dent's first reading on the subject, but also for the astronomer who wants to refer back to original sources.

This book is an excellent summary of the astrophysics of HII regions and planetary nebulae. However, it should be pointed out that the astrophysics of supernova remnants is not completely covered in this book; nonthermal or synchrotron radiation is not discussed. I hope that a later edition or a second volume will more fully depict this important group of gaseous nebulae.

In addition to astronomers, many physicists may enjoy referring to this volume, especially those involved in classroom instruction or those interested in seeing the application of fundamental classical and quantum physics to a nearly ideal medium.

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Symmetry Principles in Solid State and Molecular Physics

M. Lax
499 pp. Wiley, New York, 1974. $19.50

Rotational invariance, translational periodicity, time-reversal, and other symmetry principles play a prominent role in many branches of theoretical physics and chemistry. Accordingly, a knowledge of how to use symmetry in theoretical analysis is an important ingredient in a scientific education. Many graduate students have brief encounters with symmetry (group theory) in quantum-mechanics and physical-chemistry courses, but very few gain a working knowledge of symmetry analysis without devoting considerable additional effort to this subject. Increasingly, students are taking specialized courses in group theory, which stress physical and chemical applications rather than the underlying mathematical foundation. Melvin Lax's new book is eminently suited for such courses in applied group theory.

One of the distinctive features of the book is that it begins by stating and illustrating rather than proving the fundamental theorems of group theory. In this way the student gets down to the subject directly. After carefully discussing the relationship between group theory and quantum (or classical) mechanics, Lax treats the most important features of the full rotation group, crystallographic point groups, space groups and their associated double groups. Most of the book is devoted to instructive problems in a number of fields, including crystal field theory, macroscopic-crystal tensors, molecular vibrations, energy-band theory, lattice dynamics, and molecular-orbital theory.

Another distinctive feature—and one of its great strengths—is that the book examines many group-theoretical problems that have arisen in recent research as well as many traditional problems. The book also features detailed treatments of space groups and time-reversal symmetry. These accounts are among the best available anywhere. Lax presents full-scale symmetry analyses of the vibrations of the ammonia molecule and the diamond crystal. These and other in-depth discussions should prove particularly valuable to the serious student. The book also contains many excellent problems and reference material as well.

After spending many years at Bell Laboratories, where the early drafts of this book were written, Lax joined the City College of the City University of New York as Distinguished Professor of Physics. He has made many important contributions to theoretical physics, not the least of which is this outstanding book. Many sections are based on original research by the author, and most are illuminated by his mathematical and physical insight. I am happy to recommend the book to students of physics and chemistry as well as to research workers in these and related fields. This is one of the best books presently available on the physical and chemical applications of group theory.

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The Wave Equation on a Curved Space-Time

F. G. Friedlander. 282 pp.
Cambridge U. P., New York, 1976. $39.50

In the last few decades, new methods have been developed in the theory of partial differential equations, methods based on the theory of generalized functions and, in particular, on the theory of distributions. The theory of distributions is not merely a convenient tool; it also enlarges the scope of the theory of partial differential equations in a useful way both mathematically and physically. *The Wave Equation on a Curved Space-Time* by F. G. Friedlander is an attempt to present to physicists the classical theory of the wave equation, developed mainly by Jacques Hadamard and Frigyes Riesz, using the modern language of distributions and differential geometry.

The first part of the book reviews differential geometry, the theory of distributions, and some basic aspects of characteristics and bicharacteristics of the wave equation. The second part is the main body of the book, which treats the general construction of fundamental solutions of the scalar wave equation and their application to the Cauchy problem. In the remainder, generalizations of the theory to tensor wave equations in a space–time and to the corresponding equations in space–times of arbitrary dimension are developed.

The theory presented is local, because the classical theory of Hadamard and Riesz is constructive, and this book simply attempts to state it in a modern language. Also, the abstract approach involving Sobolev spaces is not touched. Hence this book might be disappointing for a physicist who wants a broad exposition of the modern theory of partial differential equations. However, Friedlander treats his rather narrowly chosen topic in an intensive, well organized way. One unsatisfactory point is that he does not include an example to illustrate the main theory of the book. As the author points out, there are very few examples. Nevertheless one could find, I think, some good illustration that would make this book much more attractive to physicists.

The main audience for the book will be general relativists, who often encounter problems involving basic aspects of the wave equation on a curved space–time. One instance is the Cauchy problem for Einstein's equations: how does one specify data on a spacelike hypersurface or on a characteristic half-hypercone in such a way that at later times a solution of Einstein's equations can be found that is consistent with the given data?

On the whole, I would say that this is a well written book and that it clarifies the basic mathematical structure of the wave equation on a curved space–time. Friedlander's volume will be useful to graduate students in general relativity who want a deeper understanding of the Cauchy problem for Einstein's equations.

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Solar-Energy Thermal Processes

J. A. Duffie, W. A. Beckman
386 pp. Wiley, New York, 1974. $16.95

Given the current interest in the utilization of solar energy, this timely book meets an important need. According to the authors the purpose of this volume is to summarize the state of knowledge in the design of uses for solar thermal processes and to present this summary in a form that will be useful to engineers. Actually, the coverage in *Solar-Energy Thermal Processes* is restricted to thermal processes in which solar radiation is absorbed by a solid surface in