Seminars at the Melbourne Centre for Nanofabrication

Presenting the ANFF-VIC Publication of the Year

Dr Brian Abbey and Dr Daniel Langley

04/05/2018
2:00-3:00pm

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Optical Chemical Barcoding Based on Polarization Controlled Plasmonic Nano Pixels

Dr Brian Abbey and Dr Daniel Langley

ARC Centre of Excellence in Advanced Molecular Imaging, La Trobe University

Abstract: Plasmonic devices offer the possibility of passively detecting changes in local chemistry opening up a wide range of applications from molecular sensing to monitoring water quality. Conventional plasmonics have previously shown great promise as nanoscale chemical sensors through detection of small variations in the local Refractive Index (RI). The motivation behind using plasmonics for these applications include the fact that detection is entirely passive and that the devices themselves can be readily miniaturized. Previously, a lack of any control over the output of these devices has fundamentally limited their application to chemicals, which produce clearly identifiable resonances within the range of detection.

Here I will describe the development of microfluidic devices, incorporating polarization controlled plasmonic nanopixels, which allow the device response to be tuned to the particular analyte of interest, anywhere within the visible spectrum. This dramatically increases the effective dynamic range and allows local variations in RI to be perceived directly as color changes by the human eye. Active control over the output of the device, also enables clear differentiation between a number of different analytes, paving the way for plasmonics to be used for a wide-range of real-world chemical sensing applications.

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4D Cell Culture Systems: Enabling the real-time growth and monitoring of human tissue

Dr Daniel Langley

Postdoc Research Fellow, 3D Cell Culture Systems Group, Swinburne University

Abstract: Understanding the complex interactions of the human body is still an ongoing challenge, although tissue culture has been around for about 50 years most of the research has been conducted in two dimensional mono cultures.

These systems have provided a large amount of insights into how our bodies work and how cells behave under different conditions but in some respects are reaching the limits of their usefulness. The behaviour of cells is effected by their environment both in terms of the mechanical properties of surrounding or supporting materials and interms of the chemical signals from neighbouring cells. Our research aims to develop novel methods to enable 4D cell culture, the growth of 3D human tissue samples that mimic the structures found in-vivo in a platform which enables control of the chemical environment real time monitoring.

This talk will introduce the concepts of 4D cell culture and some of the possible pathways through which we may be able to achieve these goals.

Biography: In October 2014 Daniel attained his PhD in Materials Engineering from Grenoble INP in France and an ScD in Physics from the University of Liege.

From 2015 to 2017 he worked with the La Trobe University node of the CoE for Advanced Molecular Imaging on the development of microfluidic delivery systems for X-ray free electron lasers and chemical sensors. He has now joined the 4D Cell Culture systems group under the CSIRO Research+ Science Leader Sally McArthur in the Biomedical engineering department at Swinburne University of Technology and the Cell Materials team at CSIRO Manufacturing.

Notes

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