FROM THE DIRECTOR: THE LANGUAGES WE LOVE

Stand in one of our tearooms and you'll quickly realise from the accents around you that the Australian Synchrotron is a truly international facility.


Prof. Robert Lamb

We may be looking for an Australian pet name, but we are also proud to acknowledge the international character of Australia's newest and brightest scientific facility.

Among our 100-odd staff, we have people who are native or fluent speakers of a dozen or more different languages, including French, German, Swedish and Mandarin.

The Australian Synchrotron building was constructed by people from 14 different countries. The beamlines are being built by a similarly diverse group of people.

In short, we are selecting from the best the world can offer and making it our own.

We are justifiably proud of our achievements, but the Australian Synchrotron was not built solely for reasons of national pride. Australia built a synchrotron because we really needed one.

In this issue:

Australian and NZ users of synchrotrons, past and present, see synchrotrons in an overwhelmingly international light. And we are about to welcome the first of many international research groups seeking to utilise the unique characteristics of our world-class beamlines.

We may speak different languages, but at the Australian Synchrotron we all understand one very important language in addition to the English we use every day.

We share our ideas through the language of science.

OUR FIRST USERS – WHERE ARE THEY NOW?

In June 2007, a group of researchers from Auckland and Massey Universities in New Zealand became the Australian Synchrotron's first external users.

Tom Caradoc-Davies
(Photo: Sandra Morrow)

Among the group was a young postdoc from Auckland University, Tom Caradoc-Davies, who collected data on the high-throughput protein crystallography beamline with the assistance of principal scientist Julian Adams.

A year later, Tom is an essential part of the Australian Synchrotron's protein crystallography (PX) beamlines team. As well as operating, maintaining and upgrading the beamlines, the PX team trains users and assists with data collection and interpretation. Tom also conducts his own independent research program. His main research interests are carrying out fragment-based drug design and developing methods and software for the user community, research into pore-forming toxins, and structure-based drug design targetting an enzyme involved in diabetes.

"The staff here are a great bunch of motivated, intelligent people and I love working with the user community too," Tom told *Lightspeed*.

"I have to admit that I don't enjoy the callouts at night – and neither does my family. In fact my wife made me change my mobile phone ring-tone to a rooster's crow because we get woken up so often at night. However, the night callouts are an essential part of the service we provide to users and the rest of the job is great."

Tom says the most exciting recent development in crystallography is robotics.

"Robotic sample loading means that users can collect data from the best sample they have rather than the first sample they found that diffracted reasonably. For a given beamline, a sample robot significantly improves data quality because users are able to select the few perfect crystals from their dozens of samples."

Lightspeed *would like to hear from other early users of the Australian Synchrotron, or the first external users on particular beamlines. Please send a short email to info@synchrotron.org.au with "Early users for Lightspeed" in the subject line.*

UP TO SPEED

In the first of a series of short interviews, we put science and beamlines development manager David Cookson through his paces.

Describe your job in 25 words or less.

My job is to make sure that this mind-boggling pile of technology pushes - and keeps up with - Australian science and industry.

Best aspect of your job?
Working with the best and brightest in science, technology and industry.

Worst aspect of your job?
Working with the best and brightest in science, technology and industry.

Who is your favourite person at the synchrotron, and why?
Debbie the cleaner, because she always gives me a cheery smile when she comes in to empty my paper bin – even when I am shouting rude and hurtful things at my computer.

What are you currently reading at work?
Reports, reports and more reports. Sometimes journal papers – which are like reports with better formatting.

What are you currently reading at home?
Science textbooks. It sounds a bit tragic but some of these are actually worth reading from the very beginning. They are also a guaranteed cure for insomnia.

Best thing about living in Melbourne, and why?
It is the best city in Australia (which is in turn the best country in the world). Why? It just is. If you don't believe me, come and see for yourself.

Your favourite overseas destination, and why?
Anywhere I can walk or teleport to. People who have travelled long distances with small children will understand this

SYNCHROTRON USER ADVISORY COMMITTEE

Would you like to nominate yourself or a colleague for the Australian Synchrotron User Advisory Committee?

The advisory committee is an independent group that will provide advice to the Australian Synchrotron Director on all aspects of facility operation from a user's perspective.

Its role is to:

- represent Australian Synchrotron user interests
- provide feedback on the operation and development of the synchrotron, beamlines and user facilities
- assist the Australian Synchrotron in providing feedback to users about synchrotron-related issues.

The committee will have 10 members representing a broad national and regional spread of Australian Synchrotron users. Members will be elected by popular vote, and announced at the Users Meeting in December 2008.

Send your nomination with a brief biographical note to user.office@synchrotron.org.au. Nominations close 31 August 2008.

A FINE PIECE OF DETECTOR WORK

The Australian Synchrotron's Martin de Jonge and David Paterson recently co-authored two papers on the use of specialised phase contrast detectors with a scanning transmission x-ray microscope (STXM).

Traditionally an STXM uses x-ray absorption and/or fluorescence emission spectroscopy techniques to obtain valuable elemental, structural and chemical information from a very diverse range of samples with submicron resolution. The ongoing development of specialised phase contrast detectors significantly extends the applications to imaging of thin biological specimens.

The first paper, in the Journal of Synchrotron Radiation [1], reports on the development of the segmented charge-integrating silicon detector that provides simultaneous absorption and differential phase contrast. This detector can be used in combination with a fluorescence detector for simultaneous acquisition of transmission and fluorescence data. Images obtained at the Advanced Photon Source demonstrate the superiority of phase contrast over absorption for specimens composed of light elements.

A separate article in Physical Review Letters [2] describes the theoretical basis for quantitative phase imaging with the STXM, and demonstrates this with a test measurement of latex spheres. This robust technique can be combined with fluorescence microscopy to determine elemental concentrations from a single x-ray measurement.

This work paves the way for high resolution studies of trace elements in predominantly biological samples such as single cells on the microspectroscopy beamline at the Australian Synchrotron. Quantitative phase imaging enables determination of volume or thickness of, for example, a cell. This information combined with trace element quantification from fluorescence microscopy enables concentrations to be determined. The ability to determine concentrations of biologically important trace metals such as iron, copper, and zinc will be a great advantage to bio-science researchers because

EVENTS DIARY

EVENTS IN AUSTRALIA

IUMRS-ICEM 2008: Synchrotron Radiation (Symposium J)

International Conference on Electronic Materials
28 July – 1 August 2008
Hilton Sydney, Sydney, Australia

Topics covered in the synchrotron radiation symposium at IUMRS-ICEM 2008 will include:

- Advances in x-ray microscopy techniques and instrumentation
- Novel methods for non-destructive characterisation of materials
- Three-dimensional imaging methods
- Characterisation of interfaces and microstructural defects
- Structure and deformation of nanostructured and thin-film materials
- Advances in theoretical and/or computational imaging.

More: http://www.aumrs.com.au/ICEM-08/Symposia/?S=9

TEACHING SYNCHROTRON PHYSICS 2008

In-service course for VCE teachers
8 August 2008,
Australian Synchrotron

This half-day professional development workshop will include lectures, demonstrations, hands-on practical sessions, a tour of the Australian Synchrotron, handouts, advice on classroom activities and information on additional resources available to teachers. The program will be presented by qualified teachers and synchrotron scientists.

To find out more about this event, contact Dan O'Keefe, Australian Institute of Physics (Vic. Branch) Education Committee, on 03 9561 7602 or at danok@bigpond.com

concentration is critical in regulation of healthy development and disease pathways.

The Australian Synchrotron microspectroscopy beamline will be operational in early 2009. If you are interested in microspectroscopy experiments at the Australian Synchrotron, contact David Paterson david.paterson@synchrotron.org.au or Martin de Jonge martin.dejonge@synchrotron.org.au or go here: http://www.synchrotron.org.au/content.asp?Document_ID=491

[1] Differential phase contrast with a segmented detector in a scanning x-ray microprobe, B. Hornberger, M. D. de Jonge, M. Feser, P. Holl, C. Holzner, C. Jacobsen, D. Legnini, D. Paterson, P. Rehak, L. Struder, S. Vogt. J. Synchrotron Rad. (2008) 15, 355-362.

[2] Quantitative Phase Imaging with a Scanning Transmission X-Ray Microscope, M. D. de Jonge, B. Hornberger, C. Holzner, D. Legnini, D. Paterson, I. McNulty, C. Jacobsen, S. Vogt. Phys. Rev. Lett. 100, 163902 (2008).

SOFT X-RAYS, HARD SCIENCE

Researchers from the University of South Australia recently used the soft x-ray beamline to study how surface and bulk mineral impurities can affect the processing of chalcopyrite, an important copper sulphide mineral.

The glove box on the soft x-ray endstation is designed for handling sensitive samples. (Photo: Amanda Kirby)

The researchers, Dr David Beattie, Dr Sarah Harmer and PhD student Robert Acres, will use their soft x-ray results as part of a larger AMSRI (Australian Mineral Science Research Institute) project that aims to develop a better understanding of the flotation response and leaching behaviour of chalcopyrite in the presence of impurity phases such as chalcopyrite/bornite composite particles. Flotation and leaching are important industrial processes for the extraction of copper from copper sulphide ores.

Heterogeneous mineral samples provided by the South Australian Museum were analysed on the soft x-ray beamline after being fractured under vacuum, then leached/oxidised for different periods of time and analysed again. The newly installed glove box made it possible to condition the samples in an inert atmosphere and avoid any risk of oxidation resulting from exposure to air during transfer from solution to vacuum chamber. The small spot size of the X-ray beam enabled the researchers to interrogate individual mineral phases on the heterogeneous sample surface.

Preliminary analysis of the data suggests that the surface species that form on chalcopyrite in solution are present in different proportions depending on whether the sample is pure or a chalcopyrite/bornite composite.

If you are interested in soft x-ray experiments at the Australian Synchrotron, contact Bruce Cowie (bruce.cowie@synchrotron.org.au) or go to http://www.synchrotron.org.au/content.asp?Document_ID=487

ARC Centre of Excellence for Coherent X-ray Science 3rd Annual Workshop

Physicists and Biologists Working Together

17 – 19 September 2008
Bio21 Institute, Melbourne, Australia

This workshop will focus on high resolution imaging of biological samples using synchrotron and laser X-ray sources, as well as pioneering electron and light microscopy techniques and protein structure determination techniques.

Top international speakers will present their work in the areas of:

- advanced microscopy
- cellular and subcellular imaging
- coherent diffractive imaging
- membrane protein structure determination
- optics and imaging
- sources and detectors.

Additional features include a site tour of the Australian Synchrotron, poster & oral presentations and a workshop dinner.

More:
http://www.coecxs.org/workshop2008

Western Australian X-Ray Users Conference and Schools

X-rays from industry to academia

The Australian X-ray Analytical Association WA and the Royal Australian Chemical Institute (RACI) Analytical Chemistry Group have announced the dates for the Western Australian X-Ray Users Conference and Schools.

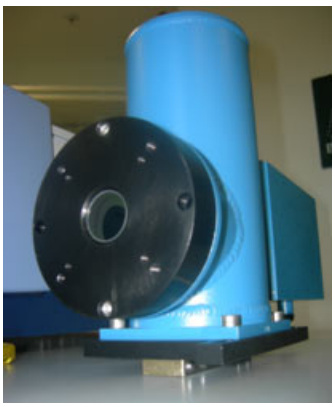
X-ray Diffraction School: Friday 10 October 2008
X-ray Users Conference: Saturday 11 and Sunday 12 October 2008
X-Ray Fluorescence School: Monday 13 October 2008.

The conference will be held at the Event Centre at Technology Park. The schools will be held at Curtin University

BEAMLINE FOCUS

Infrared Beamline

The infrared microscopy beamline continues to demonstrate its versatility. Recent users of the ATR objective have examined a wide range of samples, including reverse osmosis membranes from water treatment plants, oil inclusions in sedimentary quartz grains, 'green' geopolymer cements, and 19th century documents affected by the deterioration of iron gall inks.



The focal plane array (FPA) detector has 64x64 detector elements so that 4096 spectra can be acquired simultaneously per measurement, which only takes a few seconds.

A second IR microscope, Hyperion 3000 Focal Plane Array, has been delivered and is undergoing extensive evaluation and testing in the synchrotron's chemistry laboratory. It will eventually be moved to the IR beamline sample preparation area to enable users to collect large area overview IR images from their samples prior to high resolution mapping using the existing beamline instrument. This microscope is jointly funded by the Australian Synchrotron and Monash University.

The Hyperion 3000 Infrared Microscope in the synchrotron's chemistry laboratory. (Photo: Mark Tobin)

Mark Tobin, Principal Scientist, IR Spectroscopy

SAXS/WAXS Beamline

The basic installation of the SAXS/WAXS beamline optics is now complete and we are preparing for commissioning with x-ray beam in August. The sample table for the endstation is complete. As with all the major SAXS/WAXS endstation systems, the sample table was completely designed, engineered and integrated by Australian Synchrotron staff to meet the beamline's wide-ranging and demanding requirements. The precision X-Y-Z translation stage will be the workhorse system for precise positioning of specimens in the beam. The table is designed to allow a vast range of sample environments to be used; a bank of additional motion stages will enable users to fully exploit the beamline's capabilities, including grazing incidence scattering techniques.

(Photo: Nigel Kirby)

and/or the University of Western Australia.

More information is available from Geoffrey Carter at Curtin University of Technology
g.carter@exchange.curtin.edu.au

COMMUNITY OPEN DAY

26 October 2008,
Australian Synchrotron

The Australian Synchrotron open day is a once-a-year opportunity to see inside the synchrotron. Entry and parking are free, but participants will need to register. More details will be posted soon.

A-O Week of the Australian Synchrotron

1-5 December 2008

Australia plays host to researchers from the Asia-Oceania region at The A-O Week of the Australian Synchrotron from 1 to 5 December. The week features a series of important events beginning with a meeting of the Science Advisory Committee (SAC) planned for 1 December. This is followed by the Australian Synchrotron Users Meeting on 2-3 December and the third Asia-Oceania Forum for Synchrotron Radiation Research (AOFSRR) on 4-5 December. Satellite activities include the Next Generation Science Workshop on 4 December.

More details available at
http://www.asnevents.com.au/synchrotron08/

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

The photo shows the second half of the beamline optics in the SAXS/WAXS experiment hutch: mirrors, collimation system and beam conditioning table, with the sample table in the foreground.

Nigel Kirby, Principal Scientist, SAXS/WAXS

HOW TO APPLY FOR BEAMTIME

The third round of submissions for 2008 beamtime at the Australian Synchrotron closed on 1 July 2008. This call was for beamtime between September and December 2008 on the protein crystallography, infrared microscope and high resolution far-IR, powder diffraction and soft x-ray spectroscopy beamlines.

Key dates for the next round (2009/1) are listed at http://www.synchrotron.org.au/content.asp?Document_ID=5305.

If you would like to discuss your ideas for future beamtime 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

USER SURVEY

We are seeking feedback on your experience as a user of the Australian Synchrotron. Your comments will help us improve the services and facilities available for users. If you have completed an experiment at the Australian Synchrotron, please download the survey form from http://www.synchrotron.org.au/content.asp?Document_ID=5329

TRANSFER OF ASRP OPERATIONS TO AUSTRALIAN SYNCHROTRON

Responsibility for coordination of access to international synchrotrons by Australian researchers was transferred from the Australian Synchrotron Research Program (ASRP) to the Australian Synchrotron on 1 July this year.

From 1 July 2008, all international synchrotron access and associated travel funding for Australian users will be handled through the Australian Synchrotron User Office rather than ASRP. International access funding provided prior to 1 July will need to be acquitted through the ASRP office at ANSTO as usual.

The Australian Synchrotron's international access program for Australian researchers will cover facilities currently managed by the ASRP, including beamlines at the Advanced Photon Source (ChemMatCARS and XOR beamlines 1, 2, 4 and 20), the Australian National Beamline Facility at the Photon Factory and NSRRC in Taiwan.

Please contact us at user.office@synchrotron.org.au if you have any questions about Australian access to overseas synchrotron facilities or about the transition from the ASRP to the Australian Synchrotron.

EVENTS OUTSIDE AUSTRALIA

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

XAFS for Beginners' Workshop

1-10 September 2008,
MAX-lab, Lund, Sweden

This workshop will consist of talks and hands-on exercises for beginners in the field of x-ray absorption fine structure (XAFS) data collection and analysis. It will address XAFS experiment design, theory and data analysis. The workshop is free of charge, but the number of participants is limited. Registrations close 18 August 2008. More: http://www.maxlab.lu.se/maxlab/workshops/xafs/index.html

14th NSRRC Users' Meeting & Workshop on X-ray Crystallography / Spectroscopy

8-9 October 2008, Hsinchu, Taiwan

NSRRC international users are invited to submit posters on their research experiment findings. Abstracts can be submitted online at http://usersmtn.nsrrc.org.tw/eng/ or emailed to user@nsrrc.org.tw by Friday 8 August 2008.

The workshop on 9 October will highlight synchrotron applications in the cutting-edge research of X-ray crystallography and spectroscopy.

BioCARS Workshop on Time-resolved Macromolecular Crystallography

20-22 Nov 2008, APS, Chicago, US

This workshop will provide hands-on training in designing and conducting time-resolved experiments and in Laue data processing and analysis. Participants will also learn about recent upgrades to BioCARS insertion device beamline 14-ID X-ray and laser facilities.
More http://cars.uchicago.edu/biocars
Further information:
Vukica Srajer v-srajer@uchicago.edu
or Jane Andrew
andrew@cars.uchicago.edu

A SYNCHROTRON BY ANY OTHER NAME

As noted in the June edition of Lightspeed, we are looking for a new name. Not to replace 'Australian Synchrotron', which will remain our official name, but to use as a nickname or pet name.

Many synchrotrons around the world have short names derived from light source terminology. For example, the Berliner Elektronenspeicherring-Gesellschaft für Synchrotronstrahlung in Germany is known simply as BESSY. The French national synchrotron facility is Soleil. The Sincrotrone Trieste in Italy is Elettra. Japan's 8 GeV synchrotron photon ring is SPring-8.

For the Australian Synchrotron, we would like a pet name that is quintessentially Australian in character, easy to remember and not too long.

We invite all members of the synchrotron community and interested onlookers to submit their suggestions by email to info@synchrotron.org.au by 31 October 2008. The entries will be peer-reviewed and a short list of suitable names will be selected and submitted to the Australian Synchrotron Board to make a final decision. The chosen name will be announced at the 2008 User Meeting in Melbourne in early December 2008.

MORE INFORMATION

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

Email: info@synchrotron.org.au

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☎ 03 8540 4100

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High Pressure Molecular Biophysics Conference (HPMB2008)

10-12 December 2008
SOLEIL, Saint Aubin, France

Jointly organised by SOLEIL, Centre de Biophysique Moléculaire (CBM, Orléans) and Institut de Biologie Structurale (IBS, Grenoble), this multidisciplinary conference will highlight:

- interests and prospects of combining high-pressure perturbation and various biophysical tools, including high resolution structural methods (NMR and macromolecular crystallography)
- scientific results in the field
- recent instrumental advances
- interplay between experiments and simulations.

More: http://www.synchrotron-soleil.fr/Workshops/2008/HPMB2008 or email: conf-hpmb2008@synchrotron-soleil.fr

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