

Nanomedicine

Speaker: **Prof James K. Gimzewski**
Distinguished Professor, Department of Chemistry and Biochemistry, University of California Los Angeles (UCLA), California Nanosystems Institute

Venue: Blk S13, #M01-11, Department of Physics Conference Room, Faculty of Science, NUS

Date: **3rd January 2007 (Wednesday)**

Time: **3.00pm – 4.00pm**

Abstract:

Established techniques for global gene expression profiling, such as microarrays, face fundamental sensitivity constraints. Due to greatly increasing interest in examining minute samples from micro-dissected tissues, including single cells, unorthodox approaches, including molecular nanotechnologies, are being explored in this application. Here, we examine the use of single molecule, ordered restriction mapping, combined with AFM, to measure gene transcription levels from very low abundance samples. We frame the problem mathematically, using coding theory, and present an analysis of the critical error sources that may serve as a guide to designing future studies. We follow with experiments detailing the construction of high density, single molecule, ordered restriction maps from plasmids and from cDNA molecules, using two different enzymes, a result not previously reported. We discuss these results in the context of our calculations.

We discuss the extension of nanomechanical probing of single cells and bacteria to real time evaluation of properties such as stiffness and adhesion force. This has been applied to the effects of nocodazole and serum starvation on NIHT3 cells, to the effects of wild type and various mutant bacteria on dental enamel biofilm formation and erosion. As well as using AFM we present new results using a techniques we call nanomirrors.

Profile of Speaker

James Gimzewski pioneered research on electrical contact with single atoms and molecules, light emission and molecular imaging using STM. His current interests are in the Nanoarchitectonics of molecular systems and cells with applications for nanomedicine. Recently, he has undertaken groundbreaking research in an entirely new field of biophysics, which he calls sonocytology of living cells. In 2005 he published the most downloaded paper in Nature on a pocket sized nuclear fusion device. Gimzewski received the 1997 Feynman Prize in Nanotechnology, the 1997 The Discover Award for Emerging Fields, the 1998' Wired 25' Award from Wired magazine and the Institute of Physics "Duddell" 2001 prize and medal for his work in nanoscale science. He holds two IBM "Outstanding Innovation Awards", and is a Fellow of the Institute of Physics and a Chartered Physicist. Gimzewski was elected to the Royal Academy of Engineering, and he has joined the scientific boards of Quantum Precision Instruments, The Lifeboat Foundation and Veeco-DI Instruments and is a member of the UCLA California Nanosystems Institute, NASA Cell Mimetic Institute for Space Exploration and UCLA ART|SCI Center. With over 200 papers published, Gimzewski's research continues to appear in journals, such as Science, Chemical Engineering and Nature. He has also appeared in many popular magazines such as Discover Magazine, The New York Times, Wall Street Journal, and Scientific American. Currently he is a visiting professor at the University of Marseille II and Benjamin Meakin visiting Professor at the University of Bristol.

For details, please contact:

Mr Leong Wai Kit, NUSNNI, Blk S13, #02-12A, 2 Science Drive 3, Singapore 117542

Tel: 6516-3980, Fax: 6779-0350, Email: nmilwk@nus.edu.sg