Journal of Statistical Physics, Vol. 119, Nos. 5/6, June 2005 (© 2005)
DOI: 10.1007/s10955-005-4406-1

Book Review: *Phase Transitions: A Brief Account with Modern Applications*

Phase Transitions: A Brief Account with Modern Applications. M. Gitterman and V. Halpern, World Scientific Publishing Co., New Jersey, 2004.

This remarkable book of only 134 pages, including its bibliography and index, covers an extremely wide variety of topics in the general area of phase transitions. It is based on short graduate courses given by Gitterman at New York University and Bar-Ilan University and is intended to be useful to scientists and engineers as well as social scientists interested in the general area.

The bibliography contains references to papers extending from Onsager's 1944 publication to several publications in 2003. In the preface, the authors underline two main features of the book. One is the wide variety of problems and approaches described, and the other is the simplicity and brevity of the discussions.

The topics covered run the gamut from the Ising model through mean field theory, scaling, the renormalization group, phase transitions in quantum systems, universality, random and small world systems, and self-organized criticality. Almost all the systems discussed are in equilibrium or time-independent although there are a few mentions of the application of universality to vortices.

There is no question that the discussions are brief since most chapters contain 10 or 11 pages, and the longest chapter on quantum systems contains 17 pages. Despite the brevity of the chapters, many topics are discussed in them. For example, in the chapter on random and small world systems the sections are headed percolation, Ising model with random interactions, spin glasses, and phase transitions in small world systems. The range of topics studied in modern work on phase transitions is mirrored by the range of topics discussed in this volume.

The authors have tried to avoid formalism as much as possible but have succeeded in presenting the basic ideas in an illuminating way. In many cases, the developments produce important insights into the approaches given in the literature and into the underlying physics behind

these approaches. In some cases, particularly in the chapter on phase transitions in quantum systems, the lack of formalism is a hindrance to the discussion.

The lack of formalism does not insure that the discussion is simple. Neophytes will have to think very hard to follow the gist of the arguments. Experts in the field will find the book easy to read but still a fruitful endeavor.

All in all, I enjoyed reading the book and think it will be useful for graduate students and researchers in the field of phase transitions. The authors do point out significant papers which extended their approaches and which should lead to expertise in the field.

Irwin Oppenheim
Chemistry Department
Massachusetts Institute of Technology
Cambridge, Massachusetts 02139
E-mail: amh@mit.edu