
Editorial

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Biographical notes: Mark J. Jackson is an Associate Professor of Mechanical Engineering in the College of Technology at Purdue University, USA. His research interests include micromachining and the design of nanomachine tools. He was educated at Liverpool and Cambridge universities and is a Faculty Associate at the Birck Nanotechnology Center and the Center for Advanced Manufacturing at Purdue University.

Martin L. Culpepper is an Associate Professor of Mechanical Engineering at Massachusetts Institute of Technology. He received his MS and PhD in 1997 and 2000, respectively from the Massachusetts Institute of Technology and then joined the faculty of Mechanical Engineering at MIT in 2001. His research interests are focused upon small-scale nanopositioning technologies for nanomanufacturing equipment/instrumentation. He was the Chair of the 4th International Symposium on Nanomanufacturing, from which the Special Issue papers are drawn.

As the science and practice of nanomanufacturing matures, it will be important to move from the fabrication of two-dimensional (2D) parts and features to the fabrication of three-dimensional (3D) parts and features. We are in the midst of the early basic and applied research that will enable the transition from 2D to 3D. This transition is an important step given

- 1 the fact that 3D parts/features are required to access/exploit unique nanoscale phenomena
- 2 the need to form systems/products that require non-planar electrical, fluid, optical and mechanical connections
- 3 the need to increase packing density of nanoscale parts/features/devices.

Items (a)–(c) are ultimately critical for the successful porting of nanoscale science and technology into everyday life. There are unique challenges associated with the transition from 2D to 3D. For example, consider the understanding of how to model and control process parameters that are used in promising 3D nanofabrication processes, how to perform 3D metrology at the nanoscale, how to create cost and performance appropriate tooling/equipment/instruments for 3D processing and how to assemble modular nanoscale building blocks. The work in this field is in a nascent stage, however it is timely to examine the current work as there are several novel approaches and some exciting results that have begun to emerge. It is our hope that this Special Issue will provide an overview of the state-of-the-art and inspires new ideas/collaborations that build on these approaches and results.

Towards this end, topics that are included within this Special Issue were derived from the *Proceedings of the 4th International Symposium on Nanomanufacturing (ISNM)*, 1–3 November 2006, held at MIT, Cambridge, Massachusetts. The ISNM fosters interaction between the manufacturing community and emerging nanotechnology communities. Through the ISNM, scholars, engineers and members of the business community address basic research, education, dissemination and implementation issues that are related to the manufacture of products that utilise the characteristics of nanoscale features and phenomena. The latest theoretical and applied research issues pertaining to processes, systems, equipment and instrumentation are disseminated via conference proceedings, and then presented and discussed through technical presentations. This Special Issue contains papers on a broad range of topics that will be important to the development of techniques and technologies that are required to manufacture in 3D at the nanoscale. The papers in this Special Issue are extended versions of several papers from those proceedings.

We thank the authors for their efforts to augment the contents of these papers. Each paper has been refereed by peer reviewers who are experts in their field. We wish to thank them for their efforts, and insightful comments. We also thank the MIT Laboratory for Manufacturing and Productivity for holding ISNM and facilitating the collection of these papers. Finally, we thank Professor Mohammed Dorgham, Editor-in-Chief of the *International Journal of Nanomanufacturing*, for publishing this Special Issue.