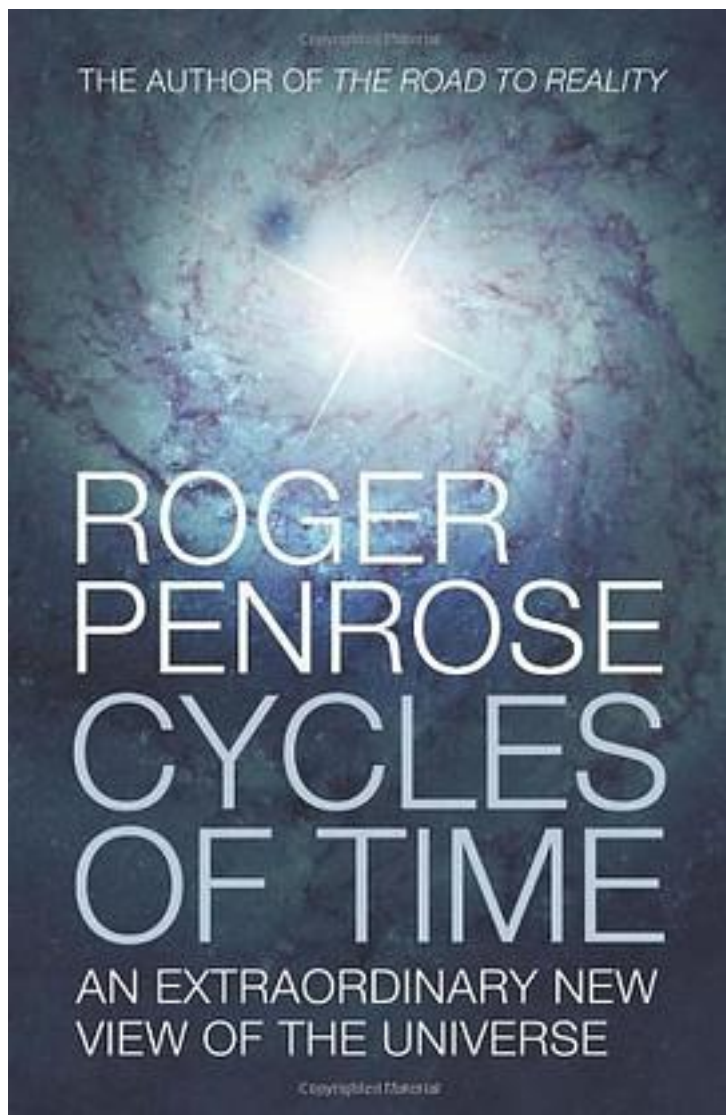# Cycles of Time

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著者:Roger Penrose

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A groundbreaking book providing a new take on three of cosmology's most profound questions: What, if anything, came before the Big Bang? What is the source of order in our universe? What is the universe's ultimate future?

Current understanding of our universe dictates that all matter will eventually thin out to zero density, with huge black holes finally evaporating away into massless energy. Roger Penrose—one of the most innovative mathematicians of our time—turns around this predominant picture of the universe's "heat death," arguing how the expected ultimate fate of our accelerating, expanding universe can actually be reinterpreted as the "Big Bang" of a new one.

Along the way to this remarkable cosmological picture, Penrose sheds new light on basic principles that underlie the behavior of our universe, describing various standard and nonstandard cosmological models, the fundamental role of the cosmic microwave background, and the key status of black holes.

Intellectually thrilling and accessible, Cycles of Time is another essential guide to the universe from one of our preeminent thinkers.

作者介绍:

罗杰·彭罗斯是牛津大学的Rouse Ball数学讲席终身荣誉教授。他获得过许多奖项，包括1988年与斯蒂芬·霍金一道因对宇宙学做出的重大贡献而获得的沃尔夫物理奖。他的著作还有《皇帝新脑》（The Emperor's New Mind）和《通向实在之路》（The Road to Reality）等。

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Audio just couldn't do the job.

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书评

上回说了，循环的CCC自然面对着两个问题：遥远的未来如何与大爆炸的起点等同起来呢？循环如何满足"永不循环"的热力学第二定律？
CCC对那两个问题的回答是：第一，宇宙的初态是低熵的，而终态是高熵的，其演化满足热力学第二定律；第二，一个世代的初态与前一个世代的终态…

上回说了，CCC是靠Weyl曲率来实现的，Weyl曲率是CCC的数学核心。这回就复习那个著名的张量。
Weyl曲率的故事大概可以从30多年前说起。1979年，剑桥大学出版社出版了一本由霍金等人编辑的纪念爱因斯坦的文集General relativity: An Einstein Centenary Survey（Eds. S W Haw…

40多年前，彭罗斯（与霍金一起）证明了奇点定理，这是他对宇宙学的最大贡献，我喜欢说那是数学的一小步（将整体微分几何用于时空结构），宇宙学的一大步。奇点定理说，在几个简单的合理的条件下（如能量条件、时序性等），时空是不完备的（即存在不能延伸的非类空测地线）。…