



**Topic:** **Research Opportunities and Design Challenges in Additive Manufacturing: Perspectives from an Additive Manufacturing Demonstration Facility**

**Speaker:** **Dr. Timothy W. Simpson**  
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The Pennsylvania State University, USA

**Date:** **13 February 2014, Thursday**

**Time:** **10.00am to 11.00am**

**Venue:** **E3-06-08** (map of NUS can be found at <http://map.nus.edu.sg/>)

**Host:** **Prof. Wong Yoke San**

### Abstract

Additive manufacturing may be as disruptive to manufacturing as the Industrial Revolution was over a hundred years ago. Additive manufacturing frees us from many of our design constraints and provides the capability to produce novel and intricate geometries never before possible. The opportunities that this is creating in fields ranging from aerospace and energy to medical and oil and gas is unprecedented, but there are real obstacles that must be overcome. The potential for warping, cracking, and distortion necessitate a careful understanding of the underlying physics occurring during additive manufacturing involving 3D metal printing. When fabricating metal parts, additive manufacturing is as much about producing a finished part as it is about making a material given the impact that powder properties and processing parameters can have on the final microstructure and resulting material properties. In this talk, I will discuss research opportunities and design challenges in additive manufacturing and summarize the activities in Penn State's Center for Innovative Materials Processing through Direct Digital Deposition (CIMP-3D), which serves as the DARPA Open Manufacturing Program's Additive Manufacturing Demonstration Facility (MDF). CIMP-3D seeks to (1) advance enabling technologies required to successfully implement AM technology for critical components and structures, (2) provide technical assistance to industry through selection, demonstration, and validation of AM technology as an "honest broker", and (3) promote the potential of AM technology through training, education, and dissemination of information. CIMP-3D also provides Penn State's interface to America Makes, the National Additive Manufacturing Innovation Institute (NAMII), which is charged with transitioning additive manufacturing technology to the mainstream U.S. manufacturing sector and enabling significant advancements throughout industry.

### About the Speaker

Dr. Timothy W. Simpson is currently a Professor of Mechanical and Industrial Engineering at Penn State with affiliations in Engineering Design and the College of Information Sciences & Technology. He is a co-Director of CIMP-3D ([www.cimp-3d.org](http://www.cimp-3d.org)). He received his Ph.D. and M.S. degrees in Mechanical Engineering from Georgia Tech in 1998 and 1995, and his B.S. in Mechanical Engineering from Cornell University in 1994. He has been PI or Co-PI on over \$20M in funding for his research in product family and product platform design, multidisciplinary design optimization (MDO), trade space exploration, and additive manufacturing, and he has published over 250 peer-reviewed papers to date. He teaches courses on Mechanical Systems Design, Concurrent Engineering, Product Family Design, and Product Dissection. He is a recipient of the ASEE Fred Merryfield Design Award and a NSF Career Award. He has received several awards for outstanding research and teaching

at Penn State, including the 2007 Penn State University President's Award for Excellence in Academic Integration. He is a Fellow in ASME and an Associate Fellow in AIAA. He currently serves on the ASME Design Education Division Executive Committee and is a former Chair of the ASME Design Automation Executive Committee as well as the AIAA MDO Technical Committee. He is also a Department Editor for *IIE Transactions: Design & Manufacturing* and serves on the editorial boards for *Research in Engineering Design*, *Journal of Engineering Design*, and *Engineering Optimization*.

**Admission is free. All are welcome to attend.**