

list Peter Goodwin analyzes the likelihood of nuclear war, the effects to be expected from it and the prospects for survival after it. Although in his introduction he claims his analysis is neutral, it is clear he is convinced and aims to convince any unsuspecting reader that the likely consequences of even a limited counterforce nuclear attack would be unimaginably devastating. After one reads the first four chapters describing how nuclear wars could begin and what they would leave, the chapters on how to prepare and to protect oneself seem a bit anticlimactic and silly.

Despite its limitations, the Lovins' book is recommended reading for anyone who doesn't comprehend the connections between nuclear-power development and nuclear proliferation. Goodwin's book can only be recommended as a gift to an acquaintance who is deluded by the concept of winnable limited nuclear warfare or who is about to invest life savings in a fallout shelter.

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The Isotropic Universe

D. J. Raine
253 pp. Hilger, Bristol, 1981. \$49.00

During the past two decades, the study of cosmology has grown into a branch of physical science. The intense research activity in this area and the wide appeal of this subject have generated a number of fine research monographs and advanced texts as well as many good elementary texts. D. J. Raine's *The Isotropic Universe* is an introductory cosmology text that helps fill the gap between these two extremes. It requires no previous knowledge of cosmology but does assume an undergraduate background in physics and a basic knowledge of astrophysics. As such, it should serve not only as a text for advanced undergraduate or beginning graduate students but also as an introduction to cosmology for researchers in other branches of physics and astronomy.

The first third of the book, treating physical cosmology, begins with a discussion of galaxy clustering and correlation functions. A section on Olbers's paradox discusses the Hubble constant and the expansion and evolution of the universe. Chapters on the cosmic microwave and x-ray backgrounds and on the masses of galaxies and the intergalactic medium set the stage for the relativistic cosmological models whose properties and consequences occupy the rest of the book.

As the sections on physical cosmology show, the modern study of the

universe draws heavily on many different branches of physics. One of the most important of these areas is general relativity, a subject that is not widely taught. To derive the cosmological models without relativity in a text such as this would rob the subject of much of its power. Fortunately, Raine has avoided that shortcoming. By first reformulating the familiar Newtonian gravity in terms of the equivalence principle, he shows that general relativity is a natural generalization of that theory. He uses local coordinate systems to introduce the metric, geodesic deviation and cosmological models. Employing physical rather than mathematical arguments at each stage, here as elsewhere, he always keeps physics to the fore. The more mathematical parts of the theory, necessary for those who wish to pursue the subject further, are explained in sections that can be skipped in a first reading of the book without detracting from the presentation.

Consistent with the title of the book is Raine's emphasis on the high degree of isotropy as the main observational feature of the universe that must be borne out and, perhaps, explained in any acceptable cosmological model. The homogeneous, isotropic Robertson-Walker models play a key role in the rest of the book. In a chapter on matter and radiation he explicates the standard model of the universe, starting with a hot big-bang and continuing through nucleosynthesis, the plasma period and recombination. He also includes interesting discussions of Mach's principle, its influence on Einstein and its relation to isotropy.

This book would be even more useful if there were more references throughout the text, or at least at the end of each chapter, to make it easier for students to follow the various topics into the literature. Another improvement would be the mention of the "pancake" theory of galaxy formation, developed by Zeldovich and coworkers, in the chapter on structure in the universe. In all, *The Isotropic Universe* is an interesting and well-balanced cosmology text.

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new books

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IEEE Transactions on Nuclear Science: IEEE Annual Conference on Nuclear and Space Radiation Effects, 1981, Seattle. D. Tasca, ed. 73 pp. IEEE Nuclear and Plasma Sciences Society, New York, 1981. no price stated

Nuclear Structure. Proceedings of the Netherlands Physical Society 1980 International Summer School, Dronten. K. Abrahams, K. Allaart, A. Dieperink, eds. 432 pp. Plenum, New York, 1981. \$49.50

Electron and Ion Swarms. Proceedings of the Second International Swarm Seminar, Oak Ridge, Tennessee, July, 1981. L. Christophorou, ed. 279 pp. Pergamon, New York, 1981. \$22.50

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Institute on the Science and Technology of Superconducting Materials, August, 1980, Sintra. S. Foner, B. Schwartz, eds. 969 pp. Plenum, New York, 1981. \$85.00

Proceedings of the Seventh International Cryogenic Engineering Conference, London, July, 1978. 727 pp. IPC Science and Technology, Surrey, England, 1978. \$85.80

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