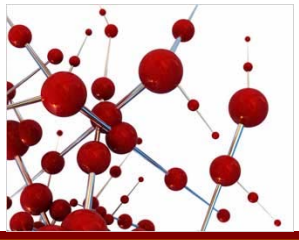
The University of Manchester
MIB



MIB Newsletter

Jan 2010

Dr Anne-Marie Buckle

Anne-Marie sadly and unexpectedly lost her battle with cancer over New Year.

Anne-Marie came to UMIST in 1995, after a spell in the US, funded by a Leukemia Research Fund Fellowship. She continued her work, developing methods to establish haematopoietic stem cell lines and study their differentiation. Haematopoietic stem cells (HSCs) are multipotent stem cells that give rise to all the blood cell types including myeloid (monocytes and macrophages, neutrophils, basophils, eosinophils, erythrocytes, megakaryocytes/platelets, dendritic cells), and lymphoid lineages (T- cells, B-cells, NK-cells). Since then, she extended her research interests to the study of signalling pathways, in particular more recently the Notch receptor pathways, in stem cell differentiation control. Her approach to science was one of hard work, mixed with refreshing modesty and openness.

As well as making substantial contributions to the stem cell research field, Anne-Marie was very active in teaching and was a driving force behind new problem-based teaching methods in the UMIST molecular cell biology (or 'Biological Science') degree programme. She devoted a lot of time and energy to this new teaching method and was exceptionally popular with students and knew how to connect with them. She was also a highly regarded and liked research group leader. As a colleague, Anne-Marie was open, warm and supportive. She was a cheerful companion who always looked on the bright side of a situation and welcomed you into her office (or to lunch!) for discussion on any topic. She will be sorely missed by anybody who worked with her or simply knew her on a more social level. Anne-Marie was a full participant in the MIB ethos - she had made many new links here (e.g. Peter Fielden, Richard Snook) and was, as a result, starting new angles to her research related to tissue engineering and cell interactions. Anne-Marie was known across campus and organised the very popular Stem Cell seminar series in the Michael Smith building. Our condolences go out to her husband Andy (Heath) and their 2 children.

Thank you to all who have contributed to the MIB collection which has been sent to MacMillan Cancer Support.

Research Highlight

David Leys - Understanding Bacterial Halorespiration.

Bacterial halorespiration is a microbial respiratory process that uses halogenated hydrocarbons as terminal electron acceptors. Improving our understanding of this process could enable the detection and removal of harmful compounds in soil, sediment and water. This is the ultimate aim of the 5 year ERC DEHALORES project that started in 2008 in the Leys group.

Billions of substances fall within the wider family of chlorinated compounds. Many of these are the result of natural processes, grasshoppers for example can generate a chlorinated phenol compound to act as ant repellent. In addition to biological production, abiotic processes such as forest fires and volcanic eruptions in particular can generate a range of chlorinated products, which are broken down by several organisms in a continuous "chloride-cycle". While many of these naturally generated compounds will have little or no harmful effect on the wider environment, the accumulation of new, man-made substances known as xenobiotics in soil, sediment and water presents significant risks. Many of these compounds have persist for long periods of time, and most of them have been found to be toxic.

E.coli bacteria that express GFP in response to the present of a chlorinated phenol.

Detecting the presence of these compounds themselves is an important first step to addressing this issue, with removal (ideally by the halorespiratory bacteria) being the ultimate aim. The recent sequencing of four separate genome sequences closely related to two particular bacteria - *Desulfitobacterium dehalogenans* and *D. hafniense* - has proved enormously relevant to our work. We have already made significant progress in understanding the molecular basis of transcriptional regulation of halorespiration by CprK [refs], one of the regulators found associated with the key enzyme in this process. This enzyme, CprA, is a membrane-associated, oxygen-sensitive, B12 and iron-sulfur cluster binding protein that reduces halogenated hydrocarbons. We have only recently been able to make significant progress towards understanding this aspect, thanks to the hard work of Mark Dunstan and Karl Fisher.

Our present research focuses on using CprK as a template for designing novel sensors using laboratory evolution techniques, an area in which Laura Kemp is doing her PhD. In addition, we are studying the properties of a wide range of unrelated halorespiratory regulators that could potentially serve as alternative templates. Following several months of trials, we are now able to produce the key enzyme CprA, which will allow us to elucidate its mechanism. Ultimately, we would hope to expand the substrate specificity of CprA to include xenobiotics such as dioxins, PCBs through protein engineering.

Crystal structure of CprK in complex with DNA and a chlorinated ligand.

References:

Levy, C, Pike, K, Heyes, D, Joyce, MG, Gabor, K, Smidt, H, van der Oost, J & Leys, D. (2008) Molecular basis of halorespiration control by CprK, a CRP-FNR type transcriptional regulator. *Mol. Microbiol.* **70**, 151-67.

Mazon H, Gabor K, Leys D, Heck AJR, van der Oost J & van den Heuvel, RHH. (2007) Transcriptional activation by CprK1 is regulated by protein structural changes induced by effector binding and redox state, *J. Biol. Chem.* **282**, 11281-11290

Joyce, MG, Levy, C, Gabor, K, Pop, SM, Biehl, DB, Doukov, RI, Ryter, JM, Mazon, H, Smidt, H, van den Heuvel, RHH, Ragsdale, SW, van der Oost, J & Leys, D. (2006) CrpK crystal structures reveal mechanism for transcriptional control of halorespiration. *J. Biol. Chem*. **281**, 28318-28325

General News

Ancient DNA Consultant in MIB

Probably the first ancient DNA consultant in Britain, if not the world, is working in the MIB. Keri Brown, an Honorary Lecturer in Biomolecular Archaeology in the faculty of Life Sciences, realised that more and more archaeologists were appreciating the potential of DNA analysis to answer their questions about kinship, gender identification and social organisation. As a consultant, she realised that the costs for ancient DNA analysis must be comparable to such established methods as radiocarbon dating, if archaeologists were to make routine use of DNA in post-excavation analysis. So far she has three projects lined up, including the DNA analysis of a 2600 year old (Iron Age) brain, amazingly preserved soft tissue from York. Initial results indicate that the mitochondrial DNA haplotype of this individual is very unusual, with the nearest comparisons coming from DNA samples from Iceland, the Balkans, Cyprus, Greece and Egypt! In addition, Dr. Peter Gardner and Dr. Elsa Correia are using IR spectroscopy on the same brain tissue sample to examine the degradation of its biomolecules when compared with fresh brain tissue. Forthcoming projects include assessing kinship in an Irish burial group, and looking at kinship and the incidence of tuberculosis in a cemetery of Primitive Methodists (18th cent AD) from Darwen, Lancashire. The latter are particularly interesting as an example of a short-lived breakaway religious sect with intensive, familial use of graves (stacked 6 or 7 to a grave). There is also evidence of non-metric skeletal and dental traits amongst the putative families, which can be compared with the ancient DNA results to show whether Mendelian inheritance of these traits is occurring or not. This work makes use of the ancient DNA facilities located in the MIB, which include state of the art clean rooms with positive air displacement and UV lighting to control modern DNA contamination. These are probably the best facilities for this kind of work in Britain, if not Europe and North America. The MIB exists to foster interdisciplinary research – it is hard to imagine anything more interdisciplinary than the fusion of molecular biology, a science, and archaeology, a humanities subject, into a new discipline, biomolecular archaeology. Last year Keri was elected as a Fellow of the Society of Antiquaries of London, one of the oldest academic societies in the world. She is on the editorial board of the Journal of Archaeological Science, and reviews papers for four other journals. She is also an active archaeologist, specialising in aerial archaeology and the Neolithic of Southern Italy, specifically a region called the Tavoliere. Keri.brown@manchester.ac.uk

Careers Advice and Guidance for Research Staff

Dr Sonja Tomaskovic (Careers Consultant - Research Staff MLP, Careers & Employability Division The University of Manchester) - We are offering 45 minute confidential consultations to help you think about your career plans, inside and outside of academia, and give you feedback on your applications and interviews. You can book the appointment to see the Careers Consultant for Research Staff on our website: http://www.careers.manchester.ac.uk/staff/research-staff .
Furthermore, through your Faculty training teams we are delivering bespoke sessions and different workshops on how to write a good CV, win at the 'interview game' and manage your academic career. The Careers Service website is an excellent resource for general career 'tips&tricks', job search, employers in different UK regions and different employment sectors, information for international students…and more. Although this website is more tailored for PhDs (and undergraduates) it may also be of interest for researchers.
http://www.careers.manchester.ac.uk/students
There is also postgraduate careers blog with informal career news, comments and vacancies:
http://manchesterpgcareers.wordpress.com

UKPMC update

Innovative new web interface improves access to UK's largest free online life sciences resource.

The open beta version of UKPMC has been launched http://beta.ukpmc.ac.uk/
To load papers onto the UKPMC for open access you can use the submission site: website
For requirements from publishers and funding bodies in terms of open access please see the Sherpa Romeo site for information http://www.sherpa.ac.uk/romeo/

Yasmin Koser

Yasmin has joined the MIB as John McCarthy's PA, covering for Lesley-Ann who has now gone on maternity leave. Yasmin.koser@manchester.ac.uk

Health and Safety News

Safety first..!

STDU Safety Training courses

STDU H&S courses are run in the Sackville Street Building, close to MIB. They are available, free of charge, to all staff and research students. To book any of the courses, see: http://www.staffnet.manchester.ac.uk/employment/training/courses/

Date	Course code	Course title
25/01/10, 22/02/10, 26/03/10	HS42	Laser training
25/01/10, 22/02/10 , 26/03/10	HS98	Laser safety awareness
03/02/10	HS7	Gas safety and regulators course
08/02/10	HS75	Safe UV practice: a users guide
09/02/10, 11/02/10 , 17/03/10	HS15	Principles of risk assessment
10/02/10	HS50	COSHH assessment for lab based staff
16/03/10	HS67	Risk assessment workshop – for lab based staff

Other H&S courses are run by STDU, but currently have no dates set. These include **HS11**: Application of COSHH to work with biological materials, and **HS26**: Safe use of GMOs. If you would like to attend any of these courses, please register an interest through the STDU website (address above).

General Safety Issues

- **Out-of-hours cards** – the current green out-of-hours cards expire on 31/01/10. New cards are now available from Tanya (2.031). **ANYONE** planning to work out-of-hours (ie. when Reception is not open – weekdays 6pm-9am and weekends/Bank Holidays) **MUST** collect a card from Tanya (2.031). This includes all PIs (lecturers, professors, etc), postdocs, technicians, admin staff and authorised postgraduate students. **Anyone** found by Security working out-of-hours who is not in possession of a valid card will be asked to leave the MIB and their details passed on to the Director's Office.
- **Thermal gloves** – when taking samples out of the -80^{o}C freezers, it is often tempting to do this without the gauntlets, as they are cumbersome and reduce dexterity. We have found thermal gloves, which are comfortable and maintain dexterity, and are suitable for working at -30^{o}C. They would be suitable for handling items from the -80^{o}C freezers for short periods of time. These gloves are available from Arco: (http://www.arco.co.uk/products/1504700/139656/Ansell_PowerFlex®_T_80-400_Hi-Vis_Thermal_Glove)

We have a selection of different sizes if you wish to come to try them on/see how suitable they would be for your work. Prices: £5.89 a pair! The order details are as follows: Powerflex 80-400 HiViz Thermal Gloves Size 7 – 1504707, Size 8 – 1504708, Size 9 – 1504709, Size 10 – 1504710

- **Health questionnaires** – have you filled in a health surveillance questionnaire? If you work in the labs, you should have registered with Occupational Health. If you have never done this, please see Tanya/Fiona for a form. This form is also available on the MIB intranet on the H&S pages, under the Personal Health section.

Focus on…..Good Microbiological Practice to Minimize Bacteriophage Contamination

- Do not remove bungs from flasks in shaking incubators. Transfer flasks to your bench before adding or removing samples.
- Transfer samples into centrifuge tubes, balance and seal them in your lab area not in the equipment parks. Decant supernatants on your bench.
- Clean up and disinfect all spills promptly and thoroughly, especially communal equipment and areas.

- Put used agar plates directly into a biohazard bag in a Blue-lidded bin. Used plates **MUST NOT** be put into open biohazard bags!
- **Refer to the notices above the sink areas for further information**

Focus on…..use of phenol within the MIB

- Before starting work with phenol – make sure you read, understand and sign the relevant COSHH form. **Phenol exposure can be fatal** – make sure you know how to protect yourself and how to treat spills/splashes on your skin.
- You must **ALWAYS** wear **gloves, safety glasses** and a **lab coat** when handling phenol or phenol-containing solutions (eg. Trizol, etc) and **work in a fume cupboard**.
- The Semperguard gloves available from Stores have a breakthrough time of 30 minutes for phenol – but it is important to always check that the gloves you are wearing do not have holes, etc.
- If you do spill phenol on your skin, **treat immediately with diphoterine** and **call a first aider.**
- **ALL phenol-contaminated plastic/paper waste must be put into a yellow sharps bin for incineration – it must not go into normal waste or biohazard bags.**
- **ALL liquid phenol-containing waste must be stored in a glass bottle and disposed of via Stores.**

Funding News

BBSRC Strategic Plan

BBSRC will be launching its new five year strategic plan on Thursday 28 January with webcast from

Chief Executive Prof Douglas Kell. To watch the webcast and to see the premiere of a new film explaining the vision for BBSRC science please visit: http://www.bbsrc.ac.uk/strategy from 10am on 28 January 2010. The strategic plan for 2010-2015 will set out BBSRC's leading high-level priorities and aspirations over the next five years, as well as some of the underlying principles upon which we will base our future funding decisions. Following the launch of plan with the webcast a blog will be open for a week for people to leave feedback and comments. Over the following week each comment will receive a response from Prof Kell. People can also ask questions about the plan through Prof Kell's twitter feed - www.twitter.com/dbkell
The new BBSRC film - called 'The Age of Bioscience' - will explain the place of bioscience research in the world and the vital role played by the BBSRC research community.

NERC New Action Plan

NERC has announced new action plans, these plans outline where NERC will invest around £80m over the next few years. The approved plans are:
Biodiversity and ecosystem service sustainability (£13M)
Network of sensors (£5M)
Macronutrient cycles (£9.5M)
Ice sheet stability (£7.4M)
Arctic research programme (£15M)
Valuing biodiversity and natural resources (£0.5M)
Taxonomy and systematics (£0.42M)
Insect pollinator decline
Increasing resilience through multi-hazard assessment of earthquake-prone and volcanic regions (£4.6M)
Algae bioenegry network (£0.6M)
Marine renewable energy (£2.4M)
Analytical science and technology studentships (£1.4M)
Development of joint climate research programme with the Met Office
Next generation weather and climate systems prediction (£4.4M)
Long term co-evolution of life and the planet (£4M)
Environmental exposure and health initiative (£3M)
Environmental and social ecology of human infectious diseases (£4M)
Summaries of each action plan can be found at:
http://www.nerc.ac.uk/research/themes/tap/tap-phase2.asp

EPSRC – New Materials equipment services

Researchers can apply to use equipment at seven new services. These services provide free access to UK academic researchers, including travel and accommodation. There are no closing dates and you can apply at any time. Services include:

- Advanced electron-beam lithography system
- X-ray photoelectron spectroscopy
- Focussed ion beam scanning electron microscopy
- Environmental scanning electron microscopy
- Time-of-flight secondary ionisation mass spectrometry
- Electron probe microanalysis
- High resolution transmission electron microscopes

Further info: http://www.epsrc.ac.uk/CallsForProposals/MaterialsEquipServices.htm

EPSRC update

EPSRC have updated their funding guide, changes include charging travel costs to grants and the

need for further justification for requesting non-specialist computers on grants (pg 16). The funding guide can be found at - http://www.epsrc.ac.uk/ResearchFunding/HowToApply/FundingGuide.htm
The justification of resources on EPSRC applications is now up to two sides of A4. They have also issued guidance http://www.epsrc.ac.uk/ResearchFunding/HowToApply/jor.htm

BBSRC Genome Analysis Centre Capacity and Capability Challenge call

The Genome Analysis Centre (TGAC) is a new national BBSRC centre for large-scale sequencing of plants, animals and microbes in partnership with the East of England Development Agency and the Norfolk Local Authorities. TGAC has recently launched a Capacity and Capability Challenge (CCC) programme, offering UK researchers the opportunity to engage with the Centre's new sequencing and bioinformatics facilities through its early access research programme. Starting this month and running for 12-18 months, the CCC will deliver a series of innovative projects addressing both biological research problems and technical challenges to sequencing and associated informatics.
The CCC is being administered with support from BBSRC Office, and will operate to a series of batching dates set at intervals to facilitate efficient review of proposals. The upcoming batching dates are 28 February and 30 April 2010. Further details about TGAC and the CCC are available from the TGAC website at: http://www.tgac.bbsrc.ac.uk/. Potential applicants are advised to contact the centre to discuss their proposals and requirements. A technical assessment form, completed in iteration with TGAC, must accompany completed applications. For more information, contact: Emily Angiolini: Emilyj.angiolini@bbsrc.ac.uk; 01603 450000

Human Frontier Science Program

The Human Frontier Science Program (HFSP) supports novel, innovative and interdisciplinary basic research focused on the complex mechanisms of living organisms; topics range from molecular and cellular approaches to systems and cognitive neuroscience. Research Grants are awarded for novel collaborations involving extensive collaboration among teams of scientists working in different countries and in different disciplines. Two types of grants are available: Young Investigator Grants and Program Grants.
For more information, visit: http://www.hfsp.org/pubs/Newsletters/news.php?date=20071218)

BBSRC Academia – Mastering a complex career

This inspirational one-day event, aimed at postgraduate and postdoctoral Bioscientists, will focus on the knowledge impact factors vital for securing an academic position. Held on Thursday 1st July, 2010, Prague, during the Society for Experimental Biology Annual Main Meeting, the session forms part of the Education Programme and registration allows delegates to attend the rest of the 4-day scientific meeting. http://www.sebiology.org/meetings/Prague/Education-Sessions.html
Registration: Postgraduates £80; early career scientists £120. Reduced registration can be secured by joining the SEB http://www.sebiology.org/membership/Benefits.html
For more information contact Sarah Blackford, s.blackford@lancaster.ac.uk

BBSRC Vitae Researcher activities

Vitae researcher activities in early 2010: Find out what's on
For research staff: Advancing in academia
http://www.vitae.ac.uk/researchers/188181-188931/Advancing-in-academia-.html 29 March in Manchester. An interactive one day event that provides research staff with the opportunity to explore and develop some of the skills, knowledge, experience and attributes required to advance an academic career.

For postgraduate researchers: Careers in academia http://www.vitae.ac.uk/researchers/188181-

188921/Careers-in-focus-Careers-in-academia-.html 30 March in Manchester.
This interactive one-day event is aimed at early career researchers and will address topics related to how to succeed in a competitive and complex research environment and allow you to think about the pros and cons of different career options available.

GRADschools http://www.vitae.ac.uk/15672/GRADschools.html
Three day courses designed to help you identify and develop your transferable skills and help you to make more informed choices about the next step of your career. Places are limited so secure your place now!
National GRADschool 1: 2 - 5 March 2010
http://www.vitae.ac.uk/researchers/188181-188071/National-GRADSchool-.html
National GRADschool 2: 19 - 22 October 2010
http://www.vitae.ac.uk/researchers/56271-188161/National-GRADschool-.html
National GRADschool 3: 16 - 19 November 2010
http://www.vitae.ac.uk/researchers/56271-188171/National-GRADschool-.html

For both research staff and postgraduate researchers
Digital researcher - managing your networks and building your profile
http://www.vitae.ac.uk/researchers/188181-191341/Digital-researcher---Managing-your-networks-and-building-your-profile.html

An interactive one day event run by the British Library and Vitae exploring the use of Web 2.0 in research, networks and building researchers own profiles.
"The creative researcher" http://www.vitae.ac.uk/researchers/169081/Researcher-booklets.html booklet containing tools and techniques to unleash your creativity

Funding Deadlines & Links

NERC Research, consortium, and partnership Grants 1st July http://www.nerc.ac.uk/
EPSRC http://www.epsrc.ac.uk/default.htm
BBRSC Responsive mode –14th April 2010 http://www.bbsrc.ac.uk/funding/index.html
MRC http://www.mrc.ac.uk/index.htm
Wellcome Trust http://www.wellcome.ac.uk/Funding/Biomedical-science/index.htm
ESRC http://www.esrc.ac.uk/ESRCInfoCentre/index.aspx

Other services

New University Diversity Calendar

The new University 2010 Diversity Calendar can be downloaded from:
http://www.campus.manchester.ac.uk/equalityanddiversity/calendar/ - it highlights religious dates for the six major world faiths currently represented within our community: Buddhism, Christianity, Hinduism, Islam, Judaism and Sikhism.

Congratulations

TOP

Recent Grant awards

Nicholas Turner has been awarded £550K from the European Commission FP7 programme for the

project “amine synthesis through biocatalytic cascades”

Births

Congratulations to **Abi Stevenson** (Post Doc John McCarthy’s lab) who has had a baby girl, Imogen Mary Stevenson Goundry (born 14th Jan).

Seminars

TOP

MIB Research Forum Talks 12.00 MIB LT

Thursday 25th Feb
Talks to be confirmed
Thursday 25th Mar
Jason Micklefield, Andrew Almond and Finbarr Hayes

MIB International Seminar Series 12.00pm MIB LT

Wednesday 10th Feb
Professor Dan Tawfik, Dept Biological Chemistry, Weizmann Institute, Israel
How do proteins evolve?
In spite the robustness and perfection of their mechanism of action, proteins posses a remarkable ability to rapidly change and adopt new functions. I will describe experimental work aimed at reproducing the evolution of new proteins in the laboratory, and unraveling their traits of evolvability. Specifically, I will describe how the functional promiscuity of proteins, their conformational plasticity, and their modularity of fold, accelerate their rate of evolution. I will address the issue of neutral (or actually, seemingly neutral) mutations, and neutral networks, as facilitators of protein evolution. Finally, I will address mechanisms for buffering and compensating the deleterious effects of mutations, including compensatory stabilizing mutations and chaperones, that can greatly accelerate the rate of protein evolution.

Thursday 4th March - Dr Mark Viant

Full seminar list: http://www.mib.ac.uk/aboutus/newsandevents/news/ISS/iss%20full%20list.html

Seminars throughout the University

- Faculty of Life Sciences
- School of Materials
- School of Physics and Astronomy
- School of Chemistry
- SCEAS

Events/Symposia/Meetings

TOP

RASOR Symposium: Lab-on-a-Chip for Cell and Proteomics

University of Glasgow on 05 March 2010. The aim is to use the event as a platform for a focused discussion on the recent technical advances in cell and proteomics research focusing on nanotechnology and lab-on-a-chip approaches. We hope this event will attract a broad cross-section of the UK scientific community. We are able to accommodate around 80 delegates, primarily from research institutions in Scotland and Northern England. The confirmed speakers are: Dr Guillaume Charras, UCL, Prof Andrew De Mello, Imperial College, Prof Mark Bradley, University of Edinburgh, Prof Kishan Dholakia, University of St Andrews, Dr Tracy Melvin, University of

Southampton, Dr Andy Pitt, University of Glasgow, Dr Logan Mackay, University of Edinburgh, Prof Ted Hupp, University of Edinburgh, Prof Jon Cooper, University of Glasgow
In addition to the invited speakers, all delegates are invited to present posters. Abstracts can be submitted along with the registration. **The registration is free. Deadline is Friday 12 Feb 2010.** To register please visit www.gla.ac.uk/rasor.

Royal Society Public Lecture - The great ideas of biology

Monday 8 February 2010 6.30pm - 7.30pm
Speaker: Sir Paul Nurse FRS, President, The Rockerfeller University
Location: The Royal Society, 6-9 Carlton House, London SW1Y 5AG
We have a free public lecture on 8 February 2010 at 6.30pm that may be of interest to you. Please feel free to pass this on to colleagues and students within your department who may also be interested. Synopsis: Three of the ideas of biology are the gene theory, the theory of evolution by natural selection and the proposal that the cell is the fundamental unit of all life.
When considering the question of 'what is life?' these ideas come together, because the special way cells reproduce provides the conditions by which natural selection takes place allowing living organisms to evolve. A fourth idea is that the organization of chemistry within the cell provides explanations for life's phenomena. A new idea is the nature of biological self organization on which living cells and organisms process information and acquire specific forms.
Sir Paul Nurse will discuss how these great ideas have influenced and changed the way we think of science today. Admission free - no ticket or advance booking required. Seats will be allocated on a first-come-first-served basis. Doors open at 5.45pm.

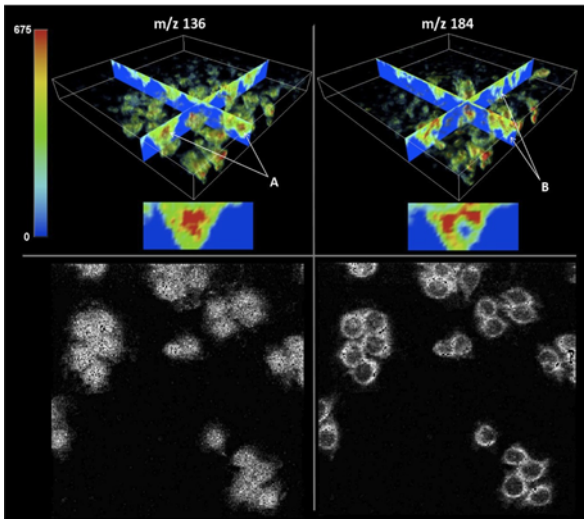
MIMIT Needs You!

TECHNOLOGY FORUM:
12TH FEBRUARY — COMMITTEE ROOM A, WHITWORTH BUILDING
JOINING FORCES TO TRANSFORM HEALTHCARE
On 12th February, we're holding a forum for researchers and clinicians to brainstorm possible solutions to an unmet clinical needs:
Advanced Sleep, Activity & Resting Monitoring
(a wearable device to detect and log patient activity over several days) We need experts, problem-solvers, and innovators to help us come up with ways to address this need: the best ideas may be taken forward in a MIMIT-funded development project.
Join us for buffet lunch and discussion: email info@mimit.org.uk to tell us you're coming.
(This forum was originally scheduled for 6th January: the University's closure that day due to weather required its rescheduling.)
Committee Room A (Knowles Room), Whitworth Building
Date: 12th February 2010 Time: 1200–1400 Contact person: Ian Mackay (0161) 306 5123 info@mimit.org.uk
MIMIT: a partnership between the University and six NHS trusts. We help fund and manage the development of solutions to unmet clinical needs from the healthcare sector, using the expertise of researchers.

Publication Highlight

Progress in 2 and 3D Mass Spectral Imaging of Bio-systems

The surface analysis research group led by John Vickerman and Nick Lockyer has recently published several papers that record significant progress towards the aim of enabling the full capability of mass spectrometry to be applied to 2 and 3 dimensional analysis of bio-systems with high spatial resolution. With significant EPSRC funding the Group is developing a completely new concept of secondary ion mass spectrometer. It exploits the capabilities of the C60+ primary ion beam system, introduced and developed by the Group, to lift molecules off the surface of analytes with high efficiency and relatively little damage to the system being analysed. It has been quite a long journey that began in the early 1980s when JV started exploring the capabilities of the new technique of static SIMS. Some highlights of this journey are recorded in a paper in the volume of Surface Science published last year to honour Gerhard Ertl's Nobel Prize in 2007[1]. Our interest in applying SIMS to biological systems developed in the early 1990s when we joined forces with Profs Winograd and Garrison from Penn State to investigate the feasibility of bio-imaging using SIMS. This crucial cooperation continues to this day and Nick and Barbara can be seen working with our group in the MIB at present. The introduction of the C60 ion beam system has revolutionised the application of SIMS to bio-systems. Three articles explain how this has come to pass and they explain why, to fully exploit the capability, we have had to produce a new generation of SIMS instrument [2, 3, 4]. John Fletcher's work has demonstrated that our new instrument will do basically what we hoped for. The figures show the new instrument (the J105 Chemical Imager) and some early 2 and 3D images of BPH and HeLa cells. As the Mass Spectrometry Review makes clear there is much further basic work to do to develop optimum performance4. However it is one thing to develop a new instrument, it is another to apply it to the solution of biological problems. We would welcome discussions with groups who would like to explore with us how our new instrument might help advance their studies.



Cell imaging using the J105. Top half of figure shows a 3D reconstruction of image data from BPH cells. Orthogonal slices through the data set facilitate visualization of the chemical distribution within selected cells. Data shown for the m/z 136 ion (left), the protonated molecular ion from adenine, and m/z 184 (right) originating from phosphocholine-containing lipids. The adenine signal is localized to the center of the cells (A) as it arises from the nuclear DNA while the m/z 184 signal is observed almost as rings around the edge of the cell (B) as it arises from the lipid membrane. Field of view for the analysis was approximately 180 x180 µm2. Lower images are the same ions from a 256 x 256 µm2, image of freeze dried HeLa cells.

[1] *Molecular SIMS - A journey from single crystal to biological surface studies.* John C. Vickerman, Surf. Sci. 603 (2009) 1926-1936

[2] *A new SIMS paradigm for 2D and 3D molecular imaging of bio-systems.* John S. Fletcher and John C. Vickerman, Anal. Bioanal. Chem. 396 (2010) 85-104

[3] *Cellular imaging with secondary ion mass spectrometry.* John S. Fletcher, Analyst 134 (2009) 2204-2215

[4] *Developments in molecular SIMS depth profiling and 3D imaging of biological systems using polyatomic primary ions.* John S. Fletcher, Nicholas P. Lockyer, John C. Vickerman, Mass Spectrometry Reviews, Published Online: Jan 14 2010 4:14PM DOI: 10.1002/mas.20275

Publications

Lu Shin Wong, Krzysztof Okrasa and Jason Micklefield. Site-selective immobilisation of functional enzymes on to polystyrene nanoparticles. Org. Biomol. Chem., 2010, http://www.rsc.org/Publishing/Journals/OB/article.asp?doi=b916773k

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