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.

W. Peter Trower
Virginia Polytechnic Institute

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.

H. Malamud
Plasma Physics Corporation

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 Zwanzig 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.

Stuart A. Rice
James Franck Institute
University of Chicago

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 electrodynamic (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

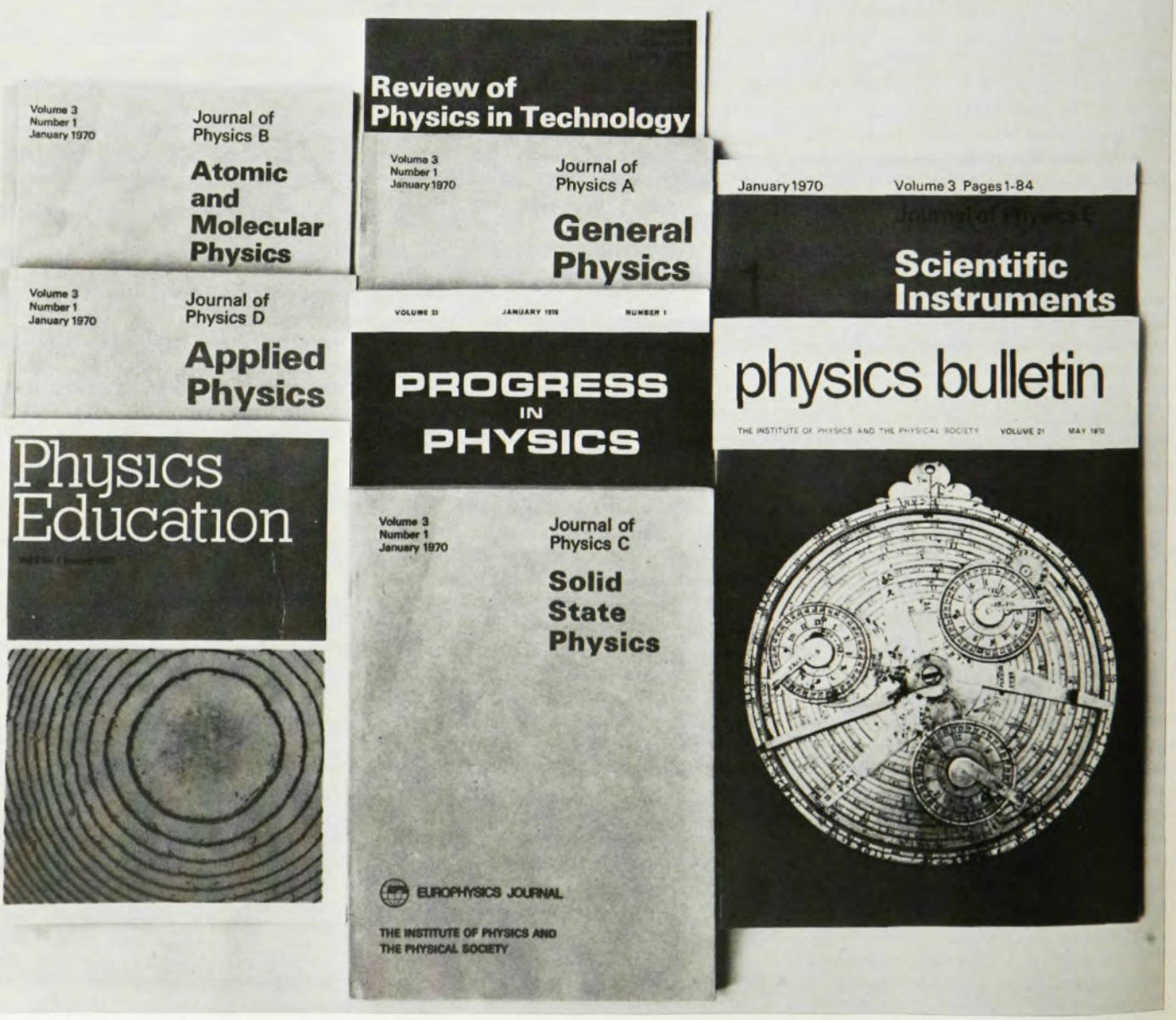
You haven't read the half of it yet...

. . . we think. Because here in Europe we are publishing a major part of the physics literature, which you may not be seeing. Journals containing original research papers on almost every branch of physics.

Our first proceedings were published in 1874 and our current research and associated journals cover Atomic and Molecular Physics, Solid State Physics, Applied Physics, Scientific Instruments, Metal Physics. As a physicist you must be involved in one of these. We also have two review journals for you ; Reports on Progress in Physics and the Review of Physics in Technology, and two magazines ; Physics Education and Physics Bulletin.

Write to us for our Publications Catalogue and descriptive leaflets. And ask your librarian if you can see one of our journals. You might be surprised by the wide-ranging list of contents, and by the international standing of many of our authors. Your librarian can order all our journals for you through the AIP, and we deliver to North America by airfreight.

Here is the address you write to for further information :
The Institute of Physics and The Physical Society, 1 Lowther Gardens, Prince Consort Road, London SW7, England.



the general ideas of auxiliary constants and stochastic input data, the quantities to be used by them as adjustable parameters, the general form of equations to be used in the adjustment and their philosophy and procedure for treating error. Following sections discuss discrepant data and the implications for quantum electrodynamics. A final set of recommended data is presented, followed by a summary and conclusions.

The major fault with this book is the way that the new information is buried. On page 291 we finally find the actual set of recommended data. Moreover, the authors point out in the introduction that "numbers resulting from a least-squares adjustment of the physical constants must be taken with a grain of salt." The real implications of the work do not become apparent until page 299, where the authors state: "For quantities which involve relatively small QED corrections and for which the experimental situation is reasonably satisfactory, the agreement between theory and experiment is adequate. For quantities which are totally quantum electrodynamic in origin the agreement between theory and experiment is considerably worse."

The work that the authors have done has important implications and it is unfortunate that it is not discussed in the beginning. Unfortunately we are still burdened with an ageless format for review articles that makes them very difficult to use. Because of the arrangement, the book is unnecessarily ponderous.

F. L. Wilson
National Technical Institute for the Deaf, Rochester Institute of Technology

Nuclear Energy, Vol. 106: Experimental Neutron Thermalisation

By P. A. Egelstaff, M. J. Poole
399 pp. Pergamon, New York, 1969. $17.50

Except for the discovery of nuclear fission itself, probably the most important single additional phenomenon for reactor science was the chance finding by Enrico Fermi, and his collaborators in Rome, of the enhanced effectiveness that slow neutrons have in producing nuclear reactions. The discovery of this startling effect, due to the presence of hydrogeneous material in laboratory table tops and in the famous goldfish pond nearby, became of immense technical utility when Otto Hahn and Strassmann discovered fission by using thermalized neutrons on uranium. Since that time the thermalization of neutrons with their greatly increased cross sections for fission in the nuclear fuels U^{235}, U^{233} and Pu^{239} has been a continuing subject of research.

The present book is by two distinguished workers who have been active in this field of science and technology for many years and is a welcome addition to the literature for everyone concerned with nuclear reactors and with neutron physics in general. The first chapters are devoted to the introductory theory of neutron scattering for the important cases needed, and they include a useful discussion of the Van Hove correlation functions and their use. This is followed by a detailed discussion of the "Scattering Law" introduced in this subject by the senior author and which has found great utility in correlating neutron-scattering and cross-section measurements with models of condensed state scatterers, and presenting the data in a highly useful form.

The book gives an adequate treatment of the various methods for neutron energy measurements, including time-of-flight techniques, crystal spectrometers and pulsed sources such as cyclotrons, betatrons and linear electron accelerators. There are good expositions of the various types of "choppers" that have proved of such great value at nuclear-reactor laboratories, but here descriptions of recent advances would have been welcome. There is ample discussion of neutron detectors and the associated electronic analyzers and computers that in modern research must be closely linked to provide rapid and useful analysis of the great mass of data that can be quickly accumulated at a large research reactor.

Next the authors give details for measurement methods of differential-scattering cross sections, especially as related to their exposition in terms of the "Scattering Law" and its interpretation. Next follows a discussion of angular distributions and total cross-section measurements on scattered neutrons. This section includes data on several important neutron moderators.

One of the most valuable parts of the book contains the measured spectra presented for neutrons, as found in several common moderators and reactor-core materials including graphite, beryllium, beryllium oxide, zirconium hydride, and light and heavy water. These results include much basic data necessary for the design, operation and understanding of large research and power reactors. Perhaps the most valuable chapters in the book are those that explain the experimental methods for neutron spectrum measurements in moderators and reactor lattices, including the results of actual measurements on important systems. This section is followed by a careful presentation of the experimental methods used to study the energy exchange "Kernal," a rather specialized subject, but one of central importance for reactor technology. These concluding chapters present a considerable amount of experimental data and also elaborate on measurement techniques introduced earlier in the book. As might be expected, much of this material has been published elsewhere, but the information summarized here should be of considerable value.

The book concludes with a mathematical appendix by P. Schofield that will be useful to many readers and with tables of measured spectral densities that should also be of value in practical work.

R. S. Shankland
Case Western Reserve University

Scene of Change: A Lifetime in American Science

By Warren Weaver
226 pp. Scribners, New York, 1970. $7.50

Recent years have seen the publication of the autobiographies of several elder statesman of science—Harlow Shapley, Otto Hahn, James Conant and Max Born come to mind, among others. These works are of interest not only to younger members of the scientific community but should prove increasingly valuable as source material for historians of science. Among the latest and most inviting of such works is *Scene of Change*, the memoirs of an exceedingly versatile, sagacious and articulate man of science. Warren Weaver's reminiscences trace his career from boyhood in a small Wisconsin community just before the turn of the century through the years of his formal education at Madison. There he met the mathematical physicist Max Mason, who became a respected mentor and lifelong friend.

Mason brought the young science student to the attention of Millikan, who invited him to join the staff at Throop College, soon to become Cal Tech. Weaver enjoyed a hectic three-year period at the new institution, with time off for scientific defense work in World War I, and subsequently returned to the state university in his native Wisconsin. Of this time he writes: "If there is a better life than that of an enthusiastic teacher in a good school, I don't know what it is! . . When the first smoky tang of autumn came into the air, there was an almost compulsive yearning to get back on the campus and see the throngs of excited (and exciting) new youngsters, to regather with colleagues, to be back in the classroom meeting the challenge of a new group of eager minds." Patently, Weaver's teaching days are far in the past!

A call from Max Mason in 1931 to join the staff of the Rockefeller Foundation as director of the Division of Nat-