Preface

Nonlinear dynamics in out equilibrium system has been appealing a great deal of attention for several decades due to their tremendous influence in many physical, chemical, biological, economical, ecological, and social processes. Many efforts in the past have focused on the understanding of complex behavior of low-dimensional system, characterization of primary, spatial, or temporal bifurcations, which generate dissipative structures that can be either periodic or localized in space or/and in time. In two-dimensional setting, regular patterns like stripes, hexagons, squares, and super lattices, and the understanding of the macroscopic particle type solutions. Prigogine and Lefever to describe the spontaneous appearance of periodic structures as a result of irreversible processes maintained by exchanges of matter and/or energy with a non-equilibrium environment have introduced the term "dissipative structures." Dissipative structures generally evolve on macroscopic scales and can only be maintained by continuous application of a non-equilibrium constraint. The spontaneous emergence of dissipative structures arises from a principle of self-organization that can be either in space or in time. A classic example of spatial self-organization is provided in the context of chemical reaction diffusion system referred to as Turing instability. This instability is characterized by a symmetry breaking that leads spontaneously to the formation of periodic structures with an intrinsic wavelength. In this case the wavelength is determined solely by the dynamical parameters such as diffusion coefficient and the inverse characteristic time associated with chemical kinetics. However, because of theoretical and numerical advances, and experimental observations are still offering many fundamental questions, which present the challenge of the nonlinear community. Such as characterization and emergence of complex spatiotemporal behavior, self-organization of life matter and nanoscale structure, and geometric characterization of localized structures. To make progress in this problematic, it is necessary to develop new nonlinear concepts, methods, and instruments.

This book contains the selected lectures given at the third Dynamics Days South America 2014, which took place at Valparaiso November 3–7, 2014. Since its beginning, a key goal of Dynamics Days South America conference has been to

promote the participation and cross-discipline interaction of young scientists together with more established experts from a wide variety of fields. The lectures were devoted to various aspects of pattern formation, coarsening dynamics, driven systems, front propagation, stochastic process, nonlinear Anderson localization, interface dynamics, defects dynamics, phase transition and nonlinear dynamics in magnetic, fluid, optical, mechanical, and social systems.

We want to thank, here, our sponsors and supporters whose interest and help were essential for the success of the meeting. However, the physical realization of the workshop would have not been possible without the decisive collaboration of the Universidad de Chile, Pontificia Universidad Católica de Valparaiso and Center for mathematical modeling.

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