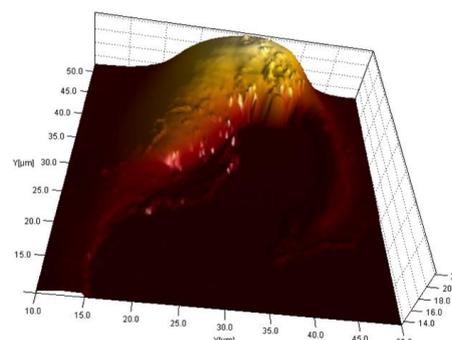
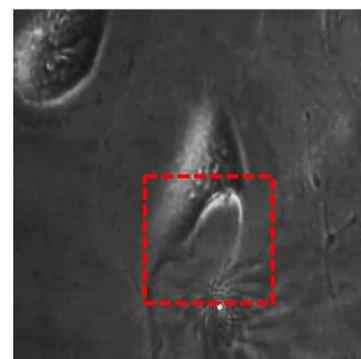
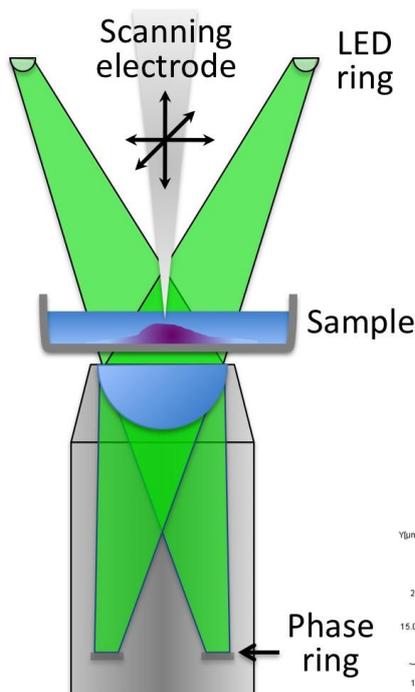


The Electrical Systems & Optics Research Division invites you to:
Applied Optics Group Lunchtime Seminar

Condenser-free contrast methods in transmitted-light microscopy

Dr. Kevin Webb



1.00pm Wednesday 14th May 2014
2nd Floor Lecture Theatre
Tower Building. All welcome

Condenser-free contrast methods in transmitted-light microscopy

Phase contrast microscopy allows the study of highly transparent yet detail-rich specimens by producing intensity contrast from phase objects within the sample. I will present a generalised phase contrast illumination schema in which condenser optics are entirely dispensed with, yielding a condenser-free yet highly effective method of obtaining phase contrast in visible light microscopy.

A ring of light emitting diodes is positioned within the optical light-path such that observation of the objective back focal plane places this ring in appropriate conjunction with the phase plate. It is demonstrated that true Zernike phase contrast is obtained, whose geometry can be flexibly manipulated to provide an arbitrary working distance between illuminator and sample. Condenser-free phase contrast is demonstrated across a range of magnifications (4-100x), numerical apertures (0.13-1.65NA), and conventional phase positions. The enhanced and flexibly-variable working distance contributed by the condenser-free design provides the opportunity to apply concurrent imaging methods, including scanning probe methods which generally involve obstruction to the optical light path. Further demonstrated is condenser-free darkfield microscopy, as well as the use of condenser-free phase contrast in conjunction with scanning ion conductance microscopy (SICM).

By eliminating the condenser assembly, and thus providing enhanced working space above the preparation, a range of concurrent imaging and electrophysiological techniques will be technically facilitated. The compact, versatile LED illumination schema will further lend itself to novel next-generation transmitted-light microscopy designs, while the condenser-free illumination method using rings of independent emitters may be exploited in future in other electromagnetic wavebands, including X-ray or the infrared.

Dr. Kevin Webb received first class honours in Biomedical Science and a PhD in Physiology from the University of Auckland, New Zealand, working on lens cataract in the eye. He joined UCL as post-doc in 2006 before moving to Nottingham in 2008 to join the group of Dr Noah Russell. In 2010 he was awarded a Royal Academy of Engineering Postdoctoral Fellowship which he currently holds in IBIOS.