

been learned, what can still be learned, and what topics are still completely mysterious in particle physics within the standard model. After a review of deep inelastic lepton-hadron scattering, he emphasizes issues related to the spin-dependent scaling functions—from the standpoint of the parton model and its field theory justification [using the Feynman diagram approach]. He discusses the “spin crisis” in the context of attempts to use data to find the carriers of spin in the nucleon, QCD corrections, inclusive and semi-inclusive reactions, and elastic scattering, among other topics, always emphasizing issues connected to spin dependence. The production of polarized hyperons and antihyperons is one such issue still shrouded in mystery.

I am enthusiastic about this book. It is carefully and clearly written. Each of the three sections will be useful to a specific audience. The book as a whole should be in every university and research institution library; however, it is not suitable as a text for a graduate course in particle physics, nor will many individuals find it a necessary part of their personal libraries.

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Fundamentals of Cosmology

James Rich
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James Rich's *Fundamentals of Cosmology* was a pleasure and distraction to review. The book provides a comprehensive and thorough explication of current cosmology at a level appropriate for a beginning physics graduate student or an advanced and motivated undergraduate. It covers all the relevant concepts of cosmology and pertinent general relativity and contains a significant number of exercises, with solutions to a sample set. This book clearly is a result of the refining of notes from a course on cosmology. (Rich regularly teaches a cosmology course at the University of Paris and l'Ecole Polytechnique in Paris.)

While in principle it would be possible to learn modern cosmology from *Fundamentals of Cosmology* from scratch, most readers would find it helpful to have been exposed first to a slightly more introductory text, such as *First Principles of Cosmology* by Eric V. Linder (Addison-Wesley, 1997).

Linder is appropriate to upper-level undergraduate physics majors and provides clear, logical explanations of the fundamental principles. There are other, more introductory books, such as *Introduction to Cosmology* by Matts Roos (Wiley, 1994 and 1997), and popular books that introduce the reader to the basic concepts. Rich's approach is both mathematically and conceptually advanced and is set to develop the reader's understanding of cosmology to a deeper level than a first introduction.

Fundamentals of Cosmology does present a clear, accurate, and complete description of current cosmology. The book does not retrace the history of cosmology but goes directly to the current observational status and gives a direct approach to modern cosmology. It provides a summary of current observations and mathematical underpinnings of the physical principles. This is an extremely valuable contribution in the field, which has been changing rapidly as a result of new technology and new theoretical motivations from the related field of high-energy physics. Concepts, such as the current acceleration of the universal expansion as a result of a mysterious “dark energy,” exotic dark matter, and scalar fields, are placed in the context of our current standard model of cosmology.

A shortcoming of the book—one that renders it conservative—is that string/M theory and the possibility of extra dimensions are not discussed even briefly. These topical and speculative areas may turn out to be relevant or generate new concepts that become features of cosmology. The book is, however, modern and up to date in areas that were considered rank speculation a few years ago.

These are exciting times for cosmologists. New telescopes, space missions, and instruments are generating data at an impressive rate, and new experiments are going online almost daily. We can anticipate answers and insights to some of the big, long-asked questions. This book provides a good look at the intellectual effort and a solid foundation for the new discoveries soon to come.

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