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Book Review: *Statistical Mechanics for Chemists*

Statistical Mechanics for Chemists. J. Goodisman, Wiley, New York, 1997.

This book is intended to be a text for a graduate course in statistical mechanics for all chemists–not just physical chemists. In order to achieve this goal, the level of mathematics cannot be too high. The author is reasonably successful in avoiding sophisticated mathematics although it makes some of the derivations a bit ungainly. After providing the fundamentals of statistical mechanics, the author discusses applications. Many of these are standard but there are some which reflect the research interests off the author. Among the latter are: spins in a magnetic field; absorption; electrons in metals; semiconductors; dipoles in a field; dielectric constants; and chemical reaction rates.

My major unhappiness with the book has to do with the presentation of ensemble theory and the interpretation of the ensemble distribution function. The association of the distribution function with the time spent in a region of phase space is correct for an isolated system or the microcanonical ensemble but it is not true for the other ensembles as is implied here. The author confuses ensembles, which are collections of isolated systems, with assemblies which are collections of systems in weak interaction with each other. The same symbol, N, is used for the number of systems in an ensemble and for the number of particles in a system. The derivations of the forms of the distribution functions for the canonical and grand canonical ensembles are unnecessarily complicated. The association of the single distribution formation $f^{(1)}(x)$, times the element of volume, dx, with the number of systems in the ensemble in that volume element is incorrect. Finally, there is the assertion that the total distribution function of a system relaxes from an initial non equilibrium form to an equilibrium form. This is essentially correct for reduced distribution functions but not for the total function. Although most of these points will have no effect on most students, there may well be students who will be misled by them.

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