termine system behavior. The concept of quasiparticles is developed and used to treat the properties of He^3. Since Landau's phenomenological theory is not applicable to microscopic phenomena, this deficiency of the theory is removed in chapter 2, which is devoted to a general theory of linear response. This powerful tool is then applied in chapter 3 to study charged Fermi liquids. Because of the long-range character of the Coulomb interaction, a charged Fermi liquid is fundamentally different from a neutral Fermi liquid. The authors follow Silin and treat screening, plasma oscillations and transport phenomena in a quantum plasma.

Chapter 4, response and correlation in homogeneous electron systems, contains material present in the authors' previous books. The dielectric response of an electron liquid is determined by the dielectric function $\epsilon(q, \omega)$ which relates the electric displacement $\mathbf{D}(q,\omega) = \epsilon(q,\omega)\mathbf{E}(q,\omega)$ to the electric field. It is shown that the response of the system to an external field is determined by $1/\epsilon(q,\omega)$, and the relation between it and the dynamic form factor is established. Long- and short-wavelength behavior of $\epsilon(q,\omega)$, sum rules, Kramers-Kronig relations, how to calculate the energy loss of a fast electron traversing a plasma and responses to a phonon and electric field are then all treated in a natural and beautiful way.

The last chapter is devoted to a treatment of microscopic theories of the electron liquid. It begins with the Hartree-Fock approximation and then the powerful random-phase approximation, RPA, is developed and used to study a high-density electron gas. The structure of the generalized RPA is described and used to study neutral and charged many-body systems and the link is made in the macroscopic limit to the Landau theory.

The authors have taken considerable pains to write a readable and modern book. In order that it may be intelligible to a wider class of readers, they have eschewed Green's functions and Feynman diagrams and other esoteric techniques of the physics of the many-body problem. At the beginning of each chapter, the material to be covered is sketched in a brief and lucid manner, followed by the actual detailed explanation and masterful execution of the avowed goals. The entire process is summarized once more at the end of the chapter. Problems are provided to extend the theory and to test the student's understanding of it. This reviewer looks forward eagerly to the appearance of volume 2, which will be devoted to the theory of superfluid quantum liquids.

* * *

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For infrared spectroscopists

WAVELENGTH STANDARDS IN THE INFRARED. By K. Narahari Rao, C. J. Humphreys, D. H. Rank. 236 pp. Academic Press, New York, 1966. $10.00

by Alvin H. Nielsen

In recent years there has been a considerable increase in interest in spectra, both atomic and molecular, in the infrared. This interest has been manifest among physicists, chemists and engineers because of the multitude of uses for the spectra aside from the fundamental use in interpretation of structure. The increased interest, along with the increased sophistication of the theory, has for some time demanded a corresponding sharpening of precision of the data being employed in the structure interpretations and in various other areas. It is therefore a very welcome experience to find *Wavelength Standards in the Infrared.*

The three authors have long and distinguished records as infrared spectroscopists working particularly with gratings and interferometers, and at very high resolution. They have each been concerned not only with separation of fine structure, but also with precise measurement of the fine-structure lines observed so that correct theoretical interpretations could be made. It has therefore been necessary for them, each in his own way, to concern themselves with optical techniques and instrumentation that would produce the desired precision. That they have consistently been able to compare spectral positions with each other to the order of several thousandths of a reciprocal centimeter is testimony

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that their methods are effective and consistent. It is particularly gratifying to see that they have collaborated in producing a volume that includes information on their techniques, as well as just figures of spectra and tabulations of the lines.

Chapter 1 includes some introductory remarks about what is to be found in the following chapters. Chapter 2 gives both figures and tables of infrared lines for the noble gases argon, neon, krypton and xenon. Many of these spectra have been published in papers by Humphreys and collaborators, but they are here brought together for easy access.

Chapters 3 and 4 show figures and give tables of line wave numbers of well known molecular absorption spectra to four significant figures beyond the decimal point for the near infrared and to three significant figures for the far-infrared rotational lines. Calculated wave numbers from determined molecular constants are given for comparison. Data on such molecules (including various isotopic species) as HCN, N_2O, CO, HCl, H_2O are given. Investigators using spectrometers of lesser resolving power should be warned that unless they use unblended lines it will not be entirely accurate to use the observed values found in the tables of this book.

Chapter 5 is a particularly valuable chapter because it details the various methods used by each author in his own laboratory. Details are also given about how to take advantage of overlapping orders. Some remarks about computer programs are also present.

The book closes with a series of three appendixes, the first of which is on conversion of wavelengths in air to wave numbers in vacuum or vice versa. Appendix 2 gives a list of the molecular constants used to obtain the "calculated" wave numbers in the tables mentioned in chapters 3 and 4. Appendix 3 gives the first-order wave numbers of molecular absorption standards for coarse echelles.

As a practicing infrared spectroscopist it is my opinion that no other practicing infrared spectroscopist can afford to be without this valuable book.

* * *

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Medium-level calculus

DIFFERENTIAL AND DIFFERENCE EQUATIONS. By Louis Brand. 698 pp. Wiley, New York, 1966. $11.95

by Joseph Gillis

Previous text-books by Louis Brand have gained a well deserved place in mathematical literature and this new addition is their worthy successor. Its main purpose is to present a parallel treatment of differential and difference equations, with the analogies between the two, both in general theory and in methods of solution, forming one of the central themes.

The first five chapters are devoted to an elementary exposition of the theory and practice of ordinary differential equations. Most of the space is taken up by linear equations of standard type but there is a short section on the Ricatti equation and another on "p- and c-discriminants," etc. Included also are some sections that are on the fringe of more advanced work, notably a short introduction to the Green's function concept and a longer but still elementary account of Liapunov stability theory. Some applications, such as damped harmonic motion, RLC circuits, planetary motion, etc., are worked out in chapter 6. This part of the book ends in chapter 7, on the theory and application of the Laplace transform. The level is strictly elementary, without appeal to analytic function theory.

Chapters 8 and 9 deal with difference equations, either linear or such as can be linearized. The standard methods are presented with special emphasis on generating-function techniques, including Maclaurin and Laurent transforms. Parallels with differential equations are carefully brought out.

In chapter 10 the author returns to differential equations, specifically to the solution by power series of linear