

Preface

The field of applied nonlinear dynamics has attracted scientists and engineers across many different disciplines to develop innovative ideas and methods to study complex behavior exhibited by relatively simple systems. Examples include: population dynamics, fluidization processes, applied optics, stochastic resonance, flocking and flight formations, lasers, and mechanical and electrical oscillators. A common theme among these and many other examples is the underlying universal laws of nonlinear science that govern the behavior, in space and time, of a given system. These laws are universal in the sense that they transcend the model-specific features of a system and so they can be readily applied to explain and predict the behavior of a wide ranging phenomena, natural and artificial ones. Thus the emphasis in the past decades has been in explaining nonlinear phenomena with significantly less attention paid to exploiting the rich behavior of nonlinear systems to design and fabricate new *devices* that can operate more efficiently.

Recently, there has been a series of meetings on topics such as Experimental Chaos, Neural Coding, and Stochastic Resonance, which have brought together many researchers in the field of nonlinear dynamics to discuss, mainly, theoretical ideas that may have the potential for further implementation. In contrast, the goal of the 2007 ICAND (International Conference on Applied Nonlinear Dynamics) was focused more sharply on the implementation of theoretical ideas into actual devices and systems. Thus the meeting brought together scientists and engineers from all over the globe to exchange research ideas and methods that can bridge the gap between the fundamental principles of nonlinear science and the actual development of new technologies. Examples of some of these new and emerging technologies include: (magnetic and electric field) sensors, reconfigurable electronic circuits, nanomechanical oscillators, chaos-based computer chips, nonlinear nano-detectors, nonlinear signal processing and filters, and signal coding.

The 2007 ICAND meeting was held in Hawaii, at Poipu Beach, Kauai on September 24–27, 2007. The waters off Poipu Beach are crystal clear and provided a truly beautiful atmosphere to hold a meeting of this kind. The invited speakers at this seminal meeting on applied nonlinear dynamics were drawn from a rarefied mix. They included a few well-established researchers in the field of nonlinear dynamics

as well as a “new breed” of pioneers (applied physicists, applied mathematicians, engineers, and biologists) who are attempting to apply these ideas in laboratory and, in some cases, industrial applications. The discussions in the meeting cover broad topics ranging from the effects of noise on dynamical systems to symmetry mathematics in the analyses of coupled nonlinear systems to microcircuit designs in implementation of these nonlinear systems. The meeting also featured, as already stated, some novel theoretical ideas that have not yet made it to the drawing board, but show great promise for the future. The organizers also attempted to give some exposure to much younger researchers, such as advanced graduate students and postdocs, in the form of posters. The meeting set aside significant amount of time and provided many opportunities outside of presentation setting to promote the discussions and foster collaborations amongs the participants.

The organizers extend their sincerest thanks to the principal sponsors of the meeting: Office of Naval Research (Washington, DC), Office of Naval Research-Global (London), San Diego State University (College of Sciences), and SPAWAR Systems Center San Diego. In particular, we wish to acknowledge Dr. Michael Shlesinger from the Office of Naval Research (Washington DC) for his support and encouragement. In addition, we extend our grateful thanks, in specific, to Professor Antonio Palacios and Dan Reifer at SDSU for their hardwork in making the financial transactions as smoothly as possible despite many obstacles thrown in their way. We also want to thank our colleagues who chaired the sessions and to the numerous individuals who donated long hours of labor to the success of this meeting. Finally, we thank Springer-Verlag for their production of an elegant proceedings.

San Diego, USA
May 2008

V. In
P. Longhini
A. Palacios

Applications of Nonlinear Dynamics
Model and Design of Complex Systems
In, V.; Longhini, P.; Palacios, A. (Eds.)
2009, XIV, 478 p., Hardcover
ISBN: 978-3-540-85631-3