

# Lightspeed

Australian Synchrotron News

August 2009



Register Now!

Australian Synchrotron 

THE AUSTRALIAN SYNCHROTRON IS PROUD TO HOST

## SRI09 | 27 SEPTEMBER TO 2 OCTOBER 2009

THE 10<sup>th</sup> 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 Program



## FROM THE DIRECTOR: IT'S OFFICIAL - WE HAVE STANDARDS

*Here at the Australian Synchrotron, we strive to achieve high standards in everything we do. And now we have the paperwork to prove it.*




Prof. Robert Lamb outside the Australian Synchrotron

In June 2009, the AS was awarded ISO 9001:2008 quality management system certification after a comprehensive external audit of policies, procedures and documentation in every aspect of our operations. The exercise involved staff across all organisational functions, with the User Office in particular coming through with flying colours.

What does this mean? If you're a user, it means an extra level of confidence that we have everything in place to optimise your scientific experience at the synchrotron all the way from bringing your samples in to taking your data home.

More specifically, the ISO 9001:2008 certification requires us to have specified procedures to cover all key business processes – from operations and equipment maintenance to staff management and record keeping. And from now on we'll keep checking them to make sure we are working at peak performance.

We believe we are the first synchrotron in the world to achieve international certification for our quality management standards.

We're working hard to keep up our standards – so that you can take them for granted. 

### In this issue:

- From the Director
- Up To Speed
- Australian Synchrotron development plan
- Beamtime applications
- Precious Little Metals
- Perovskites: Here, There and everywhere
- Beamline Focus
- Events diary
- Careers at The Australian Synchrotron

### UP TO SPEED

This month our short interview features David Paterson, who heads the XFM beamline team at the Australian Synchrotron.



## AUSTRALIAN SYNCHROTRON DEVELOPMENT PLAN

*The Australian Synchrotron has embarked on a process of planning the next major phase of development of Australia's biggest scientific user facility. Phase 1 consists of community engagement and the exchange of ideas that will ultimately constitute the Australian Synchrotron Development Plan (also known as the 'development roadmap' or 'science case 2').*

The key activity of this consultation process is a series of ASDP Workshops around Australia and in New Zealand. The objective is to engage with all stakeholders and the broader scientific community in the process that will lead to the realisation of the ASDP – a roadmap for the future of the Australian Synchrotron over the coming decade.

Each half-day ASDP Workshop will include updates on the current status of the AS as well as ongoing development plans for experimental facilities and supporting infrastructure. We will also be presenting details on the mechanism by which the ASDP will be realised and how the whole community may be involved. Finally but importantly, we propose to 'open the floor' in a discussion panel format so that ideas and suggestions can be openly discussed. We would encourage all of you not to miss this opportunity to be part of the future of synchrotron science in Australia.

So far this month workshops have been held in Canberra, Brisbane and Sydney.

Details of forthcoming workshops in Adelaide, Perth, Melbourne, Hobart and Wellington NZ are here:

<http://www.synchrotron.org.au/index.php/about-us/australian-synchrotron-development-plan>

We welcome all of you to come along to the ASDP Workshops and have your say!

Register your intention to attend the ASDP Workshops here:

<http://register.synchrotron.org.au/>



## BEAMTIME APPLICATIONS

*Beamtime submissions for the 2009/3 round (September – December 2009) closed on 17 June 2009. Users will be notified from mid-August.*

The next call for submissions is scheduled to open on 10 September and close on 5 October 2009. This call is for beamtime between January and May 2010 (round 2010/1).

Key dates for beamtime submissions are listed on the new synchrotron website at: <http://www.synchrotron.org.au/index.php/features/applying-for-beamtime/2009-2010-proposals-schedule>

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](mailto:user.office@synchrotron.org.au).



### What is the XFM beamline and what does it do?

XFM stands for x-ray fluorescence microprobe. It's basically a powerful x-ray microscope that produces highly-detailed maps showing which elements are present, where they are and in what quantities.

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

As a forester working in the Otway Ranges, I climbed 60-metre tall Californian redwoods to measure their height and diameter.

### What is the most unusual sample you've seen on the XFM beamline?

XFM can examine anything from a single human cell through to rice grains, rock sections, and stardust collected by space probes. One user group looked at some tiny microbes that live on jellyfish.

### What is the biggest challenge facing your beamline?

Coping with high user demand while continuing to upgrade and improve the beamline microscopes. We're currently discussing the potential for a second nanoprobe beamline, possibly dedicated to biological samples.



## 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: [mcmconferences.com/isrp11](http://mcmconferences.com/isrp11)

## PRECIOUS LITTLE METALS

*Greg Metha from the University of Adelaide is using the far-infrared and high-resolution beamline to study metal-carbide nanoparticles with some exciting potential applications.*

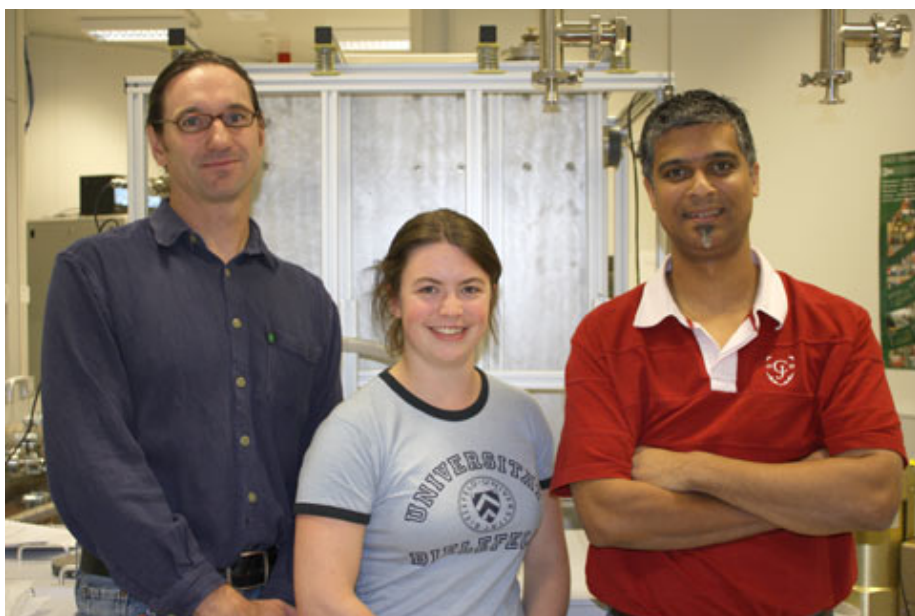
Many modern industrial processes rely on catalysts that make chemical reactions happen or run faster. Platinum-group metals are the workhorses of industrial catalysis, but their high cost and limited efficiency has prompted a search for alternatives.

Metal-carbide nanoparticles made from carbon bonded to metals such as titanium, niobium or chromium have chemically-similar surface properties to platinum-group metals – and potentially superior selectivity and efficiency. They are also cheaper to produce, but their small size makes them difficult to study.

Greg Metha's team has developed a laser-based method for preparing titanium carbide and other metal-carbide nanoparticles in aqueous solutions. The particles are small (5-10 nanometres) and uniform in size, but their chemical structure is unknown. After laboratory techniques failed to identify the chemical bonds present in the nanoparticles, Greg turned to the Australian Synchrotron.

Using the far-infrared and high-resolution beamline, Greg and German exchange student Birte Riechers collected data showing the presence of metal-carbon bonds, as expected. A more surprising find was carbon-hydrogen bonds, suggesting the nanoparticles may be able to catalyse the decomposition of water.

Greg's next step will be to test metal-carbide nanoparticles prepared in deuterated water to find out whether the carbon-hydrogen bonds are formed during production of the nanoparticles or from subsequent reactions with the air.



L to R: Greg Metha and Birte Riechers with Dominique Appadoo at the Australian Synchrotron



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

Melbourne Convention & Exhibition Centre

28 September – 2 October 2009



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 [www.sri09.org/](http://www.sri09.org/)

### Imaging and Medical Instrumentation conference

3 October 2009

Monash University Centre for Synchrotron Science, Melbourne

Satellite meeting to SRI 2009. Sessions will cover imaging detectors, dosimetry and safety, optics for high-energy x-rays, beamline instrumentation and insertion devices, and data management and processing.

More:

[www.synchrotron.org.au/index.php/news/events/australian-events](http://www.synchrotron.org.au/index.php/news/events/australian-events)

### Accelerator Physics 'Top-up' Workshop

7-9 October 2009 Melbourne

The Accelerator Physics Group at the Australian Synchrotron is holding an open workshop on top-up operations at synchrotron light sources. The workshop will include presentations and discussions on the accelerator

## PEROVSKITES: HERE, THERE AND EVERYWHERE

*They're an integral part of everyday life, but many people have never heard of them.*

Perovskite-type minerals have numerous commercial applications such as medical sensors for measuring blood pressure, microphones, mobile phones, hydrogen fuel cells, and sonar transducers for tracking fish and submarines. Japan alone fabricates an estimated four billion devices containing perovskites each year.

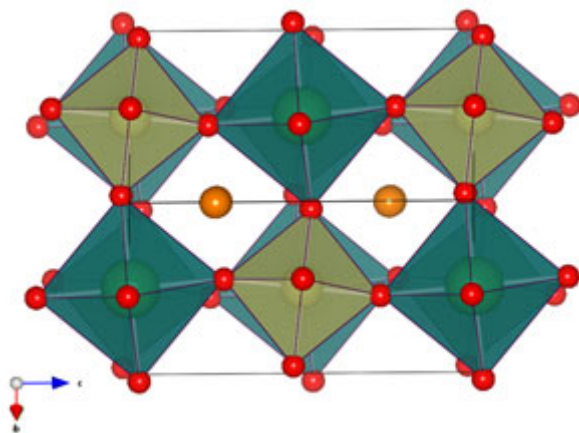
The key to the widespread usage of this class of minerals is the enormous structural and compositional flexibility of the perovskite structure. Perovskite-type oxides can be fine-tuned to take advantage of an appropriate structural, electronic, or magnetic 'instability', which confers a particular functional capability such as that required for switches in computer memories.

Brendan Kennedy and collaborators from the University of Sydney are using powder diffraction at the Australian Synchrotron to establish the precise structures of specific perovskite-type oxides and their responses to temperature changes. The work has important fundamental and practical implications.

A further reason to study perovskites is that they are important components of the earth's lower mantle, which extends downwards from about 450 kilometres below our feet. Understanding their stability under lower mantle conditions is crucial for interpreting the physical and chemical properties of the whole Earth.

Brendan and his ANSTO research collaborators recently extended their perovskite work to technetium oxides. Powder diffraction studies at the AS have revealed some unexpected structural and magnetic transitions, and further analysis is underway.

"Technetium is the most widely used medical isotope but it's radioactive so we couldn't do this work outside Australia," Brendan told *Lightspeed*. "Being able to do powder diffraction at the Australian Synchrotron also means we have more flexibility to measure data under different conditions."



Perovskite minerals have enormous structural and compositional flexibility, making them useful for numerous commercial applications



physics and operational aspects of running an electron storage ring in top-up mode.

More:

<http://www.synchrotron.org.au/index.php/news/events/australian-events>

### **BSR/MASR 2010**

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](http://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](http://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](http://www.lightsources.org/cms/?pid=1000068)

### **VUVX2010**

11-16 July 2010

University of British Columbia  
Vancouver, British Columbia, Canada

The 37th International Conference on Vacuum Ultraviolet and X-ray Physics will cover the development of synchrotron, laser, or plasma based sources of electromagnetic radiation in the vacuum ultraviolet (VUV), soft X-ray and hard X-ray regions, and novel applications of these sources in a variety of fields.

More: <http://www.vuvx2010.ca/>

### **11th SXNS Conference**

14-17 July 2010

Northwestern University, Evanston  
(nr Chicago), Illinois, US

The Eleventh International Conference on Surface X-ray and Neutron Scattering is jointly organised by

## BEAMLINE FOCUS

### High-pressure performance

In July 2009, Qinfen Gu from the Australian Synchrotron's powder diffraction team attended the Advanced Crystallography at High Pressure meeting in Harbin, China organised by the International Union of Crystallography (IUCr) Commission on High Pressure. Qinfen presented a talk entitled 'High pressure effects on pyrochlore-type superconductors'.



Qinfen Gu from the AS powder diffraction team recently attended a high-pressure crystallography meeting in China.

The trip was part of the powder diffraction team's efforts to maintain their knowledge of the latest developments in response to increasing user interest in high-pressure sample environments for powder diffraction.

High-pressure science and technology has made great progress in recent years and is becoming more widely applicable to research areas extending beyond earth and planetary science to physics, chemistry, materials science and the biosciences.

Users interested in accessing this type of capability can register their interest at [powder.diffraction@synchrotron.org.au](mailto:powder.diffraction@synchrotron.org.au).



## READER FEEDBACK

*Lightspeed* welcomes your comments and suggestions. Please send these to: [info@synchrotron.org.au](mailto:info@synchrotron.org.au) with 'Lightspeed comments' in the subject line.



## USE OF LIGHTSPEED MATERIAL

Material from *Lightspeed* may be reproduced for non-commercial purposes provided the source is acknowledged, e.g. 'This material first appeared in the Australian Synchrotron's *Lightspeed* newsletter, August 2009'.



## 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/index.php/about-us/working-at-the-synchrotron/employ>



Northwestern University and Argonne National Laboratory. This biennial event brings together researchers studying surfaces and interfaces of solid, liquid, biological and soft matter via neutron or x-ray (either hard, soft, or EUV) scattering techniques.

More:

<http://www.sxns11.northwestern.edu/>



## MORE INFORMATION


A list of Australian Synchrotron personnel can be found here: <http://www.synchrotron.org.au/index.php/about-us/working-at-the-synchrotron/staff-contact>

**Email:** [info@synchrotron.org.au](mailto:info@synchrotron.org.au)


### Facility office

800 Blackburn Road,  
Clayton, Vic 3168

### Within Australia:

 03 8540 4100

### International:

 +61 3 8540 4100