exposition of the basic elements of group theory. In the last two thirds, Rosen gives his perspective on the meaning of symmetry in physical theory. In spite of being designated a "primer," the book is not easily digested because many of the arguments in the latter portion of the book are quite formal. While the required physics background is slight, the demands of abstraction placed on the reader are great. Regrettably, the returns are not commensurate with the effort required.

The treatment of group theory is fairly conventional and rather clearly presented. The concepts of isomorphism, homomorphism, conjugacy classes, and cosets are explained effectively. Unfortunately, this strong feature of the book is not exploited, for many of the concepts so well presented in the first two chapters never reappear in the final four.

Unlike the treatment of group theory, the discussion of symmetry is very idiosyncratic. The presentation is not restricted to quantum systems whose states give representations of the existing symmetries. Instead the author deals with "states" in a more general way, including simultaneously quantum states and macroscopic states. This generalization leads to a very formal development and the invention of an extensive vocabulary that must be mastered: "Laws of nature . . .we called 'causal relations in systems' when the 'systems' are processes in physical systems, with the 'cause subsystem' being the initial state of the physical system and the 'effect subsystem' its final state." Because such passages abound and useful physical examples are few, the book cannot be recommended as a text.

The style of the book is overly colloquial, sounding much as if it were a transcript of a lecture, and there is a condescending quality which reaches its apex when, on page 157, we are presented the information: "(Isaac Newton, English philosopher and mathematician, 1642–1727)." Newton was, of course, a natural philosopher. The distinction is important, for this book contains too much philosophy and not enough natural philosophy.

Robert N. Cahn
Lawrence Berkeley Laboratory

Vibrations and Waves

W. Gough, J. P. G. Richards, R. P. Williams
278 pp. Wiley, New York, 1983.
$64.95

Vibrations and waves play a central role in many areas of current physics and its applications, from elementary particle theory to the design of integrated circuits. A good course in this area can consolidate a student's knowledge of classical physics and lay the groundwork for a thorough understanding of quantum mechanics. This concise, well-written text provides the material needed for such a course, which could be taught to physics sophmores as well as applied math majors. The book could also be used as a supplementary text for courses in acoustics or optics.

The expected topics are covered, and in the expected order: Early chapters on oscillations—free, damped, driven and coupled—lead to a longer and nicely unified discussion of waves and their properties. Fourier analysis occupies more than its usual share of a book at this level, and the discussions of convolutions, Dirac delta functions, and the uncertainty principle are welcome additions. Although *Vibrations and Waves* is quite complete in its coverage, its brevity is a hindrance in some respects. A single page treats the polarization of light, a paragraph gives the sole example of dispersive waves and, at most, only a few remarks indicate the sources of waves.

The authors of this book, who are experimental physicists, never present mathematics for its own sake; however, the book lacks the richness of physical examples, data, and hands-on experimentation of, say, Frank Crawford's *Waves.* The computer program supplied as an appendix is designed to display wave phenomena on a microcomputer screen. It will undoubtedly please many readers of the book, but its treatment is not for the novice.

Teachers using this book should be prepared to provide background on partial derivatives and the differential form of Maxwell's equations, as the authors refer the reader to other books for development of these topics. On the other hand, the problems (nearly all answered in the back of the book) are plentiful and appropriate, the writing is clear, and the development proceeds at a reasonable pace. Anyone teaching a course on wave phenomena would do well to consider *Vibrations and Waves* as a possible text.

DANA ROBERTS
Washington University, St. Louis

The Physics and Chemistry of Color: The Fifteen Causes of Color

Kurt Nassau
454 pp. Wiley–Interscience, New York 1983. $43.95

"There appears to be no book covering the wide voids between the extreme of the monograph and general expositions on color, books on optics that deal with light but only peripherally with color, and books on color measurement and color perception. This book is intended to fill this serious gap." Kurt Nassau, a research scientist at AT&T Bell Laboratories, has done an admirable job filling this "serious gap." The book is well-illustrated, with clear, accurate and generally complete discussions at the advanced undergraduate level of the great wealth of causes of color, with many examples from science, art, and everyday life. Supplementary specialized mathematical or advanced topics, such as basic atomic physics (term symbols, selection rules, and the like), band theory and incandescence equations are relegated to appendices.

It is known that virtually all color effects are due (at some level) to the motions of electrons, and Nassau proves a knowledgeable guide in the domains where a variety of electron effects are present: crystals, semiconductors, and complex molecules—his fields of research. Consider variations within just one of the "15 causes": ligand fields, the electric fields at an atom of a transition metal that are due