



Institute for Integrated Systems

Seminar and Reception
8th of October 2008
15.00-17.00

**Classroom 10, Alrick Building, School of Engineering and Electronics,
The University of Edinburgh, The Kings Buildings, Edinburgh**

This event has been organised in order to welcome the new IIS Professor of Bioelectronics, Ron Pethig, to the institute. It will consist of four short presentations on the use of engineering in biology and medicine, including one from Prof. Pethig himself. The seminar will be followed with a reception with refreshments in seminar rooms D/E next to classroom 10.

Dielectrophoresis: The gymnast of bioelectronics and what it can perform

Prof. Ronald Pethig, IMNS, School of Engineering and Electronics, The University of Edinburgh

Cells can be selectively profiled, captured, sorted, and separated from other bioparticles on microfluidic platforms using dielectrophoretic forces generated by modest radio-frequency voltages. The intrinsic dielectric properties of the cell are utilised, without the need for engineered labels, tags, dyes or other markers. The basic principles of the technique will be outlined and numerous practical examples illustrated.

Microfabricating the microenvironment in multicellular systems

Prof. Gerard Markx, Department of Chemical Engineering, School of Engineering and Physical Sciences, Heriot Watt University

The behaviour of cells is determined by its interaction with its immediate surroundings or “microenvironment”. The cell’s microenvironment is determined by chemical, physical and biological factors including the composition of the medium and the extracellular matrix, mechanical or other forces on the cells, and the interaction with other cells through diffusible signals or direct cell-cell contact. Microfabrication and micromanipulation technology allow placement of cells in defined positions to each other and the recreation of cell microenvironments at relevant length-scales. Some examples of the use of these techniques to microbial and animal cells are discussed.

Blood flow separation in microfluidic channels

Prof. Marc Desmulliez, MISEC, School of Engineering and Physical Sciences, Heriot Watt University

Blood separation is a strategic preliminary step in the preparation for biological analysis on-chip. For example, downstream analysis such as Polymerase Chain Reaction (PCR) needs a clear plasma totally free of cells which would otherwise create interference if samples were analysed optically. The objective of the system developed is to take advantage of the natural effects occurring in blood flow in microchannels to separate blood plasma on-chip.

An implantable microsystem for controlled drug delivery

Dr. Stewart Smith, IMNS, School of Engineering and Electronics, The University of Edinburgh

An active, low power drug delivery system, based on silicon micromachining, which was intended for ophthalmic applications has been developed at the Scottish Microelectronics Centre. It consists of two main parts; firstly a MEMS drug release device that uses an electrochemical reaction to selectively open reservoirs containing a single dose of a drug; secondly a wireless power and control system which uses inductive coupling to transfer enough power to open the drug reservoirs and communication to allow the user to choose which dose to release next. This presentation will describe the development of the prototype system and show the results of experiments which demonstrate the operation of the device.