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Axel Bender
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Introduction

In these Proceedings a number of papers are presented that were submitted to and featured during the Complexity and Nonlinear Dynamics Conference of the SPIE International Symposium on Smart Materials, Nano- and Micro-Smart Systems in Adelaide, 12–13 December 2006. All contributions were peer-reviewed and accepted by a technical committee of complex systems scientists.

Researchers came from around the world, including the United States of America, Japan, Russia, Italy, and all parts of Australia to participate in and contribute to the second Australian complexity science related conference under the umbrella of the International Society for Optical Engineering (SPIE). While small in attendance, it was an exciting event that provided an effective forum for multi-disciplinary exchange across many fields of science, technology and engineering. Most natural systems are "on the edge of chaos" – between order and randomness. Complexity, as governed by non-linear dynamics, can be observed everywhere. It therefore comes as no surprise that many scientific and engineering disciplines deal with complex system phenomena and characteristics such as self-organisation, emergence, adaptation, non-linear feed-forward and feedback, stochastic resonance or swarm and herd behaviours. These proceedings are a fine compendium of work addressing two of the biggest challenges of scientists and engineers today: the understanding and taking advantage of complexity and the underlying nonlinear dynamic processes.

I would like to express my gratitude to the three conference cochairs Hussein A. Abbass (UNSW@ADFA, Australia), Univ. of New South Wales (Australia), Derek Abbott, (Univ. Adelaide, Australia) and Adi R. Bulsara (Space and Naval Warfare Systems Command, USA), without whose expert advice this conference wouldn't have been possible. My thanks also go to the members of the Program Committee each of whom contributed significantly to the success of this second SPIE Complex Systems Conference in Australia: Tomaso Aste (ANU, Australia), Salvatore Baglio (Univ. Catania, Italy), Rowena Ball, Michael F. Barnsley (ANU, Australia), Matthew J. Berryman (Univ. Adelaide, Australia), Julyan H. E. Cartwright (Univ. Granada, Spain), Tiziana Di Matteo (ANU, Australia), J. Doyne Farmer (Santa Fe Institute, USA), Peter Hall (ANU, Australia), Brian Hanlon (DSTO, Australia), Plamen C. H. Ivanov (Boston Univ., USA), Geoff James (CSIRO, Australia), Neil F. Johnson (Univ. Oxford, UK), Michael K. Lauren (DTA, New Zealand), Peter A. Lindsay (Univ. Queensland, Australia), Raj Mohanty (Boston Univ., USA), Alexander B. Neiman (Ohio Univ., USA), Mario Nicodemi (Univ. Napoli Federico II, Italy), Wouter-Jan Rappel (Univ. California/San Diego, USA), Peter A. Robinson (Univ. Sydney, Australia), Alex Ryan (DSTO, Australia), Yoshiharu Yamamoto (Univ. Tokyo, Japan).

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Axel Bender

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