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Book Review: *Nonequilibrium Statistical Mechanics in One Dimension*

Nonequilibrium Statistical Mechanics in One Dimension. V. Privman, ed., Cambridge University Press, Cambridge, 1997.

The study of complex systems in statistical mechanics is usually undertaken through the study of mathematically simplified models. Exact and analytical calculations in the framework of these models, often provide valuable insight into the general behavior of complex systems and can therefore be used to test more physically realistic theories. One-dimensional models are among the most successful in furnishing analytical results. Although dimensionality is certainly a critical limitation for some mechanisms, exploration of the behavior of one-dimensional systems has been used to understand a wide range of phenomena, from correlated systems in physics to living systems in biology. The book under review presents the numerous developments in 1D models for reaction, absorption, diffusion and dynamics recently.

The book is more than just a collection of papers that show the ultimate developments in the field but which might be barely comprehensible to anyone not at the frontier of a particular research area. On the contrary, most contributors to the book make the effort to include an introductory section and develop their topics from a wide perspective, as confirmed by long lists of references. This feature serves equally well to the reader interested in becoming acquainted for first time with a particular subject and to the most informed researcher looking for a review of the advances in one of the topics discussed.

Several problems in one dimensional non-equilibrium statistical mechanics are reviewed in the book. The best summary of the topics discussed is given by the title of the seven parts into which the book has been divided by V. Privman, the editor: I, Reaction diffusion systems and models of catalysis; II, Kinetic Ising models; III, Ordering, coagulation, phase separation; IV, Random adsorption and relaxation processes; V, Fluctuations in particle and surface systems; VI, Diffusion and transport in one dimension; and VII, Experimental results.

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Each part has three papers. A short editor's note precedes each part and clearly establishes the topic addressed in each paper, along with its connections to other parts of the book. There is, of course, a redundancy in methods used in different chapters. This feature reinforces the aim of the book as a deep introduction to the subject devoted to both advanced graduate students and scientists who would like to know the state of the art of this particular field. All chapters are written by leading researchers. Taking into account the difficulty in choosing a reduced set of such researchers, the editor is to be congratulated on his final choice, since all the contributors have well-earned reputations in their respective fields.

In addition, the extensive bibliography given in each paper make this book a valuable reference in the library of any scientist working in statistical physics. Obviously, it is impossible for a book of this nature to cover all the topics in this field, but the selection of subjects included would justify referring tto the book as complete. A regrettable absence is, nevertheless, stochastic resonance which could have appeared in Part VI, on diffusion and transport in one dimension. Last, but not least, the book contains a complete subject index that is extremely useful to the occasional reader interested in a particular topic or technique.

This book will be definitively added to the selective list of well-thumbed books in statistical mechanics that, in the case of one-dimensional systems, is included under the rubric of mathematical physics in one dimension as first described in the book edited by Lieb and Mattis. I would highly recommend the book as a basic reference for researchers in statistical mechanics and, in addition, as and advanced introduction for graduate students who wish to become acquainted with the wide variety of mathematical techniques used to deal with 1D systems in statistical physics.

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