



Australian Synchrotron Update July 2007

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1. PERFORMANCE SIGNED OFF

The International Machine Advisory Committee has confirmed that the accelerator complex and the first five beamlines have met the Project Performance Acceptance Criteria.

The International Machine Advisory Committee met in May, specifically to review documents and presentations describing the current status of the Australian Synchrotron Project. The objective was to verify that the facility achieved the Project Performance Acceptance Criteria as agreed November 2003. They write:

It is our pleasure to confirm that the Performance Acceptance Criteria have been met for both the accelerator complex and the initial suite of five scientific beam lines.

We congratulate the Delivery Team for an outstanding achievement in delivering the Australian Synchrotron Project on time and within budget. We wish to convey to you our very best wishes for the success of the future Scientific Programme.

Sincerely,

*Dr. Jeff Corbett, Acting Chair, IMAC
Stanford Synchrotron Radiation Laboratory
Stanford, USA*

*Prof. John Boldeman
Department of Industry, Innovation and Regional
Development, Victoria, Australia*

*Prof. Dieter Einfeld
Consortium for the Exploitation of the Synchrotron Light
Laboratory, Barcelona, Spain*

*Prof. Hiroshi Kawata
Photon Factory, KEK, Tsukuba, Japan*

*Dr. Annick Ropert
European Synchrotron Radiation Facility, Grenoble,
France*

2. AWARDS AND HIGHLIGHTS

Design shines for Architecture Awards

The architects for the Australian Synchrotron building and internal design have won the 2007 Property Council of Australia Innovation and Excellence Award for Public Buildings for the Australian Synchrotron. Melbourne firm Architectus received the award at a ceremony held in Sydney recently. There was stiff competition from such buildings as Melbourne's Southern Cross Station, the Queensland Cultural Centre, Parramatta Transport Interchange, the State Library of Victoria redevelopment, and John Curtin School of Medical Research in Canberra.

The circular, 116 metre diameter building called for an inventive design that would help isolate external vibrations, including those from busy nearby roads, and provide a vast, column-free span. During the design process a significant number of highly customised and ingenious solutions were developed.

The building introduces filtered daylight to perimeter offices and laboratories — the first synchrotron to introduce natural light to the experimental floor, greatly appreciated by all users familiar with overseas facilities.

Congratulations to Peter Slifirski, Ruth Wilson and the team at Architectus Melbourne.



Architecture company Architectus wins a national award for innovation and excellence in public buildings with the Australian Synchrotron.

Another accelerator milestone met

The Australian Synchrotron is now running at its target current of 200 mA — well done team on another milestone.

New Zealand Prime Minister visits

New Zealand Prime Minister Helen Clark visited the Australian Synchrotron on 12 June, touring the facility with Minister Brumby and inspecting the magnets built by Buckley Systems in NZ. She met with synchrotron staff from NZ and with eminent NZ scientist Ted Baker, who will be using the protein crystallography beamline for work on antibiotic-resistant TB.



[L to R] New Zealand Prime Minister Helen Clark and Victorian Treasurer and Minister for Innovation John Brumby inspect magnets supplied by New Zealand company Buckley Systems at the Australian Synchrotron.

First drug tests start with Howard Florey

During June the first medical research experiments commenced on the Protein Crystallography Beamline, with selected expert research teams invited to test samples and procedures.

The first users were researchers from Howard Florey and St Vincent's medical research institutes investigating a protein involved in memory loss. This was captured in an ABC national television program, the 7.30 Report, which broadcast an item on 11 June. A copy of the program is currently available at:

<http://www.abc.net.au/7.30/content/2007/s1948049.htm>.

Researchers were Prof Michael Parker (ARC Federation Fellow from SVI), Drs Siew Yeen Chai and Anthony Albiston (HFI), assisted by Dr Julian Adams, Ruth Plathe and Tim Grune (AS).

Farewell Alan Jackson



Australian Synchrotron Project Technical Director Alan Jackson has completed his 4-year task with the team at the Australian Synchrotron and has returned to the USA for a well-deserved holiday. His experience and sense of humour will be missed. Thank you, Alan.



[L to R] Beamline Scientist Julian Adams, New Zealand Prime Minister Helen Clark, Science Director Rob Lamb and Victorian Minister John Brumby inspect data capture at the Protein Crystallography Beamline. New Zealander Prof Ted Baker (obscured) explained his plans to use the beamline for future protein work.

3. NEWS FOR BEAMLINE USERS

First Call for User Proposals

A joint call has been issued for proposals for ASRP and Australian Synchrotron beamtime in the third cycle of 2007, i.e. September–December.

This call is for beamtime on:

Australian Synchrotron

- Infrared Microscopy beamline,
- Powder Diffraction beamline;
- Protein Crystallography I beamline;
- Soft X-ray beamline;
- XAFS beamline.

ASRP

- Australian National Beamline Facility at the Photon Factory, Japan;
- ChemMatCARS beamline at APS, Chicago;
- XOR beamlines on sectors 1, 2, 4 and 20 at APS.

In this first operations cycle of the Australian Synchrotron, proposals will be limited to Australian and New Zealand based researchers.

The deadline for proposals for all beamlines is:

20 July 2007

Online proposal system

Proposals are being accepted using a new online proposal system, so please read the information below carefully. If you have any problems or questions, please email Richard Garrett, Director Australian Synchrotron Research Program, email: garrett@ansto.gov.au and include a description or screen shot of a problem or query if relevant.

Proposals for all the above beamlines must be submitted online to the new synchrotron proposal portal:

<http://prism.nbi.ansto.gov.au/as/proposal/index.jsp>

Notes for Online Registration

Browsers: the online system does not function correctly with Safari (Mac) or Opera (PC). It has been tested and works with Firefox, Mozilla, and Internet Explorer (Version 6). You need Pop-ups and JavaScript enabled.

Opening a user account. The first step in submitting a proposal is creating your user account. To do this, direct your browser to the above URL and you will see a "create new account" link. After creating your account you will receive an email with a link to follow. This link directs you to a page where you set your password and login for the first time. Note the login page is not encrypted. All participants in a proposal need to create accounts in this way.

Once you have logged in, you can proceed to the proposal page where you can create a new proposal, or edit or view any proposal you have worked on previously. You can also see any proposal that someone else has created with you as a participant. There is instruction text on each page, and most input fields have "i" icons next to them which open pop up information windows. Please read them as they tell you what we expect in each field. The basic structure should be familiar to you. There are some known issues with the system; please contact Richard Garrett for details on how to manage them.

Travel Support for AS Experiments: The AS will provide travel and accommodation support for (non-Melbourne) Australian-based user teams. Support will be made available through the AS User Office, with details to be announced shortly.

The five AS beamlines: If you plan to apply for time on the AS beamlines, please make email contact with the relevant beamline scientist. Contact details are at <http://www.synchrotron.vic.gov.au> and also under each beamline on the on-line proposal pages.

Powder diffraction and EXAFS/XANES proposals: Both the AS Powder and XAFS beamlines and the ANBF will offer these capabilities. If you plan to apply for beamtime at the AS this round please select BOTH the ANBF and either the Powder/XAS beamline. Both AS beamlines have recorded test data, and the beamline staff are continuing to commission them. The review committee will monitor the commissioning status of these AS beamlines and route your proposal appropriately.

Enquiries: Richard Garrett, garrett@ansto.gov.au

Beamline Progress

Soft X-ray Beamline

The Soft X-ray Beamline final software installation from FMB was finished on Monday 25 June. We can now scan the monochromator photon energy and record X-ray Absorption Spectra. The monochromator will be baked out ready to recommence commissioning operations in mid-July. The temporary commissioning chamber has successfully taken electron-induced Auger spectra indicating that all the systems on this chamber are still working correctly after its move. Towards the end of July, the Mg and Al fixed energy x-ray sources will be run in this chamber.

A successful Soft X-ray users workshop was organised by the Australian Synchrotron Research Program (ASRP) and the Australian Synchrotron on 26 June. The workshop was

held to familiarise new users of the Soft X-ray user community with the ASRP end-chamber and its capabilities before the end-chamber goes to Taiwan to run experiments on the Soft X-ray beamline in Taiwan. This will be the last experimental run for the ASRP end-chamber in Taiwan and the opportunity was taken to compare the Taiwan beamline with the new Soft X-ray Beamline in Australia.

Bruce Cowie, Soft X-ray Beamline Scientist

Infrared Beamline

Commissioning studies and some preliminary experiments have continued on both microscope and high resolution branches. Researchers from Monash Immunology and Stem Cell Laboratory have been working on the microscope, and expert users from Sydney and Canberra are expected during July and August.

Improved performance has been seen on the microscope following beam injections raised to 200 mA. The Bruker software running the microscope will be upgraded shortly.

Mark Tobin, Infrared Beamline Scientist

X-ray Absorption Spectroscopy Beamline

The XAS Beamline focussing mirror has been installed (pictured below).



The mirror has two cylinders polished along the length of the mirror, having different radii, and are coated in Platinum and Rhodium respectively. The mirror is also bent longitudinally and thus forms a toroidal shape, which is used for both vertical and horizontal focussing of the x-ray beam. The polishing of this mirror was challenging; however the mirror has well exceeded its specifications, and we are very happy with the installation. As this was the last outstanding component of the beamline, full beamline commissioning will begin in July.

Chris Glover, XAS Beamline Scientist

Microspectroscopy Beamline

Assembly and commissioning of the 2-metre in-vacuum undulator for the microspectroscopy beamline are well advanced in Japan by Hitachi Metals (formerly Neomax). Magnet measurements are being done at SPring-8, vacuum bakeout will commence shortly and arrangements for delivery to Australia and installation are being made.

Andy Broadbent, Beamline Integration Manager

Imaging and Therapy Beamline

The multipole wiggler will be installed in the storage ring in August, and wiggler commissioning scheduled until November. The 150-meter long beamline has been approved for construction and architects are preparing concept drawings for the 90-meter beam transfer tunnel and satellite building containing optics and measurement enclosures. The long beamline and satellite building will make possible a world-class program in high resolution phase contrast imaging in material science, biomedicine and medical research. Instrument design and procurement of all optics and beam conditioning equipment for radiotherapy and imaging is in progress.

Daniel Häusermann, Imaging and Therapy Beamline

4. SYNCHROTRON COMMUNITY NEWS

AAS Awards

The Australian Academy of Science is inviting nomination of early-career and career researchers for awards for outstanding research. Nominations close 30 August 2007.

<http://www.science.org.au/awards/index.htm>

Operating funding now \$100m for 5 years

Victorian Treasurer and Minister for Innovation John Brumby announced on 14 June that the Victorian Government will match the Commonwealth's contribution of \$50M towards Australian Synchrotron running costs for the first 5 years of operation.

Minister Brumby and Federal Science Minister Julie Bishop have signed an agreement enabling payment of the Commonwealth's operating funding contribution, and the \$50M payment was received on 28 June.

Victoria-Israel Call for Grant Proposals

VISTECH, the Victoria-Israel Science and Technology R&D Fund, provides grants to Victorian and Israeli partner companies to support jointly approved science and technology research and development (R&D) projects with a commercial focus. The program welcomes applications from companies across the biotech, nano, water, environment and ICT sectors as well as the advanced manufacturing sector **and synchrotron technologies**.

The Call for Applications for Round Four of the Fund is now open until 16 August.

Victorian companies can apply for matched funding up to a maximum of US\$500,000 for 50% of the joint R&D costs of a project in which they partner an Israeli company.

VISTECH already has active projects in drug development, medical devices, health management and agricultural technology.

Israel, like Victoria, has a sophisticated research base and there are several reasons why a Victorian company might consider partnering with an Israeli company if they are active in R&D:

- Israel's investment in R&D, at ~ 3% of GDP, has consistently been among the highest in the world.

- Israel continues to be a strong source of innovation and has established itself as one of the most important centres of mixed business entrepreneurship and advanced technology R&D outside the United States - consciously targeting international links with other countries and regions with common economic interests.
- There are more than 3000 high-tech companies and 1500 start-ups active in Israel, with over 80 venture capital funds managing about \$US4 billion dedicated to innovative technology investments.

Further information can be found at www.business.vic.gov.au/vistech or email: roland.diggens@iird.vic.gov.au.

5. FORTHCOMING EVENTS

AUSTRALIAN EVENTS

East Coast Protein Meeting 2007

12–14 July 2007

Novotel Opal Cove Resort, Coffs Harbour, NSW

The East Coast Protein Meeting is a biannual conference held jointly by the Queensland and Sydney Protein Groups of the Australian Society for Biochemistry and Molecular Biology (ASBMB). Session themes are likely to include: proteomics, structural analysis, interactions, emerging techniques, receptors and signalling.

Contact: Brett Collins, Ph 07 33462062

Email: b.collins@imb.uq.edu.au

International Conferences on General Relativity and Gravitational Waves— including 2 Public Lectures, 7pm

8–13/14 July 2007, Sydney Convention & Exhibition Centre

Tuesday 10 July: Prof. Kip Thorne, Theoretical Physics, CIT, "The Warped Side of the Universe: Big Bang to Black Holes"

Friday 13 July: Sir Roger Penrose, Mathematics, Oxford "What Happened Before the Big Bang? A Novel Answer"

Tickets \$30 (\$20 students)

www.grg18.com to register and for more information.

2007 Alfred Deakin Innovation Lectures: *Big ideas. Brilliant Minds*

Big Machines for Big Questions: the Australian Synchrotron and beyond

Friday 20 July, 6pm to 7.30pm

BMW Edge, Federation Square, Cnr Flinders and Swanston Streets, Melbourne

A panel of scientists will explore the big questions raised—and answered—by big machines.

Speakers:

Cathy Foley, President Australian Institute of Physics
Rachel Webster, University of Melbourne astrophysicist and Chairman-elect of the National Committee for Astronomy
Rob Lamb, Science Director, Australian Synchrotron

Free Entry — No Bookings — General Admission

The 2007 Alfred Deakin Innovation Lectures are presented by the Victorian Government's Innovation Economy Advisory Board. Supported by Melbourne Conversations, the City of Melbourne's free public talks program, the University of Melbourne, the State Library of Victoria and Future Leaders.

For details visit www.diird.vic.gov.au/deakinlectures

12th International COMS Conference 2007

2–6 September 2007, Melbourne, Vic

Conference on the Commercialisation of Micro and Nano Systems, bringing together world leaders within the field and showcases Australia's dynamic nanotechnology community, facilities and partnering opportunities.

<http://www.mancef-coms2007.org>

Email: mancefcoms2007aust@iird.vic.gov.au

EPSM-ABEC 2007 Conference

14–18 October 2007

Fremantle Esplanade Hotel Convention Centre, Western Australia

Engineering and Physical Sciences in Medicine and the Australian Biomedical Engineering Conference

<http://www.epsm.org.au>

4th International and 7th Australian Peptide Conference/2nd Asia–Pacific Peptide Symposium

21–25 October 2007, Cairns Convention Centre, Queensland

Discovery to Drugs: The Peptide Pipeline

Over 20 invited Australian and International speakers

Covers peptide chemistry and biology, with special emphasis on emerging technologies such as proteomics, biosensors, bioinformatics, fluorescent technologies, identification of new biomarkers, and novel applications of established techniques.

Four satellite symposia:

Chemical Protein Synthesis; Modern Solid Phase Peptide Synthesis; Protein Misfolding; Peptidomics

Registration and abstract forms now open.

Early bird registration and abstracts close: **7 July**

Student bursaries available

<http://www.peptideoz.org>

Contact: mibel.aguilar@med.monash.edu.au or Mike

Pickford: mp@asnevents.net.au

Australian Synchrotron User Workshop 2007

12–14 December 2007

Monash University, Melbourne, Victoria

Plan your contribution and participation now!

INTERNATIONAL EVENTS

For additional information and listings, see:

<http://www.lightsources.org/cms/?pid=1000068>

VUV 15TH International Conference on Vacuum Ultraviolet Radiation Physics

July 29 – August 3, 2007, Konzerthaus Berlin, Germany

<http://www.bessy.de/VUVXV>

International Conference on Magnetic Materials (ICMM–2007)

11–16 December 2007

Saha Institute of Nuclear Physics, Kolkata ('Calcutta'), India

The International Conference on Magnetic Materials is intended to provide a forum for presentation and discussion in the recent developments in magnetic materials. The presentations will cover both materials (magnetic thin films, nanoparticles, spin glasses, amorphous nanocrystalline and granular materials, intermetallics, magnetic semiconductors, etc) and methods (magnetization, scattering techniques, including light, neutron and x-ray), resonance, high magnetic fields, and magneto-optic effects).

Registration deadline: 30 August

<http://www.saha.ac.in/cmp/icmm.2007/>

Email: icmm.2007@saha.ac.in

8th World Biomaterials Congress—2008

28 May–1 June 2008, Amsterdam, The Netherlands

<http://www.wbc2008.com/>

Crossing Frontiers in Biomaterials and Regenerative Medicine

Deadline for abstract submission is 30 September 2007.

The Call for Abstracts and Registration is now online at:

http://www.wbc2008.com/wbc2008/Prelim_Announcement/Call_for_Abst_racts.pdf

IUMRS-ICEM 2008: Synchrotron Radiation (Symposium J)

International Conference on Electronic Materials

28 July – 1 August 2008

Hilton Sydney, Sydney, Australia

Precise and potentially non-destructive characterisation of bulk-, micro- and nanostructures is critical for the design and manufacture of contemporary electronic materials. Advances in various x-ray diffraction, absorption and microscopy techniques enable insight into the structure and dynamic behaviour of such materials. Furthermore, recent rapid development of the methods and techniques utilising synchrotron radiation has opened new possibilities for direct and diffractive imaging and in-situ studies of materials at the nanometre scale.

Collaborations between the physical and material sciences have created new methods of imaging of modern materials and nanostructures using conventional and synchrotron x-rays. We hope to bring together scientists of all disciplines who use x-rays to solve their scientific problems, allowing participants to gain a new understanding of, and appreciation for, the role that advanced synchrotron techniques can play in their research.

- 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>

RECENT SYNCHROTRON-BASED RESEARCH ANNOUNCEMENTS

New compound fights fungal infections

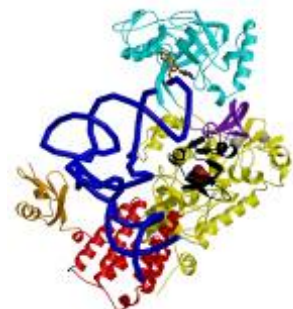
Researchers unravel how a powerful new compound kills fungi by blocking protein synthesis

Palo Alto/Grenoble, 22 June 2007: A new mechanism to attack hard-to-treat fungal infections has been revealed by scientists from the biotech company Anacor Pharmaceuticals Inc., California, and the European Molecular Biology Laboratory outstation in Grenoble, France. In the current issue of *Science* they describe how a new compound kills fungal pathogens by blocking an enzyme crucial for their protein synthesis.

The human body is home to many different kinds of fungi. While the majority normally do not harm us, some fungi can cause unpleasant infections of skin, nails or lungs.

"We have discovered a new compound that has the potential to treat common chronic nail infections caused by fungi," says Dickon Alley, researcher at Anacor Pharmaceuticals. "The compound, called AN2690, kills fungi by blocking their ability to make proteins. It has been very successful in clinical trials."

AN2690 interferes with an enzyme called leucyl-tRNA synthetase, which is involved in translation, one of the last steps in the process of turning a gene's DNA code into a protein. The process begins when the cell makes an RNA version of the gene's code, called messenger RNA. Ribosomes, the cell's protein synthesis



machinery, then translate the messenger RNA into protein by stitching together the amino acids in the order specified by the message. This requires the help of molecules called tRNAs, which link the code of the messenger RNA to the correct amino acid.

Leucyl-tRNA synthetase is one of a group of enzymes called

aminoacyl-tRNA synthetases that attach the correct amino acid to each tRNA. Some of these enzymes have two main functional parts, or active sites: a site that links the amino acid to the tRNA, and a separate editing site that proofreads this process and removes wrongly added amino acids.

To find out how exactly AN2690 blocks leucyl-tRNA synthetase Stephen Cusack, Head of EMBL Grenoble, and his team generated crystals of the enzyme bound to tRNA in the presence of AN2690. Examining them with the high-intensity synchrotron x-ray source at the European Synchrotron Radiation Facility (ESRF) in Grenoble, France, Cusack and his colleagues found that AN2690 sticks in the editing site of the enzyme where it makes a very strong bond to the end of the tRNA, trapping it on the enzyme. This stops the enzyme working and thus blocks protein synthesis, killing the fungal cell. The mechanism crucially depends on a boron atom that is part of AN2690, which is needed to link the compound to the tRNA. It is the first time that scientists describe such a mechanism, suggesting boron-containing compounds as a promising new class of drug candidates.

"We are now working towards finding related antibacterial compounds that could help counter the problem of antibiotic resistance," concludes Cusack.

Source Article: F.L. Rock, S. Cusack, M.R.K. Alley et al. An Antifungal Agent Inhibits an Aminoacyl-tRNA Synthetase by Trapping tRNA in the Editing Site, *Science*, 22 June 2007

The original Press Release can be found at:

<http://www.embl.org/aboutus/news/press/2007/22jun07/>

Published in *Science*, 22 June 2007: Vol. 316. no. 5832, pp. 1759–1761, DOI: 10.1126/science.1142189; Fernando L. Rock, Weimin Mao, Anya Yaremchuk, Mikhail Tukalo, Thibaut Crepin, Huchen Zhou, Yong-Kang Zhang, Vincent Hernandez, Tsutomu Akama, Stephen J. Baker, Jacob J. Plattner, Lucy Shapiro, Susan A. Martinis, Stephen J. Benkovic, Stephen Cusack, M. R. K. Alley; "An Antifungal Agent Inhibits an Aminoacyl-tRNA Synthetase by Trapping tRNA in the Editing Site".

Crystals were measured at the European Synchrotron Radiation Facility (ESRF) beamline ID14-4.

Link: <http://www.lightsources.org/cms/?pid=1002199>

Bacteria clean up mine waste

Here's a pollution-control tip from nature—deep inside a flooded mine in Wisconsin, scientists have discovered a world in which bacteria emit proteins that sweep up metal nanoparticles into immobile clumps. Their finding may lead to innovative ways to remediate subsurface metal toxins.

BERKELEY, CA: Research reported in the 15 June 2007 issue of the journal *Science* reveals that the proteins travel far from the microbes that produce them, and then amass metal nanoparticles into piles that are too large to be swept away by underground currents. Precisely how and why the bacteria undertake this bit of housecleaning remains a mystery, but it suggests that proteins could play a key role in bioremediation strategies designed to trap harmful metals such as arsenic, lead, uranium, and plutonium.

"We have found, in the environment, that cells release proteins and polypeptides that promote the aggregation of nanoparticulate metals," says John Moreau, lead author of the study, which was directed by Australian geochemist at Lawrence Berkeley Laboratory Jill Banfield. "The intriguing discovery that biomolecules may shape nanoparticles into larger aggregates, which reduces the nanoparticles' mobility, could have significant implications for bioremediation," Moreau says.

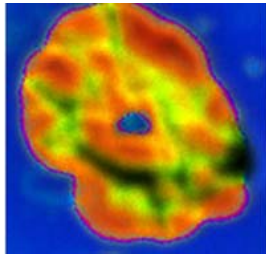
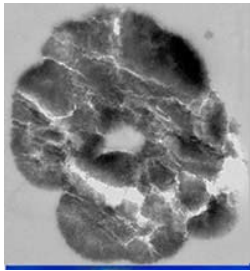
The research team analysed a biofilm rich in zinc sulphide that was collected from a water-filled mine. The sulphide is a metabolic waste product of bacteria that thrive in the oxygen-free mine. Once the sulphide is released into the watery environment, it readily combines with metals, in this case zinc, to form nano-sized biominerals that measure about one-billionth of a metre in diameter.

Why do the nanoparticles group together? Something so small should disperse throughout the mine. Instead, the metal nanoparticles form blobs that measure several microns in diameter. And these larger blobs anchor the nanoparticles in place. Stopping nanoparticles in their tracks, as this process does, could become a critical component of a bioremediation strategy, if only scientists understand how it works.

To explore this question, the team turned to the Advanced Light Source, a California-based synchrotron. Using Fourier-transform

infrared spectroscopy, the team analysed the zinc sulphide aggregates and detected the characteristic signal of proteins.

To their surprise, they found proteins and polypeptides embedded within the zinc sulphide nanoparticles. Specifically, the nanoparticles were arranged like tree rings, and the proteins coated the particles' surfaces and filled the gaps between them.



A clean-up lesson pulled from the depths of a mine. TEM (left) and NanoSIMS

(right) images of biogenic zinc-sulphide

aggregates. Red, green and blue areas represent regions of sulphur, nitrogen and carbon, respectively. Orange and yellow areas show the intimate association of both sulphur and nitrogen. NanoSIMS and synchrotron-based infrared spectroscopy were used to determine the organic origin of nitrogen in proteins and polypeptides. (Courtesy: Lawrence Berkeley National Laboratory)

"We found that the mineral aggregates, which are produced as a consequence of microbial activity, actually contain a lot of protein," says Banfield. "This is very interesting because biomineralisation has traditionally been thought of as a phenomenon that occurs within a cell, or in contact with it. But in this case, we see an intimate association of proteins and minerals that takes place as far as hundreds of microns away from the cell."

In other words, in addition to pumping nano-sized sulphide waste particles into the environment, bacteria also pump proteins into the environment. These proteins then sweep the sulphide nanoparticles out of solution into a ball. The process stops the spread of metal nanoparticles in natural environments, which is reason enough to explore it further.

Their discovery could also refine the search for the earliest indications of life on Earth, as well as help determine whether planets like Mars once harboured life.

A portion of the research was done at the Advanced Light Source (Lawrence Berkeley National Laboratory), beamline 1.4.3.

More information about Jill Banfield and her research at <http://eps.berkeley.edu/~jill/>

Published in *Science*, 15 June 2007: Vol. 316. no. 5831, pp. 1600–1603, DOI: 10.1126/science.1141064; John W. Moreau, Peter K. Weber, Michael C. Martin, Benjamin Gilbert, Ian D. Hutcheon, and Jillian F. Banfield; "Extracellular Proteins Limit the Dispersal of Biogenic Nanoparticles".

Source: <http://www.lightsources.org/cms/?pid=1002180>

MORE INFORMATION

A list of Australian Synchrotron Project personnel can be found at http://www.synchrotron.vic.gov.au/content.asp?Document_ID=129.

Email: contact.us@synchrotron.vic.gov.au

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International +61 3 8540 4100

[Please note that the facility is not open to the public]

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Within Australia, 03 9655 3315

International: +61 3 9655 3315

HOW TO UNSUBSCRIBE

TO UNSUBSCRIBE

Send an email with UNSUBSCRIBE Synchrotron in the Subject line to contact.us@synchrotron.vic.gov.au