

Lightspeed

Australian Synchrotron News

April 2009



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Early bird registration closes on Friday 26th June

Australian Synchrotron 

THE AUSTRALIAN SYNCHROTRON IS PROUD TO HOST

SRI09 | 27 SEPTEMBER TO 2 OCTOBER 2009

THE 10th INTERNATIONAL CONFERENCE ON SYNCHROTRON RADIATION INSTRUMENTATION
AT THE MELBOURNE CONVENTION AND EXHIBITION CENTRE



Australian Government
Department of Innovation, Industry, Science and Research

This conference is supported by the Commonwealth of Australia under the International Science Linkages program.



FROM THE DIRECTOR: TAKE A WALK ON THE OUTSIDE

With some welcome autumn rain in Melbourne, our plans to create a more pleasant environment for users and staff are starting to bear fruit – or at least to display green leaves rather than brown in the case of the landscaped area around the synchrotron building.



Prof. Robert Lamb

What was planted late last year struggled to survive the February heatwaves. So did the synchrotron itself; with everyone in Melbourne switching on their airconditioners we had more instrument 'brown outs' than the previous summer.

But now everything is taking on a new lease of life. Outside the facility, walking tracks invite those in need of inspiration to wander down to the lake. You can have lunch by the barbecue (the user fridge still has some sausages) or simply step outside for a breath of fresh air.

Inside the synchrotron, we are building a second user lounge with more good coffee. We are also testing a new user cabin design 'beamside', initially on the soft x-ray line. And for those of you who can bear to leave your experiments, yes we did eventually get the SciFi channel on cable TV that you requested.

If you would like to know what we've been doing scientifically in the past year, you can obtain a copy of our annual report onsite or you can

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UP TO SPEED

This month our short interview features Kia Wallwork, principal scientist, powder diffraction at the Australian Synchrotron.



download it from our website.

With eight beamlines lit up, 2009 is shaping up to be our most successful year yet.



WANTED: THE BRIGHTEST STUDENTS FROM AUSTRALIA AND NEW ZEALAND

Australian and New Zealand universities are invited to nominate outstanding honours or early-PhD students to participate in the Australian Synchrotron's inaugural winter school in July 2009.

Winter school participants will attend lectures by Australian Synchrotron scientists and gain an understanding of applications and techniques that use synchrotron light to probe the nature of matter.

Students will also perform beamline experiments that complement their lectures. They will be guided through the process of data collection by experienced beamline scientists, and learn about sample mounting, data acquisition and interpretation of the results.

The school will run from 13 to 16 July 2009, starting with a welcome session and tour of the facility.

Each university in Australia and NZ can nominate one student who is currently enrolled in an honours degree (or 4th year equivalent) or in the early stages of their PhD studies. There is a strict limit of one student per institution.

Accommodation and travel expenses will be met by the Australian Synchrotron. Universities will need to organise air travel for their winter school participants, but accommodation will be arranged by the Australian Synchrotron.

Universities will be contacted shortly by the Australian Synchrotron's external relations team to discuss the nomination process.

More information will be posted on the synchrotron website when it is available.



HOT CHIPS

Better chips and faster! Not from your local fast food outlet, but for your computer.

Computer chip manufacturing involves shining light through a patterned mask and onto a thin polymer layer called a resist, which facilitates transfer of the pattern into the silicon chip. The resist must rapidly degrade in the locations where it is illuminated, and fidelity is essential.

Rapid advances in technology mean that the density of the components on computer chips doubles roughly every two years. Next-generation chip circuits will have to shrink from 40 nm (nanometres) to below 30 nm, which requires smaller wavelengths than the 193 nm light currently used.

A promising new technology uses 13.5 nm light, in the extreme-ultra-violet (EUV) or 'soft' x-ray region. However, the instruments for fabricating the chips

Describe your job in 25 words or less.

I lead the PD beamline team. We ensure the equipment is prepared, maintained and developed for users so that we can all do fabulous research.

What have you learnt about Australian scientists as a result of your involvement with the Australian Synchrotron?

I am struck by their enthusiastic approach to their research and the passion with which they drive it forward.

Apart from the Australian Synchrotron, what's the coolest job you've ever had?

How can you get cooler than being able to play with new toys all the time!

Best things about living in Melbourne and why?

The weather. I love the variability and after living in Sydney for two years I was able to rediscover my winter wardrobe. Oh, and I can't leave out the great coffee.

A little-known fact about the Australian Synchrotron?

The proceeds of purchases from the user lounge vending machine go to the Social Club, which often donates money to charities.

What are the most important things to include in a beamtime application?

Experiment detail! The science must be relevant and compelling, but I primarily look at the technical detail of an application. The proposed experiment needs to be clear and justified.

What kinds of user projects would you like to see more of?

Materials research. Many materials with practical uses are in 'powder' form. As the structure of a material is often critical to its performance, powder diffraction studies are invaluable to development and optimisation of materials, whether it be cement or hydrogen storage materials.

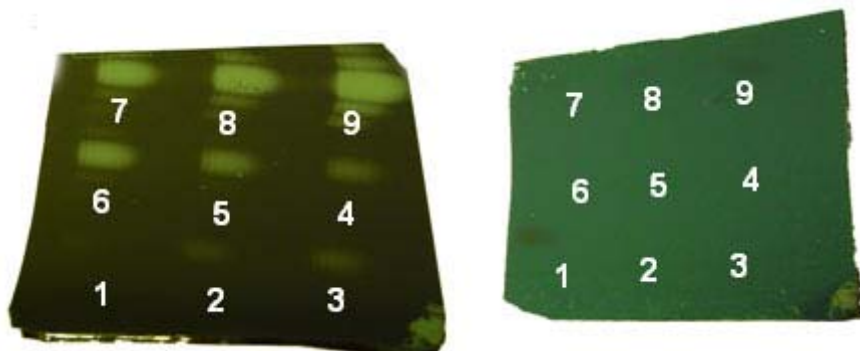


and the polymeric resists have to be redesigned.

Researchers at The University of Queensland are working with industry to design and synthesise novel polymers that are photosensitive at 13.5 nm and robust enough to use as resists. They are using the soft x-ray beamline at the Australian Synchrotron because it is the only source of 13.5 nm light available in Australia and one of very few sources worldwide.

Access to the synchrotron has greatly enhanced the group's ability to characterise their newly developed materials and validate their design models. The soft x-ray beamline can simultaneously investigate degradation mechanisms, enabling researchers to design even better materials.

More: http://www.synchrotron.org.au/content.asp?Document_ID=5626



Queensland researchers are using the Australian Synchrotron's soft x-ray beamline to develop new polymeric materials for computer chip manufacture. The new materials have better photosensitivity. (Image: Jack et al., The University of Queensland)



USER MAKES HIS MARC ON PX BEAMLINES

The first new protein structure on the PX2 (protein microcrystal) beamline has been solved by the Walter and Eliza Hall Institute of Medical Research.

In March 2009, Marc Kvasnakul and his WEHI colleagues used PX2 to solve the structure of a particularly challenging viral protein-peptide complex. The team knew the structure of the vaccinia virus F1L protein on its own, but they needed the structure of the protein interacting with one of the mammalian death-signaling peptides it binds to so they could see how to block the protein's action.

After a year of frustration, the structure was finally solved on the PX2 beamline in less than 30 minutes.

"Access to the new PX2 beamline was absolutely essential for successful structure determination," Marc told *Lightspeed*. "Our crystals had poor diffraction properties, and only by using the highly intense and finely focused beam at PX2 coupled with improved data detectors could we obtain diffraction data of high-enough quality."

The F1L protein enables the vaccinia virus to block a crucial defence mechanism in the cells it invades, essentially preventing the cells from committing suicide and ensuring that the virus can continue to reproduce within the infected cell.

Under the direction of Peter Colman, the WEHI team is studying the fundamental mechanisms of cell apoptosis – also known as programmed cell

BEAMTIME APPLICATIONS

Beamtime submissions for the 2009/2 round closed on 24 February 2009. Users will be notified from 1 April 2009 (or mid-March for ANBF proposals).

Key dates for 2009 beamtime submissions are listed here.

If you would like to discuss your ideas for future beamline proposals with the beamline scientists at the Australian Synchrotron, please allow plenty of time.

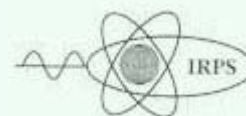
For more information about applying for beamtime at the Australian Synchrotron, contact the User Office: user.office@synchrotron.org.au



EVENTS DIARY

EVENTS IN AUSTRALIA 11th International Symposium on Radiation Physics (ISRP-11)

21-25 September 2009
The University of Melbourne, Australia



ISRP-11 is organised by the International Radiation Physics Society (IRPS) and is supported by DEST, the Australian Synchrotron and the Victorian Government. The meeting is devoted to current trends in radiation physics research.

More:
<http://mcmconferences.com/isrp11>

10th International Conference on Synchrotron Radiation and Instrumentation 2009 (SRI 2009)

Melbourne Convention & Exhibition
Centre
28 September – 2 October 2009



death or cell 'suicide switches'.

In 2007, Marc Kvasnakul was part of a team that solved the first new protein structure on the PX1 (high-throughput protein crystallography) beamline at the Australian Synchrotron.

http://www.synchrotron.org.au/content.asp?Document_ID=5627.



L to R: Alex Caputo, Oliver Clarke, Marc Kvasnakul and Tom Caradoc-Davies discuss the first protein structure solved on the protein micro-crystal (PX2) beamline.



ART AND SCIENCE MAKE GOOD PARTNERS

In March 2009, the Australian Synchrotron hosted a visit by international art conservation experts interested in finding out more about how synchrotron techniques can assist their work.

The group included delegates from art galleries and conservation laboratories in Malaysia, the Philippines, Thailand, the US and several states of Australia.

The art conservation experts were in Melbourne for an Asia-Pacific Twentieth Century Conservation Art Research Network (APTCCARN) workshop sponsored by the Australian Research Council.

The visitors were particularly interested in the capabilities of the infrared microspectroscopy, powder diffraction and x-ray fluorescence microprobe beamlines.

To find out more about how synchrotron techniques can assist art conservators, contact Cathy Harland in the user office on 03 8540 4176 or at user.office@synchrotron.org.au.



International art conservation experts met recently with Australian Synchrotron staff to discuss the latest techniques.



The world's largest and most important forum for synchrotron radiation science and technology communities, SRI is expected to attract 800 international and Australian delegates in 2009. The conference promotes international exchange and collaboration among scientists and engineers involved in developing new concepts, techniques and instruments related to the production and utilisation of synchrotron radiation. More details are available at <http://www.sri09.org/>

BSR/MASR 2010 con-joint meetings Biology and Synchrotron Radiation Medical Applications of Synchrotron Radiation

15-18 February 2010
Melbourne Convention and Exhibition
Centre

BSR 2010 session themes include protein structure and function, biomaterials, spectroscopic techniques and non-crystalline diffraction.

More: www.bsr2010.org

MASR 2010 session themes include x-ray imaging, radiology, dosimetry and radiation biology, oncology, and pathology and diagnostics.

More: www.masr2010.org

Early bird and abstract deadline is 27 November 2009. Sponsored by Monash University Centre for Synchrotron Science and CSIRO.

EVENTS OUTSIDE AUSTRALIA

For additional information and listings, see www.lightsources.org/cms/?pid=1000068

2009 Particle Accelerator Conference (PAC09)

4-8 May 2009
Vancouver, British Columbia, Canada

This well-established conference series is of particular significance to accelerator scientists, engineers, students and industrial vendors interested in all aspects of particle accelerator technology.

Early registration deadline is 3 April 2009.

More: www.triumf.info/hosted/PAC09

BEAMLINE FOCUS

FAST Work By Infrared Microspectroscopy Team

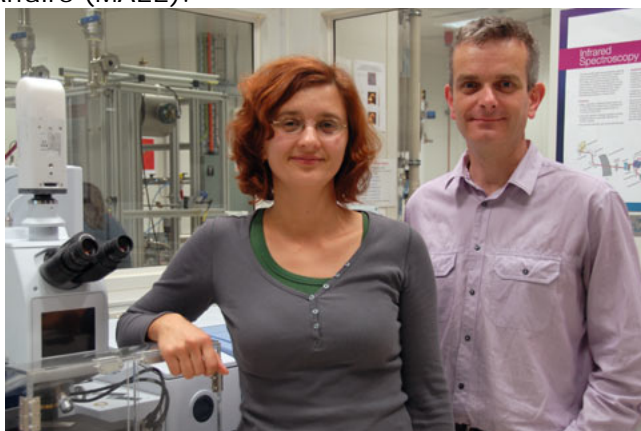
The Australian Synchrotron's infrared microspectroscopy team has been awarded an International Science Linkage grant under the French Australian Science and Technology program (FAST) for 2009-2011.

The grant will enable researchers from the Australian Synchrotron and the Soleil synchrotron in France to exchange expertise, and maintain the two synchrotrons as world leaders in infrared microspectroscopy.

The international collaborative project will officially commence in May 2009 when two Australian Synchrotron scientists travel to Soleil to learn more about taking in situ measurements under high pressure and temperature conditions. This expertise is invaluable for studies in the earth sciences, material sciences and biology, and will greatly enhance the capabilities of the infrared microspectroscopy beamline.

The work will also involve further development of microfluidic cells for studying living biological processes and the design of improved optics systems for synchrotron-based IR microscope imaging.

The FAST program is managed by the Australian Department of Innovation, Industry, Science and Research (DIISR) and two French ministries: Higher Education and Research (MESR) and Foreign and European Affairs (MAEE).



Ljiljana Puskar and Mark Tobin from the IR beamline team will visit the Soleil synchrotron in France as part of an international collaborative project.

Ljiljana Puskar, Scientific Support Officer, Infrared Beamline

Rapid Powder Diffraction

The latest example of collaboration on the powder diffraction beamline is a new high-throughput, rapid data-acquisition system designed by David Hay from CSIRO Manufacturing and Materials Technology. The system allows data to be collected in transmission geometry from samples loaded into a grid-style sample holder. The stage is mechanically positioned to allow samples (2 mm diameter) to be aligned in the beam. CSIRO researchers used the new system to collect data



CSIRO's new high-throughput sample grid and stage on the powder diffractometer

RADSYNCH 2009

21-23 May 2009

Trieste, Italy

The 5th International Workshop on RADIATION safety at SYNCHROTRON radiation sources will enable radiation physicists, radiation safety professionals and other interested parties to share experiences and exchange information about radiological issues involved in design, commissioning, operation and decommissioning of synchrotron facilities and free electron lasers around the world.

More:

www.elettra.trieste.it/radsynch09/

XAFS 14 Conference

26-31 July 2009

University of Camerino, Italy

The International Conference on X-ray Absorption Fine Structure (XAFS) is a triennial event. XAFS 14 will cover a wide range of topics, including EXAFS, NEXAFS, XANES, DAFS, SEXAFS, EELFS, XMCD and Auger spectroscopies, microspectroscopy and spectro-microscopy, resonant photoemission, resonant and non-resonant inelastic x-ray scattering, time-resolved XAFS and diffraction. Specific symposiums are planned on hot topics such as ultra-fast time-resolved spectroscopy, slicing schemes and free electron lasers in the x-ray and UV/XUV domains.

Deadline for early registration and accommodation and transport bookings is 15 May 2009.

More: <http://www.xafs14.it/>

X-RAY SCIENCE, GORDON RESEARCH CONFERENCE MEETING

2-7 August 2009

Colby College, Waterville, Maine, USA

Topics currently under consideration for this meeting include:

- science frontiers using new x-ray sources
- x-ray scattering /spectroscopy under extreme conditions
- use of coherent x-rays for imaging and studies of dynamics
- x-rays in biology, life, energy and environment science
- dynamics by pump and probe technique

from nearly 300 samples in 14 hours.

The work demonstrates the beamline team's ongoing partnership with users and their continued commitment to exploring new opportunities and further developing the range of sample stages and ancillaries.

Kia Wallwork, Principal Scientist, Powder Diffraction

PX Contact People

Julian Adams, one of the Australian Synchrotron's first employees and the driving force behind the synchrotron's two protein crystallography beamlines, has left to pursue new challenges in the private sector. We will miss his expertise and enthusiasm.

Enquiries about protein crystallography at the Australian Synchrotron should be directed to Trevor Huyton (high-throughput protein crystallography) at trevor.huyton@synchrotron.org.au or Tom Caradoc-Davies (micro-protein crystallography) at tom.caradoc-davies@synchrotron.org.au



NEW WEBSITE

The Australian Synchrotron is developing a new website to meet the evolving needs of its users and other important audiences. We will keep you informed of progress through regular updates in *Lightspeed* and on the old website



READER FEEDBACK

Lightspeed welcomes your comments and suggestions. Please send these to: info@synchrotron.org.au with 'Lightspeed comments' in the subject line.



CAREERS AT THE AUSTRALIAN SYNCHROTRON

The Australian Synchrotron offers a unique working environment for a wide range of specialists.

More information on job postings:

http://www.synchrotron.org.au/content.asp?Document_ID=14.



- inelastic x-ray scattering
- new techniques / optics, detectors and others.

The Conference Chairman is Jun'ichiro Mizuki (mizuki@spring8.or.jp), Deputy Director General, Quantum Beam Science Directorate, Japan Atomic Energy Agency (JAEA).

The Vice Chair is Brian Stephenson (stephenson@anl.gov), ANL.

WIRMS 2009

Banff, Alberta, Canada
13-17 September 2009

The 5th International Workshop on Infrared Microscopy and Spectroscopy with Accelerator Based Sources will bring scientists and synchrotron users together to discuss the latest developments and trends, future directions and promising applications. Experts will introduce young researchers and graduate students to this rapidly advancing field.

Abstract submission deadline is 12 June 2009.

More: www.lightsource.ca/wirms2009




MORE INFORMATION

A list of Australian Synchrotron personnel can be found here: http://www.synchrotron.org.au/content.asp?Document_ID=129.


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