

Contents

I. Introduction

Solitons in Mathematics: Brief History By R.K. Bullough and R.K. Dodd	2
Solitons in Physics. By J.A. Krumhansl	22

II. Mathematical Aspects

Numerical Studies of Solitons. By J.C. Eilbeck	28
Poles of the Toda Lattice. By J. Gibbon	44
Perturbation Theory of the Double Sine-Gordon Equation By P.W. Kitchenside, A.L. Mason, R.K. Bullough, and P.J. Caudrey ..	48
Soliton Perturbations and Nonlinear Focussing. By A.C. Newell	52
Novel Class of Nonlinear Evolution Equations Solvable by the Spectral Transform Technique, Including the So-Called Cylindrical KdV Equation By F. Calogero and A. Degasperis	68
The Complex Modified Korteweg-de Vries Equation, a Non-Integrable Evolution Equation. By C.F.F. Karney, A. Sen, and F.Y.F. Chu	71

III. Statistical Mechanics and Solid-State Physics

Soliton-Bound States in the Magnetic Gap. By A. Luther	78
Statistical Mechanics of Nonlinear Dispersive Systems By A.R. Bishop	85
Some Applications of Instantons in Statistical Mechanics By D.J. Wallace	104
The Theory of Structural Phase Transitions: Cluster Walls and Phonons By A.D. Bruce	116
Nonlinear Lattice Dynamics: Molecular Dynamics Studies By T. Schneider and E. Stoll	135
Computer Simulation of Structural Phase Transitions. By W.C. Kerr ...	150

Soliton-Like Features in a Two-Dimensional XY Model with Quartic Anisotropy. By E. Stoll and T. Schneider	154
Behavior of a ϕ^4 -Kink in the Presence of an Inhomogeneous Perturbation By N. Theodorakopoulos, S. Hanna, and R. Klein	158
Solitary Wave Solutions in a Diatomic Lattice By H. Büttner and H. Bilz	162
Lattice Models of High Velocity Dislocation Motion By N. Flytzanis	166
Grain Boundaries as Solitary Waves By R.J. Harrison, G.H. Bishop, Jr., S. Yip, and T. Kwok	183
The Relation of Solitons to Polaritons in Coupled Systems By D.F. Nelson	187
Solitons in CsNiF ₃ : Their Experimental Evidence and Their Thermodynamics. By M. Steiner and J.K. Kjems	191
Structure and Stability of Domain Walls - Phase Transition By J. Lajzerowicz and J.J. Niez	195
Periodic Lattice Distortions and Charge Density Waves in One- and Two-Dimensional Systems. By R.H. Friend	199
Solitons in Incommensurate Systems. By P. Bak	216
Fluctuations and Freezing in a One-Dimensional Liquid: Hg _{3-δ} AsF ₆ By J.D. Axe	234
Charge Density Wave Systems: The ϕ -Particle Model. By M.J. Rice.....	246
The Soliton Lattice: Application to the ω Phase. By B. Horovitz	254
The New Concept of Transitions by Breaking of Analyticity in a Crystallographic Model. By S. Aubry	264
Textures in Superfluid ³ He. By K. Maki	278
Creation of Spin Waves in ³ HeB. By P.W. Kitchenside, R.K. Bullough, and P.J. Caudrey	291
The Interaction of Spin Waves in Liquid He ³ in Several Dimensions By J.D. Gibbon	297
Josephson Transmission Line Oscillators. By A.C. Scott	301
Dissipative Structures in Quasi-One-Dimensional Superconductors By A. Baratoff	313
Solitary Phenomena in Finite Dissipative Discrete Systems By E. Ben Jacob, and Y. Imry	317

Stability of Nonuniform States in Systems Exhibiting Continuous Bifurcation. By M. Büttiker and H. Thomas	321
The Sine-Gordon Chain: Mass Diffusion. By T. Schneider and E. Stoll	326
Solitary-Wave Propagation as a Model for Poling in PVF ₂ By A.J. Hopfinger, A.J. Lewanski, T.J. Sluckin, and P.L. Taylor ...	330
Theory of One-Dimensional Ionic and Solitary Wave Conduction in Potassium Hollandite. By J.B. Sokoloff and A. Widom	334
 <u>IV. Summary</u>	
Summary: Where Do Solitons Go From Here? By S.E. Trullinger	338
Index of Contributors	341