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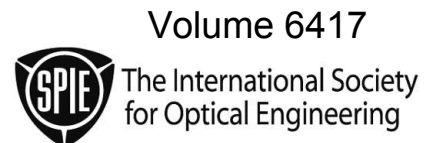
## ***Complexity and Nonlinear Dynamics***

**Axel Bender**  
*Chair/Editor*

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# Contents

v	<i>Conference Committee</i>
vii	<i>Introduction</i>
ix	<i>Symposium Sponsors</i>

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## SESSION 1 NONLINEARITY IN DEVICE APPLICATIONS AND MANUFACTURING PROCESSES

---

- 641702 **Electric field detectors in a coupled ring configuration: preliminary results (Invited Paper)** [6417-01]  
B. Ando, S. Baglio, F. Di Grande, F. Passaniti, N. Savalli, Univ. degli Studi di Catania (Italy);  
V. In, A. R. Bulsara, Space and Naval Warfare Systems Ctr., San Diego (USA)
- 641704 **Nonlinear dynamics that appear in the dynamical model of drying process of a polymer solution coated on a flat substrate** [6417-04]  
H. Kagami, Nagoya College (Japan)

---

## SESSION 2 DISORDER, IMBALANCE, AND NONEQUILIBRIUM

---

- 641706 **High-resolution optimal quantization for stochastic pooling networks (Invited Paper)** [6417-08]  
M. D. McDonnell, The Univ. of Adelaide (Australia); P.-O. Amblard, Lab. des Images et des Signaux, CNRS (France); N. G. Stocks, The Univ. of Warwick (United Kingdom); S. Zozor, Lab. des Images et des Signaux, CNRS (France); D. Abbott, The Univ. of Adelaide (Australia)
- 641707 **Relaxation in complex systems and fractional calculus** [6417-09]  
V. E. Arkhincheev, Federal Urdu Univ. of Arts, Science, and Technologies (Pakistan) and Buryat Science Ctr. (Russia); A. B. Bainova, Buryat State Univ. (Russia)

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**SESSION 3 EXPLORING AND EXPLOITING NOISE**

---

- 641708 **Brownian motion in filtered periodic potential driven by green impulse noise** [6417-10]  
S. A. Guz, M. G. Nikulin, M. V. Sviridov, Moscow Institute of Physics and Technology (Russia)
- 64170B **Simulation and measurement of a two-stage complex network model** [6417-16]  
H. Luo, K. Horadam, RMIT Univ. (Australia)

---

**SESSION 4 BIO- AND SOCIO-SYSTEM DYNAMICS**

---

- 64170C **Fractal transformations of harmonic functions (Invited Paper)** [6417-13]  
M. F. Barnsley, U. Freiberg, The Australian National Univ. (Australia)
- 64170D **Marital infidelity and its effect on pathogen diversity** [6417-14]  
M. J. Berryman, The Univ. of Adelaide (Australia)

---

**SESSION 5 THE COMPLEX HUMAN BODY**

---

- 64170F **Quantitative modeling of multiscale neural activity (Invited Paper)** [6417-19]  
P. A. Robinson, Univ. of Sydney (Australia) and Westmead Millenium Institute (Australia);  
C. J. Rennie, Univ. of Sydney (Australia), Westmead Millenium Institute (Australia), and  
Westmead Hospital (Australia)
- 64170G **1/f dynamics adaptable attractor selection and synchronizability in noise-driven multistable neuronal networks** [6417-20]  
L. A. Safonov, The Univ. of Tokyo (Japan) and Japan Society for the Promotion of Science (Japan); Y. Yamamoto, Japan Society for the Promotion of Science (Japan)

*Author Index*

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- 2 Disorder, Imbalance, and Nonequilibrium  
**Matthew J. Berryman**, The University of Adelaide (Australia)
- 3 Exploring and Exploiting Noise  
**Michael F. Barnsley**, The Australian National University (Australia)
- 4 Bio- and Socio-System Dynamics  
**Derek Abbott**, The University of Adelaide (Australia)
- 5 The Complex Human Body  
**Axel Bender**, Defence Science and Technology Organisation (Australia)

## 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).



Last but not least I wish to acknowledge the efforts of the enthusiastic teams of the SPIE Technical Program Department and SPIE Proceedings Editors, who worked hard to get the programme up and running and ensured that the manuscripts meet high standards.

**Axel Bender**

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