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## Editorial

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**Biographical notes:** D. Kanjilal is a Senior Scientist and Program Leader at Inter University Accelerator Centre (formerly Nuclear Science Centre). He was the Leader of the technical team involved in the development, installation, operation and maintenance of the large electrostatic tandem accelerator (15UD Pelletron) and associated beam lines in the 1980s. He initiated materials science research activities using swift heavy ion beam at the Centre and supervised research activities of a large number of PhD students and research groups from all over India. He is the Program Leader of niobium quarter wave resonator based superconducting linac accelerator being developed and installed at the Centre.

Sanjeev K. Sharma did PhD in Biochemistry from Indian Agricultural Research Institute. The field of specialisation during his research was Molecular Biology and Genetic Engineering. He started his job career as an Assistant Professor, Biotechnology in Doon (P.G.) Paramedical College, Dehradun, Uttranchal. He then joined as Assistant Professor, Biotechnology in College of Biotechnology and Allied Sciences, Allahabad Agricultural Institute, Allahabad, UP. He supervised about 20 Undergraduate and Post graduate students for their dissertation works. He co-authored a book on Biochemistry and Clinical Pathology published by TATA publisher, New Delhi. He has also contributed in writing book chapters and made several publications in National and International Journals. He was the convener of the International Conference on Nanoscience and Nanotechnology held at AIT from 17–21 December, 2007. He was invited as a visiting Professor by North Dakota State University (NDSU), USA, where he did his research work on studies of Biofilm production by bacteria and development of Nanocoatings for its reduction. He also worked on development of scaffolds for bone tissue engineering using Nanomaterials. Presently he is serving in the institute as an Assistant Professor and In-Charge of Faculty of Biotechnology.

M.P. Singh, Director, Ansal Institute, a Fulbright Scholar, studied in the USA; he received his PhD from University of Maryland. He retired from IIT Delhi, where he had served as a Professor concurrently in the Department of Mathematics, Centre for Atmospheric Science and Centre for Biomedical Engineering. Before joining Ansal Institute, he held a Senior Faculty position in the USA. He is a fellow of the Indian National Science Academy, Delhi. He was given the 4th Dr. Y.S. Parmar Gold Medal and Oration Award, 1984

and was UGC National Lecturer during the year 1976–1977. He has played a trail-blazing role in developing multidisciplinary programs in the country. He represented India in the scientific delegation to the then Soviet Union in 1988 and in the Indo-US Sub-commission on Science and Technology in 1985 and 1987. He was a member of the Indian delegation to attend the prestigious Science and Technology initiative meet in 1983, the so-called Blue Ribbon Panel on Meteorology set up by the then Indian Prime Minister, Mrs. Indira Gandhi and then USA President, Mr. Ronald Reagan. He was a member of ICSU International Committee for the International Decade for Natural Disaster Reduction during 1990–1992. He has supervised 27 students for the award of PhD Degree. In addition, he directed several International conferences and workshops on topics related to Environment in India, Italy and Brunei. He has published about 100 research papers in journals of International repute. He is the co-author of the book, (written jointly with Professor Sethu Raman) titled *Dynamics of Atmospheric Flow* published under the 'Advances in Fluid Mechanic Series, UK'. He has been one of the Guest Editors of the special issues (on Air Quality) of the prestigious international journal *Atmospheric Environment* which appeared in 1991 and 1995. He had been on the Editorial Board of the journal *Atmospheric Environment* (1988–1994); *Non-linear World* (1992–1996) and *Advances in Fluid Mechanics Series* under the aegis of Computation Mechanics Publications, UK (1994–1998). The prestigious journal, *Pure and Applied Geophysics* (PAGEOPH, a Switzerland based journal), has brought out a special edition – a book entitled *Weather and Climate: The M.P. Singh Volume*, in honour of Professor M.P. Singh with leading experts from all over the world as contributors. Recently, a 2-volume book entitled *Air Quality*, a PAGEOPH Topical Volume with he as one of the editors of the prestigious publication by Birkhauser Verlag, Basel, Boston, Berlin, has appeared in early 2003. He was recently awarded the prestigious *Knight of the order of Academic Palms* by French Prime Minister for his exceptional contribution in education. He has been a Visiting Professor at several Universities including University of Alabama, USA; University of Brunei; University of Calgary, Canada; University of Cambridge, UK; University of Kuwait; University of Reading, UK; National Institute of Informatics and Automatics, Paris, France; National Institute for Research and Environment, Japan. He has visited China and Poland as a guest of the respective Academies.

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Advances in science and technology have allowed for the broadening of horizons and the miniaturisation of amazingly complex devices. Nanotechnology plays a key role in such advancements and has been touted as the next technology revolution. Nanotechnology is mainly involved with the control of matter on a scale smaller than one micrometre, as well as the fabrication of devices on this same length scale.

The applications of nanotechnology are extremely important and unending. It has found its role in medicine for various purposes like diagnostics, better drug delivery vehicles, cancer treatment and tissue engineering as an alternative to present day conventional treatments, e.g., transplantation of organs or artificial implants. In the field of chemistry, the nanomaterials with tailored features and chemical properties have made a significant improvement in chemical catalysis and filtration technique.

There are promising results of this technology in the energy sectors, in the field of information and communication technology and in the field of consumer goods.

To present recent results in some of the areas mentioned above, an *International Conference-cum-Workshop on Nanoscience and Nanotechnology* was held at Ansal Institute of Technology from December 17–21, 2007. The program was co sponsored by North Dakota State University, USA and supported by Indian National Science Academy and Department of Science and Technology, Government of India. The rationale behind organising an *International Conference on Nanotechnology* at AIT is that the institute wishes to develop this field as a thrust area under its innovative programs. The young and brilliant faculty members having potential of embarking on this field would get an opportunity of exposure and interaction with leading experts in this field that will enable them to decide about the relevant research programs they will like to pursue at AIT.

The main objective behind organising this conference was:

- to create awareness of the importance of nanotechnology in the Indian context and to evolve a strategy for development of this field in the country
- to orient the interest of young research scholars and students for undertaking studies and research in the emerging fields of nanoscience and technology
- to provide a platform for interdisciplinary communication, intensify collaborations between scientists and industry
- to understand the societal implications of this nanotechnology and its future utility for science and industry.

The above conference brought together eminent professionals from research institutions, corporate world, key officials from the relevant government bodies and academicians. It provided a proper forum for academicians/experts and young researchers/scholars to discuss the recent trends in the materials and technological developments in the subject to generate productive ideas to be realised in future.

Twenty-two experts from USA, Canada, France, UK, Japan and Australia presented invited talks/participated at the occasion and about 30 speakers from India made the presentation and participated at the occasion. Overseas experts, among others, came from Ivy League colleges like Georgia Tech., reputable Universities like University of California – Los Angeles and Indian speakers came from leading academic institutions like IITs, JNU, TATA Institute of Fundamental Research – Bombay, University of Delhi, MS University – Baroda, Inter – University Accelerator Center – Government of India, Pune University, National Physical Laboratory, etc. More than 120 delegates registered for the Conference drawn from all over the country. Latest research work and reviews in some of the relevant fields were presented. The key – note speaker was Professor J. Narayan, The John Fan Family Distinguished Chair Professor at North Carolina State University, USA who is actively associated with the development of relevant program in nanotechnology in the USA. Nobel Laureate Sir Harry Kroto gave an internet based video presentation titled ‘Architecture in Nanospace’ followed by a question and answer session with him through teleconferencing.

At the end of the conference, a panel discussion was organised to bring out the major outcomes of the conference.

We acknowledge the support and help received from all the members of Organizing Committee, Program Committee, National Advisory Committee and International

Committee. The continuous advice and help rendered by Professor M.P. Singh, Director, AIT, Gurgaon, India from conception to the successful completion of the conference are gratefully acknowledged. We would like to thank all the faculty members, students and staff of AIT who helped in organisation of the conference. Finally, we thank all the participants for their active participation in the conference deliberations.

The refereeing work was carried out rigorously according to high standard of *International Journal of Nanotechnology*. We are thankful to the referees for their time and effort to review the original and revised manuscripts. We are thankful to the authors as well for their cooperation without which the job could not have been completed.

The special issue contains many original findings and some review papers. The book is expected to be a source book for research. Some of the papers could be discussed at graduate level classes dealing with nanotechnology. The scientific community in this field will find this book a useful addition to their personal and institutional libraries.

## Foreword

A good understanding of modern science and technology is crucial in our highly technological 21st century and an awareness of some fundamental intellectual aspects of the sciences is a prerequisite for wise decision-making for anyone in a position of responsibility in this complex modern world. Although knowledge does not guarantee good decision-making, common sense suggests that wisdom is an unlikely consequence of ignorance.

As chemistry and physics at one borderline and chemistry and biology at the other become indistinguishable, so cross disciplinary research is leading to the fascinating 'new' overarching field of Nanoscience and Nanotechnology (N&N). Ingenious strategies for the creation of molecules and extended atomic/molecular structures with complex exactly-specified infrastructures and/or function are being developed – basically nanoscale devices that 'do things' are now being created. New experimental approaches which focus on how atoms assemble are leading to the production of novel nanostructures and research is focusing on the control of self-assembly processes i.e., the bottom-up approach to the production of materials with advanced function. This new approach is leading to novel advanced materials with exciting new applications. Fascinating fundamental insights into formation mechanisms are being revealed and amazing nanoscale devices, which parallel devices in mechanical engineering, are now being created.

N&N research is essentially the "*Frontier Chemistry of the 21st Century*" and breakthroughs are presently being realised which are generating a paradigm shift in synthetic chemical assembly techniques. On the horizon are applications ranging from civil engineering to advanced molecular electronics and they promise to transform our everyday technology as well as basic economics. Young people must realise that scientists and engineers are responsible for many of the great humanitarian contributions to society such as penicillin which has saved many millions of lives and they also created the modern everyday world which is dependent on technologies such as computers, ipods and mobile phones – items that young people use every day. 21st century chemistry – or N&N as we now call it – is revolutionising the world as we speak. Ensuring that the spin-offs from N&N are applied wisely and for the good of humanity is crucial and so the

world desperately needs young people with a good understanding of the 21st century science and technology and the ethical attitudes need for our survival.

“After all, if the future is in anyone’s hands, it’s in the hands of our young”

Sir. Harold W. Kroto  
1996 Chemistry Nobel laureate  
Francis Eppes Professor,  
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