Grant Success for the EMU

There was considerable excitement in the EMU on October 11 caused by the announcement of outcomes from the Australian Research Council’s funding round for 2007. Academics and researchers in the unit were delighted to receive five grants, worth a total of some $3.2 million over the next five years.

Dr Julie Cairney received funding for a Discovery Project that will combine novel specimen fabrication and the use of atom probe tomography to explore grain boundary chemistry in industrially important steels and aluminium alloys. The resulting knowledge will offer a better understanding of how grain boundary segregation affects the recrystallisation behaviour of these alloys, opening up new and more efficient thermomechanical processing techniques for metallurgical industries.

Continuing in a metallurgical vein, a new Linkage Project will allow Prof. Simon Ringer and Dr Julie Cairney to work with a team from BlueScope Steel to understand and optimise the functional relationship between the nanoscale structure of strip cast steels and their final properties. This exciting project opens up a collaboration with one of the world’s leading innovators in steel products centring around the unique Castrip® process developed by BlueScope. The ultimate aim of the work is to develop a new class of strip cast steels for entirely new applications, thereby driving new market growth opportunities in Australian manufacturing.

Dr Zongwen Liu secured a QEII Fellowship to work on the development of carbon nanotube nanothermometers and their use in measuring the local temperatures within the catalytic layers.
of proton-exchange membrane (PEM) fuel cells. This research lies at cutting-edge of nanotechnology, and seeks to apply modern microscopy in the development of a practical solution for measurement of temperatures in micro and nanoscale devices. Ultimately, this work could have a profound, broad-based impact on many fields and industries in the future.

Dr Rongkun Zheng received an Australian Research Fellowship for his plan to elucidate the microstructural and nanostructural origins of ferromagnetism of dilute magnetic semiconductors. These advanced materials are expected to form the basis of spintronics – which make use of the spin of electrons – and new generation electronic systems. By providing an understanding of the structural basis of ferromagnetism of dilute magnetic semiconductors, this project will tackle a major obstacle in the development of real spintronic systems. A pleasing aspect of Rongkun’s success and the other successes mentioned above is the direct connection of these projects with the recent advances in our capabilities in atom probe tomography and, more generally, the advanced electron microscopy capacity of the unit. These projects could not be undertaken without these capabilities and will further the development of microscopy methodologies along the way towards solving the above important problems in materials science and engineering.

Considering recent advances in instrumentation brings us to the final grant awarded: A/Prof Filip Braet led a multidisciplinary team on a successful LIEF application that will see the installation of a high-resolution transmission electron tomographic facility in the EMU during the course of next year. The new instrument will allow researchers to visualise biological and physical samples in three-dimensions by electron tomography and modelling and to image samples in a near-natural state and at high-resolution by cryogenic techniques. This platform will be a major asset for research across the campus, with obvious applications in disciplines including the life, chemical and materials sciences.

Other recent grant successes in the unit have included new collaborative projects established under the CSIRO Flagships Collaboration Fund, which will characterise cold-sprayed titanium coatings by atom probe tomography and will examine the heat treatment of high pressure die castings. Researchers in the unit also continue to acquire funding contributions towards small projects as part of their involvement in the ARC Network for Fluorescence Applications in Biotechnology and Life Sciences.

All of these new grants serve to strengthen the native research activities in the EMU, which already include projects in development of new microscopy techniques and the application of microscopy to diverse research challenges. Current activities include exploring the biology of corals, the characterisation and design of advanced materials, understanding cancer
metastasis, and probing the structure of mineralogical systems. This native research provides essential know-how and new knowledge for the staff of the unit, which then enables them to better serve the research needs of the user community.

Another result of this grant success is the creation of new PhD scholarships and new postdoctoral fellowships in the unit. Full details of the projects and positions are available on our website www.emu.usyd.edu.au.

Expressions of Interest for Establishing a FESEM

The AKCMM intends to lead a bid for the establishment of a new high-end field emission scanning electron microscope (FESEM) through the ARC LIEF scheme in 2007. A new system is needed because of user demand for high-resolution, topographic information on their samples. Recent advances in the electron optics, such as in-lens detectors, offer much higher resolution, contrast and analytical capabilities, and the ability to image much larger samples than the older JEOL JSM 6000F.

In terms of applications, researchers in engineering, chemistry, physics and biomedicine (among others) employ FESEM to analyse structures as small as 1 nm on the surface of materials and biological tissue. Examples of the use of FESEM technology are characterisation of polymers, coatings on various materials, nanotechnological systems, and proteins in the subcellular context.

Research groups or individuals with an interest in or a desire to support this initiative please send an email with your contact details to either Prof. Simon Ringer or Dr Kyle Ratinac.

Some recent examples about use of this technique:

- Wood MA, Meredith DO, Owen GR, Richards RG, Rehle MO. “Utilizing atomic number contrast for FESEM imaging of colloidal nanotopography underlying biological cells.” Nanotechnology, 16 (9): 1433-1439 (2005).

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Changes to EMU Access Costs

All staff and students at the University of Sydney have access to the instruments and expertise of the EMU for conducting their research. From 1 January 2007, the charges for accessing the instrument and facilities within the EMU will be adjusted as follows:

Pay-as-you-go (PAYG) will become $40 per hour.
Subscription rates will become:
- Standard $1,200 for 60 hours
- Level C $3,000 for 180 hours
- Level B $6,000 for 380 hours
- Level A $12,000 for 800 hours
Current subscriptions will continue unchanged until they are next due for renewal.

These increases are necessary for two reasons. Firstly, the access charges have remained fixed for more than 3 years now while the basic running costs and the outlays for emitters, lasers and other essential items have continued to climb. Thus, the increase helps us to partially defray these mounting costs and ensures our ability to maintain a quality service for all our users. Of course, even with the increases in access charges, the university still substantially subsidises the services provided by the unit for the research community throughout the campus and beyond. The second reason for the increase is to ensure parity of the access charges for new “Flagship Instruments” that will be established next year as part of the National Microscopy and Microanalysis Research Facility, which was recently announced under the National Collaborative Research Infrastructure Strategy (see www.ncris.dest.gov.au). The new facility will build on the success of the NANO-MNRF and will offer researchers access to an even wider range of high-end microscopy and microanalysis research platforms through the ten nodes dispersed across the country. Note that, with the creation of the new facility, our intention is to keep this charging system in place for the next 5 years.

Please contact Prof. Simon Ringer if you have comments or questions regarding this change. If you have any difficulties in making these payments, please contact our Subscriptions Manager Dr Dennis Dwarte because we don’t want this change to be a barrier to the conduct of good research.

The unit is also undertaking a review of the charges for training courses, recognising that courses of different durations should be charged at a different rate, rather than a single, flat rate of $100 (internally). Education Coordinator Dr Lilian Soon is overseeing this review. Comments in relation to course charges can be sent to Lilian.

More information:

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Accessing the EMU and NANO-MNRF through National Competitive Grants

In a research intensive environment like the University of Sydney, chances are you or one or more of your colleagues are planning to apply for an ARC or NHMRC grant next year. Knowing the blood, sweat and tears involved in preparing such applications, we offer our sincere best wishes in the development of each application. We also want to point out that the EMU and NANO-MNRF can make an important contribution to meeting the characterisation needs for many research projects.

For all grant applicants who plan to access the facilities in the EMU, it is important for you to include a line item in the budgets of your applications to help cover our (extremely reasonable) access costs. When you access the instruments and expertise in the unit, your project incurs costs for specimen preparation materials, instrument time, and the input of our staff. The ARC or NHMRC will contribute towards these costs if they are included in the budget of a successful application. A full explanation of how to estimate your time requirements and the corresponding cost and how to incorporate these into your application may be found at the EMU website www.emu.usyd.edu.au. Follow the link on the front page under Guidelines for Grant Applicants.

More information:
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NANO Annual Report 2005–06

The Electron Microscope Unit not only incorporates the Australian Key Center for Microscopy and Micronanalysis, as well as the ARC Centre of Excellence for Design in Light Metals, 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 at www.nano.org.au/ar.htm. Alternatively, ask for a hard copy in our General Office in LG 21 or e-mail jody.cutler@emu.usyd.edu.au to send you one.

EMU Christmas Party Invitation

Don’t forget to come and join us on Thursday **14 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 Ian by 12 December (ph. 9351 3302 or e-mail ian.kaplin@emu.usyd.edu.au). This year’s theme will be ‘Christmas Down Under.’
PhD Opportunities Available

Six scholarships are currently available at the EMU for highly motivated students to undertake research studies leading to a PhD. PDFs with detailed information can be downloaded on our website at www.emu.usyd.edu.au/emu/jobs.php. Please contact the project supervisors if you require further information.

Finite Element Analysis and Nanostructural Characterisation of Light Alloy Hybrids: an Initial Case Study on Sandwich Structures.
Contact: Dr Gianluca Ranzi, ph. 9351 5215

Microscopic Origin of Ferromagnetism in Spintronic Materials.
Contact: Dr Rongkun Zheng, ph. 9351 7542

Nanotube Nanothermometers – Synthesis, Characterisation and Application.
Contact: Dr Zongwen Liu, ph. 9351 7535

Understanding Grain Boundary Chemistry through Advanced Microscopy.
Contact: Dr Julie Cairney, ph. 9351 7679

Optimisation of Nanostructure in New Microalloyed Strip Cast Steels to Control Properties.
Contact: Dr Julie Cairney, ph. 9351 7679

Modelling Biomolecular Signalling Pathways in Colorectal Cancer Cells by Using Multidimensional Correlative Imaging Techniques.
Contact: A/Prof. Filip Braet, ph. 9351 7619

Welcome Jody Cutler to the EMU

We would like to introduce Ms Jody Cutler – our new EMU Office Coordinator. Jody joined the administration team on 4 December and is going to take over from Ruth Fletcher, who is now on maternity leave.

Please talk to Jody if you have any questions about new user meetings and access to our facilities.

You can contact her on ph. 02 9351 7526 or e-mail jody.cutler@emu.usyd.edu.au.
NANO Scholarship Awards

The successful applicants for the NANO Scholarship Awards, who will commence research during the summer break at the EMU, are Ms Jessica Breeden (Centenary Institute) and Ms Kristina Jahn (Australian Key Centre for Microscopy and Microanalysis). Jessica will use our facilities to image the biodistribution of amino acid transporters in the kidney and intestine, and Kristina will use the opportunity to further analyse TEM tomograms of breast cancer cells.

To apply for the next round, please consult the EMU’s research web pages (www.emu.usyd.edu.au/emu/research.php), and make contact with the relevant academic staff to learn about the current research opportunities that might be of interest for you.

More information:

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We wish all our users, collaborators, students and colleagues a very Merry Christmas and a Happy New Year 2007.

Your EMU team

NANO Scholarship Awards

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More information:

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