



In Coherence

Autumn 2009

Newsletter for ARC Centre of Excellence for Coherent X-Ray Science

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CXS Awarded for Excellence!



Penny Bambrick of the ARC; Professor David Jamieson of the School of Physics; and Joanne Kuluveovski from the Melbourne School of Engineering, attend the joint CXS/Free Radical Centre Renewal Celebration

The Australian Research Council (ARC) has awarded CXS a further \$7.7M to continue its research until the end of 2013.

On the 16th February 2009 the ARC Chief Executive Officer, Professor Margaret Sheil, announced CXS as one of 11 Centres of Excellence from the 2005 round that will be awarded additional funding, enabling us to continue our research for a further three and a half years.

The ARC Review Panel stated that they were pleased with the Centre's progress to date particularly in the recruitment of an excellent team of researchers and students, the development of a strong interdisciplinary research effort combining ideas from physics, chemistry and biology in innovative directions, and the cooperative and highly effective management.

To celebrate this milestone, on the 22nd of April, CXS joined forces with the Centre of Excellence for Free Radical Chemistry and Biotechnology at the Woodward Conference Centre, University of Melbourne.

Guests at the celebration were entertained with a stunning performance from the Northcote High School Instrumental Music group, whose 15 piece ensemble played throughout the evening.

The University of Melbourne's Deputy Vice Chancellor (Research), Professor Peter Rathjen, commenced the speeches by congratulating both Centres on their success. CXS Director, Professor Keith Nugent and Free Radical Director, Professor Carl Schiesser, also spoke of the journey of their centres and thanked members for their contribution.

CXS SATELLITE WORKSHOP

Developments in Coherent X-ray

Methods

October 2 - 4, 2009

University of Melbourne

For more information and to register for this free workshop please go to:

www.coecxs.org

2008 CXS ANNUAL REPORT

For a copy please email:

cxsenquiries@ph.unimelb.edu.au

NATIONAL SCIENCE WEEK

The Science of Chocolate

Sunday August 16, 2009

Queen Victoria Market

Melbourne

In Brief

Publications:

Publications for the previous quarter include:

Dilanian RA, Chen B, Teichmann S, Dao LV, Quiney HM, Nugent KA, "High-harmonic-generation spectrum reconstruction from Young's double-slits interference pattern using the maximum entropy method." *Optics Letters*, 33, 2341-2343 (2008)

Hanssen E, Goldie K, Tilley L, "Electron Microscopy of Plasmodium falciparum-infected erythrocytes." *Methods in Cell Biology*, Invited Book Chapter. (2009)

Arhatari BD, Hannah K, Kappen P, Peele AG, Nugent KA, Williams GJ, Yin GC, Chen YM, Chen JH, Song YF, "A Coherence Approach to Phase-Contrast Microscopy II: Experiment." *Ultramicroscopy*, 109, 280-286 (2009)

Chen B, Dilanian RA, Teichmann S, Abbey B, Peele AG, Williams GJ, Hannaford P, Dao LV, Quiney HM, Nugent KA, "Multiple wavelength diffractive imaging." *Physical Rev A*, 79, 023809 (2009)

Lazarou M, Thorburn DR, Ryan MT, McKenzie M, "Assembly of mitochondrial complex I and defects in disease." *BAA - Molecular Cell Research*, (review) 1793, 78-88 (2009)

Baker MJ, Web CT, Stroud DA, Palmer CS, Frazier AE, Guiard B, Chacinska A, Gulbis JM, Ryan MT, "Structural and functional requirements for activity of the Tim9-Tim 10 complex in mitochondrial protein import." *Mol. Biol. Cell* 20, 769-779 (2009)

Vine DJ, et al. "Deterministic retrieval of complex Green's function using hard X-rays." *Physical Review Letters*, 102 043901 (2009)

Abbey B, Williams GJ, Pfeifer M, Clark C, Putkunz C, Torrance A, McNulty I, Levin TM, Peele AG and Nugent KA, "Quantitative Coherence diffractive imaging of an integrated circuit at a Spatial resolution of 20 nm." *Applied Physical Letters*, 93, 214101 (2008)

CXS Visitors:

Ms Esther Pachlatko, Swiss Tropical Institute, Basel, visited the Biological Science team at La Trobe University for eight weeks in February 2009.

Fu Rong Chen visited the Experimental Methods team at the University of Melbourne in February 2009.

Dr Ryuzi Katoh of the National Institute of Advanced Industrial Science and Technology visited the Short Wavelength Laser Source team at Swinburne University of Technology in January 2009.

Conferences & Workshops:

Dr Quiney was an invited speaker at DESY in Hamburg Germany, delivering the talk titled, "Interaction of Intense coherent radiation with atoms and molecules: relativistic formulation," October 2008.

He also presented the talk, "Wavefield phase retrieval in imaging and spectroscopic applications" at the Atomic and Laser Physics Seminar, Griffith University in January 2009.

Professor Leann Tilley presented the talk, "Electron and X-ray tomography of malaria parasite-infected erythrocytes" at the Asia-Pacific Congress on Electron Tomography in January 2009.

Associate Professor Andrew Peele was an invited speaker on "Advances in Coherent Diffractive Imaging" at the 1st Workshop on FEL Science, Jeju, Korea in February 2009.

Mac Luu presented a talk on "Multi-wavelength elemental contrast phase imaging" at the Australian Institute of Physics Congress, Adelaide in December 2008.

Professor Rob Lewis was an invited speaker at the Australia and New Zealand Medical Physics Meeting: EPSM ABEC in Christchurch, New Zealand during November 2008.

Presentations were made at the 18th AIP National Congress, Adelaide, December 2008 by the following CXS members: Jeffrey Davis, Lap Van Dao, Peter Hannaford, Keith Nugent, Harry Quiney and Trevor Smith.

Education:

3rd year students, Megan Huyggard and Megan Dearnley undertook a three week summer scholarship in the Biological Science Program at La Trobe University, testing antibodies and other reagents.

Masters student, Abhishek Awasthi, undertook a two month summer scholarship in the Biological Science Program at La Trobe University and has commenced a masters research project with Dr Eric Hanssen.

Evelyn Cannon undertook a PhD scholarship as part of the Short Wavelength Laser Source Program at Swinburne University of Technology.

Welcoming New Members:

CXS would like to welcome our latest members:

Dr Diana Stojanovski, Biological Sciences Program, La Trobe University.

Chandni Doshi, PhD student, Experimental Methods Program, La Trobe University.

Thanh Pham, PhD student, Experimental Methods Program, La Trobe University.

Dr Liisa Hirvonen, Short Wavelength Laser Source Program, Swinburne University of Technology.

Evelyn Cannon, PhD student, Short Wavelength Laser Source Program, Swinburne University of Technology.

Andrew McCulloch, PhD student, Ultra Cold Plasma Source Program, University of Melbourne.

On the Move:

The Detector and Beamline Development team at Monash University have moved into their new building, previously known as T8, located next door to the Australian Synchrotron, Blackburn Rd, Clayton.

Congratulations:

CXS would like to congratulate Michael Baker for winning the poster prize at the Lorne Conference for Protein Structure and Function, February 2009.

St Catherine's School meets CXS - Science Students @ Work

Six Year 10 students from St Catherine's School in Northcote were chosen to take part in the AKORN Science Students @ Work program hosted by CXS.

This AKORN Educational Services program provided the students with the opportunity to engage meaningfully in a scientific workplace by investigating relevant issues and providing structured and focused recommendations in line with a brief they were provided by CXS.

Emma Clark, Luciana Darling, Georgina Edwards, Amelia Hamer, Sharon Lee and Natalie Ng spent a week with CXS in April researching their program brief: Finding the Cure for Malaria.

The students visited the CXS offices at the University of Melbourne, the La Trobe University Malaria Lab, the Femtosecond Laser Facility at Swinburne University of Technology, the Crystallisation Lab and X-ray Facility at CSIRO and toured the Australian Synchrotron.

Working as a consultancy team engaged to write an article on CXS work, the students chose to direct their work to the general public.

On the final day of the program the students presented their findings and recommendations to CXS members, representatives of St Catherine's School and the University of Melbourne, and members of their own families.

Not only did the students explain malaria, the work of CXS, the synchrotron and methods of diffraction and producing an image; they also distributed their article, fielded questions from the audience and presented the CXS team with a 30 page document on their research.

CXS Chief Operating Officer, Ms Tania Smith said, "I'm really impressed by the girls ability to get their minds around such a multifaceted and complex subject matter in such a short amount of time. These students have really demonstrated how well they can work as a team and manage a project of this size successfully. They did a great job!"

At the conclusion of the presentation AKORN Educational Services Director, Georgene Bridgeman, presented a plaque to CXS in recognition of its participation in the Program. "The Centre can see the benefits this program provides to students and CXS. We will definitely be hosting another program soon." Ms Smith said, "We will also be using the material the students developed as part of the Centre's educational resources to secondary schools and intend to publish the document the students developed in hard copy and on our web site, as the students managed to convey all the information in an easily accessible language, which is great for anyone wanting to know more on the subject."



St Catherine's School students from left:

Sharon Lee, Luciana Darling, Emma Clark, Georgina Edwards,
Amelia Hamer, Natalie Ng



AKORN Director, Georgene Bridgeman congratulates the
St Catherine's School students after their presentation.

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The ARC Centre of Excellence for Coherent X-ray Science (CXS) is an Australian Government Initiative which began in July 2005 to explore what can be achieved with coherent X-ray optics; including an understanding of exotic phenomena such as X-ray phase discontinuities.

CXS headquarters is located at the University of Melbourne in Victoria, Australia, with participating nodes at La Trobe University, Monash University, Swinburne University of Technology and the CSIRO. Its mission is to be the world leader in the development of non-crystallographic techniques for the determination of protein structures.

"In Coherence" is produced quarterly by CXS. Contributions are welcome and should be forwarded to Ms. Tania Smith, CXS Chief Operating Officer, University of Melbourne Vic 3010, fax to +61 3 9347 8912, email: cxsenquiries@ph.unimelb.edu.au or Ms. Rosslyn Ball, Administration, email: r.ball@ph.unimelb.edu.au

This work was produced with the assistance of the Australian Research Council under the ARC Centre of Excellence Program.

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Talking Backwards: Physicists and Biologists Explain Each Others Fields

Tania Smith describes the success of the Talking Backwards Workshop.

On Monday the 18th of May 2009 members of CXS converged on the Institute for Advanced Studies at La Trobe University to listen to physicists talk about biology and biologists talk about physics.

The idea behind the workshop was for CXS biologists to work with CXS physicists to illuminate some important biology concepts, and then the physicists would in turn explain what they learned to a workshop audience from a physicist's perspective. Similarly the CXS physicists worked with the CXS biologists who then attempted to explain physics concepts to a general audience. No mean feat!

The first to take on the challenge was David Vine from the Experimental Methods Program. David visited the Biological Sciences Program and presented what he learned from his visit with a talk titled "*Understanding Protein Structures*".

Next up was Jeff Yeoman from the Biological Sciences Program who met with the CSIRO Structure Determination Methods Program. Jeff presented a talk on "*Solving X-ray Crystal Structures*".

Jenny Carmichael, also from the Biological Sciences Program met with the Experimental Methods Program to learn about her talk topic, "*X-ray Sources and Interactions of X-rays with Matter*".

The final talk for the day was presented by Mark Pfeifer from the Experimental Methods Program who spoke on "*Culturing and Understanding Cells*" after visiting the Biological Sciences team.



Guests at the Talking Backwards Workshop cut a cake to celebrate the CXS grant extension

The speakers were each allocated an expert to chair their talk and to conduct the question and answer session after their presentation.

With close to 100 members in attendance, this highly successful workshop generated a lot of conversation among the teams.

At the conclusion of the workshop all members enjoyed lunch and Professor Leann Tilley cut the specially prepared "CXS" cake to celebrate the Centre's grant extension by the Australian Research Council.