much enriched by historical notes, and by chapters on gemstones and on crystals formed by biologically active polymers.

It is difficult, however, to write satisfactorily for two classes of reader at one and the same time. As a personal opinion, I think the author would have done better to sacrifice the interests of the few interested laymen, for whom the text will be hard going, and to concentrate more on the requirements of science students. As it is, the book is one which no student could read without being much better and wiser for it. With the elimination of the more elementary material, and a slightly more formal approach where quantitative considerations become important, it would have made an excellent and appealing textbook at a level which has thus far been neglected.

Physical Acoustics. Principles and Methods. Warren P. Mason, ed. Vol. 1, Part A, 515 pp., $18.00; Vol. 1, Part B, 376 pp., $13.50. Academic, New York, 1964. *Reviewed by Walter G. Mayer, Georgetown University.*

This is the first part of a series of six volumes on physical acoustics which, when completed, should become a very important contribution to the literature in this field. The multivolume work is designed to serve as a reference book as well as a textbook on an advanced level.

All of the seven chapters in Part A of Volume 1 were written by highly qualified experts. Chapters 1 (by R. N. Thurston) and 3 (by Berlincourt, Curran, and Jaffe) could be regarded as a very thorough introduction to wave propagation in liquids and solids, and transducer materials. One can hardly think of any basic aspect related to these topics which is not considered in these two sections. Chapter 2 (T. R. Meeker, A. H. Meitzler) is devoted to guided waves in plates and cylinders. Specific geometrics for ultrasonic delay lines are discussed in Chapter 6 (J. E. May), which treats various modes in strip and wire delay lines, and in Chapter 7 (W. P. Mason) which gives a short discussion of multiple reflection delay lines. Another somewhat longer chapter by W. P. Mason is devoted to the use of piezoelectric crystals and mechanical elements in oscillators and filters. Chapter 4 (H. J. McSkimin) illustrates many experimental techniques for determining elastic properties of liquids and solids and presents a thorough discussion of the theory related to mechanical properties of substances.

Although Part B is a continuation of Part A, it is primarily concerned with semiconductor devices capable of producing kilomegacycle acoustic waves. An introductory chapter (W. P. Mason) gives the mathematical and physical background, concentrating on semiconductors, *p-n* junctions, and Esaki diodes. Some of the topics discussed in this section are taken up more specifically in a chapter (R. N. Thurston) on the theory of piezoresistance coefficients and the use of semiconductor transducers for strain gages. The chapter on the use of *p-n* junction transducers (M. E. Sikorski) not only gives useful information on the operation of semiconductor diodes and many experimental results but also discusses various applications of these devices. The section on resistive layer transducers (D. L. White), although not overly long, presents a good treatment of principles of operation of depletion layer, diffusion layer, and epitaxial transducers. Both theoretical and experimental aspects of these high-frequency devices are discussed.

There are three additional chapters which, as far as subject matter is concerned, are more closely related to the content of Part A than to what may be considered the main topic of Part B, i.e., semiconductor devices. One of these chapters is a very short discussion (E. Eisner) of design characteristics of resonant vibrators. Another chapter (B. Carlin) gives a descriptive résumé of ultrasonic processing techniques used in cleaning, welding, drilling, and many other technical applications. Finally, there is an extensive section (H. G. Flynn) on acoustic cavitation in fluids. Since the liquid state of matter is much less understood than the solid state, it is not surprising that some explanations of cavitation processes are open for discussion. Nevertheless, the author of this chapter se-

lects the various accepted or plausible interpretations of cavitation and related phenomena and presents them in a very readable manner.

It should perhaps be pointed out again that Parts A and B of the first volume form one over-all entity. Some authors who contributed chapters to both parts occasionally refer the reader to Part A for fundamental details discussed there.

In general, the authors and the editor have succeeded in preparing a really outstanding work. Although many topics discussed do have immediate engineering applications, technical details are kept to a minimum and strong emphasis is placed on physical aspects. Appropriate mathematical formulations are included to such an extent that the reader can follow the derivations, and proofs are presented only where it appears essential. All chapters are extremely well documented with an abundance of useful, up-to-date references. Numerous good illustrations and tables contribute further to the high quality of the books.

This well-written and well-balanced work will undoubtedly become one of the excellent sources of information in the field of modern physical acoustics.

Strong Interactions and High Energy Physics. Summer School Proc. (Edinburgh, 1963). R. G. Moorhouse, ed. 475 pp. Plenum Press, New York, 1964. $22.50. *Reviewed by D. B. Lichtenberg, Indiana University.*

This book is primarily concerned with dispersion relations and the analytic properties of the S matrix. As such, it is a successor to the book *Dispersion Relations*, edited by G. R. Screaton, containing the lectures given at the 1960 Scottish summer school. Comparing the two sets of lectures, one is impressed by the progress made in 3 years in the theory of dispersion relations. However, it is too early to say whether a study of analytic properties is the way to achieve quantitative predictions in strong-interaction physics.

Some of the 1963 lectures reflect solid but pedestrian advances over what was known and discussed in the lectures of 1960. Other lectures are on entirely new topics. My own opinion is that one of the most important new results is the treatment of the three-body problem by means of the Faddeev equations. Lovelace gives a good discussion of this subject, including information based on his own work.

Another new and important topic concerns Regge poles. Although at the time of the 1960 lectures Regge had already published his paper on analytic continuation in the complex angular momentum plane, the importance of this work was not then generally recognized. Thus, only in the 1964 volume do we find a discussion of Regge poles and cuts, with lectures on the theory by Oehme and on the applications by Udgaonkar. The discussion of the applications is highly speculative, and the relevance to high-energy physics has not been demonstrated.

A third new item is the discussion of "bootstraps" by Zachariasen. The hope of Zachariasen and others sharing his philosophy is that every strongly interacting particle can be constructed as a composite state of other particles. Such an all-embracing calculation is left for the future, however, and Zachariasen limits himself to a few limited calculations which give only fair agreement with experiment.

Other lectures include an introduction to dispersion relations by Squires, a discussion of applications by Hamilton, a treatment of the foundations of S-matrix theory by Barut, and a discussion by Martin of some consequences of unitarity and analyticity. Other lectures, not related quite as closely as the others to the theme of the book, are by Fubini on a model of very high-energy collisions (the so-called multiperipheral model) and by Blankenbecler on an approach to multichannel scattering.

The lectures are all given on an advanced level, suitable for postdoctoral theoretical physicists and for serious graduate students who are already familiar with aspects of the theory of analytic functions. I would recommend the book for such people were it not for the exorbitant price.