Australian Synchrotron

LIGHTSPEED June 2011

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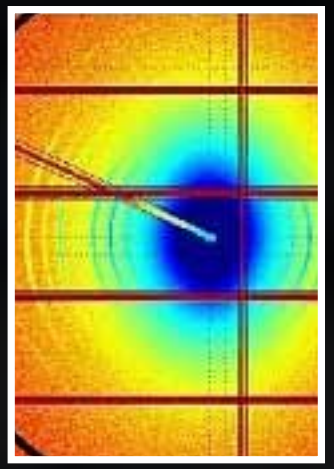

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SAXS Experts

Background image: Beamline equipment at the Australian Synchrotron

IN THIS ISSUE

From the Director - It's great to be here

As you know, I recently took up the role of Director, Australian Synchrotron. I have been involved with the development of Australian access to synchrotron facilities for quite a few years in a number of capacities. For example, I was involved at the beginning of the Australian Synchrotron Research program, I chaired the group that produced the 'Australian and New Zealand synchrotron-based science strategic plan 2007-2017', I was a member of the Board of Directors until early this year and before that I was briefly a member of the Scientific Advisory Committee. And I am a user.

My current position is nominally one day a week, which some of you might see as a relatively modest commitment. However I believe that I can be effective within this timeframe because of the really excellent team that is here. George Borg has done a fantastic job running the Australian Synchrotron over the last eighteen months or so and he will continue to oversee the operations as Chief Operations Officer, and Andrew Peele is having real impact as Head of Science. I can use my time to concentrate on ensuring strategic direction, liaising with government, and assisting with arguments for ongoing funding.

I am extremely optimistic about our future. Our discussions with government are ongoing, and it is clear that everyone genuinely wants us to succeed. On her recent visit here, the Victorian Minister for Innovation, Louise Asher, was hugely impressed by our work and very clearly indicated her support for the facility.

As part of looking to the future, we are working hard to ensure that we communicate our achievements so far to foundation investors, the institutions and consortiums who some years ago collectively provided $50 million to fund our initial set of beamlines – and demonstrate that we are continuing to address their needs.

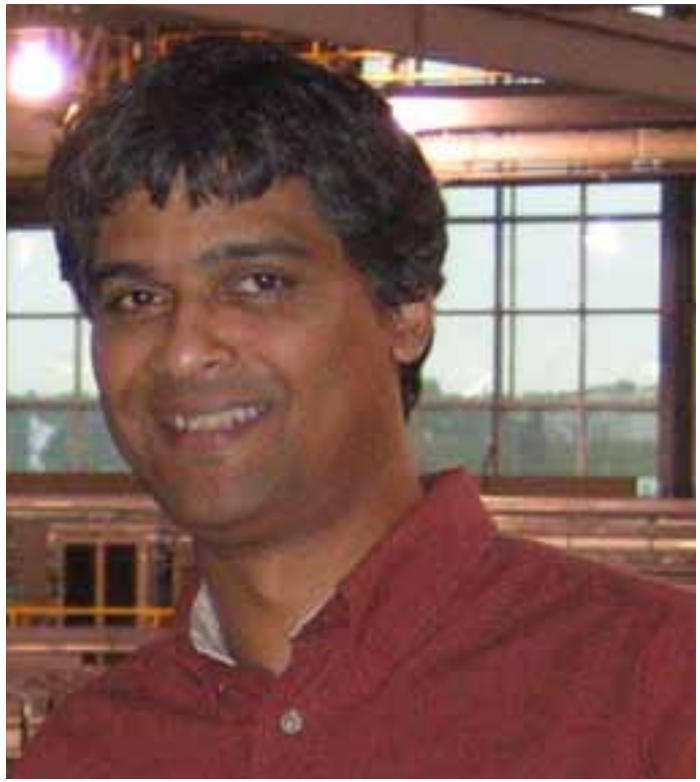
We are also working with the members of our National Science Colloquium, under the capable chairmanship of Sir Gustav Nossal. The NSC includes such eminent Australians as Nobel prize-winner Peter Doherty, the new Australian Chief Scientist Ian Chubb and former federal science minister Barry Jones. The scientific community is really strongly supportive of our work.

I'm passionate about the Australian Synchrotron and it is genuinely a real privilege to be able to contribute to its future success as part of such a fantastic team. Thank you and stay tuned.

Keith Nugent

Director, Australian Synchrotron

Up to speed: Dominique Appadoo



This month our short interview features Dominique (Dom) Appadoo, who heads the Australian Synchrotron's high-resolution far infrared beamline.

Describe your job in 25 words or less.

My job is to manage, operate and develop the Far-IR & High-Resolution beamline and build its user community.

Best thing about your job?

It's a great opportunity to rub shoulders with other scientists who are either well established or new to their fields. I enjoy the endless challenges which come with instrumentation. I also enjoy interacting with the talented Technical staff, Engineers and Controls & Instrumentation personnel, as well as the Accelerator Physicists and the Operators who are also at the root of the success of the Australian Synchrotron.

Worst thing about your job?

Trying to satisfy the unrealistic demands of upper management.

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

The coolest job I had prior to the Australian Synchrotron is working at the Canadian Light Source; it was -50°C cool!!!

Best things about living in Melbourne and why?

We are spoilt for extra-curricular activities, restaurants, markets, wine ...

Your favourite overseas destination and why?

Japan because it is so rich in culture, traditions, and very clean; the people are so respectful, the food can be interesting and the trains are on time!

A little-known fact about the Australian Synchrotron?

It has the best darn IR beam team in the world.

What's the most unusual or interesting sample you've seen on the far-IR beamline here?

Rat semen! Our users were examining the fluorescing chemical components for forensic purposes.

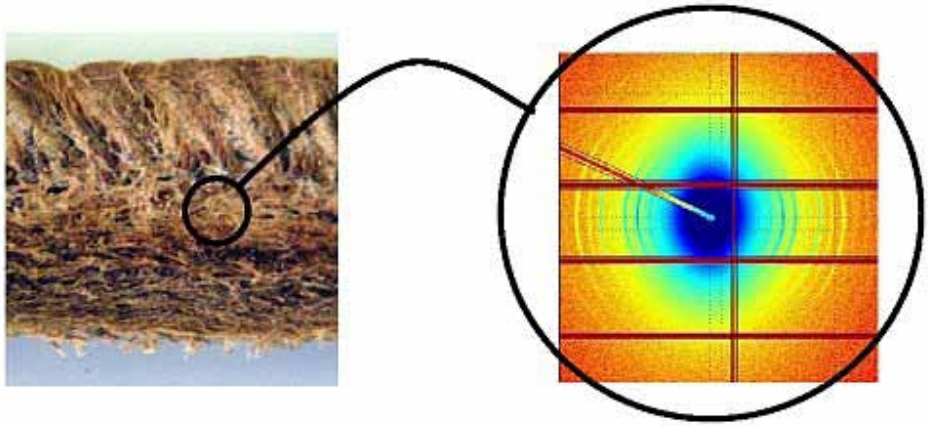
What is the biggest achievement or discovery so far for your beamline?

Securing internal funds to purchase a closed-loop cryostat which will enable the study of samples down to 5 K!!

What advice would you most like to offer users and potential users?

To read the beamline page on the website and to spread the love ... I mean word!

SAXS experts find new uses for leather



Australia may once have ridden on the sheep's back, but it's a New Zealand researcher who has discovered the secret of making sheep leather as strong as cowhide.

Sheep-skin leather is only half as strong as cow-hide leather, lowering its value and making it unsuitable for footwear.

Richard Haverkamp from Massey University recently used the Australian Synchrotron to investigate the nano-scale basis for the difference in strength between cow and sheep leather. He used small angle x-ray scattering (SAXS), a technique that can reveal the three-dimensional shape of proteins such as the cross-linked collagen fibres that make up the bulk of leather and determine its physical properties.

Richard and his colleagues used their findings to develop a processing strategy for making stronger sheep leather.

If this process were used to convert just half of Australia's annual lamb-skin production to leather suitable for footwear, it could potentially add $118 million a year to the value of Australian sheep products. A similar calculation applied to the NZ case puts the potential value for the NZ sheep industry at NZ$159 million a year.

Richard says New Zealand's preferred access to the Australian Synchrotron – as one of the facility's foundation investor groups – is what made the discovery possible. Using conventional laboratory equipment would have cost hundreds of thousands of dollars and still not given the high-resolution details needed for this discovery.

Above (L-R): Optical image of sheep leather in cross-section (approx. 2.2 mm thick), with SAXS diffraction pattern from grain-corium boundary region

Beamtime applications June 2011

Beamtime submissions for September-December 2011 (round 2011/3) will close on 23 June 2011.

Key dates for beamtime submissions are listed on the synchrotron website at: http://www.synchrotron.org.au/index.php/features/applying-for-beamtime/proposal-deadlines

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

Has your work featured in Lightspeed?

It's almost four years since the Australian Synchrotron first opened its doors to users and we're contacting researchers whose work has been featured in Lightspeed to find out what progress they've made since they used our beamlines.

The aim is to publish brief 'research updates' in Lightspeed along with other research articles. Some of the information may also be used in briefings for government and other key stakeholders.

If your work has featured in Lightspeed and you've been contacted by Lightspeed editor Nancy Mills but not had time to respond, or if you haven't yet been contacted, we'd really like to hear from you.

Please send us a short email with your contact details and brief answers to the following questions.

What stage have these projects now reached?

How have your synchrotron results helped you? What other techniques have you used, and how did the synchrotron techniques you used complement these other techniques?

Do you plan to use the synchrotron again in relation to this work? Would you recommend it to people working on similar projects?

What is the next step for your research work?

Thank you very much for your assistance.

Synchrotron connecting with local industries

Local industries invited to make research connections

Business operators and industry leaders looking to innovate are connecting with researchers working on new technologies and government representatives who can assist the innovation process.

In June 2011, the Inaugural SEMIP Innovation Showcase brought local businesses, industries and researchers in the South East Melbourne region together with government representatives.

SEMIP is the South East Melbourne Innovation Precinct (SEMIP), an initiative that involves the Australian Synchrotron, the Victorian State Government, CSIRO, Monash University, Small Technologies Cluster and the Councils of Greater Dandenong, Kingston, Knox and Monash working in collaboration with industry.

The Innovation Showcase combined keynote presentations with smaller group sessions delivered by industry leaders and innovators. Professor Keith Nugent, the new Director of the Australian Synchrotron, was part of a panel that discussed ways to connect with local industries and partner with local innovators.

To find out more about the Australian Synchrotron's capabilities or to discuss your specific requirements, please contact our business development manager, Ms Kerry Hayes. Click here to obtain contact details.

Synchrotrons in the news June 2011

Biological remains of extinct animal entombed in stone

Swedish researchers found amino acids inside the bones of a 70-million-year-old giant marine lizard.

http://www.sciencedaily.com/releases/2011/05/110502092255.htm?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+sciencedaily+%28ScienceDaily%3A+Latest+Science+News%29

Tooth decay breakthrough

Scientists in Oxfordshire have claimed a breakthrough in battling tooth decay.

http://www.bbc.co.uk/news/uk-england-oxfordshire-13267753

Frogs legs galvanised into action again

Scientists from Italy, the UK and France have observed for the first time at the molecular scale how muscle proteins change form and structure inside an intact and contracting muscle cell.

http://esciencenews.com/articles/2011/04/11/scientists.flex.their.muscles.solve.old.problem

Could city s**t be good for farming?

Enzo Lombi from the Cooperative Research Centre for Contamination, Assessment and Remediation of the Environment talks about synchrotron analysis of lead and cadmium contaminants in biosolids produced by cities. If these contaminants can be dealt with, biosolids could be used as farm manure.

http://www.abc.net.au/rural/telegraph/content/2011/s3213903.htm

Construction update June 2011

"The user accommodation rooms will be so good that we're worried our users won't want to leave," says Alexis Kouts from the Synchrotron's Major Projects and Technical Services Group.

Although the user accommodation won't be finished till 2012, several of the other new building facilities at the Australian Synchrotron are close to completion. The National Centre for Synchrotron Science has an upper floor and walls on three sides, cables are being installed inside the extended switchroom, and the technical services building and the office extension pod are expected to be ready for staff to move in within two months. Construction of the Imaging and Medical Beamline satellite building is complete and the building will now be furnished with equipment and office furniture.

Click here for main construction update webpage.

Click here for IMBL construction update webpage.

IMBL update (June 2011)

Commissioning of the imaging and medical beamline (IMBL) has recommenced following eight months in which operations were suspended to allow construction of Phase II infrastructure. The near-beam surgery and preparation facility is now in commissioning and the first high resolution imaging experiments in the satellite building are scheduled for October 2011. The superconducting multipole wiggler (SCMPW) is expected to arrive in May 2012. General users should have access to the beamline from September 2012.

Karen Siu and James Pearson joined the IMBL team in January 2011 on two-year joint appointments with the Monash Biomedical Imaging research platform. Paul Martin, a senior controls engineer recruited to the AS controls group in April 2011, has been assigned to IMBL for 80 percent of his time. Alberto Astolofo from the University of Trieste is the first IMBL post-doc. He will focus on nanoparticle tagging and tracking research supervised by Chris Hall. Astrid Kibleur from the Ecole Polytechnique Fédérale de Lausanne will join the IMBL team in July 2011 to spend 40 weeks working on high heat load optics, filters and the nanoparticle program as part of her Masters course in biomedical engineering.

IMBL has established a web-based forum to facilitate engagement with users. The forum provides detailed information on IMBL developments, operational updates and opportunities to discuss key issues. General information on beamline progress is posted in the IMBL section of the synchrotron website.

In April 2011, Daniel Hausermann, Chris Hall and Karen Siu travelled to Brussels with AS Head of Science Andrew Peele and Clinical Advisory Panel Chair Rod Hicks for the inaugural Au-EU Bilateral Workshop on Research Infrastructure hosted by the Royal Belgian Academy of Science and supported by DIISR under the International Science Linkages Program. As part of the Brussels meeting, the IMBL team organised a successful Medical Applications of Synchrotron Radiation (MASR) workshop in which seven clinicians and a dozen synchrotron scientists discussed key issues in current and future clinical programs. It was decided to establish an Australian-European Synchrotron Imaging and Therapy Working Group and DIISR are funding the inaugural meeting in Australia in September 2011.

Click here to go to forum page about Brussels meetings.

The facility's Clinical Advisory Panel and Imaging and Medical Beamline Advisory Panel will meet together in July 2011 to discuss the establishment of a clinical programs roadmap.

Beamline mascot IMBLtatouille tests the small animal holding facilities in preparation for Bureau of Animal Welfare licensing in July 2011.

XFM user cabin

Two user cabins have been constructed for the convenience of users and staff on the x-ray fluorescence microscopy (x-ray microprobe) beamline at the Australian Synchrotron.

Worm's eye view of the main user cabin under construction (looking clockwise from the MX beamlines).

Martin de Jonge in front of the second XFM user cabin (looking counterclockwise from the mezzanine above reception).

The main user cabin takes shape.

Preparing for construction (looking counterclockwise from the XFM beamline roof towards the MX user cabins)

The area outside the XFM beamline cordoned off for construction (looking clockwise from the mezzanine above the MX beamline)

Science Advisory Committee update

The Australian Synchrotron's Science Advisory Committee (SAC) was established by the Australian Synchrotron Board to advise the Board on the strategic scientific direction of current and future scientific programs to ensure that these are of the highest quality and of continuing relevance to the requirements of the Australian scientific community. The SAC is made up of leading scientists from around the world, many of whom manage programs and facilities at leading synchrotron sources internationally. The current chair is Professor Ted Baker, Professor of Biological Sciences, the University of Auckland.

The SAC met at the AS in March 2011 with members undertaking informal visits around those days. Two members (Ted Baker and Harald Reichert) also attended the launch of the MASSIVE supercomputing project on 9 March.

During their meeting, the committee received presentations from management and the board and engaged with facility scientists looking at the operations, programs and achievements of our staff. According to Ted Baker (photo on right), the SAC was very impressed with the quality and range of science that is performed as well as the technical proficiency of our operations. He noted that there are challenges ahead for the AS, particularly in relation to securing funding, but said that: "With its recent senior appointments and its adoption of SAC recommendations on internal allocations of resources, the Australian Synchrotron is structurally in excellent shape for continued operation and expansion".

AS Head of Science Andrew Peele welcomed the comments. "The SAC is an excellent review body that has provided us with a wealth of useful technical and strategic advice that optimises the scientific performance of our facility. I'm very pleased to see the positive comments regarding our performance. It's a great reflection on the dedication and enthusiasm of all our staff that we are able to perform at such a high level."

The next SAC meeting is scheduled for December 2011.

Wanted: PAC men and women

Do you know someone who has the breadth and depth of synchrotron research experience to assess and rank merit proposals to use Australian Synchrotron beamlines?

Every Australian Synchrotron beamline has a program advisory committee (PAC) with expertise in the techniques available on that beamline.

PAC members assess and rank beamtime proposals on their merit. We also have an international PAC, which assesses and ranks applications for funding to travel to synchrotrons overseas for work that cannot be carried out at the AS.

If you know a scientist who you believe could contribute to our scientific assessment of peer-reviewed proposals through one of the PACs, click here to go to a webpage where you can provide their details and the reasons you believe they would make a suitable PAC member.

Hot papers (June 2011)

The top 20 most-cited papers based on research undertaken at the Australian Synchrotron have been cited a total of 351 times in the scientific literature, according to the Scopus index as of 14 June 2011.

As of that date, the hottest research paper to draw on data collected at the Australian Synchrotron is a journal article entitled 'Differential recognition of CD1d-α-galactosyl ceramide by the Vβ8.2 and Vβ7 semi-invariant NKT T cell receptors', published in Immunity in 2009. This paper has been cited 30 times since its publication. Immunity has an SJR (SCImago Journal & Country Rank) ranking of 7.611 for 2009.

The second most cited paper, with 29 citations, is 'Structure and evolution of a novel dimeric enzyme from a clinically important bacterial pathogen' published in the Journal of Biological Chemistry in 2008. J. Biol. Chem. has an SJR ranking of 1.346 for 2008.

Close behind on 28 citations is 'A nanoscale molecular switch triggered by thermal, light, and guest perturbation' published in Angewandte Chemie International Edition in 2009. The journal has an SJR ranking of 0.829 for 2009.

This preliminary citation analysis was undertaken by Brett Wright, a history of science student at the University of Melbourne.

The Immunity article is one of three published in this journal in 2009 by James McCluskey and Dale Godfrey from the University of Melbourne, Jamie Rossjohn from Monash University, their teams and collaborators, that drew on protein x-ray crystallography data collected at the AS. The papers reported new advances in our understanding of natural killer T cells, a key component of the immune system.

The research has significant implications for immune-related disorders such as T-cell-mediated transplant rejection.

D.G. Pellicci, O. Patel, L. Kjer-Nielsen, S.S. Pang, L.C. Sullivan, K. Kyparissoudis, A.G. Brooks, H.H. Reid, S. Gras, I.S. Lucet, R. Koh, M.J. Smyth, T. Mallevaey, J.L. Matsuda, L. Gapin, J. McCluskey, D.I. Godfrey and J. Rossjohn, Differential Differential recognition of CD1d-α-galactosyl ceramide by the Vβ8.2 and Vβ7 semi-invariant NKT T cell receptors, Immunity, 31, 47-59, (2009).

The work of the last-named author of the J. Biol. Chem. paper, Matt Perugini from the University of Melbourne, was featured in a synchrotron article in Australasian Science in March 2009.

B.B. Burgess, R.C.J.Dobson, M.F. Bailey, S.C. Atkinson, M.D.W. Griffin, G.B. Jameson, M.W. Parker, J.A. Gerrard and M.A. Perugini, Structure and evolution of a novel dimeric enzyme from a clinically important bacterial pathogen, J. Biol. Chem., 283, 27598-27603, (2008).

The first-named author of the Angewandte Chemie International Edition paper, Martin Duriska from Monash University, won the 2010 Australian Synchrotron Thesis Medal for his PhD thesis entitled 'Introducing multiple functions into discrete supramolecules and coordination polymers'.

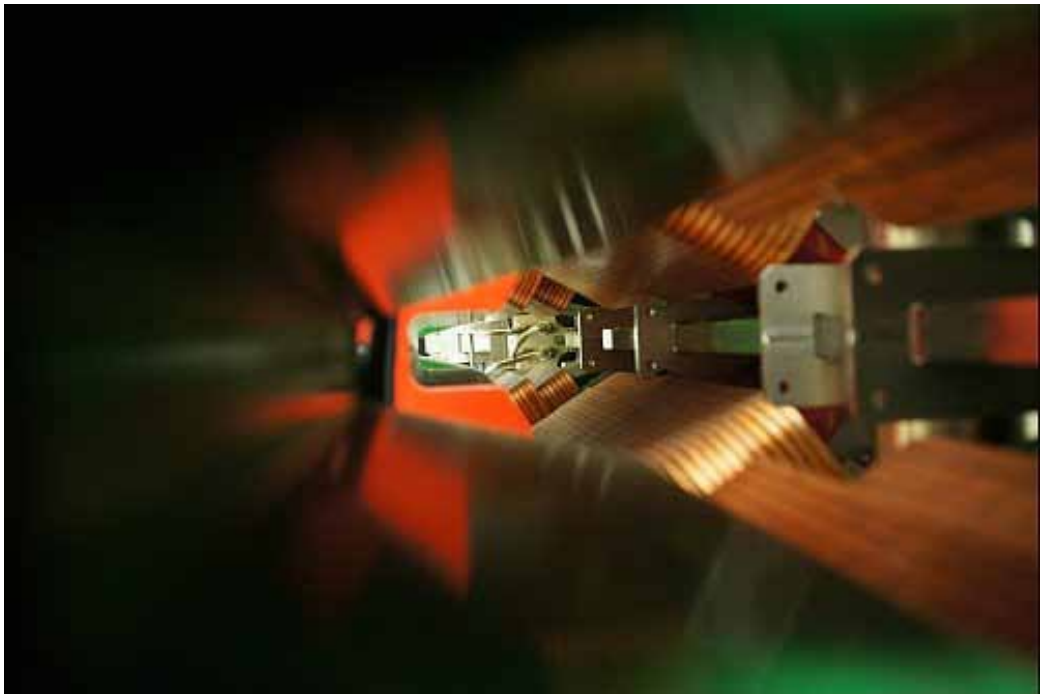
M.B. Duriska, S.M. Neville, B. Moubaraki, J.D. Cashion, G.J. Halder, K.W. Chapman, C. Balde, J.F. Letard, K.S. Murray, C.J. Kepert, S.R. Batten, A nanoscale molecular switch triggered by thermal, light, and guest perturbation, Angew. Chem. Int. Edn., 48, 2549-2552, (2009).

Photo entries May 2011

Thank you very much to everyone who entered our inaugural photo competition. We enjoyed your photos, which ranged in subject matter from beer balloons and rainbows to the late late shift at the synchrotron.

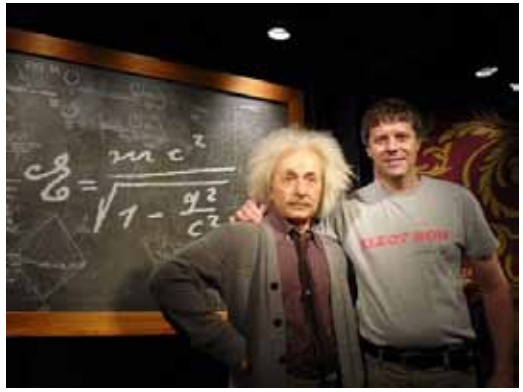
The winner is Noel Basten (electrical technician at the AS) for 'Magnetic attraction', followed very closely by Bridget Ingham (research scientist with IRL in New Zealand) for a photo of the SAXS beamline in action with a user-supplied sample cell. For his photographic efforts, Noel receives a fabulous prize from the synchrotron's Human Resources group.

The competition is on again, this time with a closing date of Friday 29 July 2011. Staff, users and visitors: get your cameras ready!



'Magnetic attraction', by Noel Basten

Photo of user-supplied sample cell on SAXS beamline, by Bridget Ingham



Honourable mention goes to Paul Leonard for 'Elect Albert', a well-dressed self-portrait in excellent company. That's Paul on the right.

Events diary

Synchrotron-related events in Australia and overseas.

Read more

Space for your event

To submit your synchrotron-related event for listing in Lightspeed and on the Australian Synchrotron website, click here.

Reader feedback

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

Use of Lightspeed material

Careers at the Australian Synchrotron

The Australian Synchrotron offers a unique working environment for a wide range of specialists. For information on job postings, go to:

http://www.synchrotron.org.au/index.php/about-us/working-at-the-synchrotron/employment-opportunities

Staff list

http://www.synchrotron.org.au/index.php/about-us/working-at-the-synchrotron/staff-contact