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Preface

Noise plays a fundamental and essential role in the explanation of natural phenomena, both at a qualitative and quantitative level. Novel ideas and concepts boost the importance of fluctuations to a level where noise must be considered as a source of order and complexity in its own right. The exploration of the combined effects of nonlinearity and noise in complex systems is an ongoing effort of increasing relevance for new advances in very diverse areas of knowledge. The goal of the workshop was to explore and to identify new horizons for existing and new themes such as: stochastic resonance, the dominant role of noise for directed transport (Brownian motors), fluctuating hydrodynamics, spatial–temporal stochastic phenomena, scale-free networks, and quantum noise, to name but a few. Particular emphasis was put on the exploration of the applicability of stochastic approaches to the understanding of biological and biophysical problems. Fields like the relaxation in complex potential landscapes, proteomics, genomics, cellular behavior, the hearing process, and the physics of glasses, etc., do provide an extraordinarily rich realm of very interesting topics with an abundance of experimental data, in which the effects of noise are intrinsically important. An adequate description of the effects of noise in these systems is lacking, both at the qualitative and quantitative levels. The algorithmic, information-theoretic and numerical aspects of stochastic descriptions prove to be very important in such situations. In the case of biological systems and physical nonlinear stochastic systems they become an essential part of the theoretical analysis, due to the very complex mathematical modeling required by realistic models. Moreover, the new technologies of parallel computing do have a huge impact in the solutions of complex stochastic problems.

The conference took place from September 15–17, 2004 at the Universidad de Sevilla. The venue for the meeting was at the beautiful Pabellón de México, suitably located in the heart of Sevilla. This Workshop was organized by Prof. Dr. Manuel Morillo, Prof. Dr. Azucena Álvarez-Chillida and Prof. Dr. Peter Hänggi. The organizers herewith like to acknowledge the generous financial support by the European Science Foundation: without this main support the event would not have taken place. Additional support was also provided by the Universidad de Sevilla, the Ministerio de Ciencia y Tecnología and the Junta de Andalucía.

This ESF-STOCHDYN workshop hopefully served to provide the necessary background from the viewpoint of stochastic physics and as well, has distributed the growing seeds to tackle new challenges of stochastic complexity. Most of all, it served to identify new horizons for stochastic complexity for already existing and new topics.

Sevilla and Augsburg, October 15, 2004

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