FROM THE DIRECTOR: THAT TIME OF YEAR AGAIN

Have you noticed how busy everyone is this time of year?

Prof. Robert Lamb outside the Australian Synchrotron

We've only just managed to catch our breath after a highly successful SRI2009 in Melbourne. Now we're gearing up for another major performance.

While synchrotron users have been polishing their applications for the next round of Australian Synchrotron beamtime, we've been preparing to report to stakeholders at our October annual general meeting and through our 2008-09 annual report.

Many of you may not realise that the Australian Synchrotron actually operates as a company. The shareholders are our foundation investors: Australian Government, Association of Australian Medical Research Institutes, ANSTO, Victorian Government, CSIRO, Monash University, The University of Melbourne, New Zealand Consortium, Queensland Consortium, AUSyn14 Consortium, South Australian and La Trobe University Consortium and Western Australian Consortium.

The AGM is required under Australian corporations legislation; it's also a great opportunity to tell shareholders what we've achieved. We think this year's report card will look pretty good.

And the annual report? It's due out in October, with plenty of highlights: 98 per cent beam availability, 10,000 user beam hours, eight beamlines open for general user access, 2000+ scientific visits, numerous major research achievements, and funding for new buildings and equipment to cater for the anticipated increase in demand for our facilities.

Cheers!

In this issue:

UP TO SPEED

This month our short interview features Nigel Kirby, who heads the SAXS/WAXS beamline team at the Australian Synchrotron.

Describe your job in 25 words or less.
My job is to design, build, commission, operate and develop the SAXS/WAXS facility on behalf of the user community.

Best aspect of your job?
A beamline is what you make of it and I enjoy the endless challenges. I marvel at having the best scientists in the country walking in the door every day.

SEEING INTO THE PAST

World-famous palaeontology imaging expert Paul Tafforeau captivated synchrotron physicists and the general public alike when he spoke in Melbourne recently about using synchrotrons to bring ancient history to life.

Paul Tafforeau from the European Synchrotron Radiation Facility holds a replica of a newly discovered ancient Australian wood beetle.

Paul uses synchrotron imaging techniques at the European Synchrotron Radiation Facility to discover new species of ancient fossilised organisms locked inside opaque amber or dense rock samples and then construct exact replicas. The replicas can be used as reference specimens in natural history collections.

Paul's techniques allow reconstruction of missing body parts to reveal extraordinary details of internal and external structures and provide more information on the organism's life history – without destroying the precious fossils. As a result, many more fossilised organisms can now be identified and classified than has ever been possible before.

The Australian Synchrotron is commissioning an imaging and medical beamline that will one day provide similarly sophisticated information to palaeontologists and to medical researchers.

Paul Tafforeau was a guest speaker at a major synchrotron conference held recently in Melbourne (see SRI2009 article below). He also presented a public lecture at the Melbourne Museum.

I also love trying to keep up with the talented staff who make it all happen.

Worst aspect of your job?
Developing a top level facility requires total commitment.

Apart from the Australian Synchrotron, what's the coolest job you've ever had?
I used to work at a steel forge, machining mechanical test samples and then breaking them. There's nothing like being paid to break things. I'm not allowed to do that anymore.

Best things about living in Melbourne and why?
There are statistically more x-rays in Melbourne, and a lot of good science is going on. You can get a lot of work done when it's raining.

A little-known fact about the Australian Synchrotron?
X-ray mirrors are the most amazingly precise devices. To produce the high quality beams needed for many experiments we have to control the shape of mirrors within nanometres.

What's the most unusual or interesting sample you've seen on the SAXS beamline here?
Bovine testicles. We couldn't fit the whole animal in the hutch, so we just took the best bits.

BEAMTIME APPLICATIONS CLOSED

Beamtime submissions for the 2010/1 round (January – May 2010) closed on 7 October 2009.

Key dates for beamtime submissions are listed on the new synchrotron website here: 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

SRI2009

More than 680 delegates from 28 countries attended the highly-successful tenth international conference on Synchrotron Radiation Instrumentation (SRI2009) hosted by the Australian Synchrotron from 27 September to 2 October 2009 in Melbourne. The largest number of international delegates came from Japan, US, Germany, France, UK and China.

Top two images: Australian Synchrotron, bottom two images: www.sdp-photo.com

Delegates enjoyed a stimulating science program with 148 oral presentations, including seven world- renowned plenary speakers, 26 invited speakers and 115 symposia speakers selected from abstracts. Two poster sessions showcased 450 posters, and 500 delegates visited the Australian Synchrotron for a facility tour.

A full social program included a lavish reception at Government House hosted by the Victorian Government. At a gala dinner in the banquet hall of the conference venue, the Melbourne Convention and Exhibition Centre, 446 guests were entertained with a display of Aboriginal culture by members of an Indigenous dance troupe.

Associated events included several satellite meetings, an Italian-Australian lunch hosted by the Italian embassy and a public lecture entitled 'Seeing into the past with synchrotron light' given by plenary speaker Paul Tafforeau (see separate article above) at the Melbourne Museum.

The twelfth international SRI conference will take place in Lyons, France in 2012, jointly hosted by the European Synchrotron Radiation Facility (ESRF) and the Soleil Synchrotron.

AUSTRALIAN SYNCHROTRON DEVELOPMENT PLAN - UPDATE

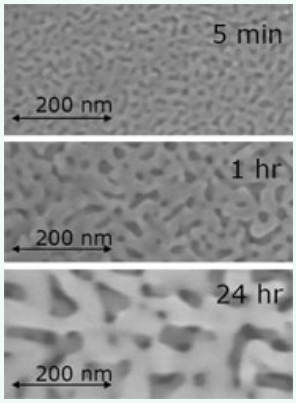
The ASDP Workshops were successfully completed during August and September with nearly 200 participants around Australia and in New Zealand contributing to the important consultation phase of the process. The AS team presenting the workshops were excited and inspired to see the strength of interest and willingness to engage from a broad spectrum of the scientific community.

PORE PERFORMANCE LOOKS PROMISING

Bridget Ingham in New Zealand is 'poring' over a new kind of advanced material: nanoporous gold.

Removing one metal from a bimetallic alloy such as copper-platinum, nickel-silver or silver-gold can create a sponge-like material with pores just a few nanometres across. That's roughly 10 times the size of an atom or about 20 000 times thinner than a human hair.

These nanoporous materials have high surface-to-volume ratios. Their many potential applications include gas sensors and industrial catalysts.



Removing silver atoms from a gold-silver alloy creates tiny pores that gradually increase in size. Image acknowledgment: E.J. Schofield, Imperial College, London.

Bridget and her collaborators are using x-ray powder diffraction at the Australian Synchrotron to study nanoporous gold formed by electrochemically dealloying silver-gold alloys. The pores in nanoporous gold range in size from tens to hundreds of nanometres, depending on the length of the dealloying process, and coarsen with post-formation ageing or annealing.

The aim is to measure the strains that affect the atoms in nanoporous gold as a result of dealloying and various ageing processes. The powder diffraction beamline enables the researchers to analyse their samples in situ, i.e.

The submission development phase of the ASDP process is now well underway with more than a dozen projects already posted on the ASDP web pages - some with draft submissions available for download. Everyone is encouraged to visit the web pages (http://www.synchrotron.org.au/index.php/about-us/australian-synchrotron-development-plan) to see what is being proposed and to register interest in one or more of the projects. It is our hope that as many members of the scientific community as possible will take advantage of this opportunity to be involved in determining the way forward for the Australian Synchrotron.

The Science Advisory Committee (SAC) of the Australian Synchrotron recently received a briefing on the progress of the ASDP and presentations from a number of project spokespersons. The progress report and presentations were well received and we look forward to ongoing feedback of the SAC as we continue along the ASDP process.

Of course, we are still open to new projects and ask that you be in touch with Ian Gentle and Garry Foran at asdp@synchrotron.org.au if you are planning to lodge a project submission by the deadline on the 12th of October 2009.

Watch this space for further updates on planning for the future of synchrotron radiation science in Australia and New Zealand.

EXPERIMENTING WITH STUDENTS

In September 2009, the Australian Synchrotron welcomed the first high school groups into its recently completed student laboratory.

Synchrotron education officer Jonathan de Booy ran a pilot program offering basic experiments for Year 12 physics students. The program explored synchrotron-related concepts such as emission spectra from specific elements (e.g. hydrogen and helium) and Bragg diffraction from crystal structures.

Over a four-week period, 540 students from 42 different schools across Victoria participated in the pilot program, including schools in Warrnambool, Sale, Echuca, Daylesford, Gippsland and Benalla. The program was a great success with many teachers already looking to book their students into next year's program.

during the actual dealloying and post-formation processes. The findings should help identify the best conditions for producing pores of particular sizes.

"We can learn much more about the process from watching the reactions happen in real-time than from using samples 'stopped' at intermediate stages of dealloying," Bridget says. "For example, how long it takes to form the pores, how pore formation induces strain, and how the nanopores coarsen to relieve the strain.

"We're keen to come back for more."

This article is taken from the Australian Synchrotron feature in Australasian Science, October 2009. To see more Australasian Science synchrotron features on the synchrotron website, visit: http://www.synchrotron.org.au/index.php/news/publications/australian-synchrotron-case-studies/australasian-science-features

EVENTS DIARY

EVENTS IN AUSTRALIA

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

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.

One teacher offered the following feedback: "I have been teaching Physics for 21 years and found the program was an excellent reinforcement of the concepts we have been studying in VCE Unit 4 Physics. The program not only related to Synchrotron but also linked beautifully to Electric Power and Light & Matter. All in all it was an excellent program and I will not only look forward to bringing future groups to the Synchrotron for such great sessions, but will highly recommend this program to others."

The synchrotron plans to open the laboratory again in early 2010, with a view to catering for junior science classes as well as VCE.

Watch our website for information about programs and bookings.

More: http://www.synchrotron.org.au/index.php/the-community

Year 12 physics students see the light in the synchrotron's new student laboratory.

SYNCHROTRON BEAMS INTO UNIVERSITY

Mark Boland and Rohan Dowd used the synchrotron OptIPortal in Clayton to give an introductory accelerator physics class to five enthusiastic third year physics students at the University of Melbourne's OptIPortal in Carlton.

The OptIPortals allowed simultaneous use of physics simulation software, video clips, slide presentations, animations and live annotated diagrams, as well as live visual and audio contact between the lecturers and the students through a HD video conferencing system. The synchrotron's OptIPortal was installed recently by Chris Myers and his team from VeRSI, the Victorian e-Research Strategic Initiative.

"It gave us the feeling of being in the same room as the students, without needing to travel into the city" Rohan told Lightspeed.

The synchrotron's Accelerator Physics Group collaborates closely with the university's School of Physics for both research and teaching purposes. The remote presentation was complemented by a trip to the synchrotron for the students to model and conduct measurements on the synchrotron Linac (linear accelerator). The students then used the VeRSI user portal to access and analyse the data back at the university.

EVENTS OUTSIDE AUSTRALIA

For additional information and listings, see 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 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/

READER FEEDBACK

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

This was the first non-demonstration use of the synchrotron's OptIPortal, which will be used to strengthen the facility's connections with national and overseas synchrotron communities.

Mark Boland and Rohan Dowd deliver a lecture to students on the other side of Melbourne.

BEAMLINE FOCUS

Better SAXS

The SAXS/WAXS beamline now has Pilatus detectors and WAXS (wide angle x-ray scattering). The Pilatus detectors offer some dramatic improvements over conventional detectors, including high speed (10s of frames per second), high sensitivity, zero noise and vast dynamic range.

The WAXS system uses a 200k pixel Pilatus detector on a precision goniometer for diffraction analysis in the vertical plane above the sample. The detector provides limited 2D resolution, which is useful for observing effects such as particle statistics. In most cases WAXS can be conducted simultaneously with SAXS. For isotropic scattering samples at shorter camera lengths, SAXS and WAXS data can be acquired without any gap in angular range.

Further reductions in instrument background intensity mean the beamline is better than ever for analysing very weakly scattering samples, such as protein solutions.

Ongoing efforts to develop and test prototype sample environment stages mean we now have good equipment for 0 - 80 °C temperature control of multiple static capillaries. If you require temperature control of liquid samples that must flow during analysis or cannot be mounted in capillaries, please check the beamline webpages, ask beamline staff and be prepared to bring your own specialised equipment.

More: http://www.synchrotron.org.au/index.php/aussyncbeamlines/saxswaxs

USE OF LIGHTSPEED MATERIAL

CAREERS AT THE AUSTRALIAN SYNCHROTRON

The Australian Synchrotron offers a unique working environment for a wide range of specialists. More information on job postings: www.synchrotron.org.au/index.php/about-us/working-at-the-synchrotron/employment-opportunities

MORE INFORMATION

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

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