



Cycles of Time: An Extraordinary New View of the Universe

By Roger Penrose

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This groundbreaking book presents a new perspective on three of cosmology's essential questions: What came before the Big Bang? What is the source of order in our universe? And what cosmic future awaits us?

Penrose shows how the expected fate of our ever-accelerating and expanding universe—heat death or ultimate entropy—can actually be reinterpreted as the conditions that will begin a new “Big Bang.” He details the basic principles beneath our universe, explaining various standard and non-standard cosmological models, the fundamental role of the cosmic microwave background, the paramount significance of black holes, and other basic building blocks of contemporary physics. Intellectually thrilling and widely accessible, *Cycles of Time* is a welcome new contribution to our understanding of the universe from one of our greatest mathematicians and thinkers.

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Editorial Review

Review

“A surprising and unorthodox work. . . . Deeply enlightening.”

—*The Wall Street Journal*

“The hyper-density of this book made my brain feel simultaneously wiped out and dazzled.”

—Anthony Doerr, Best Science Books of the Year, *The Boston Globe*

“An intellectual thrill ride. . . . There’s no science fiction here, no imaginative filling in the gaps. There is, however, a very strong scientific case for expanding the boundaries of our thinking.” —*Washington Independent Book Review*

“Science needs more people like Penrose, willing and able to point out the flaws in fashionable models from a position of authority and to signpost alternative roads to follow.” —*The Independent*

“If you’ll forgive a skiing metaphor, *Cycles of Time* is a black diamond of a book. But like all steep slopes, sometimes you take a moment from your struggles and look up, and in front of you is an utterly gorgeous view.” —*The Boston Globe*

“Truly extraordinary. . . . This fascinating book will surely become a classic in the history of cosmology.” —*Choice*

“Of interest to anyone who is interested in the world, how it works, and how it got here. . . . The best thing to do is to take a deep breath, grab a copy of this fascinating book, and plunge right in.” —*New York Journal of Books*

“We must understand why the universe began in an incredibly special state, so well ordered that 14 billion years later, the universe still has not reached maximum disorder. Penrose is at his best when he explains this deep and beautiful mystery, and the book may be worth reading for this chapter alone.” —*Science*

“A genuinely new idea about the origins of the universe . . . [which] must be taken seriously.” —*The Scotsman*

“As uncondescending in style . . . as his previous books. . . . [There are] many pleasures to be had.” —*The Sunday Times* (London)

About the Author

Roger Penrose is Emeritus Rouse Ball Professor of Mathematics at the University of Oxford. He has received numerous prizes and awards, most notably the Wolf Foundation Prize in physics, which he shared with Stephen Hawking, and The Royal Society's Copley Medal. He is the author of three previous books, including *The Emperor's New Mind*. He lives in Oxford, England.

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PREFACE

One of the deepest mysteries of our universe is the puzzle of whence it came.

When I entered Cambridge University as a mathematics graduate student, in the early 1950s, a fascinating cosmological theory was in the ascendant, known as the steady-state model. According to this scheme, the universe had no beginning, and it remained more-or-less the same, overall, for all time. The steady-state universe was able to achieve this, despite its expansion, because the continual depletion of material arising from the universe's expansion is taken to be compensated by the continual creation of new material, in the form of an extremely diffuse hydrogen gas. My friend and mentor at Cambridge, the cosmologist Dennis Sciama, from whom I learnt the thrill of so much new physics, was at that time a strong proponent of steady-state cosmology, and he impressed upon me the beauty and power of that remarkable scheme of things.

Yet this theory has not stood the test of time. About 10 years after I had first entered Cambridge, and had become well acquainted with the theory, Arno Penzias and Robert Wilson discovered, to their own surprise, an all-pervading electromagnetic radiation, coming in from all directions, now referred to as the cosmic microwave background or CMB. This was soon identified, by Robert Dicke, as a predicted implication of the 'flash' of a Big-Bang origin to the universe, now presumed to have taken place some 14 thousand million years ago—an event that had been first seriously envisaged by Monsignor Georges Lemaître in 1927, as an implication of his work on Einstein's 1915 equations of general relativity and early observational indications of an expansion of the universe. With great courage and scientific honesty (when the CMB data became better established), Dennis Sciama publicly repudiated his earlier views and strongly supported the idea of the Big Bang origin to the universe from then on.

Since that time, cosmology has matured from a speculative pursuit into an exact science, and intense analysis of the CMB—coming from highly detailed data, generated by numerous superb experiments—has formed a major part of this revolution. However, many mysteries remain, and much speculation continues to be part of this endeavour. In this book, I provide descriptions not only of the main models of classical relativistic cosmology but also of various developments and puzzling issues that have arisen since then. Most particularly, there is a profound oddness underlying the Second Law of thermodynamics and the very nature of the Big Bang. In relation to this, I am putting forward a body of speculation of my own, which brings together many strands of different aspects of the universe we know.

My own unorthodox approach dates from the summer of 2005, though much of the detail is more recent. This account goes seriously into some of the geometry, but I have refrained from including, in the main body of the text, anything serious in the way of equations or other technicalities, all these being banished to the Appendices. The experts, only, are referred to those parts of the book. The scheme that I am now arguing for here is indeed unorthodox, yet it is based on geometrical and physical ideas which are very soundly based. Although something entirely different, this proposal turns out to have strong echoes of the old steady-state model!

I wonder what Dennis Sciama would have made of it.

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Why? Because this Cycles of Time: An Extraordinary New View of the Universe is an unordinary book that the inside of the book waiting for you to snap the idea but latter it will zap you with the secret it inside. Reading this book next to it was fantastic author who else write the book in such awesome way makes the content interior easier to understand, entertaining method but still convey the meaning totally. So , it is good for you for not hesitating having this anymore or you going to regret it. This unique book will give you a lot of positive aspects than the other book have such as help improving your expertise and your critical thinking way. So , still want to delay having that book? If I were you I will go to the reserve store hurriedly.

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