

CONTENTS

CRITICAL PHENOMENA AND SCALE INVARIANCE	F.J. WEGNER
I. Scaling: Phenomenological Description	3
II. Renormalization Group Equation	8
III. An Example	14
IV. Results on the Isotropic n-Vector Model	20
V. Scaling Fields and Universality	25
References	29
INVARIANCE PROPERTIES OF THE RENORMALIZATION GROUP	M.S. GREEN
I. Introduction	31
II. Differential Renormalization Transformation in Wegner Form	33
III. RG Linearized around Fixed Point	34
IV. Redundant Perturbations to χ^*	35
V. Flow Vector Containing a Parameter	37
VI. What Happens to Fixed Point	38
VII. What Happens to Eigenvalues	39
VIII. Conclusions	41
References	42
SCALE TRANSFORMATIONS IN DYNAMIC MODELS	SHANG-KENG MA
I. Review of Basic Ideas and Terminology	44
II. Simple Examples	56
III. Monte Carlo Study of the Renormalization Group	63
IV. Perturbation Methods	71
References	78
CRITICAL DYNAMICS IN FOKKER-PLANCK FORMALISM	C.P. ENZ
I. Classification of Models	80
II. Fokker-Planck Formalism	86
III. Perturbation Theory	98
IV. Application to Structural Phase Transitions	103
References	109

DYNAMIC CRITICAL PHENOMENA AND THE RENORMALIZATION GROUP - APPLICATION TO A LATTICE DYNAMIC MODEL P. SZÉPFALUSY

I. Introduction	112
II. The Dynamics of the Model in the $n \rightarrow \infty$ Limit	120
III. Hydrodynamics and Dynamic Scaling in the Lattice Dynamical Model	127
IV. Semimacroscopic Description of the System	133
V. Renormalization Group Analysis	142
References	153

THE ALGEBRAIC APPROACH TO QUANTUM STATISTICAL MECHANICS. EQUILIBRIUM STATES AND HIERARCHY OF STABILITY R. HAAG

I. Introduction	156
II. Basic Concepts	158
III. Equilibrium States. Stability Condition. KMS-Condition	168
IV. Direct Computation of Equilibrium States from the Stability Condition for the Free Bose- and Fermi Gas	176
V. Hierarchy of Stability	184
Appendix	186
References	188

THEOREMS ON PHASE TRANSITIONS WITH A TREATMENT FOR THE ISING MODEL S. MIRACLE-SOLÉ

Introduction	190
I. Notations and Definitions	191
II. First Remarks on the Equilibrium States	194
III. Statement of the Results	197
IV. Uniqueness of the Equilibrium State	198
V. Critical Temperature and Spontaneous Magnetization	199
VI. Two Phase Coexistence at Low Temperature	202
VII. Two Phase Coexistence below T_c	204
VIII. Sharpness of the Interface Surface	209
IX. Interface Profile in Two Dimensions	211
References	213

STATISTICAL MECHANICS OF EQUILIBRIUM SYSTEMS: SOME RIGOROUS RESULTS J.L. LEBOWITZ

I. Introduction	216
II. The Canonical Ensemble: Thermodynamic Limit of the Free Energy	219
III. Phase Transitions for Systems with Long Range Potentials	225
IV. Grand Canonical Ensemble	232
V. Lattice Systems	238
References	246

PROBABILISTIC ASPECTS OF CRITICAL FLUCTUATIONS	G. GALLAVOTTI
I. Generalities	250
II. Macroscopic Fluctuations Theory	259
III. Applications to Field Theory	263
IV. Remarks	271
References	273
THE APPLICATION OF RENORMALIZATION GROUP TECHNIQUES TO QUARKS AND STRINGS	L.P. KADANOFF
Introduction	276
I. Statistical Variables and Statistical Sums	278
II. Symmetries	288
III. Renormalization Theory: A Point of View and a Calculational Method	298
IV. Properties of the Quark-String Model	317
V. Approximation Methods for Lattice Systems	328
References	346
THE ROLE OF SPONTANEOUS BROKEN SYMMETRY	R. BROUT
I. Spontaneous Broken Symmetry and the Nambu-Goldstone Theorem	350
II. Application of the Nambu-Goldstone Theorem to Particle Theory	360
III. Spontaneous Broken Gauge Theory	369
IV. Quantum Flux Lines: Type II Superconductivity: The Dual String	377
V. Odds and Ends	380
References	383