

An incessant search for new approaches

Surely You're Joking, Mr. Feynman! Adventures of a Curious Character

Richard P. Feynman (as told to Ralph Leighton)

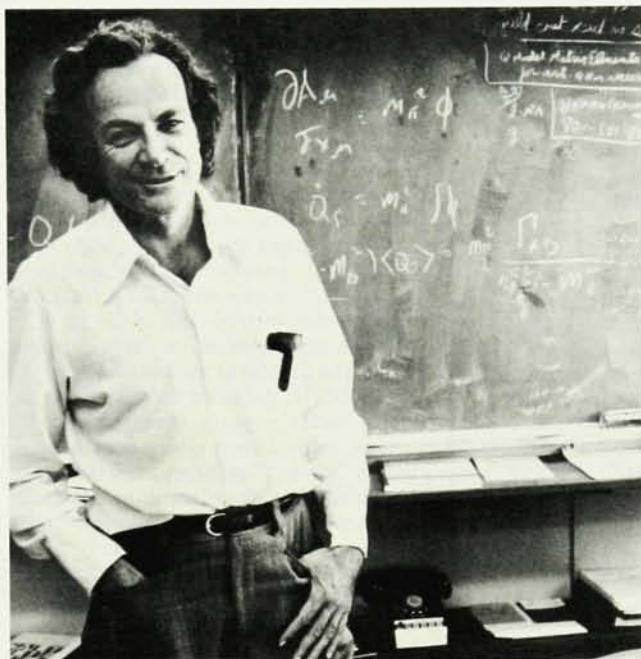
350 pp. Norton, New York, 1985. \$16.95

Reviewed by Malvin C. Teich

This may be one of the briefer reviews to appear in the pages of this magazine. The reason is simple: This book is *must* reading for every physicist who might entertain the notion that the codes and laws of social behavior merit the same kind of scrutiny as the laws of physics.

Richard P. Feynman is known to all of us as a superb physicist (Nobel Prize, 1965), an anti-philosopher (1964 Messenger Lectures at Cornell University, published as *The Character of Physical Law*, MIT Press, 1965) and the lucid originator of a now-classic series of undergraduate physics books (*The Feynman Lectures on Physics*, Addison-Wesley, 1963, 1964, 1965). Most recently, he has been an outspoken member of the Presidential commission investigating the Challenger space shuttle disaster: Newspaper headlines have reported his impromptu experiments with O rings in ice water during an open hearing, and we have seen him on the evening television news.

In this recent book, which has little to do with physics *per se*, Feynman is the autobiographical storyteller of his incessant search for new ways of approaching life's daily interactions. Some will find his tale of irreverent escapades and assaults on social convention outrageous and amusing, and others will find it simply outrageous. Feynman cherishes this aspect of his persona; as he does in physics, he revels in challenging the givens to see where they might yield. With almost child-like fascination, he approaches virtually every situation in the context that most of us reserve for scientific exploration:



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as an opportunity to carry out an experiment. He thrives on exploring the consequences of bringing his own approach to bear on whatever situation is at hand, be it scientific or social.

Feynman is an expert entertainer who loves an audience and always manages to garner one. This is because he is adventuresome and fearless—and essentially un-embarrassable. He is always out to enjoy himself; to him this means attempting to play every possible role. Although the book is virtually a litany of Feynman's tricks and ruses, it is nevertheless pervaded by an essential honesty, because Feynman is willing to expose candidly his own weaknesses and limitations.

If you are nonjudgmental in your appraisal of others, I think it likely that you will enjoy this book immensely. If, on the other hand, you respect decorum and formality in interpersonal relations, your response may be more guarded. In surveying a number of my colleagues, I discovered that a few were put off by Feynman's bravado and unbridled dedication to one-upman-

ship; however, all found the book fascinating. It is an entertaining piece of work and it provides a lively focus for discussion. I recommend it highly.

Gravitational Physics of Stellar and Galactic Systems

William C. Saslaw

491 pp. Cambridge U.P., New York, 1985. \$90.00

It is a pleasure to read this book, simply to appreciate the scholarship. A rigorous exposition of all the mathematical and physical tools needed to analyze gravitational phenomena in astronomy sounds like heavy reading. But the writing is so well crafted, and the insights and interconnections are so satisfying, that one cannot help enjoying it just for the sake of absorbing intellectually challenging information.

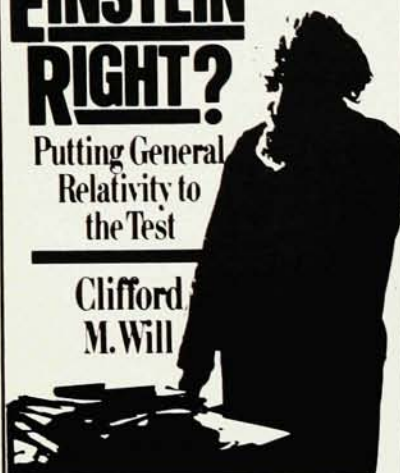
William Saslaw, as a teacher and an eminent, original researcher in these areas, is admirably qualified to write the book—the first comprehensive re-

Malvin C. Teich is a professor of engineering science at Columbia University. Like Richard Feynman, he has been affiliated with Far Rockaway in New York City, MIT and Cornell University. While a graduate student, he attended the 1964 Messenger Lectures delivered by Feynman.

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view and update of the subject for more than a generation. Of course it will be useful as a text. It will also serve as an effective reference for solving a wide range of difficult problems in gravitational astronomy. The book treats all aspects of Newtonian gravity: the general equations of motion and various approximations, dynamical friction, relaxation, coherent phenomena, star-gas interactions, gravitational thermodynamics and related subjects. In addition to developing and writing down the fundamental theory, Saslaw discusses applications to many important problems in astronomy: the virial theorem applied to aggregates of stars and galaxies, dynamics of evaporation and escape, slingshot mechanisms, the role of a central singularity, dynamics of galaxies and star clusters, and evolution and formation of galaxy clusters.

It is indicative of the honesty of the book that it does not pretend to solve all problems. After all, many astronomical phenomena are probably not determined by gravitational phenomena alone. A valuable example is Saslaw's explanation of how difficult it is, with present assumptions, to form galaxies out of the primeval medium. He wryly remarks, "If galaxies did not exist we could easily explain their absence."

One subject that slides past a little fast is "violent" relaxation. This much heralded idea would explain the paradox, noted by Fritz Zwicky in 1960, that stellar systems needed a time many times the age of the universe to reach their currently observed relaxations. It is perhaps true that the further a system is from equilibrium, the faster and more violently it relaxes. But the problem of going from near equilibrium to the observed relaxation on the time scale currently accepted is still not solved.

The account of the density-wave concept for spiral galaxies is unusually comprehensible. It is a credit to this book that it frankly discusses the great difficulties of both triggering and sustaining spiral density waves. It also mentions in several places that magnetic fields can transfer momentum and energy. Many phenomena may depend on such forces, which are not within the scope of current analyses. The most amusing sally in the book is a comment on researchers who are on the quest for the "Holy Grail" of the missing mass.

Finally, however, there is the question of the grand design in astronomical phenomena. The gross properties—masses, shapes, ages and numbers—are the aspects we should most want to understand. There could be no more valuable contribution than to explore the force we know the most about, the force that is the most quantifiable and simple: Newtonian gravity. The depth

and rigor with which Saslaw develops the consequences of Newtonian gravity are absolutely essential. Because of this contribution to the analytical literature, whenever we encounter questions of grand design that cannot be accounted for based on these precepts, we will perhaps be wise enough to turn elsewhere.

HALTON ARP

Max Planck Institut für Astrophysik

The Theory of Magnetism II: Thermodynamics and Statistical Mechanics

D. C. Mattis

177 pp. Springer-Verlag, New York, 1985.
\$29.50

The cooperative properties of magnetic materials have provided a rich field of study for almost a century. Pierre Weiss made the first attempt to explain them in 1907 by introducing the concept of the molecular or mean field. Since then, large numbers of theorists have attempted to improve on this model. The present book tries to review some of the many elegant and sophisticated developments in this area of statistical mechanics.

This is clearly a formidable task, especially for a slim volume of only 177 pages. D. C. Mattis, well known for his work on exactly soluble models and also for an earlier book, *The Theory of Magnetism I* (Springer-Verlag, 1981), has selected about 30 topics to illustrate the methods used in this field. The main purpose of the book is to introduce the reader to the existing theoretical techniques; the treatment is generally quite mathematical, and there are only a few references to experimental results.

The topics are grouped under two main headings. The first, "Statistical thermodynamics," covers the fundamental ideas of statistical mechanics, molecular field theory and its consequences, and a number of the basic models, including the Gaussian and spherical models, spin-glass models and one- and two-dimensional xy models. The second part is devoted entirely to the Ising model and deals with most of the related standard topics, including series expansions, the exact solutions in one and two dimensions and approximate solutions in three dimensions. This part is somewhat more coherent than the first because it deals essentially with only one model, but the different subsections are all, to some extent, independent.

The book should be useful, therefore, as much as a reference source as an introductory text. As always in a book of this sort, it is difficult to judge whether each topic is sufficiently explained for the reader who is really