CONTENTS

MACROSCOPIC POTENTIALS, BIFURCATIONS AND NOISE IN DISSIPATIVE SYSTEMS — R. GRAHAM

1. Introduction 1
2. Macroscopic potentials 5
3. Noise in Josephson junctions 14
4. Codimension two bifurcations and noise 21
5. Lorenz attractor and noise 26

DYNAMICS OF TOPOLOGICAL DEFECTS IN FIRST ORDER PHASE TRANSITIONS — J.D. GUNTON

1. Introduction 35
2. Pattern formation 36
3. Extensions of Lifshitz-Slyozov theory 40
4. Dynamics of interfaces for model A 41
5. Interface equations for binary fluids and binary alloys 42
6. Dynamics of topological defects in the clock model 44
7. Theoretical calculations of the scattering intensity for binary fluids and binary alloys 46
8. Real space renormalization group theory 48

AN INTRODUCTION TO PATTERN FORMATION IN NONEQUILIBRIUM SYSTEMS — P.C. HOHENBERG, M.C. CROSS

1. Introduction 56
2. Basic features of pattern formation 57
3. Real patterns 75
4. Conclusion 89

THE STATISTICAL MECHANICS OF POLYMER MELTS AND GLASSES — S.F. EDWARDS

1. Introduction 93
2. Polymer problems as field problems 94
3. The polymer melt 97
4. Viscoelasticity 102
5. The onset of the glass phase 107

ON THE REPLICA SYMMETRIC ISING SPIN GLASSES — C. DE DOMINICIS, P. MOTTISHAW

1. A toy model 123
2. General bond distribution 128

CONFORMAL INVARIANCE AND FINITE SIZE EFFECTS IN CRITICAL TWO DIMENSIONAL STATISTICAL MODELS — C. ITZYKSON

1. Preliminaries 145

2. Free fields - Gaussian and ising models 158
3. Modular invariant partition functions 167

GENERALIZED NON LINEAR σ-MODEL AND EFFECTIVE LANDAU THEORY FOR DISORDERED INTERACTING ELECTRON SYSTEMS — C. CASTELLANI, C. DI CASTRO, G. STRINATI

1. Introduction 176
2. The non linear σ-model 177
3. Renormalization parameters and the Landau theory of normal Fermi liquid 181
4. Discussion and conclusion 192

RELATIONSHIP BETWEEN D-DIMENSIONAL MODELS WITH LANGEVIN DYNAMICS, ASSOCIATED QUANTUM SYSTEMS AND (D+1)-DIMENSIONAL CLASSICAL AND STATIC MODELS — T. SCHNEIDER

1. Introduction 199
2. Sketch of the basic formalism 201
3. Relationship between dynamic, quantum and classical critical phenomena 207
4. Relationship between classical diffusion, $1/\omega$-noise and the motion of a quantum particle in random media 213

PHASE TRANSITIONS AND STATIONARY NONEQUILIBRIUM STATES — J. MARRO

1. Introduction 227
2. Stationary states 228
3. One-dimensional systems 233
4. Some standard examples 242
5. Fast ionic conductors 244
6. Further examples on a lattice 250

QUANTUM MECHANICAL CHAOS CRITERIA FOR A KICKED TOP — F. HAAKE, M. KUŚ, R. SCHARF

1. Introduction 259
2. The evolution operator and its symmetries 261
3. Classical chaos on the sphere 265
4. Regular versus erratic quasiperiodicity 267
5. Quantum beats versus broad-band excitation 270
6. Level repulsion 272

SHORT RANGE SPIN GLASSES AT LOW TEMPERATURES — A. BOVIER 277

DIFFUSION IN FULLY DEVELOPED TURBULENCE — S. GROSSMANN

A RANDOM WALK ON A FRACTAL STRUCTURE

1. Introduction 287
2. Turbulent diffusion 289
3. Eddy energy 293
4. Hierarchy 298
5. Diffusion and correlation 306

MULTIFRACTAL WAVEFUNCTION AT THE LOCALIZATION THRESHOLD — C. CASTELLANI

1. Introduction 315
2. Fractals and multifractals 316
3. Multifractals and critical phenomena 322
4. Multifractal structure of the wavefunction near the mobility edge 324
5. Conclusion 331

EFFECTS OF SCREENING IN LIQUID CRYSTAL POLYMERS — A. TEN BOSCH, P. MAÏSSA

1. Introduction 333
2. Free energy of mixing 334
3. Chain model-mean field theory 337
4. Screened potential 343
5. Effective interaction parameters 345
6. End-to-end distance 346
7. Elastic constants 347

LOCALIZATION, QUANTUM INTERFERENCE AND TRANSPORT IN DISORDERED SOLIDS — B. KRAMER, M. SCHREIBER

1. Introduction 351
2. Description of the scaling theory 358
3. Numerical test of the scaling hypothesis 361
4. Results 367
5. Open questions 374

ON THE COMPUTATIONAL COMPLEXITY OF COMPOSITE SYSTEMS — A.W.M. DRESS

1. Introduction 377
2. The interaction scheme of a composite system 378
3. The tree width of an interaction scheme 381
4. An algorithm for the computation of the ground state of a finite spin glass system and of its degeneracy 383
5. An algorithm for the computation of the free energy of a finite spin glass system 386
6. Discussion 386

DISSIPATIVE QUANTUM TUNNELING — H. GRABERT

1. Introduction 389
2. Euclidean action of a damped system 393
3. The crossover temperature T_0 394
4. Above T_0: Thermal hopping 396
5. Near T_0: The crossover region 399
6. Below T_0: Tunneling transitions 404
7. Conclusions 408

PARTICIPANTS 411