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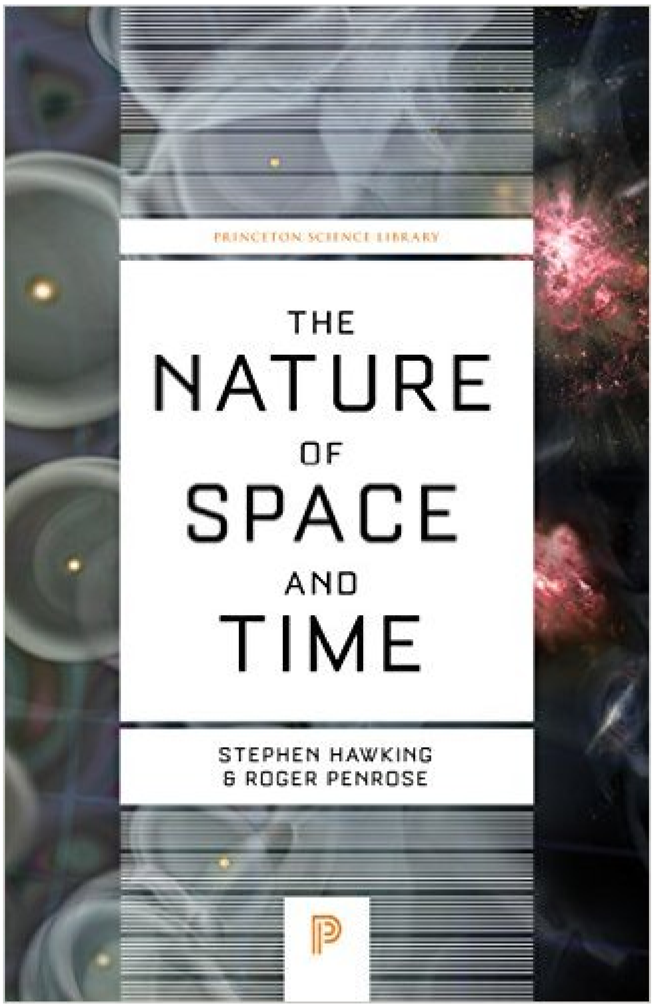
# The Nature Of Space And Time (Princeton Science Library)




## Synopsis

Einstein said that the most incomprehensible thing about the universe is that it is comprehensible. But was he right? Can the quantum theory of fields and Einstein’s general theory of relativity, the two most accurate and successful theories in all of physics, be united in a single quantum theory of gravity? Can quantum and cosmos ever be combined? On this issue, two of the world’s most famous physicists--Stephen Hawking (A Brief History of Time) and Roger Penrose (The Emperor’s New Mind and Shadows of the Mind)--disagree. Here they explain their positions in a work based on six lectures with a final debate, all originally presented at the Isaac Newton Institute for Mathematical Sciences at the University of Cambridge. How could quantum gravity, a theory that could explain the earlier moments of the big bang and the physics of the enigmatic objects known as black holes, be constructed? Why does our patch of the universe look just as Einstein predicted, with no hint of quantum effects in sight? What strange quantum processes can cause black holes to evaporate, and what happens to all the information that they swallow? Why does time go forward, not backward? In this book, the two opponents touch on all these questions. Penrose, like Einstein, refuses to believe that quantum mechanics is a final theory. Hawking thinks otherwise, and argues that general relativity simply cannot account for how the universe began. Only a quantum theory of gravity, coupled with the no-boundary hypothesis, can ever hope to explain adequately what little we can observe about our universe. Penrose, playing the realist to Hawking’s positivist, thinks that the universe is unbounded and will expand forever. The universe can be understood, he argues, in terms of the geometry of light cones, the compression and distortion of spacetime, and by the use of twistor theory. With the final debate, the reader will come to realize how much Hawking and Penrose diverge in their opinions of the ultimate quest to combine quantum mechanics and relativity, and how differently they have tried to comprehend the incomprehensible. --This text refers to an out of print or unavailable edition of this title.

## Book Information

File Size: 5443 KB

Print Length: 144 pages

Publisher: Princeton University Press; With a New afterword by the authors edition (February 8, 2010)

Publication Date: February 8, 2010

Sold by:Â  Digital Services LLC

Language: English

ASIN: B003VPWWC0

Text-to-Speech:  Enabled

X-Ray:     Not Enabled

Word Wise: Not Enabled

Lending: Not Enabled

Enhanced Typesetting:  Enabled

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## Customer Reviews

This was an early attempt to capitalize on Hawking's commercial success with the Brief History. Roger Penrose, Hawking's PhD advisor, has also written some really fascinating books for lay readers on philosophical implications of physics such as on the nature of intelligence. However, combining the two in a debate, the form of this book, cancels out the reader-friendly accessibility of their solo works as their egos take charge and they try to outperform each other. It makes sense after the fact that if they're debating, they must be discussing matters on which they disagree, and since physics is so well settled and understood on all but the most esoteric and advanced questions, the subject matter of their disagreements must lie in that advanced realm. Of course, "advanced" is a vastly relative term to apply to physics, since many ordinary readers would balk at any physics material. But I have a degree in physics, albeit only a BS - and after the initial material I have to struggle to follow anything they're saying! They should stamp this book's cover with a caveat emptor; this is no "Brief History of Time" or "Elegant Universe." They even mention at the outset that they assume the reader has a basic understanding of physics, but these guys' idea of a basic understanding is a Ph.D. specializing in general relativity. Having said all that, the book still makes for heady reading from what I could pick up here and there, so it's a thrill if you're up to it.

I really enjoyed this book. It goes beyond the popular accounts of Hawking's and Penrose's ideas, without going into all the technical detail. You get to find out (sort of) why Hawking attributes entropy to black holes, and his explanation of why we don't see the galaxies in quantum superposition. And Penrose's ideas about twistors and quantizing them, and people's caveats about twistor theory.It would help to be familiar with:- Feynman integral over paths- what is the action, and how it becomes a phase in quantum mechanics- Euler characteristic- special relativity, what spacelike, timelike and null mean- Basic topology and analysis. Like what does "compact" imply.- thermodynamic partition function- contour integral in complex analysis- what is a manifold- how you find the expectation of an operator in quantum mechanics- decoherence in quantum mechanics- what is a conformal mapThat sort of thing.

In spite of the errors mentioned in another review the discussion was fairly interesting but not as great a "debate" as I anticipated. I'd spend my money on Penrose's "The Emporer's New Mind" before this one. For those interested in Black Holes, Kip Thorne's "Black Holes and Time Warps ..." is exceptionally well written and rewarding for the reader. For the technically [mathematically] apt who wants an fascinating treatice on spacetime, try John Wheeler and Ignazio Ciufolini's book on Geometrodynamics (Princeton Univ. Press).

This is a fairly technical book, not a book that "explains science to the lay person." You have to have some familiarity with general relativity and the math that goes with it. I'll keep reading it, but much of it will go over my head. Just so you know.

To really appreciate this book requires an understanding of physics. Not the superficial stuff where you still believe that Newton was right, but Quantum Mechanics, Topology, and General Relativity.

I found this to be a fascinating overview of some of the major issues in cosmology from both Hawking and Penroses point of view. What is amazing is the actual level of agreement between the two. Perhaps only the real physicists appreciate the nuances of their differences of opinion.I would recommend this book for anyone who's gone to the trouble of picking up a basic understanding of relativity ( special and/or general ).The math is not terrbily daunting in most places and you get a real overview for the big picture of the state of relativity and quantum gravity.

If you liked "The Road to reality" and have an understanding of the Mathmatics of Quantum Physics and Relativity then you will enjoy this book. Otherwise don't bother.

The subject and the contents of this book is very interesting. However, you have to know quite a lot mathematics .....Far above my level!

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