FROM THE ACTING DIRECTOR

Dr George Borg,
Acting Director,
Australian Synchrotron.

As some of you may already know, the Australian Synchrotron Board appointed me as Acting Director of the Australian Synchrotron on 30 October 2009, following the conclusion of Rob Lamb's secondment and his return to the University of Melbourne.

On behalf of all synchrotron employees, I thank Rob for his significant contribution to the facility, particularly his passion for science.

I would also like to thank all our employees and others outside the facility who have helped make 2009 a year of major achievements for the Australian Synchrotron. As a result of your efforts the Australian Synchrotron is a facility we can all be proud of.

For those of you who don't know me, I was previously Head of Technical Services and Major Projects at the Australian Synchrotron. I have been associated with the synchrotron for several years, initially as general manager of the ANSTO-Worley Parsons bid to operate the facility. Prior to working at the Australian Synchrotron I held senior management roles in Australia and overseas.

Looking ahead to 2010, we have a strong team to lead us into the future. We look forward to completing work on Phase 2 of the Imaging Medical Beamline; construction of major new building facilities to better accommodate the needs of users, visitors and employees; planning for the development of new beamlines and storage ring capabilities to meet the needs of the next generation of synchrotron scientists; and completing the initial analytical work for the 'top-up' operation of the machine. I look forward to working with the synchrotron community.

SEASONS GREETINGS FROM THE AUSTRALIAN SYNCHROTRON

In this issue:

UP TO SPEED

This month our short interview features Don McGilvery, who leads the accelerator operations team at the Australian Synchrotron.

Describe your job in 25 words or less.
Oversee the Control Room, keep the operators happy, keep the electrons whizzing around the ring to provide a stable source of photons for the users.

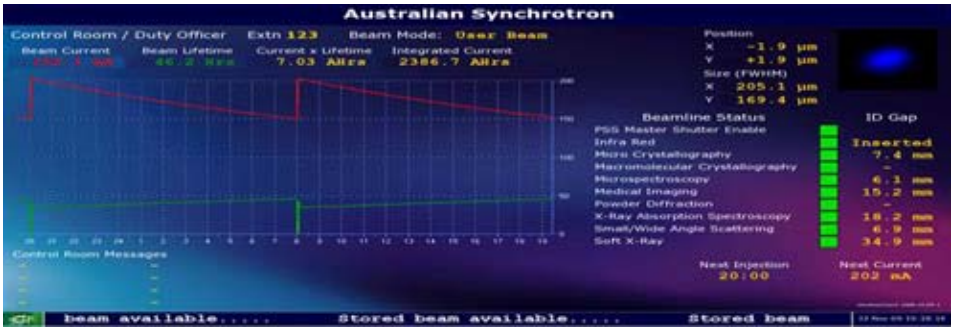
Best aspect of your job?
I really enjoy diagnosing problems and trying to fix them.

Worst aspect of your job?
Meetings and documentation.

Apart from the Australian Synchrotron, what's the coolest job you've ever had?
A postdoc at Cornell University. Three winters in Ithaca with temperatures down to -35°C is pretty cool.

ALL BEAMLINES SIMULTANEOUSLY OPERATIONAL

On the 12th November at 19:30, all Beamlines at the Australian Synchrotron were simultaneously operational for the first time. The attached screen shot shows the facility status monitoring recording the fact.



Note the green Beamline status boxes showing they are all operational. Since that date, it had become a common event for all beamlines to be working. You can see the current status for yourself by looking at https://vbl.synchrotron.org.au/fsm/

ESSENTIAL TOOL FOR AUSTRALIA'S FUTURE

The Australian Synchrotron has rapidly become an essential tool for research groups around Australia and New Zealand, but none more so than CSIRO's Materials for Energy, Water and the Environment group.

Headed by Anita Hill and Manh Hoang, MEWE team members have pooled their resources to take on a broad range of synchrotron experiments.

"Working as a big team allows us to use discoveries made about our materials on one beamline to enhance experiments done on other beamlines," Anita says. "Combining this powerful approach with the powerful analytical tools available at the Australian Synchrotron brings the next big breakthroughs that much closer."

MEWE team members outside the Australian Synchrotron

For example, Anita and her collaborators are using small angle x-ray scattering (SAXS) to examine thermally-rearranged polymer membranes with outstanding gas separation properties and thermal stability.

Matthew Hill, Danielle Kennedy and Emily Mensforth are using powder diffraction and crystallography to study a new class of highly porous materials known as metal organic frameworks (MOFS), which may be

Best things about living in Melbourne and why?
The weather (such variety!), and living close to family and friends.

Your favourite overseas destination and why?
The US and Switzerland, great trains.

A little-known fact about the Australian Synchrotron?
The energy loss by photon emission per turn of our electrons at 3GeV is about the same as the energy loss per turn for 7TeV protons in the LHC. In less technical language, for each lap of our 217m storage ring, an electron will generate a similar amount of light as a proton in LHC does for each lap of its 27 km storage ring.

What are the biggest challenges for accelerator operations at the Australian Synchrotron?
Maintaining our highly skilled physics and operator teams. Dealing with electrical storms and brownouts.

What would you personally like to see the accelerator operations team achieve at the Australian Synchrotron?
Extremely high accelerator reliability with exceptionally good beam characteristics.

What do you think is the most important or interesting aspect of the Australian Synchrotron overall?
That we are able to provide fabulous scientific tools to Australian science and make them available to so many young scientists.

BEAMTIME APPLICATIONS

Beamtime submissions for January – May 2010 (round 2010/1) closed on 7 October 2009. Users will be notified in early December.

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

used in alternative car fuel systems. Paolo Falcaro and Dario Buso are using infra-red spectromicroscopy, powder diffraction and SAXS to explore new MOF production methods.

Other collaborative projects undertaken by MEWE team members include using: x-ray absorption to investigate the nanostructure of low-weight high-strength light metal; SAXS to look at gelling agents used to thicken and stabilise foods; powder diffraction and crystallography to identify new forms of inorganic phosphates for biomedical implants; and infra-red spectromicroscopy to study how crosslinking of hybrid organic-inorganic membranes affects their performance for water purification.

http://www.synchrotron.org.au/index.php/news/publications/australian-synchrotron-case-studies/australian-synchrotron-stories

NEW CHARGE FOR DIAMONDS

Carbon is essential for life as we know it. Its diverse forms – including diamond, graphite, graphene, nanotubes and fullerenes – are also leading to an increasing number of potential industrial applications.

"Diamond may well be the material of choice in emerging quantum industries, driven by its outstanding properties and recent rapid improvements in the quality of synthetic single-crystal diamond materials," says Chris Pakes, who leads the Atom-scale Research Laboratory at La Trobe University. "Being made of carbon, it is also bio-compatible."

The La Trobe team are using the Australian Synchrotron to investigate how to control the electronic properties of the diamond surface by adding one or more layers of carbon in the form of fullerenes. Fullerenes (short for buckminsterfullerenes – named in honour of R. Buckminster Fuller's geodesic domes) are hollow spheres of 60 carbon atoms arranged in five- and six-membered rings.

The group's findings are expected to further stimulate the development of diamond-based electronic devices. Key to the current study is that fullerenes on the hydrogen-terminated surface of diamond can act as electron acceptors, introducing a charged layer to the underlying diamond.

Martina Wanke, Qi-Hui Wu, Kevin Rietwyk and Chris Pakes visited the Australian Synchrotron recently to study fullerene-diamond interfaces on the soft x-ray spectroscopy beamline, together with research collaborators Philip Moriarty and Peter Sharp from the University of Nottingham.

More: http://www.synchrotron.org.au/index.php/aussyncbeamlines/soft-x-ray-spectroscopy/highlights-sxr/new-charge-for-diamonds

L to R: Atom-scale Research Laboratory members Chris Pakes, Martina Wanke, Mark Edmonds, Qi-Hui Wu and Kevin Rietwyk.

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

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.

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/

BUNCH BY BUNCH

How do you measure the charge of a bunch of electrons when it's travelling at close to the speed of light with hundreds of other bunches?

That was the challenge facing Australian Synchrotron accelerator physicists in 2006 when they needed to measure the charge in the 30-picosecond electron bunches circulating in the synchrotron's storage ring.

The answer came from Roger Rassool and his School of Physics research group at the University of Melbourne. Thanks to some fundamental particle physics research conducted in 2001 in association with commercial partner Acqiris (now part of Agilent digitiser division), Roger was able to provide a working solution for the synchrotron – and a research project for a student.

The original research involved incorporating one of the world's best digitisers to make a precision physics measurement of one of the numbers that makes up the Standard Model of Particle Physics. This model incorporates most of our current knowledge of fundamental particle interactions in the physical universe.

The student, David Peake, designed, built and programmed the software that now constitutes the 'fill pattern monitor' used daily in the synchrotron's accelerator control room. The fill pattern monitor allows for precise computer-controlled feedback to automatically inject electrons into the storage ring synchronised to less than one nanosecond.

David is in his final year of a PhD on bunch-by-bunch feedback system diagnostics at the Australian Synchrotron. A copy of the Agilent-based system has been sold to the Pohang Light Source in Korea.

In conjunction with Agilent digitisers and University of Melbourne students, a new system is being developed to measure in real-time the transmission efficiency of the accelerator systems. This technology is required for smooth implementation of top-up operations and on-line monitoring of injection system performance.

David Peake (left) commissioning the fill pattern monitor in the control room at the Australian Synchrotron. Right: David Peake and Roger Rassool celebrate the success of the Agilent system.

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/

SPIE Optical Engineering + Applications

1 - 5 August 2010
San Diego Convention Center
San Diego, California, US

This major symposium covers classical optical R & D, design, and engineering, as well as technologies and systems for use in optical systems, remote sensing, and illumination engineering. Events of interest to synchrotron scientists include the following two conferences.

Advances in X-Ray/EUV Optics and Components V (OP321)

Advances and emerging needs in x-ray and EUV sources, optics, and applications including next-generation synchrotron and free-electron laser sources, EUV photolithography, and x-ray astronomy.

Developments in X-Ray Tomography VII (OP323)

Interdisciplinary discussion of tomography. Scientists and engineers from medicine, biology, earth science, materials testing and development, crystallography, solid state physics, chemistry, micro-mechanics, and micro-devices will present their results and describe new strategies and components for tomography as well as new applications.

Deadline for abstracts for all symposium events is 18 January 2010.

More:
http://spie.org/optical-engineering.xml

A MO-MENT TO BE PROUD OF

In the mo-nth of Mo-vember 2009, mo-re than 20 mo-dest but highly mo-tivated AS staff members mo-thballed their shaving gear and grew mo-ustaches to raise awareness of – and funds for – prostate cancer, which kills around 3300 men a year in Australia.

The full mo-nty: AS staff mo-del their mo-dish new mo-ustaches to raise awareness of prostate cancer. Ru-mo-ur has it that participants are looking forward to a few close shaves in December.

MORE INFORMATION

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

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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. More information on job postings: www.synchrotron.org.au/index.php/about-us/working-at-the-synchrotron/employment-opportunities