

CONTENTS

A REVIEW OF CURRENT ISSUES IN THE QUANTUM THEORY OF ENVELOPE SOLITONS	K. LINDENBERG D. BROWN X. WANG
1. Introduction	1
2. The Davydov Ansätze	3
3. Analysis of Davydov's $ D_2\rangle$ Ansatz State (37)	10
4. Nonlinear Density Matrix Equations (39-41)	19
5. Future Directions	25
 FLUCTUATIONS IN THE TRANSIENT DYNAMICS OF NONLINEAR OPTICAL SYSTEMS	 M. SAN MIGUEL
1. Introduction	29
2. Laser Switch-on Problems	30
3. Relaxation from Marginality in Optical Bistability	34
4. Dynamics of Pattern Formation in the Turing Optical Instability	37
 THEORETICAL METHODS IN PATTERN FORMATION IN PHYSICS, CHEMISTRY AND BIOLOGY	 M. C. CROSS
1. Introduction	45
2. Basic Features of Pattern Formation	45
3. Simple Theories	51
4. Applications	66
 TWO NONEQUILIBRIUM PHASE TRANSITIONS: STOCHASTIC HOPF BIFURCATION AND ONSET OF RELAXATION OSCILLATIONS IN THE DIFFUSIVE SINE-GORDON MODEL	 L. L. BONILLA
1. Introduction	75
2. Martin-Siggia-Rose Formalism and Effective Equation	77
3. Stochastic Hopf Bifurcation	81
4. Diffusive Sine-Gordon Equation in 2D	86
 EXACTLY SOLVABLE MULTISTABLE FOKKER-PLANCK MODELS WITH ARBITRARILY PRESCRIBED N LOWEST EIGENVALUES	 H. R. JAUSLIN
1. Introduction	97
2. Darboux-Crum Transformation	98
3. Adding One Eigenvalue	99
4. Adding Two Eigenvalues	101
5. Adding N Eigenvalues	103
6. Propagators	104

VI

PHASE AND FREQUENCY DYNAMICS IN LASER INSTABILITIES

N. B. ABRAHAM

Introduction	108
Outline	114
The Entrance of the Phase into the Dynamics of Single Mode Lasers	115
Time Dependent Phase and Frequency with Moderate Detuning	121
Behavior of the Phase in Single Mode Lasers at and near Resonance	127
Phase and Frequency Dynamics in a Bidirectional Ring Laser	130
Conclusions, Discussions, Speculations	134

FLUCTUATIONS AND CRITICAL PHENOMENA IN REACTION-DIFFUSION SYSTEMS

A. S. MIKHAILOV

1. Noise-Induced Phase Transition	139
2. Decay and Reproduction in Fluctuating Media	143
3. Explosion Threshold for Strong Centers	146
4. Explosion Threshold for Weak Centers	147
5. The Role of Rare Clusters	148
6. A Population-Settling-Down Transition	153

FROM DETERMINISTIC CHAOS TO NOISE IN RETARDED FEEDBACK SYSTEMS

M. LE BERRE
Y. POMEAU
E. RESSAYRE
A. TALLET
H. M. GIBBS
D. L. KAPLAN
M. J. ROSE

1. Introduction	157
2. Statistical Properties of Single Well Retarded Equations with Periodic Feedback	160
3. Correlation Decay and Lyapunov Exponents	171

NON-LOCAL AND NON-LINEAR PROBLEMS IN THE PHYSICS OF DISORDERED MEDIA

E. GUYON
S. ROUX
A. HANSEN

1. Introduction	177
2. Central Force Percolation	180
3. Non Linear Effects	185
4. Conclusions	191

CONVECTION IN BINARY MIXTURES: PROPAGATING AND STANDING PATTERNS

M. LOCKE

1. Introduction	195
2. The System	195
3. Standing and Propagating Roll Patterns	197
4. Competition Between Roll and Square Patterns	207

TIME-DEPENDENT PHASE TRANSITIONS

P. MANDEL
H. ZEGHLACHE
T. ERNEUX

1. Introduction	218
2. Static Bifurcation	218
3. Time-Dependent Perfect Bifurcation	221
4. Time-Dependent Bifurcation: Constant Imperfection	223
5. Time-Dependent Bifurcation: Periodic Imperfection	225
6. Time-Dependent Bifurcation: Stochastic Imperfection	227
7. Time-Dependent Bifurcation: Nonlinear Threshold	229
8. Nonlinear Analysis of the Imperfect Bifurcation Problem	231
9. Conclusions	233

QUANTUM TREATMENT OF DISPERSIVE OPTICAL BISTABILITY

H. RISKEN
K. VOGEL

1. Introduction	237
2. Model and Basic Equations	240
3. Pseudo Fokker-Planck Equation and Fokker-Planck Equation with an Additional Third-Order-Derivative Term	242
4. Expansion into Complete Sets and Derivation of Vector Recurrence Relations	245
5. Matrix Continued Fraction Method	247
6. Results	250
7. Conclusion	260

SPONTANEOUS SYMMETRY BREAKING AND SPATIAL STRUCTURES IN OPTICAL SYSTEMS

L. A. LUGIATO
C. OLDANO
L. SARTIRANA
WANG KAIGE
L. M. NARDUCCI
G.-L. OPPO
M. A. PERNIGO
J. R. TREDICCE
F. PRATI
G. BROGGI

1. Introduction	263
2. The Kerr Model with Diffraction; Passive, Externally Driven Systems	264
3. Stationary Spatial Patterns	266
4. Passive Systems, Cavity with Spherical Mirrors	269
5. The Spatial Instability in the Laser: Cooperative Frequency Locking	272
6. Ring Laser with Spherical Mirrors	275
7. Spontaneous Breaking of the Cylindrical Symmetry	278

VIII

SCALING FOR AN INTERFACIAL INSTABILITY

D. JASNOW

1. Introduction	281
2. Model and Simulations	283
3. Results	287
4. A Proposed Scaling Law	292
5. Macroscopic Description and Dynamics in a Field Gradient	293
6. Interface Equations	298
7. Concluding Remarks	302

FIELD THEORY FOR GROWTH KINETICS

G. F. MAZENKO

1. Introduction	307
2. Separation of Variables	310
3. Perturbation Theory	321
4. Results	325
5. Conclusions	331

LIST OF PARTICIPANTS

337