FROM THE DIRECTOR: GROWING UP

Across Australia, parents are proudly watching as their kids experience school or university for the first time.

Prof. Robert Lamb

Similarly, the Australian Synchrotron is growing up and moving into the next phase of its life.

No longer content to play within the confines of our own backyard, we're growing bolder and moving into the street to meet new people and invite them to visit us.

The Australian synchrotron community is a national community with strong international links. During construction of the first nine beamlines, however, our lifeblood has been local users with valuable expertise and widespread connections who have helped commission and test the facility.

In March 2009, we can see that the word is starting to spread. Interstate users now outnumber local ones and we are now attracting users from around the world: Asia, Europe, North America.

I'd like to remind users from outside Melbourne that we are a national facility and that successful beamtime applicants receive financial assistance towards travel and accommodation costs. Australian-based scientists can also apply through us for access to the best of the world's other synchrotrons.

In this issue:

UP TO SPEED

This month our short interview features Dean Morris, head of operations at the Australian Synchrotron.

If you haven't already considered applying for beamtime to help you achieve your research goals faster, we want to hear from you..

MALARIA BREAKTHROUGH

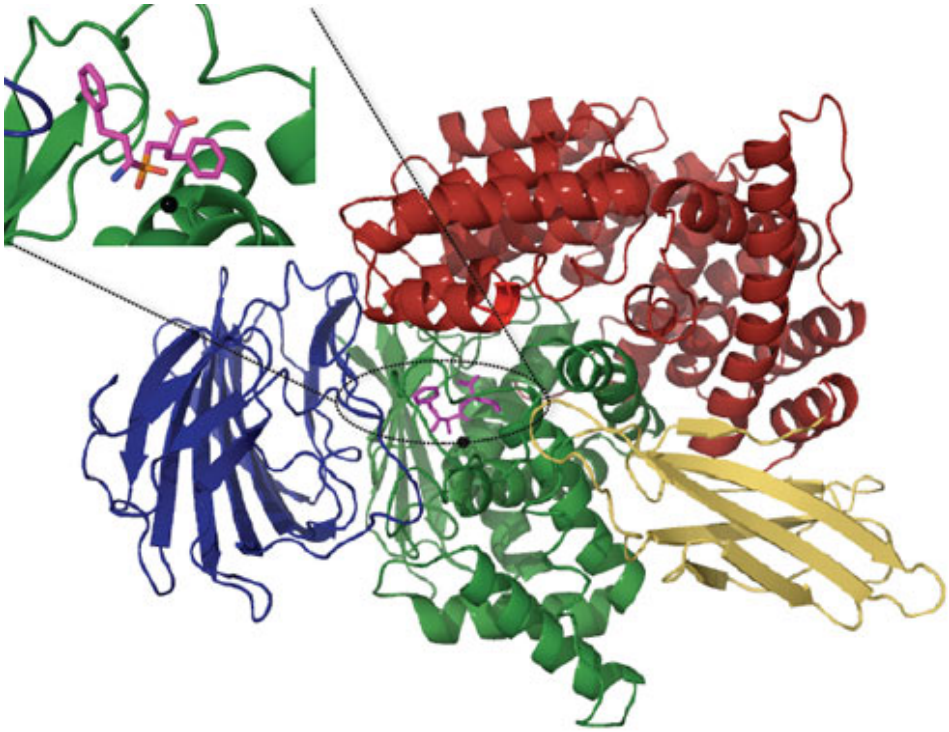
A collaboration between Monash University, the University of Technology Sydney, and the University of Queensland has laid the foundations for a new class of antimalarial drugs, with the help of the high-throughput protein crystallography beamline at the Australian Synchrotron.

The work is part of international efforts to defeat the malaria parasite, which infects as many as half a billion people around the world every year and kills more than one million, many of them children.

Dr Sheena McGowan, Dr Corrine Porter and Professor James Whisstock from the ARC Centre of Excellence in Structural and Functional Microbial Genomics at Monash University used the synchrotron to obtain high-resolution crystal structures of a key malarial enzyme in its natural state and the same enzyme bound to potential inhibitors.

The collaborative research has revealed features within the enzyme's active site that will now become prime targets for the development of a previously undescribed class of antimalarial therapeutics.

More: http://www.synchrotron.org.au/content.asp?Document_ID=5596



A potential new antimalarial drug (shown in magenta) blocks the active site of a key digestive protein, effectively starving the malaria parasite to death. Image: ARC Centre of Excellence in Structural and Functional Microbial Genomics at Monash University

Describe your job in 25 words or less.
I oversee the scientists and operators who develop and run the machine, and the mechanical, electrical and controls groups who maintain the facility and provide engineering services.

Best aspect of your job?
The varied and interesting nature of the work. There's never a dull moment!

Worst aspect of your job?
The stress when the machine breaks down and nobody knows how to fix it.

How long have you been with the Australian Synchrotron?
Six years. I think I was the fourth person appointed to this project.

What's been the most rewarding part of those six years?
Seeing the project grow from a few pieces of paper in an office in Melbourne to the world-class facility it is today.

What is the most useful lesson you've learned from being head of operations with the Australian Synchrotron?
Just because someone is very intelligent doesn't mean they know what they're talking about!

Apart from the Australian Synchrotron, what's the coolest job you've ever had, and why?
Business Manager for the Large Hadron Collider. Absolutely huge magnets and cryogenics.

A little-known fact about the Australian Synchrotron?
A supplier who let us down is buried inside the Linac tunnel wall.

BEAMTIME APPLICATIONS

Beamtime submissions for the 2009/2 round closed on 24 February 2009. Users will be notified from 1 April 2009 (or mid-March for ANBF proposals).

Key dates for 2009 beamtime submissions are listed here.

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.

DIAMOND RESEARCH AT THE CUTTING EDGE

Thanks to Marilyn Monroe, it's common knowledge that diamonds are a girl's best friend. Diamonds are also ideal for less glamorous but more valuable applications that rely on physical properties such as exceptional hardness and heat conductivity.

Synchrotron x-rays could hold the key to new high-tech diamond applications, providing unique analytical tools and production methods.

More versatile than single crystals, microcrystalline and nano-crystalline diamond films can be deposited on silicon, steel and other surfaces. Applications include protective films for knife edges and other surfaces, electron emission devices, heat sinks for solid state lasers and possibly thermo-electric energy converters. Nano-diamonds can also generate photons for high-tech quantum communication and cryptography devices being developed for secure, long-distance communications.

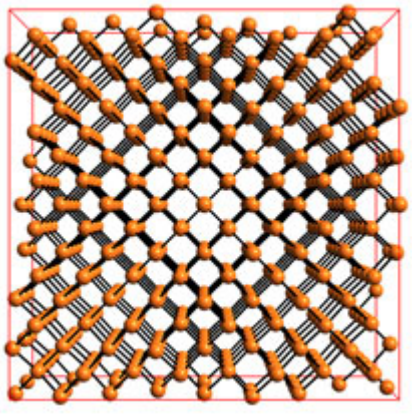
Professor Alon Hoffman from Technion, the Israel Institute of Technology, has been based at the University of Melbourne conducting research into the production and properties of nano-diamonds in collaboration with Professor Steven Prawer.

A major objective is to create diamond films that can act as single photon sources. One approach involves selectively bonding atoms to the surface of individual diamond nano-crystals. Inducing and characterising this process is greatly facilitated by synchrotron x-ray beams. Similar challenges are associated with other potential applications.

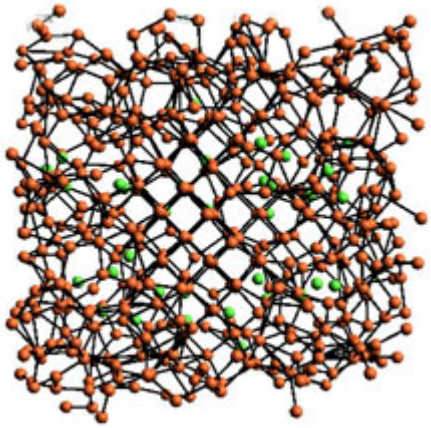
Alon used the soft x-ray beamline at the Australian Synchrotron to investigate the thermal stability and surface properties of nano-diamond particles. He used a technique called 'near edge x-ray adsorption fine structure' (NEXAFS) to measure the presence of hydrogen on diamond surfaces and sub-surface regions.

"Our results prove that we can use NEXAFS to determine the bonding of hydrogen to diamond surfaces," Alon said.

More: http://www.synchrotron.org.au/content.asp?Document_ID=5595



Diamond model showing carbon atoms in a lattice



Nano-diamond model showing carbon atoms in a deformed lattice with hydrogen atoms in green

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

CRYSTAL 26

26th Meeting of the Society of Crystallographers in Australia and New Zealand.
14-17 April 2009
Barossa Valley Novotel Resort, Rowland's Flat, South Australia

The conference will cover all aspects of crystallography and will feature distinguished invited speakers from overseas and around Australia.

More:
http://xrsi.cmit.csiro.au/SCANZ26/

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

10th International Conference on Synchrotron Radiation and Instrumentation 2009 (SRI2009)

Melbourne Convention & Exhibition Centre
28 September – 2 October 2009

REMOTE POSSIBILITY NOW A REALITY

Using the remote access capabilities of the high-throughput protein crystallography beamline at the Australian Synchrotron is so easy even a politician could manage it.

Synchrotron scientist Julian Adams (seated, left) shows Victorian Premier John Brumby the remote access capabilities of the high-throughput protein crystallography beamline.

Just ask Victorian Premier John Brumby, who recently used remote access to gather diffraction data from a crystal of trypsin, a pancreatic enzyme. Under the guidance of principal beamline scientist Julian Adams, the Premier mounted a crystal from the robot, centred the crystal, took a test shot and collected a full data set.

The training session took place in December 2008 at the Walter and Eliza Hall Institute in Melbourne at the unveiling of a scale model of the new expansion building by Professor Suzanne Corey, WEHI executive director.

To find out more about remote access to the high-throughput protein crystallography beamline, contact Julian Adams on 03 8540 4232 or julian.adams@synchrotron.org.au or visit http://www.synchrotron.org.au/content.asp?Document_ID=435.

FINE CONTROL FOR FINE CRYSTALS

A Rigaku Proteros Free Mounting System (FMS) is now available for use in the biochemistry laboratory at the Australian Synchrotron, thanks to the generosity of the Bio21 Collaborative Crystallisation Centre.

Dr Ruby Law from Monash University's biochemistry department attended a recent FMS training session at the Australian Synchrotron.

This device allows users to precisely control the level of hydration of protein crystals. It has been shown to achieve spectacular improvements in diffraction resolution for some protein crystals.

Because the FMS requires some skill in crystal manipulation and can be quite time-consuming, users are advised to contact beamline staff well in advance of their scheduled beamtime to arrange a training session.

For more information, contact Julian Adams on 03 8540 4232 or julian.adams@synchrotron.org.au or visit http://www.synchrotron.org.au/content.asp?Document_ID=435.

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 http://www.sri09.org/

BSR / MASR 2010

con-joint meetings
Biology and Synchrotron Radiation
Medical Applications of Synchrotron Radiation
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

2009 Particle Accelerator Conference (PAC09)

4-8 May 2009
Vancouver, British Columbia, Canada

This well-established conference series is of particular significance to accelerator scientists, engineers, students and industrial vendors interested in all aspects of particle accelerator technology.

Early registration deadline is 3 April 2009.

More: www.triumf.info/hosted/PAC09

BABY JUST LOOK AT US NOW

When they told me the Australian Synchrotron was a young facility, I didn't realise this was what they meant!

Six babies have been born to Australian Synchrotron staff since the facility officially opened in July 2007.

1. Elliot (Cathy Harland, user office), 2. Emmett (Martin de Jonge, microspectroscopy beamline), 3. Samuel (Tom Caradoc-Davies, protein crystallography), 4. Yu-Shuen (Eugene Tan, accelerator physics), 5. William (Rohan Dowd, accelerator physics), 6. Sophie (Bernt Johannessen, ANBF)

MEASURING AND MODELLING AT THE SPEED OF LIGHT

It's hard to believe, but it's true. Two undergraduate students from Melbourne University recently gave up their holidays to work on accelerator physics projects at the Australian Synchrotron.

Alexis Illig (University of Melbourne) and Lachlan Shaw (RMIT University) are the inaugural recipients of the summer student scholarships awarded jointly by the Australian Synchrotron and The University of Melbourne. They spent January and February 2009 at the synchrotron, using cutting edge science and technology to solve real physics problems.

Lachlan developed a model to simulate the behaviour of the 3 GeV electron beam in the storage ring, using the Monte Carlo particle

RADSYNCH 2009

21-23 May 2009
Trieste, Italy

The 5th International Workshop on RADiation safety at SYNCHrotron radiation sources will enable radiation physicists, radiation safety professionals and other interested parties to share experiences and exchange information about radiological issues involved in design, commissioning, operation and decommissioning of synchrotron facilities and free electron lasers around the world.

More:
www.elettra.trieste.it/radsynch09/

XAFS 14 Conference

26-31 July 2009
University of Camerino, Italy

The International Conference on X-ray Absorption Fine Structure (XAFS) is a triennial event. XAFS 14 will cover a wide range of topics, including EXAFS, NEXAFS, XANES, DAFS, SEXAFS, EELFS, XMCD and Auger spectroscopies, microspectroscopy and spectro-microscopy, resonant photoemission, resonant and non-resonant inelastic x-ray scattering, time-resolved XAFS and diffraction. Specific symposiums are planned on hot topics such as ultra-fast time-resolved spectroscopy, slicing schemes and free electron lasers in the x-ray and UV/XUV domains.

Deadline for early registration and accommodation and transport bookings is 15 May 2009.

More: http://www.xafs14.it/

X-RAY SCIENCE, GORDON RESEARCH CONFERENCE MEETING

2-7 August 2009
Colby College, Waterville, Maine, USA

Topics currently under consideration for this meeting include:

- science frontiers using new x-ray sources
- x-ray scattering /spectroscopy under extreme conditions
- use of coherent x-rays for imaging and studies of dynamics
- x-rays in biology, life, energy and environment science
- dynamics by pump and probe technique

tracking code GEANT4 developed at CERN by an international collaboration. He demonstrated the predictive powers of his computer model by comparing his results with measurements made on the real machine.

Lachlan Shaw (left) and Alexis Illig are the Australian Synchrotron's first summer school scholarship recipients.

Alexis developed a nanosecond measurement device to count electrons as they passed through parts of the injection system accelerators and keep track of beam-transport efficiency in real time. Her system provides sensitive diagnostic feedback that can be used to improve the performance of the injection system and will be replicated on other parts of the beam transport system on the injector.

In 2009, the Accelerator Group will also supervise three PhD students, one Honours and one Masters student, and provide undergraduate projects for four computer science students and four physics students from Melbourne universities.

Students interested in the group's research projects should contact Greg LeBlanc or Mark Boland at the synchrotron for more information.

NEW WEBSITE

The Australian Synchrotron is developing a new website to meet the evolving needs of its users and other important audiences. We will keep you informed of progress through regular updates in *Lightspeed* and on the old website

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.

- inelastic x-ray scattering
- new techniques / optics, detectors and others.

The Conference Chairman is Jun'ichiro Mizuki (mizuki@spring8.or.jp), Deputy Director General, Quantum Beam Science Directorate, Japan Atomic Energy Agency (JAEA).
The Vice Chair is Brian Stephenson (stephenson@anl.gov), ANL.

WIRMS 2009

Banff, Alberta, Canada
13-17 September 2009

The 5th International Workshop on Infrared Microscopy and Spectroscopy with Accelerator Based Sources will bring scientists and synchrotron users together to discuss the latest developments and trends, future directions and promising applications. Experts will introduce young researchers and graduate students to this rapidly advancing field.

Abstract submission deadline is 12 June 2009.

More: www.lightsource.ca/wirms2009

MORE INFORMATION

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

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