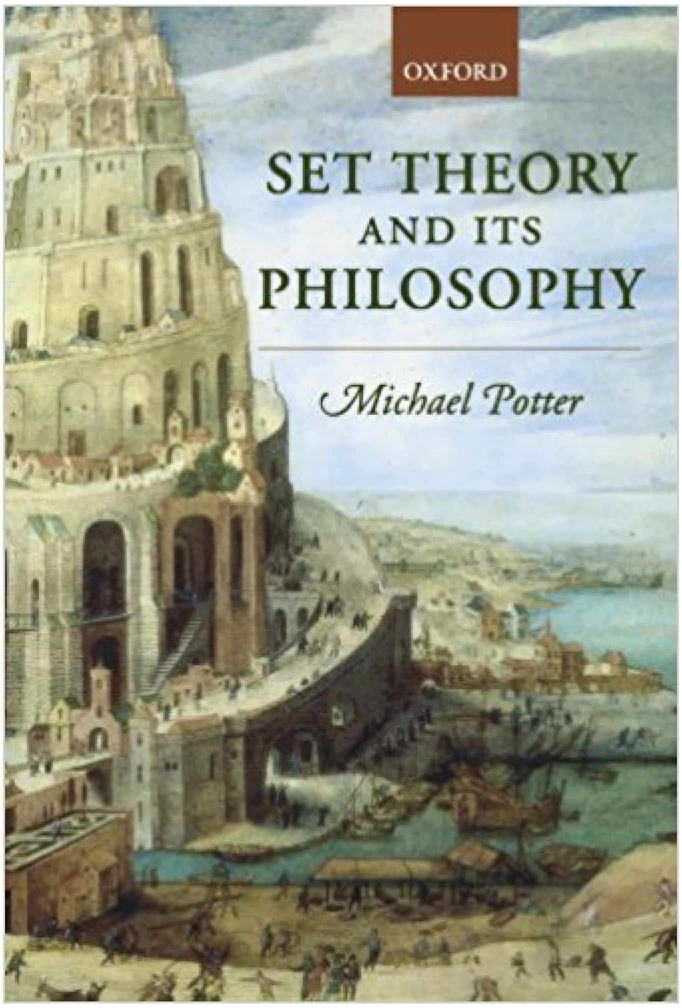
Set Theory And Its Philosophy: A Critical Introduction



Synopsis

Michael Potter presents a comprehensive new philosophical introduction to set theory. Anyone wishing to work on the logical foundations of mathematics must understand set theory, which lies at its heart. What makes the book unique is that it interweaves a careful presentation of the technical material with a penetrating philosophical critique. Potter does not merely expound the theory dogmatically but at every stage discusses in detail the reasons that can be offered for believing it to be true. Set Theory and its Philosophy is a key text for philosophy, mathematical logic, and computer science.

Book Information

Paperback: 360 pages

Publisher: Clarendon Press; 1 edition (March 11, 2004)

Language: English

ISBN-10: 0199270414

ISBN-13: 978-0199270415

Product Dimensions: 9.2 x 0.8 x 6.1 inches

Shipping Weight: 1.4 pounds (View shipping rates and policies)

Average Customer Review: 3.6 out of 5 stars 5 customer reviews

Best Sellers Rank: #908,536 in Books (See Top 100 in Books) #100 inÃ Â Books > Science & Math > Mathematics > Pure Mathematics > Set Theory #445 inÃ Â Books > Textbooks > Humanities > Philosophy > Logic #450 inÃ Â Books > Science & Math > Mathematics > Pure Mathematics > Logic

Customer Reviews

"Michael Potter has given us a wonderful new book. The mathematics are extremely clearly presented, it’s an easy book to learn from. Potter is very good at explaining the motivations-both philosophical and technical-for various bits of mathematics, so one never has the feeling of wading through long pages of pointless technical minutiae. It is a rewarding read even for those who don’t intend to follow all the technical details. Potter’s book provides a great introduction to set theory and its philosophy, he has written the best philosophical introduction on the market." --Notre Dame Philosophical Reviews

Michael Potter is University Lecturer in Philosophy, and Fellow of Fitzwilliam College, at Cambridge. He is the author of Sets (1990), on which the present work draws but which was written for a more specialist readership, and Reason's Nearest Kin (2000).

This is a superb book, but it has a very specific audience. It is a careful, systematic, investigation of the extent to which the methods of set theory can be used to address philosophical questions. So the audience needs to both be comfortable with the formal presentation of mathematical theories, and to know the issues in the philosophy of mathematics. If you lack the philosophical part, you'll wonder why Potter doesn't just use ZF, and why he keeps being drawn off into various topics along the way. If you lack the mathematical part, you'll find the book hard to understand, although it is extremely systematic. (If you don't know what ZF is, for example, I'd advise starting with some other book.)Having said that, Potter goes out of his way to present matters clearly and explicitly. Readers who don't exactly fit the audience will learn an enormous amount from this book. Moreover, it is so clear and authoritative, and covers so much ground, that it deserves to be in the canon. It ought to displace Quine's Set Theory and its Logic, for example.ZU is Potter's set theory (76). It is spare, and very powerful. I believe Potter is trying to capture as much as he can of Frege's original view of sets as logical objects, although he doesn't say this. ZU allows flocks of doves and packs of wolves to be sets, just as it intuitively ought to, but it can also capture the real and transfinite numbers. The book divides into four parts. First, there is the presentation of ZU and its properties. Then we get the usual development of the real numbers. The third section deals with ordinals and cardinals, and a fourth section the axiom of choice and the continuum hypothesis.What sets the book apart, though, is its constant return to the history of its subject and the philosophical issues that have been embroiled in it up to the present. You can look through the book at any issue that interests you - Russell's paradox, non-standard analysis, whether there is some deeper notion of a collection underlying set-theory - and Potter always gives a clear explanation and has something interesting to say about it. With graduate students of sufficient ability, the book would make for a really worthwhile graduate level course in philosophy.When I'd finished reading it, I wanted to read it again.

I believe one has to have some familiarity with logic and set theory in order to fully appreciate this wonderful book. Granting that, reading it was the first time I have ever read a mathematics book that I could hardly put down, it was so fascinating.When I was an undergraduate, a course in naive set theory (similar in content to Halmos' classic) persuaded me to become a mathematician. But when I asked my instructor to precisely define what a 'property' of a set was, a notion that was used in the Axiom of Separation, he evaded the question as too philosophical. Much later, when I studied mathematical logic, I found a precise definition.Michael Potter does not seem to evade any philosophical questions about set theory. The answers he proposes are given from various points of view so the reader can clearly see the differences and possibly choose the one most congenial: platonism (internal, uncritical, limiting case), constructivism, formalism (pure, postulational). I couldn't pin down exactly what is Potter's point of view except that he is not a strict formalist or a strict constructivist or an uncritical platonist.His development of the purely mathematical part of set theory is very elegant, especially his axiomatization of the levels of the set theoretical hierarchy. Unlike most strictly mathematical texts, Potter explains why, at each major stage, he is doing what he is doing. In three appendices he also contrasts his approach with the traditional ones. I felt he did not give enough credit to the simplicity and elegance of NBG theory, so well presented in Mendelson's classic text; he is averse to introducing classes as well as sets.His treatment is replete with fascinating history. He does not hesitate to discuss advanced results which he cannot prove in a treatment at this level, and he provides ample references if the reader is interested in pursuing them.I am still puzzled by the nature of second order logic, which he says "decides" the continuum hypothesis, which is an undecidable statement in first order logic. I wish he had explained that more.This is a book that I intend to re-read and to discuss with colleagues who are expert in the field. Very highly recommended.

It's an ok book. Maybe my set theoretic background is lacking, but I would have loved a bit more explanation especially in the early parts where the reader is just beign introduced. I was lost early on and it took lots of deep thinking to figure out the logic. I come from a stochastic process / probability theory and differential equations / calculus background.

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