Philips CM12 TEM:  
New Morada 11 MegaPixel CCD Camera now installed

The new Morada CCD camera has just been installed on the CM12 and is up and running. With significantly higher pixel resolution than any other CCD camera (approximately 3800x2500 pixels), it offers the opportunity to collect images directly from the microscope with much greater detail than ever before. The 14-bit dynamic range also means we now have an easy way of capturing electron diffraction patterns while avoiding the usual problem of blooming.

Example images:

*CBED pattern from Si.*

*Whip extruding stinging cells (nematocysts) in coral epidermis.*

*(Fe,Cu) Intermetalics in AlCuMg alloy.*
**New in 2006: NSOM coming soon**

A Near-Field Scanning Optical Microscope (NSOM) is a type of a scanning probe microscope (SPM) that is related to the atomic force microscope (AFM) and scanning tunneling (STM) microscope. NSOM can generate topographical and optical images simultaneously. This is done by scanning a very sharp optical fiber above a surface in a similar way to AFM tips. By bringing such narrow optical fibers (<50 nm) close to the surface it is possible to scan areas much smaller than the conventional diffraction limit, resulting in optical resolutions in the order of 20 nm and less.

The EMU will soon (mid-2006) add this powerful technique to its array of instrumentation. Thus the EMU user-community will be able to benefit from NSOM. Adding the NSOM to our suite of high-end microscopes was a result of the leadership of Prof. Benjamin Eggleton, Federation Fellow and Director of the ARC Centre for Ultrahigh Bandwidth Devices for Optical Applications (CUDOS) in the School of Physics. He brought together a group of scientists from the School of Physics and the EMU, who successfully obtained a Major Equipment Grant from the University of Sydney to purchase the NSOM. Many thanks to everyone involved here.

The NSOM is particularly well suited for high-resolution probing of optical phenomena such as the research by the group of Prof. Eggleton and CUDOS. Its unprecedented optical spatial resolution also makes it a powerful tool to study single-molecule dynamic processes like ligand-receptor proteins interactions.

If you want to know more about NSOM, or if you already have projects in mind for which you could use the NSOM, please get in touch with us. We’d love to hear from you!

Example: NSOM image of single-molecules of lipophilic Dil dye on a surface. The difference in intensity (vertical scale) is thought to represent different orientation on the surface (image from the Topometrix website, by P.F. Barbara and D.A. Higgins, University of Minnesota).

Example: NSOM Optical image of Tobacco Mosaic Virus (TMV). The TMV rods are 18 nm in diameter (image from the Topometrix website).

**If you have any questions regarding the NSOM please contact:**

Dr Pall Thordarson  
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A/Prof. Filip Braet  
Tel. +61 2 9351 7619  
filip.braet@emu.usyd.edu.au
Breast Cancer Metastasis: EMU Researchers Receive NHMRC Project Grant

Cancer cells of epithelial origins develop the ability to migrate following processes such as epithelial-mesenchymal and mesenchymal-amoeboid transitions. Recent studies have shown that cancer cells adopt different modes of chemotaxis, which may reflect heterogeneity in the cytoskeletal organisation of these cells. Ongoing studies involve investigations of the motile properties of breast cancer cells using a novel chemotaxis chamber.

Recent progress made by Dr Lilian Soon reveals the function of reduced on-random motile (ROM) in regulating the speed, but not the direction of cancer cell motility. Conversely, N-WASP regulates the direction of cell motility, but not the speed. This work has recently received NHMRC support for three years (No. 402510, Lilian Soon & Filip Braet), which will allow further investigations on the function of ROM and N-WASP in breast cancer metastasis by *in vivo* imaging of live tumours with two-photon microscopy. The mechanism of N-WASP function will also be investigated by using a N-WASP biosensor for FLIM and correlation of FLIM signals with integrin binding using TIRF. The organisation of the actin cytoskeleton regulated by ROM and N-WASP will also be studied by cryoEM tomography.

PhD scholarships are available for enthusiastic students to undertake research on the functions of ROM and N-WASP involving state-of-the art bioimaging techniques.

If you are interested in this project please contact:

Dr Lilian Soon  
Tel. +61 2 9351 5322  
lilian.soon@emu.usyd.edu.au

Course Timetable for 2006 online

Check out the new course timetable for 2006, that is available on the Unit’s website at www.emu.usyd.edu.au/emu/training_main.php
Good News from the EMU’s Image and Visualisation Group

The Image and Visualisation Group has had another successful year with excellent outcomes in our research programs. A new ARC Linkage grant, in collaboration with BHP Billiton, will support research into 3-D structure/function relationships of metallurgical minerals.

3D X-ray microtomography of bone structure (1GB data approximately 8mm cube).

Of particular note in this regard is the appointment of Dr Naomi Tsafnat as an APDI Fellow who will be applying Finite Element Analysis (FEA) to our mineralogical studies. We are also very pleased to be able to invite applications for 2 APAI scholarships ($24,650pa tax-exempt) for PhD candidates interested in research in 3-D modelling and image analysis associated with this project.

A second ARC Linkage grant with Dr Greg King of the Woolcock Institute will also see our research into X-ray microtomography of the lung enter a new phase of discovery. We are currently looking for a research associate with a medical/computer background to join us in this work. We also continue to have some exciting outcomes in orthodontic research, in vestibular anatomical studies and in a wide range of other 3-D analytical studies.

Further information and contact:

Dr Allan Jones
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allan.jones@emu.usyd.edu.au

EMU Christmas Party Invitation

Come and join us on **15 December at 1:00pm** for our EMU Christmas party in LG 92.

Please bring a plate to share for the Buffet Lunch, and a gift for the Giving Tree if you wish. RSVP to Ruth by 12 December (ph. 9351 2351 or e-mail ruth.fletcher@emu.usyd.edu.au)

This year’s theme is **Underwater**, so use your imagination!

NANO Annual Report

The Electron Microscope Unit does not only incorporate the Australian Key Center for Microscopy and Micronanalysis, but it is also headquarters of the Nanostructural Analysis Network Organisation Major National Research Facility (NANO-MNRF). The latest NANO annual report can be downloaded from [www.nano.org.au/ar.htm](http://www.nano.org.au/ar.htm). Alternatively, ask for a hard copy in our General Office in LG 21 or e-mail ruth.fletcher@emu.usyd.edu.au to send you one.
**New EMU Booking System & Online Registration**

If you wish to use the Electron Microscope Unit’s facilities you can register online via our website [www.emu.usyd.edu.au](http://www.emu.usyd.edu.au). Click on the ‘User Area’ tab, and follow the online instructions. This area, as well as the Unit’s instrument booking system, will shortly be updated to streamline the registration process. The new online registration system will guide you through the following steps:

1. Register your personal details.
2. Register your project.
3. Register your subscription information.
4. Shortly after these online details are completed, you will be contacted for a New User Meeting where your project can be discussed with academic and technical staff of the EMU.

Please direct any queries regarding subscriptions or user registration to Dennis Dwarte, who has taken over the role as Subscription Manager from Tony Romeo. We thank Tony for his great work in the past.

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**ACMM19 – Microscopy Solutions**

For the die-hard microscopists among us, we are pleased to announce that the Australian Conference on Microscopy and Microanalysis returns to Sydney, from 5th-9th February 2006.

We are scheduling an exciting program of workshops, to elucidate state-of-the-art microscopy methodologies such as atom probe tomography, advanced scanning probe microscopy, laser cell microdissection and much more.

To present your work at this conference, you are invited to submit your abstract on-line. The deadline for submission of 31 October 2005 has passed, however, **late submissions will be accepted until 9 November 2005**.

Detailed information regarding the program and the venue can be found on the conference website [www.acmm19.org.au](http://www.acmm19.org.au).

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**If you have any questions regarding the new booking system please contact:**

Dennis Dwarte
Tel. +61 2 9351 7534
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Sydney Confocal Users Group
Meeting at the EMU

This is a forum where confocal users can discuss technical aspects of how they obtain their results. The session will be informal, allowing for strong audience participation. Participants include wide-field fluorescence and confocal users of varied experience and also vendors from various microscope companies.

Thursday, 17 November 2005, in LG 92A/B

3.00 pm
A/Prof. Guy Cox and A/Prof. Filip Braet
Introduction & Welcome

3.05 pm
Othon L. Gervasio DDS, MS, PhD, Department of Physiology, Institute for Biomedical Research, The University of Sydney
A new FRET technique reveals developmental changes in post-synaptic receptor clustering

3.25 pm
Catherine Woolnough, PhD student, Biopolymer Research Group, School of Biotechnology and Biomolecular Sciences, University of New South Wales
3-D surface reconstruction of the PHB polymer stained with nile blue

3.45 pm
Alessandra Doolan, PhD student, Centenary Institute for Cancer medicine and Cell Biology
Disease Pathogenesis of Hypertrophic Cardiomyopathy: At a cellular level

4.05 pm
Penelope Bayl, Sydney West Area Health Service, Westmead Hospital
Two and three dimensional imaging of silver-stained microvasculature using reflection confocal microscopy

4.25 pm
Refreshments

Further information and RSVP by 15 November 2005:

Dr Louise Cole
Tel. +61 2 9351 7673
louise.cole@emu.usyd.edu.au

EMU Shutdown Between Christmas and New Year

The EMU will shutdown for its traditional clean-up on Wednesday, 21 December and reopen for business on Wednesday, 4 January 2006.

If you wish to use the facility in the shutdown period you must be a CAT 3 user and get permission to work. Please contact Ellie Kable (9351 7566) for further inquiries.

EMU Newsletter November 2005

The Editors

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