



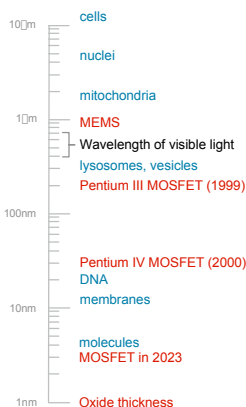
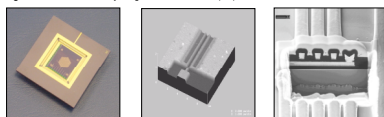
Genomic Nanoprocessors



The Scottish Microelectronics Centre (SMC) provides the semiconductor industry with access to state-of-the-art facilities and expertise, including R&D support to technology commercialisation. It holds the key technologies to fabricate and electrically/fluidically package chips and appropriately interface silicon with other technologies. The SMC has recently moved into new £4.2m buildings with 250 m² of Class 10 cleanrooms, 1,000 m² of lab and office space and over £10m of equipment, which provide excellent infrastructure in micro- and nanofabrication.

The SMC contains the complete range of process equipment required to fabricate submicron CMOS technology and the University employs highly qualified and experienced staff to maintain its operational status. The SMC also has a successful track record in commercialising research with its own dedicated incubation unit. Prof Anthony Walton, who together with other staff at Edinburgh has expertise in microelectronic fabrication, will lead the SMC aspects of the collaboration.

Images
Left: Electrode array in package
Middle: An AFM image of a MOS transistor
Right: Cross section of circuitry using a focussed ion beam (FIB)



a sense of scale



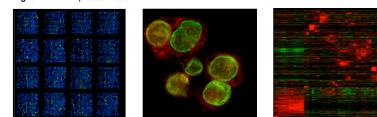
SCOTTISH CENTRE FOR GENOMIC TECHNOLOGY AND INFORMATICS

The GTI is a not-for-profit centre for world-class post-genomic research, located within the University of Edinburgh Medical School. Our goal is to exploit the power of post-genomic science and technology to explore fundamental questions of biology and provide insights into genetic networks. It is our aim to apply this work to enhance our understanding of human health, to develop new methods of disease treatment, and to build an engine of growth for biotechnology industry through research commercialisation.

GTI combines a wide range of leading edge post-genomic research with a £6m centre of expertise in microarrays, bioinformatics and bioimaging. A unifying theme for this research is the exploration of Pathway Biology, developing a systems level understanding of complex biological processes.

The GTI approach is innovative and unique. We believe that dramatic progress can be made from a collaborative, multidisciplinary style of research. Our work crosses traditional boundaries, combining science and technology, blue-sky and applied research, academia and business.

Images
Left: Shows 25% of a large-scale mouse developmental array produced in the GTI
Middle: Visualisation of Chromatin following infection of cells
Right: An RNA Expression Atlas



Converging nano-scale science and technology ...

...to integrate DNA biomolecules on a silicon chip to form DNA transistors...

...with a range of market applications..

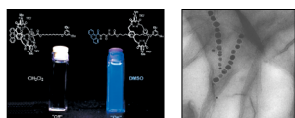
- Biosensors
- Bioengineering
- Medical Diagnostics
- Medical Devices
- Bioinformatic Chip Platform

Chemistry
the University of Edinburgh

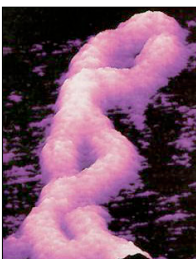
The University of Edinburgh Department of Chemistry, along with the Edinburgh Materials and Microanalysis Centre (EMMAC), bring an understanding of chemistries vital to the design of regulating mechanisms used in DNA 'transistor' switching. The lead researcher, Dr Andy Mount, is an electrochemist with extensive experience in redox active films, which enable the controlled binding and release of ions. He also has expertise in the design of electrodes with these films in biosensor applications.

EMMAC is a £3m collaboration between Geologists, Chemists and Engineers which will use state-of-the-art surface analysis equipment to analyse and image surfaces and surface films on the micron scale, giving quantitative chemical information on their composition. This centre will provide excellent infrastructure in the microanalysis of surface films for this programme.

Images
Right: Nanoparticles grown by mineralisation in bacterial cells
Left: Chemical structures demonstrating molecular mechanical switching

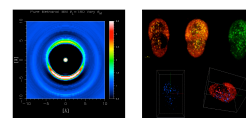


... and to build a platform for next generation Bio-intelligent Medicine



Optical characterisation will play a pivotal role throughout the proposed project and state-of-the-art spectral imaging tools and expertise are provided by the recently-established £2m Collaborative Optical Spectroscopy, Micromanipulation & Imaging Centre (COSMIC) at the University of Edinburgh. The proposed project will benefit from the unique facilities, extensive infrastructure and core staff in this major new cross-disciplinary centre for characterisation, visualisation and control of materials at the molecular level.

In particular, the project will use ultra-fast spectroscopy to probe the structure and processes of materials ranging from simple systems to complex macromolecules and biological systems over timescales from 10⁻¹⁵ to 10⁻² seconds. It will also use and develop advanced imaging techniques to view chemically tagged molecules and structures in complex environments down to near-single-molecule resolution. Dr Jason Crain is the founding Director of COSMIC, and brings extensive experience of industrial research with IBM as consultant and visiting Professor.



Images
Left: Liquid state structural determination in aqueous systems: models for protein folding
Right: In vivo real-time monitoring of Fluorescently labelled biomolecules

Team Science

Peter Ghazal
Genomics

Anthony Walton
Microelectronics

Andy Mount
Electrochemistry

John Beattie
Interdisciplinary
Innovation Management

Jason Crain
Advanced Imaging

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