Journal of Statistical Physics, Vol. 37, Nos. 5/6, 1984

Book Review: *Introduction to Statistical Mechanics and Thermodynamics*

Introduction to Statistical Mechanics and Thermodynamics. Keith Stowe. John Wiley & Sons, New York, 1984, 534 pp.

The philosophical differences between those who believe that thermodynamics should be learned from a postulatory basis and those that favor a microscopic basis will probably continue to rage for a long time. The postulatory approach, being the one that reflects the historical evolution of thermodynamics and statistical mechanics more accurately, has long dominated the textbooks on the subject. Thus, in most course sequences thermodynamics is taught before statistical mechanics. Keith Stowe takes issue with the historical approach and has designed a text that somewhat reverses the sequence by firmly basing thermodynamic concepts as they arise on microscopic ideas. Therefore, although the total material covered in the book is more or less the standard fare, the format of and approach to the material are less conventional. This is not to say that the order in which various subjects are introduced varies from the usual but rather that the necessary microscopic notions are introduced whenever the author feels that they can clarify a macroscopic concept. The author views the postulational approach as more or less a historical accident that places an unreasonable burden on the student; he sees the microscopic or statistical approach as the more logical one. All quarrels about the basic philosophy aside, the text succeeds in its purpose.

The book is meant as an introductory text for a standard thermodynamics–statistical mechanics course. The author has designed it to satisfy several requirements. The text is self-contained in that it introduces and deals with the basic concepts of thermodynamics, statistical mechanics, and quantum mechanics that one would expect at this level. A large amount of flexibility is possible in the design of a course using this text. The author has divided the 29 chapters into ten so-called "core chapters" and 19 "extensions and applications" chapters. The ten core chapters deal with the fundamental notions of thermodynamics, equations of state, statistical mechanicanics, and quantum mechanics. The other 19 chapters are

0022-4715/84/1200-0711$03.50/0

interspersed among the core chapters and deal with further explanations and applications that can be studied selectively and in various orders.

There are many excellent summaries sprinkled throughout each chapter. While this certainly highlights the main ideas, some may find that a summary prepared *by* a student is ultimately more helpful than one prepared *for* him. The book also contains many excellent problems that range from the purely conceptual to the numerical. Students will find the absence of any solutions to these problems frustrating (perhaps solution manuals that this reviewer is not aware of are available).

In summary, this reviewer found the text to be a good one within a given paradigm that many certainly take issue with. The approach inevitably leads to a lack in historical perspective, and also to a less than clear division between microscopic and macroscopic concepts. On the other hand, I have often heard it said that the more traditional approach leaves first-time students equally mystified.

Katja Lindenberg
Department of Chemistry
University of California at San Diego
La Jolla, California