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5.3 Lorenz equations; 5.4 Low dimensional autocatalytic networks; 5.5 Chua equations; 6. Reaction Diffusion Dynamics; 6.1 Introduction; 6.2 Pulse front solutions of Fisher and related equations; 6.3 Diffusion driven spatial inhomogeneities; 6.4 Turing mechanism of chemical pattern formation; 7. Solitons; 7.1 Introduction; 7.2 One dimensional lattice dynamics; 7.2.1 Korteweg-de Vries equation; 7.2.2 sine-Gordon equation; 7.3 Burgers equation; 8. Neuron Pulse Propagation; 8.1 Introduction; 8.2 Properties of a neural pulse; 8.3 FitzHugh-Nagumo equations; 8.4 Hodgkin-Huxley equations  
8.5 An overview  
9. Time Reversal, Dissipation and Conservation; 9.1 Introduction; 9.2 Irreversibility and diffusion; 9.2.1 Theory of random walk; 9.2.2 Langevin equation and equilibrium fluctuations; 9.2.3 Newtonian mechanics and asymptotic irreversibility; 9.3 Reversibility and time recurrence; 9.3.1 A linear synchronous system; 9.3.2 Recurrence in nonlinear Hamiltonian systems: Fermi-Pasta-Ulam Model; 9.4 Complex dynamics and chaos in Newtonian dynamics: Henon-Heiles equations; Bibliography; Index

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Sommario/riassunto

This book aims to provide mathematical analyses of nonlinear differential equations, which have proved pivotal to understanding many phenomena in physics, chemistry and biology. Topics of focus are autocatalysis and dynamics of molecular evolution, relaxation oscillations, deterministic chaos, reaction diffusion driven chemical pattern formation, solitons and neuron dynamics. Included is a discussion of processes from the viewpoints of reversibility, reflected by conservative classical mechanics, and irreversibility introduced by the dissipative role of diffusion. Each chapter presents the su

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