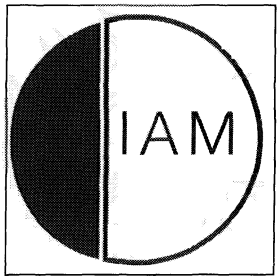


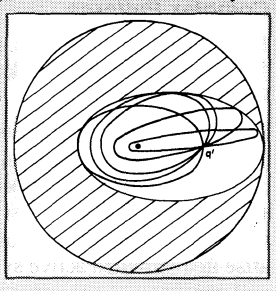
Interdisciplinary Applied Mathematics

M.C. Gutzwiller, IBM T.J. Watson Research Center, Yorktown Heights, NY

Chaos in Classical and Quantum Mechanics

1st ed. 1990. Corr. 2nd printing 1991. XIII, 432 pp. 78 figs. (Interdisciplinary Applied Mathematics, Vol. 1) Hardcover DM 68,- ISBN 3-540-97173-4

Contents: Introduction.- The Mechanics of Lagrange.- The Mechanics of Hamilton and Jacobi.- Integrable Systems.- The Three-Body Problem: Moon-Earth-Sun.- Three Methods of Section.- Periodic Orbits.- The Surface of Solution.- Models of the Galaxy and of Small Molecules.- Soft Chaos and the KAM Theorem.- Entropy and Other Measures of Chaos.- The Anisotropic Kepler Problem.- The Transition From Classical to Quantum Mechanics.- The New World of Quantum Mechanics.- The Quantization of Integrable Systems.- Wave Functions in Classically Chaotic Systems.- The Energy Spectrum of a Classically Chaotic System.- The Trace Formula.- The Diamagnetic Kepler Problem.- Motion on a Surface of Constant Negative Curvature.- Scattering Problems, Coding and Multifractal Invariant Measures.- References.- Index.



S. Wiggins, California Institute of Technology, Pasadena, CA

Chaotic Transport in Dynamical Systems

1992. Approx. 340 pp. 116 figs. (Interdisciplinary Applied Mathematics, Vol. 2) Hardcover DM 78,- ISBN 3-540-97522-5

Provides a new and more realistic framework for describing the dynamics of non-linear systems. A number of issues arising in applied dynamical systems from the viewpoint of problems of phase space transport are raised in this monograph. Illustrating phase space transport problems arising in a variety of applications that can be modeled as time-periodic perturbations of planar Hamiltonian systems, the book begins with the study of transport in the associated two-dimensional Poincaré Map. This serves as a starting point for the further motivation of the transport issues through the development of ideas in a non-perturbative framework with generalizations to higher dimensions as well as more general time dependence.

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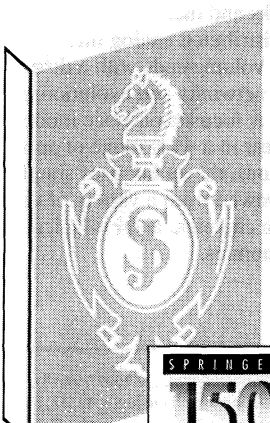

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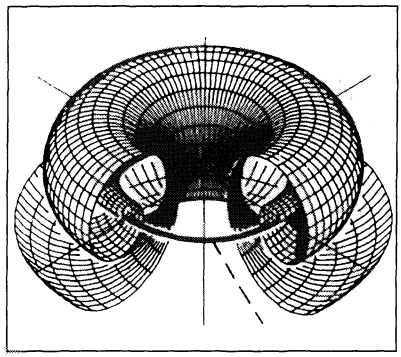

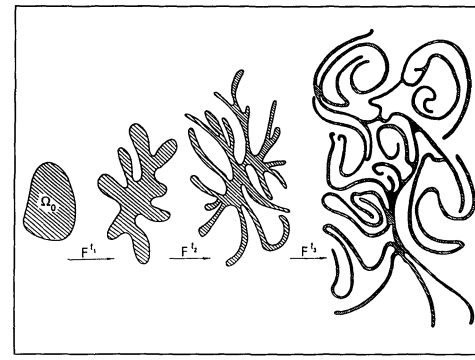

SYNERGETICS

A.S. Mikhailov, Moscow State University

Foundations of Synergetics I

Distributed Active Systems

1990. X, 187 pp. 68 figs. 5 tabs. (Springer Series in Synergetics, Vol. 51) Hardcover DM 110,-
ISBN 3-540-52775-3

This textbook presents an introduction to the mathematical theory of cooperative behavior in active systems of various origin, both natural and artificial. This volume (the first of two) is devoted to the properties of regular self-organized patterns in distributed active systems. An analysis of pattern formation and self-supported wave propagation in active media is followed by a description of the properties of neural networks and their possible applications in the field of distributed analog information processing. The volume ends with a discussion of reproductive networks and evolutionary systems. Attention is focused on basic models which might appear in a wide range of applications. As illustrations, the author uses simplified examples borrowed from a variety of disciplines ranging from chemical and biological physics to market economics.

A.S. Mikhailov, **A.Yu. Loskutov,** Moscow State University

Foundations of Synergetics II

Complex Patterns

1991. VIII, 210 pp. 98 figs. (Springer Series in Synergetics, Vol. 52) Hardcover DM 110,-
ISBN 3-540-53448-2

This book is the second of two volumes that together give a comprehensive introduction to the theory of cooperative behavior in active systems. This volume is devoted to the properties of the complex chaotic patterns that can arise in distributed active systems. The reader will encounter strange attractors, fractals, discrete maps, spatio-temporal chaos..., and will learn how these phenomena relate to the emergence of complex and chaotic patterns. Examples treated in detail include population explosion and extinction in fluctuating distributed media, and fluctuation effects in binary annihilation.

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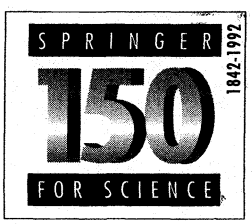

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