

# CUDOS

The Centre for Ultrahigh bandwidth Devices for Optical Systems (CUDOS)



## Annual Report 2005



# Links and Communications

CUDOS researchers have built peer-to-peer links with local and international researchers through involvement in conference organisation, through a strong program of visits by scientific colleagues and collaborators, and by participation in international research consortia.

## ACOFT/BGPP Conference and PC Workshop, Sydney

The Australian Conference on Optical Fibre Technology (ACOFT) is the principal Australian meeting for photonics researchers. This year the meeting was co-located with the international meeting on Bragg Gratings, Photosensitivity and Poling (BGPP), which is held biennially and organised under the auspices of the Optical Society of America (OSA). Ben Eggleton coordinated the bid for the BGPP meeting to be held in Sydney, and chaired the program committee for the meeting.

A major workshop "Photonic Crystals: Fundamentals to Devices" was also organized as part of the BGPP/ACOFT conference. This two-day workshop, conceived and organized by CUDOS researchers, was attended by over 150 delegates including 40 international delegates. It featured talks by the representatives of some of the leading groups in the field, including the Universities of Bath and St Andrews (UK), Karlsruhe (Germany), MIT and Stanford (USA) and the Technical University and University of Aarhus in Denmark as well as CUDOS researchers.



▲ Delegates at the Photonic Crystals workshop held in Sydney as part of the BGPP meeting.

## Visiting Scientists

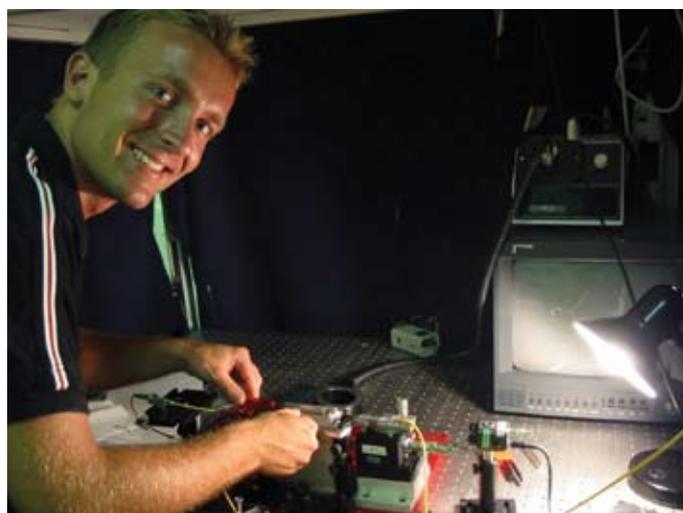
Each node of CUDOS has benefited from a constant influx of international visiting scientists, the majority of which are self-funded. With each year of the Centre's operation the number of visitors has grown to the extent that in 2005 we hosted more than 15 visits, including the following with durations of six months or more:

- Dr Martin Rochette (Sydney), a Visiting Scholar from August 2004 until 2006 from Canada supported by a prestigious Canadian Travelling Scholarship.

- Dr Jose Ramon Salgueiro from Santiago de Compostela, Spain, Visiting Fellow for six months at the ANU.
- Associate Professor Marc Dignam from Queens University, Ontario, a Visiting Scholar for 10 months sabbatical at Sydney. Dr David Fussell, a former PhD student at Sydney, has recently joined Prof Dignam's group in Canada to continue work on this collaboration.
- Dr Klaus Finsterbusch (Muenster, Germany) has joined the Sydney laboratories for 18 months supported by the German Research Foundation (DFG).
- Professor Andrew Kirk (McGill, Canada), sabbatical visitor for six months at Sydney.

## Visiting Students

The Centre hosted ten international postgraduate students during 2005 who chose to spend an internship of typically three months working with CUDOS researchers. The Centre values these students as a long term investment – both as potential recruits and as future collaborators. Three of the students came from North America while four came from Europe and three from Asia. In addition, four international students (two from North America and two from Europe) are enrolled as doctoral students on CUDOS research programs.



▲ Dominik Pudo, visiting student from McGill University, Canada.

## International Research Consortia

Through the initiative of Professor Ross McPhedran and his contacts with the French photonics community, the Centre has been offered Associate Membership of the PHOREMOST consortium (<http://www.phoremost.org/>), a **European Union** Framework 6 project (FP6). PHOREMOST is a Network of Excellence in the area of Nanophotonics and Molecular Photonics with more than thirty contributing partners. Associate Membership allows Centre researchers to negotiate projects with the European partners directly and to apply for funds under DEST's International Science Linkages program to support the Australian component of this research.

**Canadian** students (Dominik Pudo), researchers (Dr Martin Rochette, Mr Rhys Adams) and academic staff (A/Professor Marc Dignam, A/Professor Andrew Kirk) from Ontario and Quebec have collaborated with Sydney group through visits lasting for several months (in the case of the students) to more than a year for Dr Rochette. Some of these visits were funded through the Canadian Institute for Photonic Innovations, a Network of Centres of Excellence in Canada ([http://www.nce.gc.ca/nces-rces/cipi\\_e.htm](http://www.nce.gc.ca/nces-rces/cipi_e.htm)). The Centre looks to a strong alliance with research Centres in Canada like CIPI over the coming years, as Canada (like Australia) has traditionally had a strong presence in photonics. This link has been considerably strengthened through the involvement of Principal Research Scientist Dr David Moss, a Canadian researcher with strong academic and industrial ties in Canada.

### Associate Researcher

As a Centre with more than three years of operation successfully completed, CUDOS is continually looking to broaden its collaborative interactions with national and international researchers. Some of these interactions occur opportunistically on a project-by-project basis, while others grow into significant long term collaboration, based very much on complementarity of skills and mutual research interests. We have been encouraged by the Australian Research Council to recognize such interactions by the creation of a new class of CUDOS researcher, Associate Member. Associate Members (or rather, their institutions) do not receive funding from the Centre of Excellence grant, but in every other respect are regarded within CUDOS as full members of the Centre.

During 2005 we invited Dr Arnan Mitchell of RMIT University to become the first Associate Member of CUDOS. Dr Mitchell is the research team leader of the Microelectronics and Materials Technology Centre at RMIT, with particular expertise in integrated optics, photonic devices, microwave engineering



and micro-technology. He is currently in collaborations with the teams at the ANU and Sydney, where his micro-fabrication expertise has been invaluable in the development of new device concepts. Over the coming years we look forward to welcome other researchers to CUDOS as Associate Members.

◀ **Dr Arnan Mitchell, CUDOS Associate Member.**

### Outreach

CUDOS' role as a Centre of Excellence has led to considerable interest in its activities by the academic communities of the five participating universities and from the wider community. The Centre's research program and the achievements of individual researchers have featured in a range of university publications. As an example, the Macquarie group, and the work of PhD student Luke Stewart in particular, were featured in the August 2005 issue of ResearchActive, leading to a feature article in AusInnovation News.

The principal rationale for CUDOS' research is to develop a photonic chip for next generation communications systems. The fundamental implications of this development are not well understood, either by the future designers of optical networks or by the consumers of the vastly increased bandwidth provided by these networks, so CUDOS has liaised with engineering and trade journals to publish articles to address this. As examples, articles were published in What's New in Electronics (May) on the laser-based direct write program at Macquarie and two articles were published in the influential magazine Electronics News, one in April describing the fundamental principles of a photonic chip and the other in November describing the Centre's work on chalcogenide-based devices for optical regeneration. The Editor was impressed by the reader response to both articles, which has resulted in an invitation for the Centre to present an overview of next generation optical communications technologies at the Technology Futures Conference in Melbourne during 2006.

We have frequent opportunities for interaction with school students, primarily as part of the tours organised through the university departments in which our Centre nodes are located. During 2005 Martijn de Sterke presented a series of lectures on photonics to the International Science School organised by the Science Foundation at the University of Sydney.

We undertook a major initiative to provide resource teaching material for Higher School Certificate teachers of Physics in NSW through the provision of a web site addressing all aspects of the syllabus for "The World Communicates", an optional module within the HSC Physics course. This site <http://science.uniserve.edu.au/school/curric/stage6/phys/communicates/> provides not only an extensive overview of the course curriculum, but also links to CUDOS and sets our work in the context of international developmental research in this area.

From 2006 we intend to pursue a more strategic approach to our Outreach program. Reporting to the CUDOS Executive Committee, Ms Kali Madden (Macquarie) has agreed to coordinate the program and is working with representatives in each node to both develop initiatives and to monitor on-going activities. Kali was elected to the Executive of the NSW branch of the Australian Science Communicators in 2005.