



# **Topology and Dynamics of Chaos: In Celebration of Robert Gilmore's 70th Birthday (World Scientific Series on Nonlinear Science Series A)**

*Christophe Letellier, Robert Gilmore*

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The book surveys how chaotic behaviors can be described with topological tools and how this approach occurred in chaos theory. Some modern applications are included.

The contents are mainly devoted to topology, the main field of Robert Gilmore's works in dynamical systems. They include a review on the topological analysis of chaotic dynamics, works done in the past as well as the very latest issues. Most of the contributors who published during the 90's, including the very well-known scientists Otto RöSSLer, René Lozi and Joan Birman, have made a significant impact on chaos theory, discrete chaos, and knot theory, respectively.

Very few books cover the topological approach for investigating nonlinear dynamical systems. The present book will provide not only some historical — not necessarily widely known — contributions (about the different types of chaos introduced by RöSSLer and not just the “RöSSLer attractor”; Gumowski and Mira's contributions in electronics; Poincaré's heritage in nonlinear dynamics) but also some recent applications in laser dynamics, biology, etc.

## Contents:

- Introduction to Topological Analysis (*Christophe Letellier & Robert Gilmore*)
- **Emergence of a Chaos Theory:**
  - The Peregrinations of Poincaré (*R Abraham*)
  - A Toulouse Research Group in the “Prehistoric” Times of Chaotic Dynamics (*Christian Mira*)
  - Can We Trust in Numerical Computations of Chaotic Solutions of Dynamical Systems? (*René Lozi*)
  - Chaos Hierarchy — A Review, Thirty Years Later (*Otto E RöSSLer & Christophe Letellier*)
- **Development of the Topology of Chaos:**
  - The Mathematics of Lorenz Knots (*Joan S Birman*)
  - A Braided View of a Knotty Story (*Mario Natiello & Hernán Solari*)
  - How Topology Came to Chaos (*Robert Gilmore*)
  - Reflections From the Fourth Dimension (*Marc Lefranc*)
  - The Symmetry of Chaos (*Christophe Letellier*)
- **Applications of Chaos Theory:**
  - The Shape of Ocean Color (*Nicholas Tuffillaro*)
  - Low Dimensional Dynamics in Biological Motor Patterns (*Gabriel B Mindlin*)
  - Minimal Smooth Chaotic Flows (*Jean-Marc Malasoma*)
  - The Chaotic Marriage of Physics and Financial Economics (*Claire Gilmore*)
  - Introduction of the Sphere Map with Application to Spin-Torque Nano-Oscillators (*Keith Gilmore & Robert Gilmore*)
  - Robert Gilmore, a Portrait (*Hernán G Solari*)

**Readership:** Graduate students and researchers interested in topological analysis of nonlinear dynamical systems producing chaotic attractors.

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