

- Official Launch of South Australian Regional Facility (SARF)
- Nobel Laureate Dr Heinrich Rohrer visits the AMMRF
- AMMRF Linked Laboratories
- Travel and Access Program now available

FOCUS

## South Australian Regional Facility officially launched



The Hon Paul Caica Minister MP flanked by representatives of the three universities that have combined to form SARF.

From left: Prof. Caroline McMillen (Deputy Vice-Chancellor & Vice President, Research & Innovation, University of South Australia); Prof. Simon Ringer (CEO & Executive Director, AMMRF); Prof. James McWha (Vice-Chancellor and President, The University of Adelaide); The Hon Paul Caica MP; Prof. Michael Bull (Associate Head, Research, Faculty of Science and Engineering, Flinders University) and Prof. Richard Russell (Pro Vice-Chancellor, Research, University of Adelaide).

Inset: The Minister was presented with a set of cufflinks on which a nanoscale inscription was made using the focussed ion beam on the new flagship instrument at the University of Adelaide.

A new South Australian research facility launched at the University of Adelaide will help researchers around Australia view, analyse and modify structures smaller than a ten-thousandth of the diameter of a human hair.

Science and Information Economy Minister the Hon. Paul Caica launched the South Australian Regional Facility for Microscopy and Microanalysis (SARF) as part of the Australian Microscopy and Microanalysis Research Facility (AMMRF).

SARF's first new flagship instrument, a high-resolution FEI Helios NanoLab™ DualBeam, which incorporates a focused ion beam and a field-emission scanning electron microscope, has been installed at Adelaide Microscopy, the University of Adelaide. The \$3.5 million high-powered electron microscope is the only Helios installed in the southern hemisphere, and one of just a handful of dualbeam instruments in Australia. It gives researchers the ability to look at the tiniest parts making up the structure of materials – at the nanometre level – and it can, for example, allow researchers to 'see' a human brain cell in three dimensions.

Adelaide Microscopy Director John Terlet said: "The DualBeam instrument is relevant to

research in a range of disciplines including engineering, photonics, geology, health and physics. It will be invaluable for advanced industrial applications such as solar cell manufacture and prototyping micro-electro-mechanical devices."

SARF Director Prof. Hans Griesser said: "This new research facility, and the national network, will help Australian researchers compete internationally. The national network is truly world-class in the instrumentation and expertise it offers researchers. Microscopy and microanalysis are enabling technologies, and this facility will help Australian researchers do cutting-edge research in a broad range of disciplines with application across industries like defence, health, biotechnology, mining, manufacturing and pharmaceuticals."

SARF is a collaboration between South Australia's three universities, the Ian Wark Research Institute at the University of South Australia, Flinders University's School of Chemistry, Physics and Earth Sciences, and the University of Adelaide's Adelaide Microscopy. SARF is funded by the Federal and State Governments and the participating universities. ■

Information and photographs supplied by the University of Adelaide.

## Nanotechnology is a key to sustainability, explains Nobel Laureate

By Kyle Ratinac

On Valentine's Day, 2008, the Great Hall at the University of Sydney was the venue for the Vice-Chancellor's Public Lecture, *Nanotechnology – A Key to Sustainability*, by Dr Heinrich Rohrer. Dr Rohrer was co-recipient, with colleague Dr Gerd K. Binnig, of the 1986 Nobel Prize in Physics for designing the scanning tunnelling microscope, an instrument that gave scientists the ability to manipulate atoms on surfaces and that has revolutionised many areas of science and technology. Who better, then, to discuss his views on nanotechnology, the science and technology of molecules and atoms?

A large crowd gathered to hear the public lecture and, after an opening address and welcome by Prof. Merlin Crossley, Acting Deputy Vice-Chancellor (Research), and Vice-Chancellor Prof. Gavin Brown, Dr Rohrer began, in his charming Swiss accent, to outline his thoughts on the opportunities of nanotechnology and how they might enable greater sustainability in our world.

The sandstone walls, vaulted ceiling and stained glass of the Great Hall seemed an



entirely fitting backdrop to Dr Rohrer's opening explanations of how working at ever smaller length scales has shaped the technical revolutions throughout history. He traced the move from the global scale, as exemplified by Columbus's discovery of the Americas, to the Industrial Revolution, with the development of precision machinery at the millimetre scale and below, to the development of the transistor and other microscale technologies in the IT revolution, and, finally, to the current revolution associated with nanotechnology.

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## LAB NEWS

### AMMRF welcomes first Linked Laboratories

By Miles Apperley

Queensland University of Technology and James Cook University are the first two Linked Laboratories (Linked Labs) to become active in the AMMRF. Equipment at QUT's Analytical Electron Microscopy Facility and JCU's Advanced Analytical Centre join the entire capability grid available to all Australian researchers.

Amongst the instruments available at these laboratories is an FEI Quanta 3D Dualbeam FIB/SEM, a Quanta 200 ESEM fitted with a Peltier and heating stage and a JEOL JXA 8200 EPMA.

Commenting on these Linked Labs coming on-line, Simon Ringer, CEO of the AMMRF said "The Linked Laboratories build the 'hub and spoke' model that is the distributed national

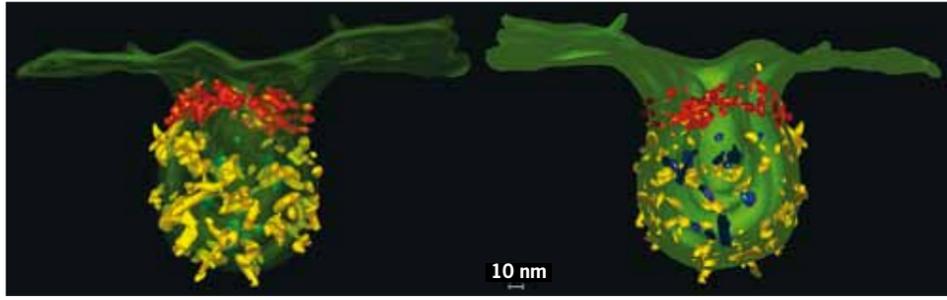
capability grid across Australia. These links will add to the regional capability of the AMMRF and we look forward to the engagement between the Linked Labs and the broader AMMRF as new and exciting research opportunities are created".

Contract arrangements with additional proposed Linked Labs at RMIT University, CSIRO-AAHL and Macquarie University are almost complete and will see some unique resources become available to users through the AMMRF. ■



RESEARCH

Cancer cell conquest



Two views taken from a tomographic reconstruction of a caveola. Green indicates the membrane surface (diameter 65 nm), yellow indicates putative coat material on the cytoplasmic side of the caveolae, red shows putative neck structures, and blue illustrates lumenal (extracellular) structures. Left: view of cytoplasmic face of caveola, with cell surface to top. Right: rotated structure showing interior face of caveola. Figures by Matthias Floetenmeyer, Charles Ferguson, James Riches, Brad Marsh and Rob Parton.

By Janelle Miles

Queensland researchers have discovered a protein essential for the normal functioning of cells that may have implications for the future diagnosis and treatment of prostate cancer.

The protein, known as PTRF-cavin, is necessary for the formation of pits on the surface of cells, known as caveolae, which are important for processes involved in healthy functioning,

including tumour suppression. Scientists had previously identified one protein involved in caveolae formation, called caveolin, but they were unaware that it functions in tandem with PTRF-cavin.

Cell biologist and AMMRF Deputy Node Director Rob Parton said most cancers cells stopped expressing caveolin and the caveolae failed to form – thus eliminating a mechanism for tumour suppression.

However, some aggressive prostate cancer cells show much higher levels of caveolin than normal. A team led by Prof. Parton at the University of Queensland's Institute for Molecular Bioscience found that, despite the high caveolin levels, caveolae still failed to form on the prostate cancer cells because PTRF-cavin was missing.

"Obviously there's a signal in these cells which tells them to divide and keep dividing that's not being switched off," he explained.

The scientists discovered that adding PTRF-cavin to prostate cancer cells in the test tube, promoted the formation of caveolae. Further research is underway to determine whether this can alter the invasive properties of those cells.

The team's research was published in the highly-regarded international journal *Cell*.

Prof. Parton, together with his colleague Prof. John Hancock, recently received the prestigious *NHMRC Achievement Award* for their scientific endeavours. ■

Janelle Miles is Health Reporter for the Courier Mail, Brisbane.

Continued from page 1

"Smaller, faster, cheaper' – that was the paradigm of microelectronics. You have to go now to 'smarter, smarter, and smarter' – that's the way to go for the nanoscale..."

He discussed how nanotechnology is copying from nature's strategy of building up large-scale functional objects, like the human body, at the molecular level, which is a far more efficient and sustainable manufacturing approach than our modern approaches. After clearly showcasing the pros and particularly the cons of our

current technologies, he presented a fascinating series of examples of the potential of nanomaterials and nanotechnologies illustrating the unique aspects – the disruptive steps – and the amazing promise of nanotechnology.

Dr Rohrer concluded by describing how, with the many possibilities and future opportunities afforded by nanotechnology, we no longer need to ask the question 'Can we do it?', but rather questions such as: 'Do we want to do it?' 'Do we need to do it?' and 'Can we afford to do it?' Ultimately, he stressed, mankind will have to

make many choices about nanotechnology and it is essential that we consider the benefit for all humanity in doing so.

Dr Rohrer was in Sydney to participate in a review of the Electron Microscope Unit, and the associated Australian Key Centre for Microscopy and Microanalysis (AKCMM), during the Unit's 50th anniversary.

The Unit is a centralised provider of advanced microscopy and expert support, and it is headquarters of the AMMRF. ■

RESEARCH

AMMRF Travel and Access Program now online



The AMMRF Travel and Access Program (TAP) is now operational. This program assists researchers, particularly in their early careers, to access the AMMRF's state-of-the-art instrumentation and expertise for nanostructural analysis for short periods of time.

Applications can be made at any time by filling in a simple online form ([www.ammrf.org.au/tap.php](http://www.ammrf.org.au/tap.php)). These are processed quickly, so that applicants will know the outcome, decided on the basis on scientific merit, within 3 weeks. We look forward to welcoming you to one of our nodes soon! ■

COMMUNITY

New General Manager for the AMMRF

Dr Miles Apperley was recently appointed as the General Manager of the AMMRF. Dr Apperley is familiar with the workings of national characterisation facilities, having been the Business Development Manager of the NANO-MNRF, and more recently, the Acting General Manager of the AMMRF, a role he held since July 2007. During this time, the AMMRF has launched and accelerated through a start-up phase dominated by promotional activity, instrument purchases, staff recruitment and ironing out the necessary KPI, financial and progress reporting that the AMMRF must fulfil.

"I am absolutely delighted that Dr Apperley has been successful in the recruitment process and can now be appointed as the General Manager of the AMMRF" said Prof. Simon Ringer, CEO of the facility. "I have enjoyed working with him over the last few months and, now that he is the General Manager, I am confident that the team work and enjoyment will continue well into the future".

Dr Apperley completed his Bachelor of Metallurgical Engineering and PhD at the School of Materials Science at UNSW, followed by 15 years of industrial-based R&D. Many of the projects he was involved in had university and national laboratories as collaborators and this fuelled an interest in collaborative R&D teams and technology transfer, leadership and management.

Dr Apperley is located at the AMMRF's headquarters at the University of Sydney. ■



EXECUTIVE DIRECTOR'S COLUMN

Welcome to the first edition of AMMRF News, the quarterly newsletter of the Australian Microscopy and Microanalysis Research Facility. The AMMRF is an unincorporated joint venture between large, open-access microscopy-and-microanalysis centres across the country. It comprises nodes at the Australian National University, the University of New South Wales, the University of Queensland, the University of Sydney, the University of Western Australia and the South Australian Regional Facility. The AMMRF is the national research facility for characterisation of materials with microscopy and microanalysis at length scales from the millimetre to the atomic. But what exactly does this mean?

It means that the AMMRF supports Australian research in three key ways. The first and primary role is through provision of **research services**. Each node of the facility serves the research needs of all users through provision of diverse microscopy and microanalysis instruments that are supported by a full contingent of highly-trained support staff. We achieve this through the distributed nature of the AMMRF, which brings together more than 150 instruments and a similarly large team of academic, research, technical and administrative staff. The AMMRF provides Australian researchers with open access to world-class microscopy instrumentation supported by outstanding scientific and technical knowhow.

The second is through **research training**. The AMMRF provides instrumental and theoretical training to users of the facility. This allows users to maximise the quality of their work within the facility and also provides a training ground for next-generation microscopists for Australian research and industry. The final page of this newsletter summarises the AMMRF's training programs around the country for 2008.

The third is through **research programs**. The nodes undertake research in the development and application of advanced methodologies in microscopy and microanalysis, particularly around the flagships instruments such as atom probes and tomographic cryo-electron microscopes. Whilst this research is supported primarily through competitive funding programs by the Australian Research Council (ARC) and the National Health and Medical Research Council (NHMRC), we feel that this research is also an essential element of maintaining a world-class national research facility. It guarantees that the technical and scientific staff members are able to solve challenging user problems and it helps to ensure that the instruments can operate to their full potential.

With these capabilities and our Travel and Access Program at your disposal, I hope that you will take the time to contact your local AMMRF node to find out how we can help you answer your research questions. ■

Regards,  
Simon Ringer, Executive Director & CEO

## COMMUNITY



The Cameca NanoSIMS 50 at the Centre for Microscopy, Characterisation and Analysis at the University of Western Australia. This AMMRF flagship instrument is the only one of its kind in the southern hemisphere.

## UWA hosts International NanoSIMS Workshop

By Matt Kilburn

NanoSIMS is a nanometre-scale microanalysis technique for measuring and mapping the concentration of different elements and isotopes in a wide range of materials, finding diverse applications in geosciences, materials science and life sciences. It uses mass spectrometry to quantify the types and concentrations of ions knocked out of surfaces by a focused ion beam.

Dr Peta Clode and Dr Matt Kilburn of the UWA node of the AMMRF hosted the 2nd International NanoSIMS Workshop from 15–18 February. The workshop attracted 45 people from 12 different countries, with research presentations by representatives from 9 of the 20 NanoSIMS labs around the globe.

Following the close of the ACMM-20 conference across town, the workshop began with showcase presentations from each NanoSIMS lab. These presentations demonstrated the versatility of the NanoSIMS; topics ranged from microbiology to astrophysics.

On the second day, Francois Hillion, Chief R&D Engineer from CAMECA led a discussion on technical issues, giving an in-depth perspective on the inner workings of the NanoSIMS.

The final day of the workshop allowed current NanoSIMS users to demonstrate how their research had benefited from the technique. Meanwhile, potential users made capitalised on the expertise on hand to design their experiments and determine the best analytical conditions.

The workshop was a wonderful opportunity for NanoSIMS researchers to come together and discuss their work and to hear what is happening in other laboratories worldwide. ■



The delegates of the First Australian Tomography Meeting, The Shine Dome, Canberra, in December 2007.

## First Australian Tomography Meeting

By Tim Senden

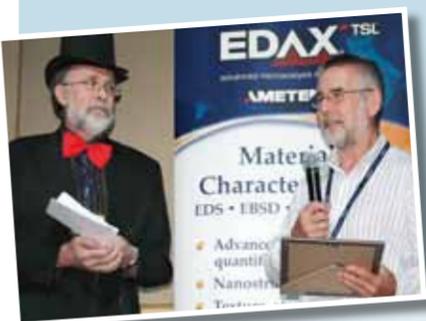
Tomography is a technique used in many fields of scientific research and in medical diagnostics. The basic principle is that a large number of projected images of a 3D object collected at different angles around a single axis can be mathematically reconstructed into a digital model of that object. This approach is common across many fields, from medical CAT scans to electron tomography of biological cells and advanced materials.

On 10 December 2007, 55 of Australia's key tomography practitioners and researchers met under the grand Shine Dome at the Australian Academy of Sciences in Canberra. From students to group leaders, the spectrum of tomography users and research areas was pre-

sented in an extensive program, which included a tour of ANU's tomography facilities.

It was exciting to see the breadth of tomography interests – from new developments in the mathematical foundations, to novel computational methods, to electron and X-ray applications – and to hear of the growing interest from general users. The day only allowed an introduction to the various topics, but the attendees agreed that there was sufficient critical mass in the country for a tomography conference and special interest group. Further, it was decided to host the meeting at a different venue each time to give members a chance to showcase their facilities. Please contact A/Prof. Tim Senden (tim.senden@anu.edu.au) with any enquiries.

The organisers would like to thank the Complex Open Systems Research Network, the Molecular and Materials Structure Network, the Australian Research Network for Advanced Materials and the AMMRF for their support. ■



## ACMM-20/IUMAS-IV: "Through the Looking Glass"

By Miles Apperley

Coming from all corners of the globe, 425 microscopists and microanalysts recently descended on Perth, Western Australia, as Australia's 20th national microscopy conference, ACMM-20, joined forces with the 4th conference of the International Union of Microbeam Analysis Societies, IUMAS-IV. The conference included over 60 national and international speakers in a strong scientific program, a trade exhibition of 52 exhibition booths, and pre- and post-conference workshops and short courses.

The AMMRF was a Gold Sponsor for the conference, and AMMRF facilities featured in the opening plenary sessions. Emeritus Prof. John de Laeter and the WA Chief Scientist, Prof. Lyn



Beazley, both highlighted the NanoSIMS facility at the Centre for Microscopy, Characterisation and Analysis at the University of Western Australia, and the impending investment in a state-of-the-art large-radius ion microprobe. These facilities will provide Australian geoscience, minerals and mining scientists with world-class research outcomes for many years.

The AMMRF Internet Café was the focal point of the exhibition for many delegates and provided that invaluable electronic link to the outside world.

A major activity was the AMMRF Public Evening Lecture presented by Prof. Max Bennett of the University of Sydney. Prof. Bennett, a Director of the Brain and Mind Research Institute, gave an extremely stimulating pres-

entation titled, *Brain, Mind and Mental Illness*. In an engaging lecture, Prof. Bennett spoke of how alleviating mental suffering requires interdisciplinary research that is not constrained by disciplinary silos that originated in the 19th century. Medical, biological and physical scientists, together with engineers, must work in a single environment that challenges them collectively to identify and rectify those workings of the brain that have gone awry.

AMMRF staff from UWA were heavily involved in organising the conference and associated workshops and short courses, working closely with the organising committee and Conference Chair Prof. Brendan Griffin to produce a memorable and very successful event. ACMM-20/IUMAS-IV ran from 7–15 February 2008. ■



STAFF NEWS



**Australian National University**

The Research School of Biological Sciences farewelled and acknowledged the contribution of **Dr Sally Stowe**, a 33-year member of the School and the Head of the ANU Electron Microscopy Unit since 1990. The ANU thanks Dr Stowe for her enormous contribution over the years and wishes her success in her research career with the RSBS Central Nervous System Stability and Degeneration Group.

In the meantime, **Dr Frank Brink** will be acting in Dr Stowe's former position until a new director is appointed. Dr Brink has considerable experience in a wide range of electron microscopy techniques. He has worked in the EM Unit since 1994 and holds a PhD in solid-state chemistry from the ANU. ■

**The University of Sydney**

Arriving from Oxford University, **Dr Gang Sha** recently took a leadership position as Senior Research Associate at the University of Sydney's node of the ARC Centre of Excellence for Design in Light Metals, working closely with Prof. Simon Ringer on research projects in aluminium alloys. Dr Sha has strong experience in using experimental and modelling approaches to access atomic-scale information on microstructural evolution of materials, enabling understanding, prediction and optimisation of material microstructure.

At the recent ACMM-20/IUMAS-IV, the Australian Microscopy & Microanalysis Society awarded **A/Prof. Guy Cox** life membership "for his sustained and outstanding service to the microscopy community". For her presentation "Monitoring Lipid Rafts in Cancer Cells by Means of Correlative Fluorescence and TEM", PhD student **Ms Kristina Jahn** received a John Farrant Memorial Prize in Biological Sciences of \$1000. ■

**South Australian Regional Facility**

**Dr John Denman** has been appointed as ToF-SIMS Technologist at the Ian Wark Research Institute, University of South Australia. Dr Denman will provide specialised expertise in ToF-SIMS for The Wark's consultancy and research projects and the AMMRF's user community. In particular, he will be responsible for the commissioning, operation, maintenance of the AMMRF ToF-SIMS flagship instrument to be installed in late 2008, and he will be involved in research towards the development and implementation of new analytical methodologies and protocols to extend the use of ToF-SIMS to new fields of research. ■

COMMUNITY

**Ron Rasch makes a big hit in South Africa**

By Kay Hodge

On the invitation of Luc Harmsen of Anaspec Ltd, Ron Rasch, a charismatic member of the University of Queensland's node of the AMMRF, spent two weeks in South Africa visiting electron microprobe facilities to provide advice and training in microanalysis.

Reports coming back from South Africa, and especially from Mintek – a major organisation

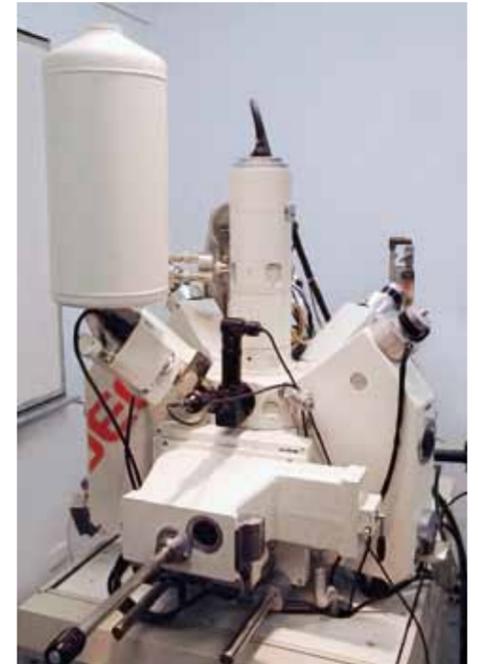
that provides advice to the minerals industry – suggest, that the visit was a benchmarking experience for them, and the good will and cooperation that has been set-up will provide the framework for a burgeoning relationship between the South African electron microscope community and the AMMRF.

This type of exchange has important consequences for our international relations and it is a mark of the high quality of general staff within the AMMRF that they are sought after to provide expertise internationally.

Ron met with several groups including Mintek, Mineralogy Division – SA Government

Labs, Nelson Mandela University and Mineral Services during his stay in South Africa.

Ron managed to get instruments working to their full capability and provided one-on-one training for a range of operators. Further visits are planned and we are looking forward to a growing relationship. ■



The JEOL 8800L microprobe, housed at the Center for Microscopy and Microanalysis at the University of Queensland.

TEACHING

**AMMRF teaching timetable 2008**

COURSE NAME	DATES FOR 2008
<b>The University of Sydney, Australian Key Centre for Microscopy and Microanalysis</b>	
Introduction to Microscopy and Microanalysis	March 10–13, March 17–20 and August 4–15
Operation of the Transmission Electron Microscope	April 21–24 and August 18–21
Operation of the Scanning Electron Microscope	March 31 – April 4 and August 25–29
Biological Specimen Preparation for TEM & SEM	April 7–11 and September 1–5
Fluorescence Microscopy Techniques	April 28 – 2 May and September 15–18
Light Microscope Workshop	May 5 and September 22
Introduction to Confocal Microscopy	May 6–9 and September 23–26
Stereology	May 12–13 and October 27–28
Image Analysis	May 14–16 and October 29–31
Materials Specimen Preparation for TEM & SEM	May 19–22 and October 13–17
TEM of Crystalline Materials	May 26–28 and October 20–22
Research Methodology	August–October
<b>The University of Western Australia, Centre for Microscopy, Characterisation and Analysis</b>	
Scanning Electron Microscopy	March 10–13
Transmission Electron Microscopy	March 17–20
Electron Microprobe Analysis	March 25–29
Optical & Confocal Microscopy	April 1–3
Introduction to Flow Cytometry	April 8–10
Workshop: Preparing Images for Theses and Publication	April 22
Workshop: Tissue Fixation and Immunolabelling for Biological Samples	April 29
Workshop: Specimen Preparation for Biological TEM	As required
Workshop: High-Resolution TEM	As required
Workshop: WDS X-ray Microanalysis	As required
Workshop: Energy-Filtered TEM	As required
Workshop: Selected Area Electron Diffraction	As required
Workshop: Electron Energy-Loss Spectroscopy	As required
Workshop: Variable Pressure/Environmental SEM	As required
<b>Australian National University, Electron Microscopy Unit</b>	
Understanding and Manipulating Images	April 4
Introduction to Scanning Electron Microscopy	April 10
Introduction to Transmission Electron Microscopy	April 12
Light Microscopy	April 26
<b>The University of New South Wales, Electron Microscope Unit</b>	
Elements of Microscopy	June/July (date TBA)
<b>SARF: Ian Wark Research Institute</b>	
Workshop: Microanalysis and Surface Analysis	As required
<b>SARF: Adelaide Microscopy</b>	
General Training Sessions for SEM, TEM, Dualbeam FIB, EPMA, LAICPMS, X-ray, MicroCT, Laser Dissection, Confocal & Optical Microscopy, Sample Preparation	Available on demand
Workshop: Laser Ablation ICPMS	September (date TBA)
Workshop: EBSD/EDS Fast Mapping	September (date TBA)
<b>SARF: Flinders University Nanotechnology</b>	
Raman/AFM/NSOM	February 18–22
Workshop: Combining High-Resolution Optical and Scanning Probe Microscopy	February 20
<b>The University of Queensland, Centre for Microscopy and Microanalysis</b>	
General training sessions are scheduled throughout the year	
SEM, TEM & XRD	Commencing January 14
SEM, TEM & XRD	Commencing March 10
SEM, TEM & XRD	Commencing May 19
SEM, TEM & XRD	Commencing July 14
SEM, TEM & XRD	Commencing September 15
SEM & TEM	Commencing November 10

The AMMRF is funded by



An Australian Government Initiative  
National Collaborative Research  
Infrastructure Strategy



Department of State and  
Regional Development



Government  
of South Australia

The AMMRF News is published four times a year.

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