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Book Review: *Statistical Mechanics: Methods and Applications*

Statistical Mechanics: Methods and Applications. F. Mohling. Creative Services Inc., New York, 1982, 608 pp. Distributed by J. Wiley & Sons, Inc., $49.95.

The book *Statistical Mechanics* by the late Franz Mohling was intended by the author to be a text for second or third year graduate students. The book is fairly standard in its choice of material and is strongly oriented toward equilibrium statistical mechanics. However, the presentation is more quantum mechanically oriented than most texts.

The book begins with a chapter on the probability theory of independent random events and then a chapter which reviews thermodynamics starting from the second law. The material on thermodynamics contains only cursory discussion of phase transitions (second-order phase transitions are relegated to a three-sentence footnote). In the third chapter the author derives the Boltzmann equation, and from it obtains the laws of hydrodynamics. He then uses Chapman–Enskog theory to derive transport coefficients. In the fourth chapter he treats zero temperature interacting quantum gases and introduces Foch space and Green's functions. The quantum and classical Liouville equations are obtained in Chapter 5, and very cursory comments about the foundations of statistical mechanics are made in this chapter. Chapters 6–8 and 11 contain applications of the equilibrium ensembles. These include diatomic gases, simple crystals, ideal quantum fluids, the virial expansion of the equation of state, the van der Waals equations, ionized gases, para- and ferro-magnetism, and relativistic Fermi gases. Chapter 9 is a catchall discussion of irreversible processes, including a derivation of the fluctuation–dissipation theorem for simple Brownian motion, irreversible thermodynamics, Onsager relations, nuclear spin relaxation, the master equation, Kubo's linear response theory, and the Ehrenfest urn model. In Chapter 10, the author computes one- and two-body distribution functions for fluids and crystals and shows their relation to structure factors which may be measured in inelastic scattering experiments.

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This book could have been written in the 1960s. There is very little reference to topics of current interest, in particular, equilibrium and nonequilibrium phase transitions. There is almost no background discussion of time-dependent stochastic theory to orient the student. Nonequilibrium phenomena are not treated with any depth, except for the material on the Boltzmann equation. The book places heavy emphasis on quantum formalism but then, surprisingly, never treats superfluidity or superconductivity. However, the material that is presented in this book is carefully and clearly written. The chapters are followed by a number of problems which help elucidate the material. The applications which are used to illustrate theoretical material are well chosen and interesting.

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