

Contents

Introduction	
By P. Manneville	1
<hr/>	
Part I	Information Theory and Statistical Physics
<hr/>	
Cellular Automata, Dynamics and Complexity	
By E. Goles (With 10 Figures)	10
Scaling Properties of a Family of Transformations Defined on Cellular Automaton Rules	
By N. Boccara (With 4 Figures)	21
Entropy and Correlations in Dynamical Lattice Systems	
By K. Lindgren (With 8 Figures)	27
Cellular Automata Probability Measures	
By M.G. Nordahl (With 10 Figures)	41
Complex Computing with Cellular Automata	
By J. Signorini (With 3 Figures)	57
Phase Transitions of Two-State Probabilistic Cellular Automata with One Absorbing Phase	
By R. Bidaux, N. Boccara, and H. Chaté (With 3 Figures)	73
Simulating the Ising Model on a Cellular Automaton	
By O. Parodi and H. Ottavi (With 3 Figures)	82
Domain Growth Kinetics: Microscopic Derivation of the $t^{1/2}$ Law	
By E. Domany and D. Kandel (With 8 Figures)	98
Critical Behavior in Cellular Automata Models of Growth	
By J. Myczkowski and G. Vichniac (With 3 Figures)	112
<hr/>	
Part II	Lattice Gas Theory and Direct Applications
<hr/>	
Deterministic Cellular Automata with Diffusive Behavior	
By C.D. Levermore and B.M. Boghosian	118
Cellular Automata Approach to Diffusion Problems	
By B. Chopard and M. Droz (With 6 Figures)	130

Long-Time Decay of Velocity Autocorrelation Function of Two-Dimensional Lattice Gas Cellular Automata By D. Frenkel (With 5 Figures)	144
Evidence for Lagrangian Tails in a Lattice Gas By P.-M. Binder (With 1 Figure)	155
The Construction of Efficient Collision Tables for Fluid Flow Computations with Cellular Automata By J.A. Somers and P.C. Rem (With 6 Figures)	161
Lattice Boltzmann Computing on the IBM 3090 Vector Multiprocessor By S. Succi, R. Benzi, E. Foti, F. Higuera, and F. Szelényi (With 3 Figures)	178
Bibliography on Lattice Gases and Related Topics By D. d'Humières	186

Part III	Modeling of Microscopic Physical Processes
-----------------	---

Multi-species Lattice-Gas Automata for Realistic Fluid Dynamics By K. Molvig, P. Donis, R. Miller, J. Myczkowski, and G. Vichniac (With 8 Figures)	206
Immiscible Lattice Gases: New Results, New Models By D.H. Rothman (With 4 Figures)	232
Lattice Gas Simulation of 2-D Viscous Fingering By M. Bonetti, A. Noullez, and J.-P. Boon (With 1 Figure)	239
Dynamics of Colloidal Dispersions via Lattice-Gas Models of an Incompressible Fluid By A.J.C. Ladd and D. Frenkel	242
Strings: A Cellular Automata Model of Moving Objects By B. Chopard (With 7 Figures)	246
Cellular Automata Approach to Reaction-Diffusion Systems By D. Dab and J.-P. Boon (With 8 Figures)	257
Simulation of Surface Reactions in Heterogeneous Catalysis: Sequential and Parallel Aspects By B. Sente, M. Dumont, and P. Dufour	274

Part IV	Complex Macroscopic Behavior, Turbulence
----------------	---

Periodic Orbits in a Coupled Map Lattice Model By F. Bagnoli, S. Isola, R. Livi, G. Martínez-Mekler, and S. Ruffo (With 4 Figures)	282
Phase Transitions in Convection Experiments By F. Bagnoli, S. Ciliberto, R. Livi, and S. Ruffo (With 3 Figures)	291

Using Coupled Map Lattices to Unveil Structures in the Space of Cellular Automata
By H. Chaté and P. Manneville (With 6 Figures) 298

Part V Design of Special-Purpose Computers

A Cellular Automata Machine
By F. Bagnoli and A. Francescato (With 11 Figures) 312

Index of Contributors 319