Editorial

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Biographical notes: Prof W. Waqar Ahmed is the Chair of Nanotechnology at the University of Ulster and is conducting research in the area of thin films and nanotechnology. He was educated at Salford University in the area of thin diamond films. His current research is focused on advanced manufacturing technology applied at the micro- and nanoscales.

Dr. Mark J. Jackson is an Associate Professor of Mechanical Engineering in the College of Technology at Purdue University and is a Faculty Associate in the Center for Advanced Manufacturing and the Birck Nanotechnology Center. He was educated at Liverpool and Cambridge universities and is focused on micro and nanomanufacturing research.

1 Introduction

Nobel Laureate Richard Feynman's revolutionary vision on nanotechnology was captured in a paper published in the February 1960 issue of Caltech's journal, *Engineering and Science*. In this paper, Feynman speaks about manipulating atoms and constructing products atom-by-atom, and molecule-by-molecule. Feynman describes the scaling down of lathes and drilling machines, and talks about drilling holes, turning, moulding and stamping parts. Even in 1959, Feynman describes the need for micro- and nanomanufacturing as the basis for creating a microscopic world that would benefit mankind. Since the 1960s, Feynman's vision has created the basis for the foundation of the semiconductor industry and within the last decade, has rapidly contributed to the development of Micro-Electro-Mechanical Systems (MEMS). Nanotechnology encompasses technology performed at the nanoscale that has real world applications.

Nanomanufacturing includes methods that manipulate atoms and molecules to produce single artefacts to produce submicron sized components and systems. Nanomanufacturing is a challenge presented to us to produce single nanoscale artefacts in a mass production fashion that obviously produces the accompanying economies of scale. Nanotechnology will have a profound effect on our society that will lead to breakthrough discoveries in materials and manufacturing, electronics, medicine, healthcare, the environment, sustainability, energy, biotechnology, information technology, national security and preventing the spread of global terrorism. Nanotechnology will lead the next industrial revolution.

The purpose of this journal is to present information and knowledge on the emerging field of micro- and nanomanufacturing. The papers presented in this special issue are written in the spirit of scientific endeavour outlined by Richard Feynman, who stated that one of the greatest challenges to scientists in the field of miniaturisation is the manufacture of tiny objects using techniques such as turning, moulding, stamping and drilling. The papers contained in this special issue describe the design of spindles for nanomachining applications, the use of lasers for micro- and nanoprocessing, wear of micro-cutting tools, analysis of micro-grinding grains during micro-grinding operations, deformation of carbon nanotubes, a review of environmental monitoring strategies for micromachining applications, micro-grinding with tools manufactured using micro electro-discharge machining, growth of nanodiamond crystals, machining of metals using nanocrystalline diamond, micro-machining of fuel cell materials, preparation of gold nanoparticles for nanomanufacturing applications and the measurement of subsurface damage during the micro-grinding of silicon wafers.

Professor Jackson and I hope that this special issue will serve as a reference volume consisting of high quality research papers especially for research workers in the field of micro and nanomanufacturing. The papers presented in this volume have been refereed by peer reviewers who are experts in the field of micro and nanofabrication. The referees have been extremely helpful and have returned reviews as per schedule. We both wish to thank them for their reviews and the authors for submitting such high quality research papers.