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Editorial

Nonlinearity, nonequilibrium and complexity: questions and perspectives in Statistical Physics

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This volume contains a collection of eighteen original articles and two mini reviews on a varied choice of current problems in Statistical Physics. These contributions cover a wide range of topics from basic thermal systems and their fluctuation properties, to out-of-equilibrium processes and complex system problems in assorted subjects, including networks and their applications, and innovative appearances of nonlinear dynamics and stochastic processes in other fields. Thus, specifically, we have: efficiency of thermal or chemical engines from novel viewpoints; noise properties of reversible fluctuations; unusual circumstances in equilibrium statistical mechanics; ideas around generalized entropies; gel model obstruction of glass formation; multiplex networks, learning networks, and networks from time series; conduction at the onset of chaos; localization transitions and deterministic intermittency, intermittency of critical fluctuations, intermittency in coarse-grained evolutionary ecosystem models; synchronous chaos in coupled lasers; Fokker-Planck equation invariants; vegetation patterns from stochastic instabilities; model of stem cells in colonic crypts; deterministic foraging; multilayer models for financial market dynamics.

The contributions in this volume, envisioned as a celebration of Professor Alberto Robledo's long research career in Statistical Physics, mirror his evolving research interests in this field. His contributions have spread through random walks, equilibrium structure of inhomogeneous systems, solidification, interfacial phase transitions, microemulsions, confined fluids, liquid crystals, magnetism and superconductivity in bidimensional materials, etc. We emphasize here his contributions in the last few years, those that refer to the occurrence of the patterns of the onset of chaos in low-dimensional dissipative systems in leading topics of condensed matter physics and in complex systems of various disciplines. These consider the dynamics in and towards the attractors at period-doubling accumulation points and at tangent bifurcations to describe features of glassy dynamics, critical fluctuations and localization transitions. They also provide an analytical framework to reproduce rank distributions of large

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classes of data (including Zipf's law), and mimic the evolution of high-dimensional models, such as those for evolution models of ecosystems. His latest works point out a common circumstance of drastic contraction of configuration space and generalized entropic concepts.

Thus, we would like to present this volume not only to provide the reader with the latest developments but also to highlight Professor Robledo's significant contributions to Statistical Physics.

The Guest Editors,
Sumiyoshi Abe and Hans Jürgen Herrmann