ZEPLER INSTITUTE

UNIVERSITY OF Southampton

New Forms of Microscopy Enabled by Nanostructured Surfaces

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Abstract

Since the advent of optical microscopy, a flat glass microscope slide has been the standard surface upon which tissues, cells, and biomolecules are attached for observation. Recently, we have utilised the optically resonant properties of nanostructured photonic crystal (PC) surfaces to enable several new microscopy modalities where the nanostructure provides new forms of contrast for a wide variety of compelling applications. By designing PC surfaces with resonances that match the excitation and emission spectra of photon emitters such as fluorophores and quantum dots, PC enhanced fluorescence (PCEF) microscopy reduces the detection limits of any surface-based fluorescence assay. By generating spatial images of the PC resonant reflection intensity, we can selectively and dynamically visualize the cell-extracellular matrix interface during processes that include stem cell differentiation, cancer cell response to drugs, and chemotaxis. We call this approach Photonic Resonator Outcoupler Microscopy (PROM) The seminar will describe the physical principles, nanostructure design/fabrication, instrumentation, and applications for nanostructure-enabled microscopy for disease diagnostics, personalised medicine, and life science research.

Short biography

Brian Cunningham completed his Ph.D. at the University of Illinois at Urbana-Champaign in 1990. He joined Raytheon in 1991 and the Micromachined Sensors Group at the Charles Stark Draper Laboratory in Cambridge, MA in 1995 as a senior member of the technical staff. At Draper Laboratory, he initiated efforts in biosensors, microfluidics, and tissue engineering. In 2000, he founded SRU Biosystems to commercialise Photonic Crystal (PC) biosensors, detection instruments, and assays for applications in drug discovery and diagnostics. Brian established the Nanosensors Group at Micro and Nanotechnology Laboratory (MNTL) in 2004 and became Director in 2014.

11:00-12:00 Tuesday 6 November, B46 4050 Highfield