



Preface

The Conference on Nonlinear Systems and Dynamics, 2018 popularly known as CNSD is a major event organized annually in India. Over the last two decades, the study of nonlinear systems and dynamics has emerged internationally as a major area of interdisciplinary research. In India, there are a number of groups actively involved in research on nonlinear dynamics. A need was being felt for a forum where active researchers in this area can meet periodically to report new experiments and theoretical developments, to examine hypothesis to explain physical phenomena, and to discuss common problems faced by researchers working in this field. The conference had its 1st edition in the year 2003.

In the year 2018, the 11th edition of CNSD was organized in Jawaharlal Nehru University (JNU), New Delhi from 11 to 14 October. CNSD 2018 provided a platform for bringing various researchers working in the area of nonlinear systems and dynamics to present their work, exchange views and report latest research findings. CNSD 2018 had a total of 248 registered participants. There were 112 poster presentations and 93 lectures. The themes covered in CNSD 2018 included Random Matrix Theory, Chaos and Synchronization, Time-Series Analysis, Complex Networks, Chaos and Solitons, Chaos and Communication, Coupled System, Chemical System, Mathematical Biology, Pattern Formation and Synchronization as well as some general topics.

One of the main reasons to organize this conference in Delhi, particularly in JNU, was to honor Professor Ramakrishna Ramaswamy and Professor Akhilesh Pandey who was superannuated in year 2018 and 2019 respectively. A brief introduction about them is given below.



Professor Ramakrishna Ramaswamy

Professor Ramaswamy, one of the founding members of the School of Physical Sciences (SPS), Jawaharlal Nehru University, New Delhi, retired on October 30, 2018 after an illustrious teaching and research career in physical, chemical and biological sciences spanning over 32 years.

Born in Madras on October 14, 1953, Professor Ramaswamy obtained his B.Sc. in Chemistry from Loyola College, Chennai in 1972, M.Sc. in Chemistry from IIT, Kanpur before moving to Princeton University, USA for pursuing Ph.D. in Chemistry (1974) under the supervision of Professor Herschel Rabitz. After a post-doctoral stint at California Institute of Technology, Pasadena with Professor Rudolph A. Marcus from 1978 to 1980, he returned to India in 1980 and joined the Tata Institute of Fundamental Research (TIFR) Centre, Bombay as a visiting fellow from 1981 to 1983 and then as a fellow from 1983 to 1986. He later moved to JNU in the year 1986, as one of the founding faculty members of SPS, where he remained until his retirement. From 2002 to 2018 he also held a concurrent position in establishing the School of Computational and Integrative Sciences at JNU.

In addition to his teaching at SPS, JNU, Professor Ramaswamy supervised more than 32 PhD students, majority of whom are now eminent scientists in reputed institutes in India and abroad. With more than 200 research

publications in peer-reviewed top international journals, Professor Ramaswamy has made fundamental scientific contributions in the field of Nonlinear Systems, Strange Non-chaotic Attractors, Self-Organizing Criticality, Chemical Clusters etc. He has been a visiting scientist at the University of Tokyo in 2010, at the Isaac Newton Institute for Mathematical Sciences, Cambridge in 1994 and at the Institute for Molecular Science, Okazaki in 1989–1990. Professor Ramaswamy has been a member of the Institute for Advanced Study, Princeton during 2004–2005.

Professor Ramaswamy has held numerous academic leadership positions: Vice Chancellor of the University of Hyderabad from June 2011 to January 2015, Chairman, National Council of Rural Institutes, Hyderabad from April 2012 to January 2015, Vice President and Editor of Publications, Indian Academy of Sciences, Bengaluru from 2013 to 2015. He was appointed as the Vice President of the Indian National Science Academy, New Delhi in 2015, and the President of the Indian Academy of Sciences, Bengaluru from 2016 to 2018.

Professor Ramaswamy is currently a full-time visiting professor in the Chemistry Department at IIT Delhi, New Delhi and continues to pursue his passion of teaching, supervision of PhD students and active scientific research.



Akhilesh Pandey

Akhilesh Pandey has been a pioneer in random matrix theory (RMT) and his contribution to quantum chaos and RMT can hardly be overstated. He was born on 30 June 1954 in Jaunpur, Uttar Pradesh (UP). After receiving his initial education from TDS Intermediate College, Jaunpur in 1968, he moved to Varanasi for his higher education and joined Banaras Hindu University. He obtained B.Sc. and M.Sc. degrees in Physics in 1972 and 1974, respectively, and secured the university second rank in both.

He joined J. B. French at the University of Rochester, New York in 1974 for pursuing his Ph.D. degree. The field of RMT, introduced by E. Wigner in Nuclear Physics, was in a state of infancy at that time, but exhibited immense potential to deal with several questions in many body complex systems that could not be dealt by conventional methods. Akhilesh enriched the field with several path-breaking contributions and successfully completed his Ph.D. in 1978. He continued his exploration in the field and collaborated with several big names in the subject, such as M. L. Mehta and O. Bohigas during his post-doctoral research. Among his several important contributions, ergodicity result pertaining to the ensemble average of random matrices and random matrix modelling of complex systems with partially broken symmetries hold a special place. In particular, along with Mehta, he found exact solutions for certain crossovers associated with time-reversal breaking. The associated matrix model and the corresponding Hamiltonian are now referred to as Pandey–Mehta matrix model and Pandey–Mehta Hamiltonian, respectively.

Professor Pandey joined SPS, JNU as an Associate Professor in 1987 and was promoted to full professorship in 1996. He continued his impressive research at JNU and also became very popular among the students as a great teacher with his unique style of teaching. He also has had fruitful research collaborations with his colleagues R. Ramaswamy, S. K. Sarkar and S. Puri. He is still going strong, training new minds and enriching the RMT field with fundamental contributions to topics as diverse as quantum chaos, skew orthogonal polynomials, non-uniform circular ensembles, time series and Wishart matrices, quantum transport and information theory.

The conference could not be successful without the shouldering of responsibility by the members of the Local Organizing Committee, namely Andrew Lynn (JNU), A. Krishnamachari (JNU), Debashis Ghoshal (JNU), Ram

Ramaswamy (JNU) and S. Patnaik (JNU). We thank the members of the National Organizing Committee who have enriched the conference by offering timely and constructive suggestions and advice namely, V. Balakrishnan (IIT, Chennai), Soumitro Banerjee (IISER, Kolkata), A. V. Khare (IISER, Pune), M. Lakshmanan (BDU, Trichy), K.P.N. Murthy (CMI, Chennai), G. Rangarajan (IISc, Bengaluru), Deb Shankar Ray (IACS, Kolkata), Somdatta Sinha (IISER, Mohali), R. E. Amritkar (IITMRM, Ahmedabad), A. N. S. Iyengar (SINP, Kolkata), M. Daniel (SNSRCAS, Coimbatore), Abhijit Sen (IPR, Ahmedabad), Late K. Porsezian (UoP, Pondicherry), G. Ambika (IISER, Pune), Sudeshna Sinha (IISER, Mohali), Sarika Jalan (IIT, Indore), Pragya Shukla (IIT, Kharagpur). We are also thankful to the members of the International Advisory Committee including Kazuyuki Aihara (Tokyo), M. V. Berry (Bristol), Ulrike Feudel (Oldenburg), Jürgen Kurths (Potsdam), Rajarshi Roy (College Park), K. R. Sreenivasan (New York). We also thank our students for their assistance. Last, but not the least, sincere thanks are due to the various funding agencies and organizations who provided the necessary financial support without which the organization of the conference would have been impossible. The organizing committee acknowledges the financial support from Council of Scientific & Industrial Research (CSIR), India, the National Board for Higher Mathematics (NBHM), DST J. C. Bose Fellowship and DST Purse.

We also acknowledge the Indian Academy of Sciences, particularly the Editorial Board of *Pramana – Journal of Physics* to permit us to publish these proceedings. We also thank all the authors for their contributions to these proceedings.

Bibhu Biswal

University of Delhi, India

Santhosh Kumar

Shiv Nadar University, India

Awadhesh Prasad

University of Delhi, India

Manish D. Shrimali

Central University of Rajasthan, India

Brojen K. Singh

Jawaharlal Nehru University, India

(Editors)