**WARREN**

ter on perfect crystal theory; although no work in this field has come from MIT, several members of the Warren "school" have made contributions to this important subject.

Structural crystallography is introduced but not covered fully, small-angle scattering is not treated and details of apparatus and procedures are not included. However, there is enough on techniques so that one can learn how data are obtained and related to theory.

This book is notable for its exceptional clarity. It begins at the beginning with free-electron scattering and proceeds with a rigorous development of basic diffraction theory. As we might expect from someone who has attracted and taught two generations of students, there are numerous simplified retreatments of theory that are pedagogically very satisfying. Theoretical derivations are carried far enough to relate to experimental quantities. Such relations are necessary for students to appreciate the real world; all too often they are given highly sophisticated treatments that appear to have little relevance to actual experiments. In the chapter on noncrystalline scattering both approximate and exact theories are given; this again makes good pedagogical sense.

Much data and many results of significance are to be found, and some case studies are very detailed. For example, long- and short-range order studies are discussed with respect to acquisition of data and how they are treated to minimize errors. (By the way, most of us refer to short-range order coefficients as Warren coefficients; Warren, however, refers to them as Cowley parameters.) An example of the useful and practical information included is the treatment of termination effects in Fourier inversion.

There is a good selection of nontrivial problems, many of which are drawn from actual research questions. Each chapter has numerous references, some to other texts but most to papers in the research literature. A few tables are appended to provide ready reference to wavelengths, absorption coefficients, atomic scattering factors, dispersion corrections and Compton scattering intensities.

In summary it may be said that Warren has produced the expected and long-awaited book and the scientific world welcomes it as an important and unique contribution.

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## Monte Carlo Principles and Neutron Transport Problems

**By Jerome Spanier, Ely M. Gelbard**
234 pp. Addison-Wesley, Reading, Mass., 1969. $14.95

In many complicated problems of particle transport, the numerical simulation of particle histories is a powerful tool for obtaining solutions. Because the histories are constructed by a more or less random sampling of possible histories, these techniques are called "Monte Carlo" methods for the solution of particle-transport problems.

Such Monte Carlo methods have proved useful in designing radiation shields and nuclear reactors and in studying cascade reactions. Often, one seeks to determine the probability of a rare event, such as the penetration of a particle through a shield. Then the central problem is to construct a biased simulation in which interesting histories are sampled preferentially while the probability of the rare event is still estimated in an unbiased manner. These are called "variance reducing simulations."

The present book is concerned with such methods and their application to practical problems of neutron transport in reactors. The authors are experts in their field; Jerome Spanier has helped to give the methods a firm mathematical foundation, and Ely Gelbard has pioneered in their application to selected reactor-design problems. The book reflects this expertise. The first half is a fairly rigorous and systematic presentation of the principles (without use of measure theory). Following a general introduction, emphasis is placed on methods for variance reduction and the techniques of importance sampling, correlated sampling, use of expected values, splitting, and Russian Roulette are explained.

In the second half, two neutron-transport problems arising in reactor design are considered, namely the absorption of thermal neutrons and resonance capture in cell geometry. Their solution using general Monte Carlo methods together with superposition principles and adjoint equations is explained in some detail, and serves to introduce the reader to the subtlety and diversity of techniques that are likely to be embodied in a numerical Monte Carlo program.

The exposition of Monte Carlo methods is a difficult task, for although many of the principles are

intuitively simple, their precise formulation and justification tend to be cumbersome. The authors have, however, succeeded in finding a middle ground showing us both precision and intuition, the science and the art. This book is clearly the best available introduction to the subject and can be examined with profit by anyone concerned with complicated particle-transport problems.

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## Mechanics

**By Wallace Arthur, Saul K. Fenster**
665 pp. Holt, Rinehart and Winston, New York, 1969. $14.95

The prevalent trend to upgrade undergraduate physics courses has resulted in the publication of high-level, mathematically sophisticated undergraduate physics texts. Unquestionably not all students have the proper mathematical sophistication to take full advantage of these newer texts.

This book does not follow the trend. It represents Newtonian mechanics at a more traditional intermediate level. It appears to be addressed to students who are not as proficient in mathematical manipulations as we would like them to be. To help such students, the authors, Wallace Arthur and Saul K. Fenster, have retained a considerable number of intermediate mathematical steps in the solution of problems and in the derivation of pertinent results. Regrettably, from the reviewer's point of view, this help is not coupled with a sufficient repeated stress on the physical principles that frequently provide the motivation for the mathematical techniques. For example, the text repeatedly utilizes the work–energy theorem without any mention of it until the very end of the problem under discussion, when the results are interpreted as attesting the work–energy theorem.

The text begins with a chapter on vector algebra and vector calculus, followed by eight chapters on the kinematics and the dynamics of particle motion. Sufficent stress is given to the very important topics of simple harmonic motion and the central force-field motion of a particle. The reviewer was irked by the treatment of Newton's first law of motion as a special case of the second law. On the whole, however, the material in this first half of the text is clearly presented and easy to follow.

Chapter 10 provides a brief and elementary introduction into relativistic mechanics. It is marred by a confusing derivation of the dependence of the relativistic mass of a particle on its speed. Chapter 11, on the dynamics of a system of particles, is followed by a chapter on rigid-body motion that includes a discussion of the inherently difficult topics of the motion of a top and the torque-free motion of rigid body. Chapter 13 is a long chapter titled "Mechanics of Deformable Continua." In 85 pages this chapter treats such diverse topics as stress and strain, the bending of beams, vibrating strings and vibrating beams, fluid statics, static fluid flow, viscous fluid flow and sound waves in fluids. It is one of the more formidable chapters in which Fenster's engineering background is clearly evident. The text concludes with a chapter on Lagrange's equations of motion. They are derived from Newton's equations through use of the principle of virtual work.

In summary, what we have here is a generally clear, traditional mechanics text. Although it is not this reviewer's cup of tea, it may appeal to the mathematically weak student to whom this text appears to be directed.

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## A Discussion on the Origin And Treatment of Noise in Industrial Environments

**E. J. Richards, *ed.***
(Philosophical Transactions of The Royal Society of London, Series A: Mathematical and Physical Sciences, Vol. 263.) 480 pp. Royal Society, London, 1968. $14.00

We may not all agree with Macbeth that "life is a tale told by an idiot," but when the Scottish king goes on to describe life as "full of sound and fury," most of us are perfectly willing to acquiesce.

During the past decade a great many conferences have been held on various aspects of the noise problem. This book is the report of the proceedings of such a conference held in the spring of 1967 under the joint auspices of the Royal Society of London and the British Acoustical Society. The