positions, but, on the other hand, there is an increase in the number and type of examples, particularly from the field of physics, which are used to illustrate and illuminate the methods of solution.

Several new features are particularly worthy of note. There is an expanded treatment of characteristics, both from the purely mathematical point of view and in relation to propagation phenomena. This is the only place in the literature, English or German, in which such a complete and satisfying account can be found. The theory of distributions is used to generalize the solution theory of linear hyperbolic equations, and an appendix gives a concise but perspicuous introduction to and survey of distribution theory. The relation between conservation laws and differential equations is also discussed with special reference to discontinuous solutions. The treatment of transient effects in linear systems and Heaviside's calculus is given in a way that makes possible an easy transition to the generalized operational calculus recently developed by Mikusinski. Finally, there is a bibliography of 20 pages.

It is most satisfying to welcome this work as an essential and readable reference and text for anyone interested in the theory of partial differential equations and their applications.

**An Introduction to the Physics of Vibrations and Waves.** By Norman Feather. 330 pp. Edinburgh U. Press, Edinburgh, 1961. $6.00. *Reviewed by Walter G. Mayer, Michigan State University.*

THIS book is intended to familiarize the "beginning specialist" with the classical concepts of waves and mechanical vibrations. Starting with a chapter on stretched strings, Professor Feather introduces the reader to the fundamentals of wave propagation, damping, pulses, and spectral analysis. The next sections discuss coupled vibrations, elastic vibrations of rods, and vibrations of air columns. The book also contains chapters on plane waves in an infinite medium, water waves, and interference and diffraction. Although the book is concerned mostly with mechanical vibrations, it also contains a long chapter on the wave-particle duality in which the author discusses briefly the origins of electricity and magnetism.

The treatment of the various topics is rather extensive, possibly a little too extensive for some second-year undergraduate students. The interested student, however, will find the style and presentation very refreshing, particularly the clarity and simplicity with which the author describes the physical meaning of equations and derivations he uses—not primarily as statements of self-explanatory facts but more as illustrations of discussions in the text. There are no numerical examples, problems, and answers; instead one finds a great number of quotations by old and modern scientists, biographical details, and a good deal of historical information. Nevertheless, the author does give all the mathematical details necessary for the development of the various topics without losing sight of his ultimate goal: to make the reader understand and appreciate the unity of the subject.

**Particle Accelerators.** By M. Stanley Livingston and John P. Blewett. 666 pp. McGraw-Hill Book Co., Inc., New York, 1962. $17.50. *Reviewed by D. Keefe, Lawrence Radiation Laboratory.*

THE very rapid growth in the field of accelerator physics in the last decade has created an urgent need for some comprehensive textbook treatment of the subject. Both the authors of this volume have been actively concerned in machine development for many years, and have produced a valuable source book on the history, present status, and immediate future of particle accelerators.

This book and Livingood's recent *Cyclic Particle Accelerators,* reviewed in these pages (*Physics Today,* May 1962, p. 57), together should form an excellent and rather thorough introduction to this branch of physics. Actually, these two books are in a sense complementary; where Livingood has concentrated largely on the development of the basic theory of machines in a useful mathematical way, Livingston and Blewett have centered each chapter about specific accelerators and have managed to include a large amount of descriptive detail with a virtual minimum of mathematics.

The descriptions of specific types of accelerators include chapters on low-voltage and electrostatic generators, cyclotrons, betatrons, and weak- and strong-focusing synchrotrons. Other more general chapters are devoted to ion sources, particle motion, phase stability, and shielding. There is an abundance of illustrations and the references are good. The wealth of descriptive detail, albeit suffering from wordiness in many places, makes it a useful reference for anyone associated with the accelerator field. Although the level of understanding required is not high, it is probably likely to be less useful to the student than a more basic and less special text.

It is stimulating to find in the pages of a physics text an occasional heightening of the rhythm of presentation by certain personal embellishments and individualistic touches—mainly to the credit of the senior author (MSL).

**Inelastic Scattering of Neutrons in Solids and Liquids.** Symp. Proc. (Vienna, Oct. 1960). 651 pp. Internat'l Atomic Energy Agency, Vienna, 1961. Distr. in US by Internat'l Publications, Inc., New York. Paperbound $12.00. *Reviewed by A. A. Maradudin, Westinghouse Research Laboratories.*

ONE of the most powerful tools for the experimental study of the details of atomic motions in solids and liquids is the inelastic scattering of low-energy neutrons from solids and liquids. The suggestion that neutron-scattering experiments could be used

for this purpose was first made in the late nineteen-forties, but its implementation had to await the construction of reactors capable of producing the neutron fluxes required in such experiments. However, since the first successful experiments were carried out, in the middle of the last decade, a great deal of theoretical and experimental study has been devoted both to the experimental method itself and to the interpretation of the results it has provided.

The book under review is a good survey of what was achieved with the aid of this research tool in the first five years of its use. It contains fifty papers divided into seven categories: general theory; methods of neutron spectrometry; liquids and molecules (other than water); water; cold moderators; solids; neutron spectra. Most of the papers are in English, with a few in Russian and in French. Each paper is prefaced by abstracts in English, French, Russian, and Spanish, and the discussions connected with the papers presented are included. The scientific level of the papers is almost uniformly high, and a great deal of effort seems to have been devoted to presenting them in a useful and attractive setting. This is a book which will be of value not only to neutron physicists, but also to other experimentalists and theoreticians interested in the microscopic properties of solids and liquids.

**Mathematical Statistics and Probability.** Symp. Proc. (Berkeley, Summer 1960). Jerzy Neyman, ed. Vol. 1, Theory of Statistics, 767 pp., $16.00; Vol. 2, Probability Theory, 633 pp., $13.50; Vol. 3, Astronomy, Meteorology, and Physics, 335 pp., $7.00. U. of California Press, Berkeley, 1961. *Reviewed by Mark Kac, The Rockefeller Institute.*

THE first three volumes of the proceedings of the Fourth Berkeley Symposium on Mathematical Statistics and Probability cover the theory of statistics, probability theory, and astronomy, meteorology, and physics. There are two more volumes, devoted to biology, econometrics, industrial research, and psychometry, but these are not under review here.

Volumes 1, 2, and 3 are collections of papers bearing little relation to each other. An exception to this is a group of papers in Volume 3 by Hammersley, D. G. Kendall, Kerr, and Lyttleton on the statistical theory of the loss of long-period comets from the solar system. The reviewer's interest was particularly aroused by these contributions.

Because the proceedings are much more like a research journal than a book, it is impossible to give them any kind of a comprehensive review. Even listing the titles of individual contributions would require more space than this journal could easily spare. And yet these proceedings represent a sample of a five-years' effort in a large and important field of science, and as such they deserve some kind of general comment and appraisal.

There are three observations (one for each volume)