Statistical Physics

I

M. Toda, R. Kubo, N. Saito

Equilibrium Statistical Mechanics

2nd ed. 1992. XVI, 252 pp. 90 figs. (Springer Series in Solid-State Sciences, Vol. 30) Softcover DM 59,- ISBN 3-540-53662-0

The fundamentals of equilibrium statistical mechanics are discussed in this text, which focuses on basic physical aspects. No previous knowledge of thermodynamics or the molecular theory of gases is assumed. Illustrative examples based on simple materials and photon systems elucidate the central ideas and methods.
This book not only offers an elementary introduction to statistical physics but also sets the stage for likely future developments. A fluent exposition of the general principles is given in the first half, while the second deals with two of the most fascinating subjects in this area: phase transitions and ergodic problems.

II

R. Kubo, M. Toda, N. Hashitsume

Nonequilibrium Statistical Mechanics

2nd ed. 1991. XVI, 279 pp. 28 figs. (Springer Series in Solid-State Sciences, Vol. 31) Softcover DM 59,- ISBN 3-540-53833-X

This text, the second volume of a two-volume set, treats statistical theories of nonequilibrium states from the viewpoint of the fluctuation-dissipation theorem, mainly in the framework of linear response theory. It begins by introducing the fundamental concepts and methods of stochastic theories. The classical theory of Brownian motion is generalized into a standard theory for fluctuation , relaxation, and response. The problem of coarse graining is treated on the basis of the stochastic Liouville equation and the damping theory formalism uses the projection operator method. One chapter is devoted to phenomenological treatments of relaxation and another to linear response theory. The final chapter is an introduction to the fieldtheoretic Green's function method.

Monte Carlo Methods

K. Binder

The Monte Carlo Method in Condensed Matter Physics

With contributions by A. Baumgärtner, K. Binder, A. N. Burkitt, D. M. Ceperley, H. De Raedt, A. M. Ferrenberg, D. W. Heermann, H. J. Herrmann, D. P. Landau, D. Levesque, W. von der Linden, J. D. Reger, K. E. Schmidt, W. Selke, D. Stauffer, R. H. Swendsen, J.-S. Wang, J.-J. Weis, A. P. Young

1992. Approx. 395 pp. 85 figs. 8 tabs. (Topics in Applied Physics, Vol. 71) Hardcover DM 99,-
ISBN 3-540-54369-4

The "Monte Carlo method" is a method of computer simulation of a system with many degrees of freedom, and thus it has widespread applications in science. It takes its name from the use of random numbers to simulate statistical fluctuations in order to numerically generate probability distributions (which cannot otherwise be known explicitly, since the systems considered are so complex). The Monte Carlo method then yields numerically exact information on "model systems". Such simulations serve two purposes: one can check the extent to which a model system approximates a real system; or one may check the validity of approximations made in analytical theories.
This book summarizes recent progress obtained in the implementation of this method and with the general analysis of results, and gives concise reviews of recent applications. These applications include simulations of growth processes far from equilibrium, interfacial phenomena, quantum and classical fluids, polymers, quantum problems on lattices, and random systems.

K. Binder

Applications of the Monte-Carlo Method in Statistical Physics

2nd. ed. 1987. XVI, 341 pp. 90 figs. Softcover DM 70,-
ISBN 3-540-17650-0

K. Binder

Monte Carlo Methods in Statistical Physics

2nd. ed. 1986. XVII, 411 pp. 97 figs.
Softcover DM 76,- ISBN 3-540-16514-2

K. Binder, D. W. Heermann

Monte Carlo Simulation in Statistical Physics

An Introduction

1988. VIII, 127 pp. 34 figs. (Springer Series in Solid-State Sciences, Vol. 80) Hardcover DM 49,-
ISBN 3-540-19107-0

K. K. Sabelfeld

Monte Carlo Methods

in Boundary Value Problems

1991. XII, 283 pp. 62 figs. (Springer Series in Computational Physics) Hardcover DM 128,-
ISBN 3-540-53001-0

This book deals with Random Walk Methods for solving multidimensional boundary value problems. Monte Carlo algorithms are constructed for three classes of problems: (1) potential theory, (2) elasticity, and (3) diffusion.
Some of the advantages of our new methods as compared to conventional numerical methods are that they cater for stochasticities in the boundary value problems and complicated shapes of the boundaries.

G. A. Mikhailov

Optimization of Weighted Monte Carlo Methods

Translated from the Russian by K. K. Sabelfeld

1992. XI, 228 pp. 9 tabs. (Springer Series in Computational Physics) Hardcover DM 136,-
ISBN 3-540-53005-3

Weighted Monte Carlo algorithms are extremely useful when direct simulation techniques are inapplicable or ineffective. The methods presented in this book help to minimize computer time and memory required in constructing statistical models for systems described by integral equations. Approximate solutions of integral and differential equations serve as weighted functionals of special Markov chains. Variances of these solutions are minimized by (nonlinear) "importance" functions for the determination of which the author presents an asymptotic approach.
Key points: Optimization of randomized algorithms for estimating probabilistic characteristics of equations with random parameters and applications; computational models for random fields and numerical simulations; vector Monte Carlo algorithms for solving systems of integral equations; a special approach to the application of perturbation theory based on this method.

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