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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, Griffith University 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 (or thereabouts) by CXS. Contributions are welcome and should be forwarded to Ms. Tania Smith, CXS Chief Operating Officer, University of Melbourne, Parkville, 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

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A Merging of Minds

Given the wealth of international expertise that was in hand at the CXS Annual Workshop, it was decided that this would be an opportune time to discuss forward planning for a future Centre of Excellence. On Thursday 13 October, a roundtable meeting was held in the Yasuko Hiraoka Myer Room in the Sidney Myer Asia Centre to explore possible themes for future research and to assess past successes and failings of CXS as a guide to the future.

Director, Keith Nugent, provided an overview of CXS, detailing its outputs and the successes of its personnel. Each group leader presented their vision of the future, constrained only by the requirement that another Centre should continue to involve physicists and biologists working together. The floor was then opened and an enthusiastic debate ensued. Several themes could be identified as gaining the support of those present. These included x-ray microscopy of cellular structures and the continued development of coherent electron sources from ultra cold atoms.

Broadly it was clear that enthusiasm continues to exist for a Centre in which research in Physics and Biology is combined in an interdisciplinary format.



Collaborative discussion on the our future



In Coherence

Spring 2011

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

Wow! What a Workshop!

CXS sponsored the 4th Japanese XFEL Workshop at Palm Cove, Queensland from 28 August – 2 September 2011. The workshop showcased the close ties between CXS and the newly commissioned SACLA in Japan. We also had the privilege of witnessing the signing of a Memoranda of Understanding between the Australian Nuclear Science and Technology Organisation and RIKEN SPring-8 Center, Japan.

Peppers Beach Club Spa and Resort, 25 minutes north of tropical Cairns, was an ideal venue for the workshop, allowing delegates to take in the talks as well as the sun-soaked social activities with its warm day and cool nights. Some delegates even managed to find time for a nocturnal sea dip.

It was a perfect blend of fun and hard work where everyone made a contribution; whether it be planning, talking, overseeing or facilitating.



Workshop Delegates,
Palm Cove, Queensland

The multitude of overseas visitors far outweighed those from Australia, so in an effort to show our visitors what a great place Australia is, the talks and meetings of the workshop were peppered with a few Queensland treats; the Kuranda Scenic Railway trip, the Cairns Tropical Zoo visit at night and a morning investigating Green Island and the Great Barrier Reef. The three excursions were described as fabulous but the view of the breaching humpback whale on our way to Green Island, was described as simply awesome.

The successful workshop has paved the way for future collaboration between CXS and SACLA and has further enhanced the growing relationship between the two organisations.

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Coming Events

Professor Martin Chalfie

30th November 2011

University of Melbourne

CXS is a co-sponsor of a visit to the University of Melbourne of the 2008 Nobel Prize Winner in Chemistry, Professor Martin Chalfie from Columbia University.

CXS End of Year Review and

Christmas BBQ

December 1, 2011

University of Melbourne

School of Physics

Hercus Theatre

Come and recap on the year, plan for 2012 and have a great lunch!

In Brief

Publications:

Publications for the second half of 2011 include:

Abbey, B., Lachlan, W., Quiney, HM., Vine, DJ., Cadenazzi, GA., Henderson, CA., Nugent, KA., Balaur, E., Putkunz, CT., Peele, AG., Williams, GJ., and McNulty, I. "Lensless imaging using broadband X-ray sources." *Nature Photonics*, 5, 420-424 (2011)

McGuinness, LP., Yan, Y., Stacey, A., Simpson, DA., Hall, LT., Maclaurin, D., Praver, SD., Mulvaney, P., Wrachtrup, J., Caruso, F., Scholten, RE., and Hollenberg, LCL., "Quantum measurement and tracking of fluorescent nanodiamonds inside living cells." *Nature Nanotechnology*, 6, 358-363 (2011)

Dinh, KB., Hannaford, P., Dao, LV., "Phase-matched high harmonic generation for the study of rational coherence molecular dynamics." *Optics Communication* 14, 3607-3611(2011)

Wood, BR., Bailo, E., Khiavi, MA., tilley, L., Deed, S., Deckert-Gaudig, T., McNaughton, D., Deckert, V., "Tip Enhanced Raman Scattering (TERS) from hemozoin crystals within a sectioned erythrocyte." *Nano Letters*, 11 (50:1868-73 (2011)

Pullen, MG., Wallace, WC., Laban, DE., Palmer, AJ., Hanne, GF., Grum-Grzhimailo, AN., Abeln, B., Bartschat, K., Weflen, D., Ivanov, I., Kheifets, A., Quiney, HM., Litvinyuk, IV., Sang, RT., and Kielinski, D., "Experimental ionization of atomic hydrogen with few-cycle pulses." *Optical Letters*, 36, 3660 (2011)

CXS Visitors:

Jun Ye visited the Attosecond Sciences Program at Griffith University in August.

Associate Professor Stephen Hladky, University of Cambridge, United Kingdom, visited the Biological Sciences Program at La Trobe University.

Associate Professor Cather Simpson, University of Auckland, New Zealand, visited the Short Wavelength Laser Source Program at Swinburne University of Technology.

Conferences & Workshops:

Associate Professor Robert Scholten presented "Arbitrarily-shaped high-coherence electron bunches from cold atoms," at the American Physical Society Division of Atomic Molecular and Optical Physics, Atlanta, USA in June 2011.

Dr Victor Streltsov presented "Structural studies of Amyloid-B oligomerization and metal binding in Alzheimer's disease," at IUCrXXII Congress in Madrid Spain, August 2011.

Dr Grant van Reissen presented the talk, "Coherent X-ray Diffraction," at the La Trobe - NUS Workshop on Synchrotron and Nanoscale Science at the National University of Singapore, June 2011.

Associate Professor Harry Quiney gave the talk, "Partial coherence in diffractive imaging applications," at SACLA XFEL/SPRING-8, Japan, September 2011.

Dr Trevor Smith presented, "Ultrafast Emission-Based Measurements of the Excited-State Lifetime of Low Quantum Yield Chromophores," at XXV International Conference on Photochemistry, Beijing, China, August 2011.

Professor Mike Ryan was an invited speaker, "Biochemistry for tomorrow's Medicine," at the 36th Federation of European Biochemical Society Congress in Torino, Italy, June 2011.

Professor David Kielinski presented "Attosecond Science in Australia," at the inaugural workshop of the Max Planck Centre for Attosecond Science in Asia, POSTECH, Pohang, Korea, July 2011.

Media:

Biological Science at La Trobe featured in the article, *Malaria breakthrough shines light on drug resistance*, in *The Conversation*, June 27, 2011.

The Biological Sciences Program at La Trobe were interviewed for Millions Against Malaria Foundation Documentary about a journey by Ken Evers and Tim Pryse around the world in a GA8-TC Airvan to raise money for the fight against malaria. Documentary released September 2011.

Farewell to Members:

Lachlan McKimmie has taken a position at Coherent Scientific.

Nadia Davidson has taken on a role at the Bioinformatics Centre at the Murdoch Children's Research Institute.

Welcoming New Members:

CXS would like to welcome the following new members:

Biological Science Program:

- Stephen Batinovic, PhD
- Maria Crespo, Research

Experimental Methods Program:

- Giang Tran-Nhan, PhD

Short Wavelength Laser Source Program:

- Chris Hall, Research

Outreach:

The Short Wavelength Laser Source Program has mentored the 3rd year chemistry research project students at Swinburne University.

A number of CXS members attended the Growing Tall Poppies Alumnae Meeting at Santa Maria College in September 2011.

CXS has continued its sponsorship of the KOALA Conference in 2011.

Alex Maier visited Coburg Primary School to present a talk to students on flies.

Griffith University's conducted lab tours of the Quantum Dynamics Lab, August 2011.

Awards:

Congratulations to the following members:

Megan Dearnley was awarded the following awards in 2011:

- CXS Top-Up Scholarship 2011
- Caswell Grave Scholarship
- Network Researcher Exchange Training and Travel Scholarship
- Anders Travel Award
- Bruce Stone Travel Award.

Alex Maier was nominated as a finalist for the 2011 Eureka People's Choice Award.

6th Annual Workshop for CXS Hits the Mark Again

CXS annual workshops keep on getting better at attracting physicists and biologists from the world of science at the 6th Annual Workshop was no exception.

Harry Quiney opened the three-day workshop, which was held from Monday 10 October to Wednesday 12 October 2011 at the Bio21 Institute in Parkville.

The workshop incorporated four popular themes - X-ray Imaging, Super-Resolution Optical Microscopy, XFELS and Short Wavelength Lasers and Electron Diffraction and Imaging.

Speakers from all over the world attended the event, including

- Jom Luiten, Netherlands
- Tatiana Latychevskaia, Switzerland
- Peter Carlton, Japan
- Bonnie Wallace, UK
- Markus Sauer, Germany
- Christian Soeller, New Zealand
- John Spence, USA
- Abbas Ourmazd, USA
- Peter Kner, USA
- Carolyn Larabell, USA
- Jabez McClelland, USA
- Garth Williams, USA
- Rick Millane, New Zealand

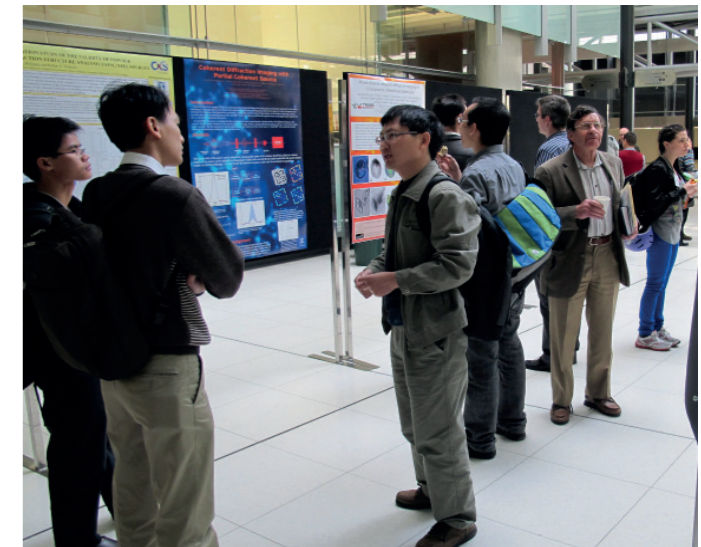
National speakers included:

- Corey Putkunz
- Harry Quiney
- Terry Mulhem
- Victor Streltsov
- Brian Abbey
- Eric Hanssen
- Martin de Jonge
- Benedicta Arhatari
- Lloyd Hollenberg
- Lynne Turnbull
- Kat Gaus
- Leann Tilley
- Trevor Smith
- Jeffery Davis
- David Sampson
- Geoffrey Kong

It was great to see familiar faces again. Steve Lane, NSF Centre for Biophotonic, Science & Technology, UC Davis, USA and Bonnie Wallace, Birkbeck College, UK, two of CXS' Advisory Committee members, also presented.

Delegates were given the opportunity to tour of the Bio21 laboratories and research areas on Monday and a tour of the Australian Synchrotron. Both of these tours were well attended.

A poster presentation and trade display was held on Tuesday afternoon.



6th Annual Workshop Poster Presentation



Workshop guests enjoy dinner at University House
University of Melbourne