



# In Coherence

Winter/Spring 2009

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

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## LIGHT IN LIFE SCIENCES

### CONFERENCE

November 24 - 27, 2009

Sebel Albert Park Hotel

Melbourne, Australia

For more information and to register please go to: [www.physics.mq.edu.au/research/fluoronet/LILS09/](http://www.physics.mq.edu.au/research/fluoronet/LILS09/)

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## Growing Tall Poppies wins Schools First State Award!

Santa Maria College Northcote, in collaboration with CXS, has been announced as the State Finalist of the Schools First Award 2009 for their educational outreach program, Growing Tall Poppies (GTP).

Schools First is a new grant system funded by the National Australia Bank in partnership with the Australian Council of Educational Research (ACER) and the Federation of Young Australians. From over 1500 applications (15% of schools in Australia applied), 68 grants were awarded of which 16 went to Victorian schools.

Initially it was announced that the CXS partnership, via Santa Maria College, was a Victorian Impact Grant winner and that GTP had been awarded a \$50,000 local impact grant - complete with giant novelty cheque! Within a few weeks the 16 Victorian winners were invited to a workshop and cocktail party in which the winner of the State award was announced. GTP was delighted to discover that it was again successful and awarded a further \$50,000 for the program.

"This is a remarkable achievement, especially in light of the truly superb partnerships that were in contention. It was very humbling to see such great work going on in the community. It was also great to see the National Australia Bank recognising work that is trying to promote the sciences." said CXS Director Professor Keith Nugent.

The Growing Tall Poppies program, which aims to encourage more students to the study of physics through working with active scientists, has been supported by the Catholic Education Office, Akorn Educational Services, and a grant from the Knowledge Transfer Office of the University of Melbourne.

The program is now in contention for the National Award and a grant of \$500K - \$1M, which will be announced at a dinner with Ms Julia Gillard, Australia's Deputy Prime Minister, and other luminaries in late November. Best of luck GTP!



Katerina Latkoska of Santa Maria College discovers Jurassic Park in Miniature as part of the Growing Tall Poppies Program



## In Brief

## Publications:

Publications for the previous half include:

Klonis N. and Tilley L. "Monitoring molecular dynamics in live cells using fluorescence photobleaching." Book Chapter in Fluorescence Applications in Biotechnology and Life Sciences, pp 1-25 (2009)

Wen X.M, Smith T.A, Ghigginio K.P, Dao L.V, Hannaford P, "Observation of back-surface reflected luminescence in GaAs excited by ultrashort pulses." Appl. Phys. Lett. 94, 102101 (2009)

Henderson C.A, Williams G.j, Peele A.G, Quiney H.M, Nugent K.A, "Astigmatic phase retrieval: an experimental demonstration." Optics Express, 17, 11905 - 11915 (2009)

Flewett S, Quiney H.M, Tran C.Q, Nugent K.A, "Extracting coherent modes from partially-coherent sources." Optics Letters, 34, 2198 - 2200 (2009)

Dilanian R.A, Chen B, Williams G.J, Quiney H.M, Nugent K.A, Teichmann S, Hannaford P, Dao L.V, Peele A.G, "Diffractive imaging using a polychromatic high-harmonic-generation soft X-ray source." J. Applied Physics 106, 023110 (2009)

Fu Y, Klonis N, Suarna C, Maghzal G, Stocker R, Tilley L, "Spatial mapping of oxidative stress in *P.falciparum*-infected erythrocytes reveals differential sensitivity of host and parasite membranes." Cytometry Part A 75A (5), 390 - 404 (2009)

Teichmann S, Hannaford P, Dao L.V, "Phase-matched emission of few high-harmonic orders from a helium gas cell." Appl. Phys. Lett. 94, 171111 (2009)

Putkunz C.A, Peele A.G, "Detailed simulations of a Lobster-eye telescope." Optics Express, 17, 14156 - 14165 (2009)

Hao X, Chan N.Y, Dunstan D.E, Smith T.A, "Conformational changes and photophysical behaviour in poly[2-methoxy-5-(2'-ethylhexyloxy)-1,4-phenylene vinylene] Thin Films casts under an electric field." J. Phys. Chem. C, 113, 11657-11661 (2009)

## CXS Visitors:

Dr Emily Cook, University College London, visited the Detector and Beamline Development Program at Monash University in May 2009.

The following people visited the Short Wavelength Laser Source Program at Swinburne University of Technology mid 2009:

- A/Prof Greg Scholes, University of Toronto, Canada
- Prof David Millar, Scripps Institute San Diego, USA
- Prof Ron Steer, University of Saskatchewan, Canada
- Dr Brendon Conlan, ANU
- Prof Keitaro Yoshihara, Toyota Physical and Chemical Research Institute, Japan

Dr Jolanda van der Ven, Eindhoven University of Technology, visited the Ultracold Plasma Source Program at the University of Melbourne in September 2009.

## Conferences &amp; Workshops:

Prof Leann Tilley was an invited speaker at the Cell Biology of Malaria Workshop, Baltimore, Maryland, USA in May 2009. She presented the talk, "High resolution imaging of Maurer's cleft trafficking in *P.falciparum*-infected erythrocytes."

Prof Rob Lewis was a keynote speaker at B/HERT Medical Innovation 2009, Griffith University, Queensland in June 2009.

Prof Keith Nugent gave a plenary talk at the SPIE Congress in San Diego, USA in August 2009.

Dr Rueben Dilanian was an invited speaker at Crystal 26 in the Barossa Valley, South Australia. His talk was titled, "The MEM-based pattern-fitting approach for 2D protein crystallography." in May 2009.

Prof Rob Schoten and Sebastian Saliba presented talks at the International Conference on Laser Spectroscopy, Hokkaido, Japan in June 2009.

## Education:

Matthew Dixon of the Biological Science Program has been involved in a high school program with students from Ivanhoe Grammar which included student interviews followed by discussions about malaria research, which students compiled into a multimedia report.

Prof Keith Nugent gave a lecture series at the XMNP Summer School in Italy, June 2009.

Members of the Detector and Beamline Development Program, in conjunction with the Monash Centre for Synchrotron Science gave a seminar series in June 2009. Special guests included A/Prof Stephen Robinson of Monash University and Dr David Abbott of the Brain Research Institute, Melbourne.

## Welcoming New Members:

CXS would like to welcome our latest members:

Lisa Lansfield, Finance and Administration Officer, University of Melbourne.

Ben Morrison, Post Grad, Short Wavelength Laser Source Program, Swinburne University of Technology.

Boris Reljic, PhD student, Biological Sciences Program, La Trobe University.

## Departures:

Michael Baker has submitted his PhD thesis and is now undertaking a potdoc in Cologne, Germany.

## In the Media:

Biological Science Program member Abhishek Awasti was featured in the article, *Indian Highlight*, issue 14, 2009 of the La Trobe University Bulletin.

Prof Leann Tilley and A/Prof Andrew Peele were interviewed by Robin Williams on the ABC Science Radio Show in May 2009.

Prof Mike Ryan was featured in the article, *Unveiling Cellular Bioenergetics Secrets*, in Genetic Engineering and Biotechnology News Vol 29, No. 7 April 2009.

## CXS Retreat 2009

On the 1st October 2008 the Australian Research Council held its review of the ARC Centre of Excellence for Coherent X-ray Science (CXS). As a result of this review CXS received extended funding for the period 1 July 2010 until 31 December 2013.

The 2009 CXS Retreat, held from Sunday afternoon 13 October to Tuesday 15 October was initiated by Professor Keith Nugent to enable CXS members to regroup and revisit common goals, objectives and the mission to which CXS should aspire during its extended life.

La Trobe at Beechworth, a multi-purpose function centre, and formerly the "Mayday Hills Hospital" was selected as the retreat venue. 62 CXS members attended the retreat including two overseas Advisory Board members Bonnie Wallace, of Birkbeck College, UK and Stephen Lane, of NSF Centre for Biophotonic, Science & Technology UC Davis, USA.

Senior CXS members arrived on Sunday afternoon to participate in a discussion on the CXS strengths and weaknesses. The aim of this session was for CXS members to have a sharpened vision of what needs to be achieved in the remainder of CXS' term.

The remaining CXS members, including invited guests and students, arrived in time for a Monday morning start.

The Monday program started at 8.30am with four 30 minute introductory sessions. Jose Varghese led the first session *Imaging at the Atomic Level*, followed by Andrew Peele's session *X-ray Sciences*.

Harry Quiney led the third session *Laser Sciences* and the final introductory session *Optical Imaging Methods* was led by Trevor Smith and Mike Ryan.

The introductory sessions were each followed by a group discussion with a final report back session to delegates at the end.

On Monday afternoon a number of breakout groups formed to discuss a wide range of issues affecting CXS with several groups, taking advantage of the beautiful sunny day by setting up their tables and chairs on the lawns. These groups were chaired by CXS Research Fellows and Post-Doctoral Fellows and were held in two consecutive sessions of three to four parallel groups. To maximise their input effectiveness retreat delegates took advantage of the opportunity to "snowball" between groups.

The CXS retreat dinner was held on Monday evening. The majority of retreat delegates attended the dinner enjoying the opportunity to relax and chat at the end of a long day.

The final feedback sessions from the discussion groups took place on Tuesday morning following Dr Stephen Lane's talk on "The NSF Centre Experience".

The retreat concluded at lunchtime on Tuesday when delegates left for the long but scenic journey home. The retreat provided an atmosphere conducive to fostering and nurturing both new ideas and objectives, and students in particular were pleased to have the opportunity to provide input into the future direction of the Centre.

Thank you to the Organising Committee comprising Keith Nugent, Fabienne Perani, Tania Smith, Trevor Smith, Leann Tilley and Steve Wilkins for making the retreat possible.

A special thank you is extended to Fabienne Perani for her time and effort in co-ordinating and arranging all the finer details of the retreat, particularly the accommodation and meals. She did an excellent job trying to please retreat delegates.

We look forward to the next CXS workshop, Fabienne.



Retreat delegates found the Beechworth sunshine conducive to providing great ideas for CXS' future





## What CXS Members had to Say about the Retreat

### **Keith Nugent**

*"September saw most members of CXS participate in a retreat held at the Latrobe University facilities at Beechworth. It was nice to get away from the distractions of Melbourne and we spent a valuable and enjoyable few days contemplating important issues for the future development for CXS.*

*Bonnie Wallace and Steve Lane from our Scientific Advisory Board were both able to attend with Bonnie facilitating a very valuable assessment of our strengths, weaknesses, opportunities and threats while Steve shared his experiences with his National Science Foundation Centre for Biophotonic Science & Technology. And, of course, they both contributed to many of our other discussions.*

*The meeting explored a wide range of issues including future research directions and collaborations; it also generated ideas on how we can do better in many of our numerous other activities. A particular highlight for me was the excellent, collaborative and supportive manner in which many discussion sessions were run by CXS research staff and post-doctoral fellows.*

*We are now in the process of distilling the outcomes from the retreat and a report and action list will follow in the next few weeks."*

### **Bonnie Wallace**

*"The 2009 annual CXS retreat differed from previous years in that it was an "internal" meeting of members rather than an external series of scientific talks. This enabled members to examine priorities and directions for the next several years of the Centre, which was entirely appropriate given the excellent (and well-deserved) news that the Centre had been extended.*

*The meeting site and format fostered excellent discussions/brainstorming between the participants, ranging from the SWOT analysis on day one with the senior investigators to the fun, but informative snowballing exercise with all Centre members discussing issues such as outreach as well as scientific directions.*

*All in all I believe this was an excellent format for the Centre at this mature time in its existence. In addition I would like to thank all of the administrative staff for the excellent planning and organising to make it run so smoothly."*

### **Azah Aziz**

*"Being a first year PhD student with CXS, I found that the Retreat gave me a better insight into both the business of CXS and its' plans for the future. It was good to see CXS members with different backgrounds and levels of expertise complementing one another as they worked together towards the same goal namely, the uses for coherent x-ray science.*

*The retreat also offered a good opportunity to meet people within the Centre which I would not usually have the opportunity to meet. The Retreat also provided the opportunity to review the previous year's work and CXS members were able to offer their thoughts for improvement immediately.*

*Although there was quite a bit of travelling involved in the return trip to Beechworth, I was glad to be away from the city, to experience the breathtaking scenery in Victoria's beautiful countryside. Overall, I was happy with the workshop, but it would have been great to have been provided with the opportunity to enjoy some outdoor activities. That would have made the retreat - perfect."*

### **Sebastian Saliba**

*"I particularly enjoyed the breakout sessions, but felt they would have benefited from being a little bit longer. It was a good idea to have them run by post-docs.*

*I got a lot out of the retreat as far as understanding the wider CXS program, for example learning about the Eureka prize ambitions and how the CXS biologists' and physicists' publications have improved, but in different ways. I think physicists have increased the impact factor for their publications, whereas biologists have increased the number and quality of their publications, as a result of being part of CXS.*

*It was also great to see how CXS is performing compared with other Centres of Excellence that I know of. Their attitude towards students and community outreach is particularly notable.*

*On a personal level, the CXS Retreat fostered the opportunity to follow a new direction for my PhD. Instead of performing a fundamental physics experiment, I will now be incorporating a strong biological slant to my work.... the big negative was that we had to travel so far to reach the location!"*

## UoM Post Graduate Careers Forum

"I've had more than one radical career change and it can seem daunting but if you understand your strengths it can be very rewarding." says Dr Nicole O'Leary, Senior Risk Advisor for the finance company KPMG in Melbourne.

Dr O'Leary was guest speaker representing CXS at the University of Melbourne's Post Graduate Careers Forum on 10th June 2009. One of four guest speakers, Dr O'Leary talked about her life after receiving her PhD in physics and outlined some of her experiences which lead to a career beyond the research bench.

"Science and finance are both fundamentally about problem solving and communication." said Dr O'Leary, demonstrating that science degrees can lead to many other careers outside of research.

Over 70 Honours, Masters, PhD students, Research Assistants and early career Post Docs attended the forum, which was supported by four University of Melbourne's ARC Centres of Excellence.

Other speakers include Dr Eugene Fredericks of the ARC Centre of Excellence for Kangaroo Genomics, now a Chief Operating Officer; Dr Renee Smart of the ARC Centre of Excellence for Free Radical Chemistry and Biotechnology, now a Community Awareness Programme Manager; and Dr Thomas Montague of the ARC Centre of Excellence for Mathematics and Statistics of Complex System, now an Industry Marketing Manager.

The attendance to this forum was outstanding and will ensure its repeat in the years to come.



Dr Nicole O'Leary represents CXS at the University of Melbourne  
Post Graduate Careers Forum

## IP @ CXS 2009: Information Session and Show & Tell Forum

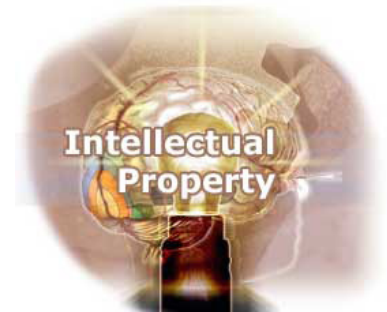
Once again CXS hosted its biannual IP @ CXS Information Session and IP Show & Tell Forum. This years Information Session concentrated on identifying and dealing with Intellectual Property, as well as aspects of commercialisation. Guest Speakers were John Jenkins from IP Australia and David Cookson from the University of Melbourne Research Office.

All members of CXS were invited to attend, particularly new members who had not taken part in the previous session in 2007, and students new to IP identification, ownership, valuation, protection and the patent system; in preparation for the CXS IP Show & Tell Forum.

Each program team then gathered on the 18th August to present their teams ideas on their research work which they beleived may develop into an IP opportunity. Led by a Post Doc from each program, the speakers gave a closed session talk and demonstration (where possible) of their ideas to the CXS IP Committee Panel and forum audience. After an open discussion and questions session with the audience the program team received feedback from the CXS IP Committee.

Many excellent ideas were presented and some were completely unexpected off-shoots of CXS research, demonstrating the capability of all our programs to think outside the box.

After further development as a result of their feedback some ideas will be revisited in the future to determine their progress and viability as CXS Intellectual Property.



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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](mailto:cxsenquiries@ph.unimelb.edu.au) or Ms. Rosslyn Ball, Administration, email: [r.ball@ph.unimelb.edu.au](mailto:r.ball@ph.unimelb.edu.au)

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Special thanks to Rosslyn Ball, Azah Aziz, Sebastian Saliba and Clare Henderson for their contribution to the Winter/Spring 2009 edition.

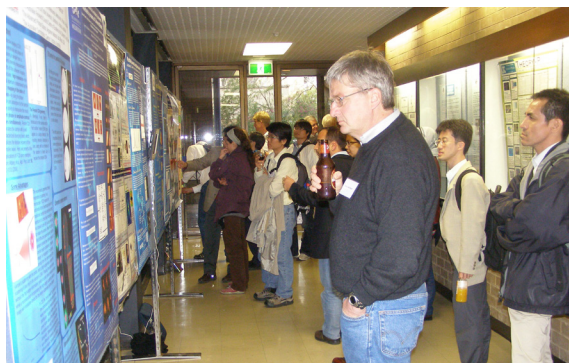
## Developments in Coherent X-ray Methods: A satellite workshop of SRI 2009

CXS hosted a SRI 2009 satellite workshop in the Hercus Theatre at the University of Melbourne.

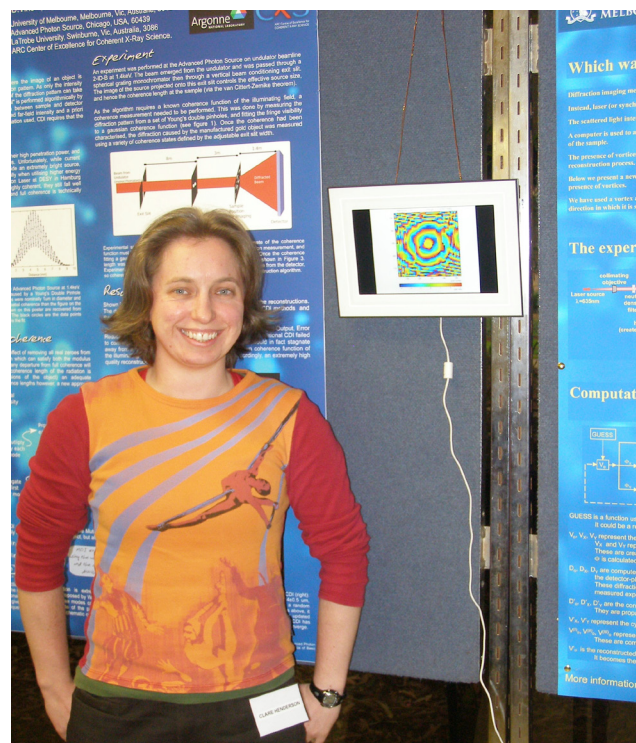
The workshop which focussed on developments in coherent x-ray methods commenced early in the afternoon of 2 October and concluded at lunchtime on 4 October. Delegates were provided with an excellent opportunity to update their awareness of developments in this important and fascinating field of research.

About 70 people attended the workshop which was co-ordinated by Garth Williams, Research Fellow - Experimental Methods Program (CXs). A large number of the delegates chose to enjoy the first night of the workshop at the Café Italia where they could relax after a busy day.

Overseas guest speakers included Henry Chapman of the University of Hamburg, Germany; Ian McNulty, Argonne National Laboratory, USA; Yoshinori Nishino, RIKEN Spring-8 Center, Japan; Chris Jacobsen, Stony Brook University, USA; Ivan Vartanian, DESY, Germany; and Ian Robinson, University College London, UK. Harry Quiney (CXs) also presented at the workshop.



Workshop delegates during the poster session



ABOVE: Clare Henderson, a PhD student in the Experimental Methods Program, presents her recently published work on optical vortices. She has used an optical phase vortex as a sample to demonstrate the effectiveness of the Astigmatic phase retrieval method. The movie frame shows the reconstruction process, where the direction in which the vortex rotates is determined uniquely.