# Books

**Introduction to the Physics of Many-Body Systems.** By D. ter Haar. 127 pp. Interscience Publishers, Inc., New York, 1958. Clothbound $3.95; paperbound $1.95. *Reviewed by Herman Feshbach, Massachusetts Institute of Technology.*

If we include field theory, as in fact we should, it is not an exaggeration to say that theoretical physics in recent years has been almost completely devoted to the study of the ground state and low-lying states of many-body systems; states which empirically are found to have particularly simple properties. The ground states of atomic nuclei, the behavior of electrons in metals, superconductivity, and liquid helium are familiar examples. It is the aim of theory to predict properties of these states starting from the known elementary forces between the constituent particles. This small volume provides a survey of these theories which, because of the limited space, cannot be exhaustive or detailed. Rather the author must emphasize the principal physical ideas organizing his discussion around them.

In one approximation, the many-body problem is transformed to the solvable problem of noninteracting quasi-particles which move in a common field of force. The Fermi-Thomas, the Hartree-Fock approximations, as well as the Brueckner method are examples of the procedure. These methods as well as their application to nuclear and solid-state problems (the polaron and exciton are the quasi-particles) are discussed in Part 1. Part 2 is concerned with the collective behavior of many-body systems. The methods employed involve the determination of the appropriate collective coordinates by the requirement that the Hamiltonian be approximately separable when expressed in terms of these coordinates and those describing the remaining "internal" degrees of freedom. The methods described in some detail are those of Tomonaga, Bohm and Pines, Yevick and Percus, Skyrine, Bogoluibov and Zubarev, and Brenig. The principle difficulty of most of these theories is the elimination of the original variables of the problem and their replacement by the collective coordinates. Applications of these theories to sound waves, plasma oscillations, and the Bohr-Mottelson theory of collective motion in nuclei and liquid helium are given. The discussion of these diverse subjects is possible because a common method can be used to explore each of them.

This book is well written. It will provide an excellent introduction for the neophyte and a fine summary as of 1957 for the cognoscenti. There is an extensive bibliography. Of course many topics are not touched upon. Perhaps the most serious of these omissions is the subject of superconductivity as well as the description of methods borrowed from quantum field theory which seem to be particularly suited for the discussion of many of these problems.

**Reports on Progress in Physics.** Vol. 20, 1957. Edited by A. C. Stickland. 568 pp. The Physical Society, London, England, 1957. £3 3s; postage 1s 8d. *Reviewed by R. T. Beyer, Brown University.*

The annual volume of *Reports on Progress in Physics* is always an item of great interest and value. One has come to expect first-class review articles on significant topics, accompanied by extensive bibliographies and presented in a most attractive format. The reader will not be disappointed by Vol. 20 in any of these expectations.

S. Raimes presents the theory of plasma oscillations in metals, stressing the historical development from the first work by Langmuir to the work of Bohm and Pines. In close mathematic relation, D. ter Haar discusses theories of collective behavior (in physics). The tremendous growth of this study is evidenced by the more than 150 references.

Particular aspects of low-temperature physics are treated in two papers; the theory of liquid $He^4$ by J. Wilks, and the theory and properties of solid argon by Dobbs and Jones. The Wilks review is concerned primarily with liquid helium II, and emphasizes the importance of the concept of "excitations", while the Dobbs and Jones study pertains mainly to theories of crystalline structure as applied at low temperatures.

Solid state is also represented by a study of microwave properties in solids, given by Bagguley and Owen.

A. E. Taylor covers recent work in proton-proton and proton-nuclear scattering, and R. H. Dalitz discusses $K$ mesons and hyperons in a review which occupies one quarter of the entire volume.

On the side of applied physics, there are two articles on photography. J. S. Courtney-Pratt reviews the methods of high-speed photography, while J. W. Mitchell reports on photographic sensitivity.

As usual, individual reports may be purchased separately at prices depending on their length. Information on these prices may be obtained directly from the offices of the Physical Society of London.

**Nuclear Quadrupole Resonance Spectroscopy.** Supplement 1 of Solid State Physics, Advances in Research and Application. By T. P. Das and E. L. Hahn. 223 pp. Academic Press Inc., New York, 1958. $7.00. *Reviewed by D. J. E. Ingram, University of Southampton.*

Nuclear quadrupole spectroscopy is well known as being the most complex and the most difficult of magnetic resonance studies. Not only are the strengths of the absorption signals very weak, thus requiring very