

reading of the original literature. It is far, however, from sufficient to achieve this end. A knowledge of relativistic kinematics and dynamics, beam and target design, electronic and digital computational techniques as well as statistical methods of data analysis, all of which Paul ignores, are also needed to reach such an objective.

A fourth deficiency may actually contribute to its publisher's intended success as a text for a senior or first-year graduate course. There are no worked examples, few problems (about three per chapter) and a perplexing paucity of references (about six per chapter). The text itself, which has little truck with sophisticated mathematics, basically covers its fields well and with an easy gait. However, in doing so it makes (to the innocent) some startling pronouncements, which, being without sufficient references, go unsubstantiated. All of these qualities, liabilities in a reference tome or a self-study situation, are very appealing to the confident lecturer. The lecturer can count on text to cover the basic ground, while he devotes his energies to those subjects that he or his students fancy.

The book was prepared from a draft left by Paul at the time of his death. E. Bonner undertook the impossibly difficult and briefly acknowledged task of seeing the text through press. The result is remarkably good compared to other posthumous publications. Although one can quibble with some point or other on almost every page, the book is largely free from serious errors. It reads well with only an occasional lack of clarity. There is no doubt, however, that the results would have benefited greatly had the author survived its publication. Bonner's respectful guidance has made the best out of an unfortunate situation and has provided us with a useful textbook.

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Physical Ultrasonics

By Robert T. Beyer, Stephen V. Letcher
378 pp. Academic, New York, 1969.
\$18.50

It is a rare physics department that offers more than a single one-semester course in acoustics. Seldom indeed then, is a course in ultrasonics available. Yet applications of ultrasonics are steadily increasing, as are the number of toilers in this vineyard. There is then a need for a reasonably sophisticated account of the present state of the science of the "sound you can't hear." This book, I believe, fills the need nicely.

Fundamentals of sound transmission, reflection and absorption are covered, treating sound in various combinations of homogeneous and nonhomogeneous,

isotropic and nonisotropic solids as well as in liquids and gases and in the various interfaces. Sources of ultrasound, such as piezoelectric and electrostrictive types and their magnetic analogs, are discussed, as well as detection and measurement techniques. Acoustic nuclear magnetic resonance and electron paramagnetic resonance are also given a few words. One chapter discusses spin-phonon interactions, another spin-electron interactions.

All this is at a level understandable to any reasonably good graduate student, and useful to anyone who isn't already familiar with each and every topic. Three hundred and thirty nine references increase this book's usefulness.

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Nucleation

A. C. Zettlemoyer, ed.
606 pp. Marcel Dekker, New York, 1969. \$29.50

The study of phase transitions has provided fascination to generations of physical scientists. It is interesting to note that throughout the development of our current understanding kinetic and equilibrium considerations have been intertwined. From time to time one or the other has been more advanced; much remains to be done on both fronts.

Nucleation, edited by A. C. Zettlemoyer, is a multiauthored volume that surveys the theoretical and experimental information available concerning vapor-liquid condensation, precipitation in liquid solutions, precipitation in solids and several other topics. The first three chapters, by W. J. Dunning, R. P. Andres, and J. Lothe and G. M. Pound, respectively, describe the current theory in detail. There is, unfortunately, excessive overlap between these chapters, but together they give an up-to-date description of the current state of the theory. Controversy is not avoided. In particular, the difficulties of interpretation of the partition function of a cluster phase put forward by Lothe and Pound are discussed in detail. A resolution of the paradox is not achieved despite comparisons of the several different kinds of analyses. This failure of resolution is particularly disappointing in view of the very close agreement between the classical theory and the most recent measurements.

The theory of nucleation in liquids and solids follows closely the classical theory of nucleation of the gas to liquid transition. Good reviews of both homogeneous and heterogeneous nucleation are contained in the chapters by R. A. Sigsbee, A. G. Walton and E. Hornbogen, and a very interesting description of atmospheric nucleation and cloud

formation is contained in a chapter by E. A. Boucher. The nucleation of polymer crystallization presents problems somewhat different from those encountered in the nucleation of crystallization of small molecules because of the connectivity and internal flexibility of the macromolecule. An excellent survey of the theory, including pertinent comparisons with experimental data, is given by Price. Unfortunately, the most recent work by Zwanig and Hoffman appeared too late to be included in this chapter. Two somewhat different applications, namely deposition of metal vapors on surfaces and nucleation in glass-forming materials are covered in chapters by D. Walton and J. J. Hammel, respectively. Finally the historian of science will be interested in the role of nucleation processes in sugar purification that is charmingly described in a chapter by A. Van Hook.

I know of no other source of theoretical and experimental information on nucleation so convenient as this book. Despite its outrageous price, it will probably be a very useful addition to most libraries.

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The Fundamental Constants and Quantum Electrodynamics

By B. N. Taylor, W. H. Parker, D. N. Langenberg
353 pp. Academic, New York, 1969.
\$5.00

This book is a reprint of the same article appearing in *Reviews of Modern Physics*, 41, 375 (1969). For those who prefer hardbound editions of review monographs, Academic Press has provided them with one.

As the book is a *Review of Modern Physics* monograph, it has been thoroughly reviewed by the usual refereeing process. Technically, the presentation is authoritative and complete. The authors make a good case for the need for this work: until recent experiments involving the Josephson effect, it has not been possible to provide unambiguous comparisons between quantum electrodynamics (QED) theory and experiment. This has been true since the coupling constant of QED is the fine-structure constant α , and the best value of α could be determined only by experiment and by the aid of equations drawn from QED.

But the Josephson effect provided a value of e/h independent of QED. The value obtained, the authors point out, indicate a definite need for a new least-squares adjustment of the fundamental constants.

Within the early chapters of this work, the authors give background material on