experienced in introducing many particle theory to graduate students at Stanford University. Professors Fetter and Walecka are well known for their distinguished researches into the theory of quantum fluids and nuclear physics and there can be few scholars as well qualified to undertake this task.

Several approaches to the theory of many particle systems are possible, but in this book the authors have chosen to present a unified account from the viewpoint of non-relativistic field theory. Following an introduction to the basic ideas of second quantization, the reader is led into a discussion of the powerful Green's function techniques, as well as to the Feynman–Dyson perturbation theory and the diagrammatic method initiated by Goldstone. These formalisms are first applied to the determination of the properties of the ground and low lying excited states of a system, and subsequently the theory is developed so that it can be applied to systems at a finite temperature. In a further section, the method of canonical transformations is introduced in connexion with a discussion of both interacting Bose and interacting Fermi gases. Throughout, techniques are illustrated with reference to the electron gas, including descriptions of collective modes of oscillation in plasmas, and to the hard sphere Fermi and Bose gases. To follow the basic material, it is necesary to be acquainted with some parts of statistical mechanics and the necessary discussion of systems with variable numbers of particles, based on the grand canonical ensemble is given in a separate chapter.

The basic theory of many particle systems has received a multitude of applications in the varied fields of nuclear, low temperature, solid state and molecular physics, and while no single book would be expected to cover each of these fields in depth, a remarkably successful attempt has been made to show in the second half of the book the unity of theory underlying these topics. The five physical systems selected for review in separate chapters are nuclear matter, interacting electrons and phonons, superconductors, superfluids and finite nuclei. The treatment of each of these topics is self-contained, each chapter starting with a short review of the experimental and theoretical situation, which provides necessary background for a newcomer to the field.

Throughout the book the level of treatment is that appropriate to an American graduate course. It could be followed by a British student in his first postgraduate year, who had acquired a good knowledge of quantum mechanics in his undergraduate career, together with some familiarity of thermodynamics, statistical mechanics, electromagnetism and mathematical methods. Plenty of examples, some of considerable interest and of varying difficulty, are given at the end of each chapter, enabling the reader to test his skill and mastery of the material.

This is clearly a very useful and important book that can be warmly recommended to research students beginning work in any of the fields based on many particle theory. The material has been well selected and the treatment is always clear and accurate. A word is in order about the physical appearance of the book, which is of such importance in a work containing a high percentage of mathematical formulae and in this respect the high quality and legibility expected from a volume in the International Series in Pure and Applied Physics is, in general, successfully maintained, although wider margins would have removed a somewhat crowded appearance on the printed page.

B. H. Bransden

Helium-4

Helium-4. By Z. M. Galasiewicz. (The Commonwealth and International Library of Science, Technology, Engineering and Liberal Studies: Selected Readings in Physics.) Pp. vii+338. (Pergamon: Oxford and New York, April 1971.) £3; $9.50.

This book comprises an introductory essay of sixty-odd pages on helium-4, from its discovery in 1868 in the Sun's atmosphere, to recent ideas about the exact nature of its superfluid phase, plus an extensive collection of relevant papers, both experimental and theoretical, which supplement the author's introduction. The latter is a very readable account of the historical development of the various concepts that are currently in use in the field of superfluid helium compiled by one who has had the privilege of studying for some time under Professor N. Bogoliubov in the USSR. As such, reading this text and familiarizing oneself with the contents of the reprinted papers would serve as an excellent introduction to this field of physics for prospective newcomers whom I would expect to comprise principally of low temperature research students just embarking on their studies. More experienced workers, who learned their subject mostly from review articles, would, I have no doubt, find the author's insight into the historical development of the subject both entertaining and enlightening.

This book is concerned principally with phenomena in bulk liquid helium. The reprinted papers are classified into an experimental section comprising twelve papers and a theoretical section comprising seven papers. Most of the papers chosen not only illustrate the author's introduction but are at the same time acknowledged key papers in the development of the subject. This is especially true of the experimental papers although there are some notable omissions such as the pioneer papers on quantization of circulation, the determination of the phonon excitation curve in bulk helium by neutron scattering, the analogue of the Josephson effect in superfluid helium and possibly others. On the theoretical side the reprinted papers are all older than fifteen years and were acknowledged milestones in their day although the ideas presented in some are not now considered correct. For example, Landau's well known explanation of superfluid flow in terms of the phonon excitation spectrum is not widely believed today, one reason being that his explanation depends on the phonons being exact excitations of the superfluid system. Once we realize that the excitation curve is in reality a plot of that ω, for which the Van Hove $S(q,\omega)$ is a maximum, versus q then it is seen that no absolute meaning can be attached with drawing a tangent to the curve passing through the origin to determine a critical velocity. Feynman and Pitaevski's works on the excitation spectrum are included but the relevance of these papers to the property of superfluidity is only tenuous if one refutes the validity of the Landau argument. Nowadays the feeling seems to be that a proper explanation of superfluidity should result along the lines of some macroscopic coherence, like in the BCS theory of superconductivity, establishing itself in the helium system below the λ-point. The exact nature of this coherence is still a matter of controversy today, some believing that superfluidity is somehow essentially connected with coherence resulting from the existence of a single particle condensate while others would argue that it results from a Bose analogue to the pair condensate of superconductivity, and yet others would claim it to be a combination of both. Professor Galasiewicz, influenced as he is (see preface to *Superconductivity and Quantum Fluids* by Z. Galasiewicz, Pergamon (1970)) by Bogoliubov's ideas and methods, is a supporter of the single particle condensate explanation but he has chosen not to include any of the many recent theoretical papers on the theory of superfluidity in this book and contents himself with just reprinting Bogoliubov's original paper. Until a consensus of opinion, which clearly favours one recent model over all the others, emerges, I think this is a wise decision in a text of this nature.

This book is hard bound and the printing quality is very good. Its cost seems a trifle high, but, in spite of this, I have no hesitation in recommending it.

W. A. B. Evans