minimum of practical application. This enables the author to spend half of the book discussing renormalization and its physical implications.

The first half of the book is a valuable, if spare, introduction to Feynman diagram methods. Some topics, the nonrelativistic limit of the Dirac equation in particular, are given beautiful and novel treatments. More often, Huang takes the standard route and covers the ground in a terse mathematical style. The clean and compact way that he has organized the subject has real value. Nonetheless, certain topics need more flesh. For example, a full chapter on Green's functions works up to a derivation of the Bethe–Salpeter equation but then has no space for any application to bound states in a real system.

In the second half of the book, Huang presents the theory of renormalization and the renormalization group. He introduces Kenneth Wilson's method of integrating out degrees of freedom in the functional integral formalism of quantum field theory to generate a flow in the space of possible Lagrangians. He explains formally how this method describes the way the physical content of a quantum field theory changes as a function of the momentum scale and why renormalizable Lagrangians appear at fixed points of this flow. Unfortunately, the discussion does not include any Feynman-diagram computations that would show explicitly how the method works.

Even in the case of quantum electrodynamics, for which the momentum-dependent coupling constant had been computed in the first half of the book, Huang does not look back to convert this information into the new language he has developed. Similarly, the author mentions the ε expansion for critical exponents but fails to present any computations in this framework. Thus, the discussion of renormalization is left at a completely formal level.

The book also includes a discussion of the basic principles of spontaneously broken symmetry. One chapter gives a very clear presentation of the Kosterlitz–Thouless theory of phase transitions in the two-dimensional XY model. However, the applications of this theory are not carried beyond what was current in the mid-1970s, and the general picture of two-dimensional phase transitions afforded by conformal invariance is not discussed. References to elementary particle physics are even more dated.

Huang's book, then, falls short of its objective: to be a basic text that clarifies the meaning of renormalization. But the book does give instructive explanations of many specific aspects of quantum field theory and thus should be a useful reference work for students.

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An Introduction to Nonlinear Chemical Dynamics: Oscillations, Waves, Patterns, and Chaos

Irving R. Epstein
and John A. Pojman
Oxford U. P., New York, 1998.
392 pp. $75.00 hc
ISBN 0-19-509670-3

Nonlinear chemical dynamics is a young, rapidly developing field; it came into existence essentially in the late 1960s and has brought about a radical reassessment of a number of ideas that prevailed in the literature until then. One such idea is that, in purely dissipative systems—chemical reactions, for example—the second law of thermodynamics imposes a monotonic approach to a final stationary state. Nonlinear chemical dynamics has also played an instrumental role in advancing our understanding of rhythmic phenomena in biology, which are known to prevail at all levels of biological organization. And it has contributed substantially to the development of the wider field of nonlinear science and dynamical systems theory, by offering the most convincing, physically implementable models of complex behavior in systems involving few variables and kept free of spatial inhomogeneities.

Irving Epstein and John Pojman's *An Introduction to Nonlinear Chemical Dynamics* is intended to provide an introduction to the field at the advanced undergraduate or introductory graduate level. It consists of two parts of comparable length: an overview, including such topics as introductory kinetics, some selected models, elements of stability theory, the design and analysis of chemical oscillators, and patterns in spatially extended systems; and a special topics part, covering chaos, the role of external fields and delays, polymer systems, coupled oscillators, biological oscillators, Turing patterns, and stirring effects. The book concludes with two appendices devoted, respectively, to demonstrations and to the design of experiments for the undergraduate lab.

The authors are active researchers in the field and have shown over the years a firm commitment to the training of students and young scientists. Epstein played a pioneering role in the design and analysis of chemical oscillators and the study of stirring effects on chemical dynamics. He has also helped promote the field on an international scale, notably by organizing a 1982 Gordon research conference on the subject, the first of a continuing series that attracts impressive numbers of participants. Pojman was one of the first in the field to tackle systematically the incidence of nonlinear dynamics in polymerization processes.

The book, written in a pleasant, informal style, covers a wide range of topics, for which it provides both representative and illustrative examples and a good coverage of the literature. In this sense it succeeds in one of its goals: to introduce the reader to the phenomenology and ideas of nonlinear chemical dynamics. In most cases, however, the coverage is of the review paper style. As a result, after studying this book, readers will not have acquired the necessary tools and insight to apply their knowledge to new problems, nor will they have found a new technique that was perhaps missing from their background. In this respect, the book cannot be regarded as a reference textbook for students in the terminal years of study.

Despite this reservation, it should be noted that the book covers, for the first time, certain important topics that had been missing in the literature at this level, such as external fields, delays, polymer systems, and stirring effects. It also provides useful information on the operational aspects of chemical reactors.

All in all, the book constitutes a source of information to which both students and teachers interested in nonlinear science in general and in nonlinear chemical dynamics in particular may advantageously turn to complete a more technically oriented training.

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Acoustics: Basic Physics, Theory, and Methods

Paul Filippi, Dominique Habault,
Jean-Pierre Lefebvre,
and Aimé Bergassoli
Academic, San Diego, Calif., 1999.
317 pp. $69.95 hc
ISBN 0-12-256190-2

For years, there have been three standard popular texts for graduate-level