INTERFERENCE AND COMPUTED IMAGING

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Most familiar optical imaging systems produce data that are immediately recognizable as correlated to object structure, i.e., an image is measured. However, practicable imaging systems need not be restricted to those that produce a direct object-to-data relationship. Physical structure and other object features may be encoded in data that form no obvious image; through physics-based mathematical inversion, this information may be recovered. In this talk, this computational approach to optical imaging is addressed in a variety of applications including fluorescence microscopy, nanoparticle characterization and near-infrared bioimaging.

Interference phenomena play a critical role in each of these problems. In each case, physics connects object properties to the optical field. Interferometry encodes the complex optical field in a measurement of the real optical intensity. Access to the field provides information-rich measurements and makes feasible the recovery of object properties from the data, i.e., a tractable inverse problem is given. In this manner, interferometric computed imaging frees instrument design from the restrictions of direct image formation and opens the door to new and optimized measurement schemes.

Brief Biography: Brynmor Davis holds a B.E. from the University of Canterbury, New Zealand (1999), a M.S. from the University of Arizona (2001) and a Ph.D. from Boston University (2006). He is currently a postdoctoral researcher at the University of Illinois at Urbana-Champaign. His research interests lie in the intersection of optical physics and statistical signal processing with applications including microscopy, ultrafast pulse characterization, spectroscopy and remote sensing.