Book Reviews

Developments in Transport Theory. Ed. by E. Inönü and P. F. Zweifel, Academic Press, New York (1967). 380 pp. $19.50.

Developments in Transport Theory is the result of the NATO Advanced Study Institute held in Ankara, Turkey in 1965. Neutron transport theory, radiative transfer, and plasma theory are all discussed with most of the emphasis on neutrons. Almost all of the attention is directed to linear or linearized transport theory. The proposed goal of discussing similarities and differences of transport theory problems and methods was achieved by a considerable and successful effort of relating the results from the several fields. Each lecturer and seminar contributor developed his area with admirable skill and clarity, giving sufficient detail for understanding and adequate references for results not obtained directly. Although the detail and rigor are not always as great as found in *Linear Transport Theory* by Case and Zweifel, the interested reader should encounter no particular difficulties in following any of the developments.

K. M. Case initiates the lectures with a development of some of the requisite mathematical tools in "Methods for Solving Linear Transport Problems," including a resume of generalized functions and singular integral equations. Numerous simple applications in plasmas and neutron transport are developed to illustrate the techniques.

P. F. Zweifel opens the second lecture series with a discussion of the significance of the approximations used in obtaining one-speed, one-dimensional "Neutron Transport Theory" from the general form. Various explicit topics (eigenfunctions, eigenvalues, orthogonality, normalization and completeness relations, to mention a few) are examined in detail, while others are summarized. Finally, the picket fence model in radiative transfer is discussed in terms of the solution to a singular integral equation.

John C. Stewart begins "Some Topics in Radiative Transfer" with a discussion of basic definitions and the local thermodynamic equilibrium hypothesis (LTE). Non-LTE problems are discussed and a delineation of the neutron transport theory counterparts to LTE for five radiative transfer problems is made, including a discussion of their physical reality. Finally, a class of tractable problems is reviewed and a numerical technique (the Rybicki-Usher transformation) for varying optical properties is summarized.

W. Kofink reviews "Recent Developments in the Spherical Harmonics Method" for solving the neutron transport equation in plane geometry using the 2^{L+1} multipole error source term and relates Gauss quadrature and P_L results for various interesting cases. The Sonine transformation is developed and utilized to obtain "New Integral Solutions of the Boltzmann Equation in Spherical Geometry" in some detail including regular and singular solutions and comparison with spherical harmonics.

Carl Oberman reviews problems in fully ionized "Plasmas." The Vlasov equation is derived and the instability of a linearized electrostatic plasma oscillation discussed. Using the Bogoliubov Ansatz on the equations of order 1 in ϵ (inverse number of particles in Debye sphere) the kinetic equation for the time evolution of a distribution is derived and discussed. Finally, a simple physical model is developed from the Vlasov equations to investigate the frequency dependence of resistivity and absorption and emission of radiation. Limiting forms are compared favorably to other calculational results.

I. Kušćer opens the last lecture series by summarizing some of the forms and physical assumptions made in neutron "Transport Problems for Thermal Neutrons." A discussion of scattering laws, eigenfunction expansions, diffusion parameters, the reciprocity theorem, and decay times with specific model applications follows with special emphasis being made to validity and unsolved problems.

Eight seminars are included as appendices supplementing and expanding on various aspects of the main lectures.

The editors are to be commended for retaining the freshness of the lecture with the detail of a text in this book. A few typographical errors slipped through, but none that should cause the reader any difficulty. The type and format are quite legible.

In summary, this book contains an eloquent comparison of transport theory problems, is highly readable and could readily supplement the students' overall view of the field, in learning about the techniques and the problems present and unsolved.

Clarence E. Lee

Los Alamos Scientific Laboratory
Los Alamos, New Mexico 87544

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About the Reviewer: *Clarence Lee is a member of the Theoretical Physics Division of the Los Alamos Scientific Laboratory. His work in reactor physics includes contributions to neutron transport, stochastic theory of neutron multiplication, and delayed-neutron multiplication. He is a member of the American Nuclear Society and American Physical Society.*

Hydrogen Bonding in Solids. By W. C. Hamilton and J. A. Ibers. W. A. Benjamin, Inc., 1 Park Ave., New York, N.Y. (1968). 284 pp. $13.95.

This 284-page book (including an 18-page index and nearly 20 pages of references) is divided into eight chapters. The first one is devoted to basic concepts and definitions in the theory of solids and chemical bonds. The