The Dept. of Chemical Engineering & Applied Chemistry and BioZone present

SPECIAL SEMINAR

Fluorescent nanosensors: measuring and modulating the cellular environment

Dr. Jonathan Aylott

Assoc. Prof., Analytical Bioscience, School of Pharmacy, University of Nottingham

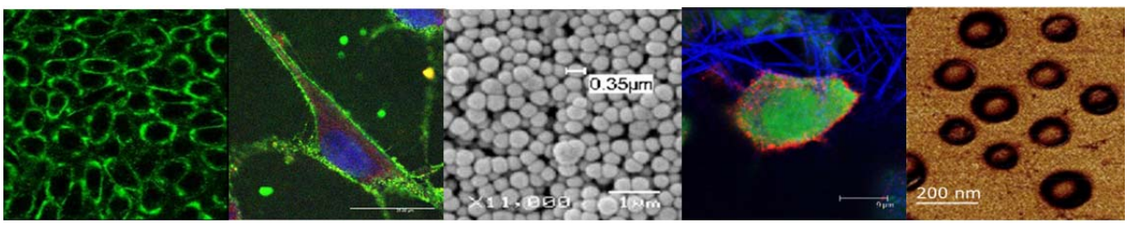
Thursday, March 21, 2013 | 12 pm – 2 pm
Room 215, Wallberg Building, 200 College Street

Optical nanosensors are the primary focus of this research and utilise the sensitivity of fluorescence to make quantitative real-time measurements of biological systems. Nanosensor devices can be made in the size range 50–500 nm diameter, dependent on the matrix they are synthesised from and the application requirements. The small size of the nanosensors allows them to be delivered directly into cells, with minimal physical perturbation, to measure changes in small molecule concentrations within single cells. Nanosensors exhibit advantages over widely used fluorescence dye based methods as they have been designed to be ratiometric so effectively contain an internal standard. The nanosensor matrix also imparts two key benefits:

1. Protection of the sensing component from interfering species within the intracellular environment
2. Protection of the intracellular environment from any toxic effects of the sensing component.

An additional attractive feature of the nanosensors is that they can be imaged and quantified using standard technologies, e.g., confocal microscopy, utilised in life science research. Nanosensors capable of measuring glucose, oxygen, calcium, zinc and pH and proteases have been demonstrated and work is ongoing to expand the range of analytes that can be detected using this technology.

In this presentation I will discuss some of the methods we are using to develop new sensors and detail a range of applications for nanosensors. These include the development of self-reporting scaffolds for measuring metabolic health in 3D culture systems; measuring the intestinal pH of *C.elegans* nematodes; and using reactive oxygen generating nanoprobes for modulating human mesenchymal stem cell behaviour.



BIOGRAPHY

Jonathan Aylott gained his degree and PhD in Chemistry from the University of East Anglia. He then undertook a Postdoctoral Fellowship in Raoul Kopelman's laboratory at the University of Michigan. In 2000, he returned to the UK to take up a Lectureship in Analytical Science at the Department of Chemistry, University of Hull. In 2004 he was appointed Lecturer in Analytical Bioscience in the School of Pharmacy at Nottingham and promoted to Associate Professor in 2011. Jon's research interests focus on the design, development and implementation of miniaturized analytical devices. Such devices can then be applied to measuring biological samples in-situ and in real-time, generating a better understanding of disease states. Jon takes a multi-disciplinary and collaborative approach to research and has obtained funding from a variety of sources to investigate the use of nanosensors in a variety of biological applications including, embryo development, stem cell biology, biofilms, photodynamic therapy and regenerative medicine.