foreword, and editor Alice Calaprice provides a preface with insightful commentary.

In 1879, Einstein was born in Germany. He entered a Catholic primary school where he was the only Jew; religious instruction in Judaism was given at home. At age 17, he gave up his German citizenship to show his dislike for the German military mentality. At age 27, he received a doctorate from the University of Zurich. He made his first trip to the United States in 1921 where he gave lectures at Princeton University; in 1940 he became a US citizen. In 1944, a handwritten copy of his theory of relativity was auctioned off for six million dollars as a contribution to the war effort. In 1952, he was offered the presidency of Israel (he refused). In 1955, he died of a ruptured atherosclerotic aneurysm of the abdominal aorta.

Some readers may be surprised to discover in the 550 quotes included in this volume that Einstein was a witty, thoughtful, gifted, and prolific writer. He left a vast source of material from which to draw quotes: there are 40,000 documents in the Einstein archive. The intent in this volume was to select the most important and interesting quotes. Some quotes will elicit pleasure and delight from readers. Others may distress readers who have worshiped Einstein as a compassionate, tolerant, and flawless hero …” (p. xvii).

Einstein's humanity is seen in the paradoxes of his personality. He could be "irascible and benign, warmly humorous and coldly dismissive, one who was at first bemused by the fame the world bestowed on him but who came to abhor the glare of publicity" (back flaps). If you’re undecided about reading this book, perhaps a few quotes will help. First, here are some of Einstein’s thoughts on religion. "The idea of a personal God is quite alien to me and seems even naïve" (p. 156). "I am a deeply religious nonbeliever … This is a somewhat new kind of religion" (p. 158). "The Lord God is subtle, but malicious he is not … I have second thoughts. Maybe God is malicious” (p. 169). Here are some observations on science. "The more success the quantum theory has, the sillier it looks” (p. 166). "Science will stagnate if it is made to serve practical purposes” (p. 181). "An hour sitting with a pretty girl on a park bench passes like a minute, but a minute sitting on a hot stove seems like an hour” (p. 184).

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Shreeve, a contributing editor to Discover magazine, wrote fiction before pursuing a career in science writing. In The Neanderthal Enigma, he addresses some of the more profound and hotly debated questions concerning human origins. Shreeve tackles not only those questions pertaining to the when and where of human evolution—he also addresses the much more elusive mysteries surrounding the why of Homo sapiens success as the only surviving hominid species today, for it is apparent that a number of potential outcomes are suggested by the evolutionary record. In answering these questions, Shreeve’s strategy is to identify and explain the very essence of “humanness”—those qualities that distinguish modern humans from ancestral forms and from our other cousins in the primate order.

The Neanderthal Enigma is impressive in the scope of its subject, in the sheer amount and variety of data the author incorporates into the narrative, and with respect to the originality and plausibility of the explanatory models he suggests. In reading this book, it becomes apparent that Shreeve’s purpose is two-fold. The Neanderthal Enigma is as much a personal quest for meaning on the author’s part as it is an opportunity to propose a new interpretation of the varied—and often conflicting and confusing—evidence pertaining to modern human origins. Most impressive of all is that Shreeve manages to synthesize such an array of archaeological, fossil, and genetic data into a coherent and highly absorbing account. It is rare enough for a science writer to effectively communicate the minutiae of an often arcane and esoteric field to a more general audience (comparisons to Carl Sagan or Stephen Jay