Editorial

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Biographical notes: Sir Harold W. Kroto, FRS, graduated in Chemistry at the University of Sheffield in 1961 and in 1964 received his PhD. After two years postdoctoral research in electronic and microwave spectroscopy at the National Research Council in Ottawa, Canada, he spent one year at Bell Laboratories, New Jersey, studying liquid phase interactions by Raman spectroscopy. He started his academic career at the University of Sussex (Brighton) in 1967, where he became a Professor in 1985 and in 1991 he was made a Royal Society Research Professor. In 1996 he received his Knighthood for services to chemistry and the Nobel Prize for Chemistry.

Waqar Ahmed is the Chair of Nanotechnology at the University of Ulster. His area of research is in chemical vapour deposition of thin-film nanostructures, especially nanocrystalline diamond. He was educated at Salford University, UK, where he studied chemical and physical vapour deposition.

Nasar Ali Heads the Surface Engineering and Nanotechnology group at the Department of Mechanical Engineering at the University of Aveiro in Portugal. He has extensive research experience in hard carbon-coating materials, including nanosized diamond coatings and CNTs, deposited using CVD methods. He has over 100 international refereed research publications, including four book chapters. He is serving on a number of committees for international conferences based on nanomaterials, thin films and nanotechnology. He is the fellow of the Institute of Nanotechnology and the President of the newly formed Society of Nanoscience and Nanotechnology.

Sam Zhang received his PhD Degree from the University of Wisconsin-Madison (1991). He is a Professor of Mechanical and Aerospace Engineering at the College of Engineering, Nanyang Technological University. He is also the Director of Thin Films Strategic Research Program of the Faculty and is serving as the Principal Editor of *Journal of Materials Research* (USA) and Vice President of the Institute of Materials (East Asia). He has been working in the field of magnetron sputtering of protective coatings, electronic thin films and coatings for biological applications.

Mark J. Jackson is a Professor of Mechanical Engineering at the College of Technology of Purdue University. His research interests include micromachining and the design of nanomachine tools. He was educated at Cambridge and Liverpool universities.

The new millennium has seen the birth of a new perspective, which conflates research in solid state physics, biological science as well as materials engineering. The perspective is one that recognises that future new advances in all these areas will be based on a fundamental understanding of the atomic and molecular infrastructure of materials that has resulted from two centuries of chemistry. Major advances will be achieved when the novel behaviour, in particular the quantum mechanical behaviour, which nanoscale structures possess, can be controlled and harnessed. To go with this new perspective, the conflated fields have acquired a new name – Nanoscience and Nanotechnology (N&N). The promise of developing functional devices at the molecular and atomic scale is now becoming a reality. However, a massive effort is still needed in order to control the fabrication of such novel nanodevices and nanomachines and exploit processes based on quantum mechanical laws. The next decade should see the emergence of new technologies based on nanosystems with not only improved but hopefully also fundamentally new physico-chemical properties produced at reasonable costs. Experimental and theoretical research should lead to industrial applications yielding important breakthroughs. If universities, independent research centres, government agencies and innovative industrial organisations invest time and resources imaginatively in this multidisciplinary adventure, a highly synergistic process will ensue in the development of these new technologies.

This special issue of the *International Journal of Nanomanufacturing* contains papers that focus not only on fundamental advances that are taking place but also on important applications that promise to revolutionise a wide range of technologies in the 21st century. The unique properties that emanate from nanoscale structures are immensely varied, and, in the next decade, nanoscience and nanotechnology will give birth to a vast new range of exciting technological application, which promises to help the creation of a sustainable socio-economic environment.