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Book Review: *An Introduction to Statistical Thermodynamics*

An Introduction to Statistical Thermodynamics. Robert P. H. Gasser and W. Graham Richards, World Scientific, Singapore, 1995.

This book presents an engaging introductory exposition to statistical mechanics. The main goal of the text is to explain to the beginning graduate student the physical link between the macroscopic behavior of a system and the properties of its constituents (atoms or molecules). Several elements make the book succeed in its aim.

The material is presented in a clear and concise style. Mathematical rigor is sacrificed wherever it would divert the reader from the point under discussion. This is not a drawback in the light of the many existing textbooks on statistical thermodynamics that concentrate on more formal aspects of the subject. Second, the principles and tools explained are illustrated with experiments from the very beginning. Finally, but hardly less important, the book is an updated and revised version of the book *Entropy and Energy Levels*, first published in 1974, which has been very popular with students.

The book is divided into ten chapters. The first chapter briefly reviews the laws of thermodynamics. Distribution laws are discussed in the next chapter based on the assumption that the energy states accessible to particles are quantized. The relation between the entropy and distribution laws is established in the third chapter, where the partition function appears for the first time. A discussion of the partition function together with applications is the subject of the fourth chapter. The remainder of the book is devoted to applications. Specific subjects discussed in these chapters include kinetics, physical phenomena at low temperatures, spectroscopy, the theory of heat capacities, and modern computational methods as applied to problems in statistical mechanics. Finally, in the last chapter, some basic ideas of statistical mechanics are applied to several areas of human endeavor (although with some care, as befits this controversial group of topics). It may be somewhat surprising to find such a topic in a

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textbook, but it helps to emphasize the intimate relationship between the macroscopic behavior of a system and microscopic properties of its constituents.

Mathematical techniques which are necessary but which might distract the reader from focusing on physical ideas are included in appendices. The book also contains some problems that "are intended more to illustrate and extend the discussion in the text,..., than to test his [the student's] ability to do numerical calculations," as the authors express in the preface. Finally, the extensive bibliography should help to orient the student in finding additional useful texts or, if desired, to delve deeper into the subject.

I highly recommend this book to students (physicists or chemists) as an introductory text, and to more experienced practitioners of statistical mechanics for its discussions of physical applications.

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