in the study of interacting particles in modern field theory that comprises the second half of the book. Lee develops the formalism hand-in-hand with the physical ideas of non-Abelian gauge theories and QCD. He illustrates the need to specify gauges when carrying out the quantization and the origin of the Gribov ambiguity (corresponding to the vanishing of a Jacobian in making gauge changes) with a simple and illuminating mechanical model of point particle motion. This is just one example of very recent original research by the author that frequently appears in this volume. Lee also describes and traces the confinement and asymptotic freedom problems in QCD. He develops in detail path integration methods that lead to the Feynman rules for calculation, including the origin of the Faddeev–Popov ghosts and the construction of the effective Lagrangian of QCD, which he recently derived in collaboration with N. H. Christ.

The book concludes with extensive applications of QCD. Lee considers quark models of the hadron, the gauge theory of weak and electromagnetic interactions, high-energy processes and the quark–parton model, jets and the gluon sector in QCD, and chiral symmetry. These chapters carry the reader through many practical calculations, such as the discussion of correlations in analyses of three-jet events. There is also a variety of good exercises for the serious student.

The students in Beijing privileged to hear Lee's lectures in 1979 had a rare and very valuable treat. Many more can now share that treat.

SIDNEY DRELL
Stanford Linear Accelerator Center

Electromagnetic Radiation

F. H. Read
345 pp. Wiley, New York, 1980. $58.50

It has been said that one who knew everything about one thing would know everything about everything! Though the task that Frank H. Read has undertaken in the book *Electromagnetic Radiation* is a discussion of less than everything about light, he does cover the classical and quantum aspects of electromagnetic radiation in a thorough yet concise fashion. He has written this textbook for advanced undergraduates or first-year graduate students (for whom the level of mathematical sophistication and physical explanations is probably more appropriate). The book can, however, also suit the wider audience of practicing physicists and engineers interested in an initial "look-see" into such topics as the coherence of laser light. The careful presentation in the text and the well-chosen references will help satisfy such an interest.

Starting with Maxwell's equations, the author discusses the propagation of electromagnetic waves and their generation by moving electrical charges. After formulating the concepts of the quantum theory of radiation and atomic energy levels initially in a theoretical manner, he applies them to intrinsically interesting technical developments. To cite an example, he presents the idea of the stimulated emission of radiation according to the classic derivation of Einstein and subsequently uses it in the explanation of the laser and the maser. Similarly, in the chapter on the scattering and absorption of radiation he looks in a general way at Compton scattering of a photon by a free electron; in a later chapter, he analyzes the role that Compton scattering plays in the detection of gamma rays with scintillation counters. This procedure, which includes obtaining numerical estimates for the significant quantities, clearly gives added insight into the physical process being considered.

Although I enjoyed reading the book, I sometimes felt that its emphasis should have been a bit different. The discussion of the classical electromagnetic field on the basis of Maxwell's equations would have been improved with greater emphasis on the equations in vacuum and with a subsequent discussion pointing out that the customary way of defining the phenomenological permeabilities and the effective fields is just a very convenient, but limited, model for treating the complex interaction of radiation with matter. This is the approach followed in the *Feynman Lectures in Physics, Vol. II, The Electromagnetic Field*. It does minimize the confusion that can arise in differentiating between the B and H (E and D) fields, particularly when the presentation employs MKS units.

In short, this fine textbook may well start a student of physics on "the yellow brick road" to everything about light.

JOHN C. HERRERA
Brookhaven National Laboratory

Acoustics: An Introduction to Its Physical Principles and Applications

A. D. Pierce
642 pp. McGraw-Hill, New York, 1981. $28.95

Publication of a new advanced text on the foundations and principles of acoustics is so rare an event as surely to elicit great curiosity. A book as successful as this one earns praise as well. One anticipates that many of a new generation of graduate students will form their skills through Pierce's *Acoustics;* when they have mastered it, they will be well and broadly founded in physical acoustics.

Allan Pierce based this book on his own years of experience in research and teaching in acoustics at MIT and the Georgia Institute of Technology. Preliminary versions have been used as class notes for a three-term (one academic year) introductory course in acoustics for graduate students in various fields of engineering, physics and mathematics. While this is the audience for which the book is designed, the author indicates that it is also suitable for a one-term senior-level course if the instructor avoids the more highly mathematical sections. Several such selections are suggested. Professional acousticians concerned with analysis should also profit from reference to this book, especially with respect to those areas in which they are not fully aware of current work.

Organized into eleven chapters, the book develops those concepts appropriate to application in such areas as audio engineering, noise control, architectural acoustics, propagation in the atmosphere, and remote sensing. Other areas—propagation in the ocean, interaction of sound and structural vibration and arrays of sources—are touched on more or less briefly, Pierce has quite properly resisted the temptation to be encyclopedic in favor of a thorough and coherent development of basic principles through more nearly "classical" areas of application.

Two chapters and parts of a third are devoted to radiation from small objects, baffled sources, and flexural waves on an infinite plane. They include the expected theorems and examples, but also introduce the method of matched asymptotic expansions in application to small bodies. A fine chapter on room acoustics treats the statistical description of high-frequency response in considerable detail. A chapter on low-frequency transmission in tubes and horns precedes excellent chapters on ray acoustics (including inhomogeneous and moving media) and on scattering and diffraction. The latter, the longest chapter in the book, very thoroughly covers the principles of wedge diffraction, creeping waves, fields near caustics, and bistatic scattering measurements. The final two chapters constitute a thorough introduction to the nonideal phenomena of real fluids: viscous effects (vorticity and entropy modes, acoustic boundary layer, attenuation in tubes and porous media, and relaxation processes in gases) and nonlinear effects (weak shocks, N waves, ballistic shocks, but not parametric arrays).

We can illustrate what Pierce's