

outline of various methods for deriving maximum information from Monte Carlo experiments, as well as a catalog of Monte Carlo methods for solving problems which might not seem amenable to probabilistic methods at first glance. Physicists with the inclination to apply Monte Carlo to their particular problems would do well to consider the use of such techniques as importance sampling, anti-thetic variates, or conditional Monte Carlo, to maximize the efficiency of their calculations. A good short introduction to these methods is to be found in the present volume. Examples of their use are taken from the fields of radiation shielding, polymer physics, and statistical mechanics.

If there is any fault to be found with the book, it is that the authors are occasionally too enthusiastic in appearing to suggest the use of Monte Carlo. For example, it is unlikely that random sampling will be more useful for the calculation of large-scale matrix products than some deterministic method. There are also occasional overhastily written sections, as on page 33, which is almost incomprehensible. Nevertheless, the book is a valuable introduction to an interesting and often quite useful mathematical technique, and can be warmly recommended.

Principles of the Theory of Solids. By J. M. Ziman. 360 pp. Cambridge University Press, London, 1964. \$8.50.

Reviewed by Lars C. Luther, University of Copenhagen.

The author of *Electrons and Phonons* offers a demanding and rewarding text for graduate students in physics. Its main purpose is to present ideas on a selection of fundamental topics. Usually it has several ideas on each subject and impresses with the mileage it can get out of a simple idea before going over to the more complicated one. It does not forget to point out where both the simple and the sophisticated ideas will fail. The author draws the line on one side by avoiding bubble diagrams and group theory, on the other by excluding tables of measured quantities and comparisons between theory and experiment. He very deliberately limits the discussion to a few topics:

periodicity, phonons, electrons, optical properties, magnetism, and superconductivity, all in perfect crystals. The last restriction is the most serious one. Impurities are only considered in two instances: impurity levels in semiconductors and electron scattering. Imperfections are not considered at all. Thus, regrettably, the text will probably not easily surmount the barrier between the physics and the chemistry departments. The author anticipated criticism on this account and with his superior presentation makes a strong case for the philosophy of preferring to explain some things well rather than mentioning almost everything.

A few words about particulars. The eleven chapters contain 174 simple and helpful diagrams, but no graphs dotted with experimental points or photographs. There are no problems or exercises, but the reader who wants to carry the mathematics along will find things to do. Symbols are consistently used, but unfortunately ν and v , when equipped with subscripts, look very much alike and mean related things. There is an exhaustive index and a list of references for supplementary reading. These references are to recent books and review articles with careful exclusion of original articles as a matter of principle (what principle?).

Physical chemists will find the prerequisites somewhat demanding: Fermi-Dirac notation, time-dependent perturbation theory, scattering (Born approximation and partial-wave analysis), normal modes of the lattice, and, as the author puts it, elementary descriptive facts about solids. Although it is quite reasonable to expect the student to be acquainted with ladder operators, it is unreasonable for the author to presuppose second quantization language, at least more unreasonable than for the reader to expect a text on the theory of solids to develop the ideas of N-representation and creation and destruction operators. This topic does not require much space, and one might save some by eliminating the résumé starting with "it is well known".

Where does the book take the reader from here? Naturally, it aims to show him the ideas behind various

experimentally established rules. Also naturally it develops the mathematics of simple, successful theories while emphasizing the vital assumptions. Its real distinction rests on three features. It has an easily appreciated structure; there is no doubt about which chapter deals with what. Secondly, though difficult theory is presented, the mathematics is kept under control and interspersed with pauses for breath while the preliminary result is examined from another angle. A good example is the calculation of electrical conductivity from the Boltzmann equation rather than from kinetic arguments. Although this is much more difficult, the development can be followed without agony and is more rewarding. Again the author's ability to convey the essence is demonstrated in a well-balanced survey of the multitude of attempts to obtain electron wave functions for solids. Thirdly, the book has the advantage of being up to date; it discusses BCS theory and the de Haas-van Alphen effect.

Perhaps one can give an idea of the range covered within the selected subjects by mentioning a few topics which are parenthetically discussed: cohesion, phonon-phonon interaction, umklapp processes in thermal and electrical conductivity, the two-dimensional Ising lattice. The discussion of magnetic properties is essentially restricted to ferro- and antiferromagnetism considered in the light of the two approaches: the Ising model and spin waves.

Strong, Electromagnetic, and Weak Interactions. Summer School Proc. (Erice, Sicily, 1963). A. Zichichi, ed. 248 pp. Benjamin, New York, 1964. Cloth \$9.00; paper \$4.95.

Reviewed by J. E. Mansfield, Harvard University.

This is a rather short set of notes from the Summer School "Ettore Majorana" of 1963. J. S. Bell of CERN provides an introduction to the elements of S-matrix and field theory, expanded and revised after the other lectures were completed; this no doubt helps, for by then it is clear what needs introducing.

Regge's twenty-page article on non-relativistic potential scattering is good