

ELECTRICAL & COMPUTER ENGINEERING SEMINAR

“New Directions in Coherent Microscopy: Nanoparticle Polarizability Determination and Interferometric Synthetic Aperture Microscopy”

by

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LSC Grey Rock Room

Abstract & Biography

Abstract. In this talk two novel computed-inference technologies are discussed - both of which are based on broadband coherent microscopy.

1. Interferometric Synthetic Aperture Microscopy (ISAM): In ISAM the spectral data dimension is used to map sample structure along the optical axis of the lens. In contrast to comparable Optical Coherence Tomography (OCT) systems, it is shown that optimal transverse resolution is not contingent on a focused probing beam. Consequently, the apparent trade-off between OCT resolution and depth-of-field is obviated.

2. Nanoparticle Polarizability Characterization: High-aperture coherent microscopes are sufficiently sensitive to detect single nanoparticles, while also producing data that are sensitive to anisotropic scattering phenomena. In this talk it is shown that the polarizability tensor of a nanoparticle can be determined using physically-motivated inference and a simple modification to the coherent microscope. In a broadband instrument the polarizability tensor can be found as a function of wavelength, giving significant information for the characterization and discrimination of nanoparticles.

Biography. Brynmor J. Davis received the B.E. degree in Electrical and Electronic Engineering from the University of Canterbury, New Zealand, in 1999; the M.S. degree in Electrical and Computer Engineering from the University of Arizona, Tucson, in 2001; and a Ph.D. from Boston University, Boston, in 2006. He is currently a Postdoctoral Research Associate in the Beckman Institute for Advanced Science and Technology at the University of Illinois, Urbana-Champaign. His research interests lie in the intersection of inverse problems, optics and statistical signal processing. Applications include problems in microscopy, optical coherence theory, remote sensing and spectroscopy.

Please contact Prof. Randy Bartels, bartels@engr.colostate.edu, with any questions.