Candidate for the Director, Bindley Bioscience Center (BBC), Discovery Park, Purdue University Position

GABRIEL POPESCU

Quantitative Light Imaging Laboratory, Department of Electrical and Computer Engineering, Beckman Institute of Advanced Science and Technology at the University of Illinois at Urbana-Champaign

will present

MULTISCALE STUDIES OF CELLS AND TISSUES USING QUANTITATIVE PHASE IMAGING

April 16, 2018 ▪ 9 a.m.

Martin C. Jischke Hall of Biomedical Engineering 1001

Most living cells do not absorb or scatter light significantly, i.e. they are essentially transparent, or *phase* objects. Traditionally, these structures are rendered visible by using exogenous contrast agents, such as stains and fluorescent dies. Thus, fluorescence microscopy has become a valuable tool in cell biology, while diagnosis on stained tissues has been the standard of histopathology for more than a century. However, the use of external contrast agents is not without limitations: photobleaching and photoxicity plague fluorescence imaging of live cells, while tissue staining is known to introduce variability to the pathology slides, hindering objective and automated analysis.

Quantifying specimen-induced shifts in the optical path-length permits nanometer scale measurements of structures and motions in a non-contact, label-free manner. Thus, quantitative phase imaging (QPI) has recently become an active field of study and various experimental approaches have been proposed, especially over the past decade. We have developed Spatial Light Interference microscopy (SLIM) as a highly sensitive QPI method. Due to its exquisite pathlength sensitivity, SLIM enables nondestructive structure and dynamics studies over broad spatial (nanometers-centimeters) and temporal (milliseconds-weeks) scales. I will review our recent results on applying SLIM to basic cell studies, such as intracellular transport, cell growth, and single cell tomography. Recently, we have demonstrated that SLIM is a quantitative tool for cancer diagnosis and prognosis in both labelled and unlabeled biopsies. Finally, I will cover a new and exciting method called GLIM (gradient light interference microscopy), which can suppress multiple scattering and, thus, extend our imaging capability to thick 3D specimens: embryos, brain slices, organoids, C. Elegans, etc. Equipped with these QPI methods, we aim to bridge the understanding of function and disease from the molecular to organism scale.

Gabriel Popescu is a Professor in Electrical and Computer Engineering, University of Illinois at Urbana-Champaign. He received his Ph.D. in Optics in 2002 from the School of Optics/ CREOL (now the College of Optics and Photonics), University of Central Florida. He continued his training with Michael Feld at M.I.T., working as a postdoctoral associate. He joined UIUC in August 2007 where he directs the Quantitative Light Imaging Laboratory (QLI Lab) at the Beckman Institute for Advanced Science and Technology. Dr. Popescu served as Associate Editor of Optics Express and Biomedical Optics Express, Editorial Board Member for Journal of Biomedical Optics and Scientific Reports. He authored a book, edited another book, authored 150 journal publications, 200 conference presentations, 29 issued and pending patents (12 additional disclosures under review), and gave 190 lecture/plenary/invited talks. He founded Phi Optics, Inc., a start-up company that commercializes quantitative phase imaging technology. He is an OSA Fellow and SPIE Fellow.

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