TABLE OF CONTENTS

PREFACE	v
Introduction to modern theory of phase transitions J.M.J. VAN LEEUWEN	1
Renormalization theory for systems with continuously varying exponents H.J.F. KNOPS	7
Introduction Discrete Gaussian model XY-model Vertex models Generalized Villain model Renormalization picture for the generalized Villain model References	7 7 10 13 15 16 20
Statistical mechanics of ising spin glasses K. BINDER	21
Introduction General relations for ordering and correlations in spin glasses	21 26
Mean field theory of spin glasses: replica method and tap equations	29
Computer simulations for short-range Edwards-Anderson models	32
Is the "Freezing-Transition" a phase transition? More realistic models	38 46
Conclusions References	48 49
Two dimensional superfluidity and melting D.R. NELSON	53
Introduction	53
Superfluidity and the two-dimensional XY model	59 70
Dynamic scaling and third sound in helium films Statistical mechanics of melting	77
Melting dynamics	91
Anisotropic melting References	97 103
Exactly solved models R.J. BAXTER	109
Introduction	109
Matrix inversion trick for calculating the free energy	$114 \\ 119$
Generalized star-triangle relation Solutions of the star-triangle relation	122
Corner transfer matrices	129
References	140

Spectral transform and solitons: an introduction to a novel technique to solve (certain classes of) nonlinear evolution equations F. CALOGERO	143
Integrable many-body problems and related mathematical results F. CALOGERO	151
Self-generated chaotic behavior in nonlinear mechanics R.H.G. HELLEMAN	165
Introduction Conservative systems Dissipative systems Acknowledgements Appendix References	166 169 199 216 216 219
The Boltzmann equation and fluctuations E.G.D. COHEN	235
The Boltzmann equation The approach to equilibriumH-theorem Remarks The Chapman-Enskog solution of the Boltzmann equation Fluctuations Fluctuations around equilibrium Fluctuations around a stationary state Questions Acknowledgement Footnotes References	235 236 237 237 240 240 243 245 246 246 246
Exact solutions of the nonlinear Boltzmann equation M.H. ERNST	249
Introduction Discrete velocity models Simple continuous velocity model Maxwell molecules Diffuse scattering models Very hard particle model Conclusion Acknowledgements References	249 252 256 261 267 277 288 289 289
On relativistic kinetic theory: neutrino-antineutrino systems S.R. DE GROOT	293
Kinetic theory Transport equation Linear theory Approximation method Application to neutrino-antineutrino systems Acknowledgement References	293 294 296 303 307 311 312
Hydrodynamic fluctuation theory for a one-component fluid in equilibrium; the non-linear case D. BEDEAUX	313

Introduction The Clebsch representation for an ideal fluid Variational principle for ideal fluids and Hamiltonian	313 315
formulation The Liouville equation Hydrodynamic fluctuations Green-Kubo relations Concluding remarks Appendix References	317 322 325 328 331 332 334
Some properties of quantum liquids and solids R.A. GUYER	335
On the binding of many particle systems, T = O°K [.] Quantum crystals Excitations of a quantum crystal, tunneling The simplest magnet; the solid ³ He magnet References	335 345 351 359 368
Quantum gases: spin-polarized atomic hydrogen and deuterium I.F. SILVERA	369
Introduction Limitations on density Experimental stabilization of atomic H↓ and D↓ H↓ in contact with helium surfaces References	369 371 371 372 374
Superconductivity in the thirties H.B.G. CASIMIR	377
AUTHOR INDEX	387

387