experiments when making comparisons to theory and also when showing the present state of knowledge in a particular area. Thus the interested reader not only has a fine guide to the theoretical literature, with some emphasis on the recent theoretical approaches taken by Glyde and his collaborators, but also has an appropriate guide to the relevant experimental data base in the field.

This is a fine book. I highly recommend it to those who are entering the field, those who want a tutorial on the subjects covered and those who want a guide to the relevant literature.

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An Introduction to Quantum Field Theory

Michael E. Peskin
and Daniel V. Schroeder
Addison-Wesley, Reading, Mass. 1995. 842 pp. $54.95 hc
ISBN 0-201-50397-2

The absence of a comprehensive, modern treatment of quantum field theory aimed at nonexperts has for many years been a barrier to those wishing to learn the subject. *An Introduction to Quantum Field Theory* by Michael Peskin and Daniel Schroeder more than meets this need and should also provide a valuable reference for practitioners of the art.

The book is geared toward particle physics applications of quantum field theory, but connections to other areas—particularly statistical mechanics and critical phenomena—are made along the way. The overall presentation reflects senior author Peskin's calculational approach to the subject as well as his pedagogical style (which I had the good fortune to experience as a graduate student). Thoughtfully, the authors have devoted a Web page on the Internet to the cumulative correction of errors and typos appearing in their book.

The book's first section motivates the introduction of field quantization with a demonstration of the incompatibility of single-particle quantum mechanics and relativistic causality, then proceeds with free-field quantization. Feynman graphs make their appearance as a set of rules for time-ordered perturbation theory (thus emphasizing familiar quantum-mechanics methodology at the expense of more elegant but formal path-integral techniques). The scattering matrix and an introduction to radiative corrections (mostly in quantum electrodynamics) conclude this part, which stands alone as a full semester of course material.

After an overview of path integrals and functional methods, the second section explores the systematics of renormalization of the graphical expansion. Then comes one of the great strengths of the text—two chapters on the renormalization group and critical phenomena. While comparable treatments of the perturbative evolution of couplings and operator correlation functions may be found elsewhere, Peskin and Schroeder explain their conceptual connection to the modern Wilsonian viewpoint underlying quantum field theory. This perspective teaches us that all field theory is an "effective" or approximate description—physics at a given scale is determined by physics at smaller scales, which may have rather different field content and dynamics. Moreover, it relates scaling in field theory induced by quantum fluctuations to scaling induced by thermal fluctuations in statistical mechanics, thus bringing to

bear a rich and fruitful set of analogies.

The final section constitutes the essentials of non-Abelian gauge theory: the rudiments of Lie group theory and the geometry of gauge connections, Faddeev–Popov ghosts, anomalies and so on. This lays the foundation for a rather extensive overview of quantum chromodynamics and electroweak theory, from deep inelastic scattering and the parton model to quark mixing and flavor-changing neutral currents.

The orientation is definitely towards perturbation theory and, while the authors are correct that much insight is attained through this route, one could wish for at least a survey of nonperturbative methods—particularly instanton calculus, soliton solutions and other semiclassical methods. Related to this is a de-emphasis of path integral intuitions, which provide a useful heuristic. However, these presentation choices on the part of the authors probably reflect a decision to take the shortest route to connecting the formalism with the experiments it is designed to explain.

Students in my course on quantum field theory, most of whom are inclined toward experimental physics, liked the book; one applauded the avoidance of excessive formalism. They also found the problems at the end of each chapter worthwhile. The concrete calculations that permeate the text are helpful for the beginner, although a number of students wished for more intermediate steps to be shown.

In the past, it has been common for beginning students of quantum field theory to rely on a variety of source materials. Peskin and Schroeder have replaced this hodgepodge with a single, coherent introduction to this vital area.

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Plasma Astrophysics

J. G. Kirk, D. B. Melrose and E. R. Priest
Springer-Verlag, New York, 1994 (Reissue). 324 pp.
$68.00 hc ISBN 0-387-58327-0

Plasma Astrophysics is number 24 in the highly respected Saas-Fee Advanced Course series, based on an annual school given in the Swiss Alps. Like its predecessors in the series, *Plasma Astrophysics* consists of three sections on a closely related theme. These, titled magnetohydrodynamics, kinetic plasma physics and particle acceleration, were prepared respectively by Eric R. Priest, Don B. Melrose and John G. Kirk, all prominent scientists in their respective disciplines. The authors pitch their material at a level between those of introductory texts for astrophysics graduate students and the primary journal literature. Each section is about 100 pages long and covers substantial ground. The result is a superior monograph that is certain to be valuable to both graduate students and practicing researchers for its compact but comprehensive theoretical treatment of several fundamental—and often technically difficult—areas of astrophysics.

Priest's section, on MHD, begins with a beautifully illustrated observational account of magnetic activity in the solar corona. He then lays out the basic equations of MHD, discusses the properties and uses of force-free and current-free solutions in magnetostatics and describes the families of MHD waves and MHD shocks.

Priest devotes a chapter each to solar wind and magnetic reconnection models. The remainder of his section applies the foregoing ideas to the mod-