



Department of Mechanical Engineering  
Faculty of Engineering

You are cordially invited to our:  
**Department Seminar**

**Topic:** Compressive Phase Retrieval

**Speaker:** Dr. George Barbastathis  
Massachusetts Institute of Technology (MIT);  
Singapore-MIT Alliance for Research and Technology (SMART) Centre

**Date:** Wednesday, 19 June 2013

**Time:** 2.00pm to 4.00pm

**Venue:** EA-06-04 (map of NUS can be found at <http://map.nus.edu.sg/>)

#### Abstract

Compressive sensing is a class of image recovery techniques utilizing sparsity priors to recover undersampled signals with high fidelity. In this talk, several examples of application of compressive sensing to phase retrieval, both interferometric and non-interferometric, will be described. For interferometric techniques, also known as “digital holography,” it will be described how to localize sparse objects, such as vibrating whiskers and particles in multi-phase flows, with sub-pixel accuracy. For non-interferometric techniques, what will be discussed in particular is the use of intensity priors in the “transport of intensity equation” method, where the phase is obtained by analogy to a lateral pressure potential in a compressible flow. Transport of intensity is especially interesting in the x-ray regime, where standard interferometry is difficult because common sources are spatially partially coherent and beam splitters-combiners are not available; as a concluding example, it will be shown how the sparsity prior of quasi-constant object density allows successful x-ray phase recovery despite the low coherence.

#### About the Speaker

**Dr. George Barbastathis** joined the Department of Mechanical Engineering faculty at MIT in 1999, where he is now Professor of Mechanical Engineering and holds the Singapore Research Professorship in Optics. He was educated at the National Technical University of Athens (Πολυτεχνείο) and Caltech, and has worked or held visiting appointments at the University of Illinois at Urbana-Champaign, Harvard University, the Singapore-MIT Alliance for Research and Technology (SMART) Centre, and the National University of Singapore. His research interests are three-dimensional and spectral imaging; phase estimation; and gradient index optics theory and implementation with subwavelength-patterned dielectrics. In 2010 he was elected Fellow of the Optical Society of America.

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