CUDOS gratefully acknowledges the support of the Australian Research Council. We also acknowledge the financial and in-kind support provided by the Collaborators – the University of Sydney, the Australian National University, Macquarie University, the University of Technology Sydney, Swinburne University of Technology and RMIT University. Finally, we are grateful for financial support provided by the New South Wales Government through the Department of State and Regional Development.

Vision

CUDOS is a world-leading Centre in micro photonics, with internationally pre-eminent research underpinning a strategic focus on all-optical signal processing devices.

Mission

CUDOS conducts fundamental strategic research aimed at demonstrating and developing technology for optical processing devices that will enhance Australia’s communications infrastructure and our status as a technologically-advanced economy.
2008 was then a year of continuity as our existing Flagships moved closer to their strategic goals, but also a year of renewal as our new Partner and Chief Investigators joined the Centre and a new Flagship commenced.

It was also a year of achievements. These are of course the subject of this report, but mention of a few is appropriate here.

**All optical signal processing:** The dream of practical switching of ultrahigh bandwidth streams of data was realised by CUDOS teams at Sydney and the ANU, working in collaboration with a team at the Danish Technical University, when we were able to optically strip a 10 Gb/s signal from a 640 Gb/s data stream with minimal system penalty. This result was reported at the 2008 OECC meeting in Sydney and a press release associated with this presentation attracted international media attention.

**Compact waveguide laser:** Our Macquarie team succeeded in writing (using the most complex “pen” ever developed) the components of a laser oscillator (waveguide and resonator mirrors) inside a block of solid glass. When pumped by a diode laser, this compact device oscillated at powers of up to 50 mW at a wavelength pre-determined by the Macquarie researchers. This achievement places the team well in front in this internationally competitive field and puts CUDOS in an excellent position to offer a compact, high brightness laser for a variety of end user applications.

**Workshops:** We organised two Workshops during the year. In February we held our Annual Workshop, in essence our ‘kick off’ meeting for the extension phase of the Centre. We had nearly 130 attendees including almost all local CUDOS members and Partner Investigators Krauss, Kuipers, Wilson, Richardson and Harvey while Stoian Radic, John Haub, Thas Nirmalathas and Hugo Thienpont sent delegates. Andre Melloni (Milan), Andrei Faraon (Stanford), Tanya Monro (Adelaide), Tom White (St Andrews), Joss Bland-Hawthorn (AAO/Sydney University), Juerg Leuthold (Karlsruhe), and Stojan Radic, John Haub, Thas Nirmalathas and Hugo Thienpont attended delegates. Andre Melloni (Milan), Andrei Faraon (Stanford), Tanya Monro (Adelaide), Tom White (St Andrews), Joss Bland-Hawthorn (AAO/Sydney University), Juerg Leuthold (Karlsruhe), and Susumu Noda (Osaka) also attended by invitation.

In September we held a tutorial workshop on the exciting subject of Metamaterials. Our aim was to provide our students and researchers with an overview of the fundamentals and the current research in this extremely topical area, with invited speakers from inside and out of CUDOS.

**International Conference Organisation:** The largest meeting in optics and photonics to be held in Australia for at least ten years was held at Darling Harbour in July 2008, with CUDOS staff playing leading roles in the organisation. I chaired the Optoelectronics and Communications Conference (O ECC), Asia’s most prestigious meeting in this area, while CUDOS COO Chris Walsh chaired the Congress of the International Commission for Optics (ICO), a triennial event attended by optics researchers from all fields. The meetings were co-located at Darling Harbour with over 700 attendees.

One of the principal objectives of the Centre of Excellence scheme is to build Australia’s human capacity in a range of research areas. The Centre continues to address this objective admirably. A number of our researchers are winning ARC Fellowships and our Chief Investigators continue to win Discovery and Linkage grants in areas that build on, but of course do not overlap with, Centre programs.
Chairman’s Introduction

The CUDOS Advisory Board met once during 2008 and several Board members met one on one with Ben and his team during the year to pursue Board-initiated activities. I’m delighted to report that there have been positive outcomes from this interaction.

Mr Laurie Bode, who directs a program in the Defence Materiel Office to develop and supply airborne self-protection systems to the armed forces, has initiated a strategic engagement between CUDOS and the Defence industry to develop advanced photonic technologies for electronic warfare applications. RMIT (who already have a strong engagement with Defence), Macquarie University and the University of Sydney all have strong potential to contribute to this program, and the Board looks forward to seeing this collaboration develop during 2009.

Dr Steve Frisken, CTO of Finisar Australia, a developer and provider of advanced equipment for telecommunications, visited CUDOS for a detailed briefing on the optical signal processing technology being developed at the Centre to provide a commercial perspective on opportunities for further development. I understand from Ben that this information has been extremely valuable for the Centre in planning its research activities in this area.

Ben and Steve are co-investigators on an ARC Linkage Grant that commenced in 2006. The broad aim was to explore a number of novel areas of application for technology patented and commercialised by Steve and his colleagues at Finisar using the unique skills and facilities at CUDOS. The project was extremely successful, with a product launched at the ICO/OECC meeting at Darling Harbour and the recruitment by Finisar of the research associate hired to conduct the project at the University of Sydney.

While this work was outside the Centre’s research program, it is clear that this commercially-motivated project could not have taken place without the capacity built by the Centre under Ben’s direction. This is a perfect example of the value added across a range of sectors, both industry and community by a Centre of Excellence – others include the training given to young scientists and engineers at the Centre, and the engagement with science of the next generation through the Outreach program.

I found out during the year at first hand about another form of engagement the Centre has with the community. I was driving between appointments when I heard, to my great surprise, Ben’s voice on my car radio describing the progress that the Centre was making towards a terabit optical chip. It turns out that I was just one of many tens of thousands of Australians who, through radio, television and the daily newspaper, were informed of the CUDOS breakthrough with the community. I was attested to by the intense media interest. Congratulations to Ben and his team for the result, and the interest shown in it by the man in the street, others include the training given to young scientists and engineers at the Centre, and the engagement with science of the next generation through the Outreach program.

Dr Bob Watts
FAA, FTSE, FRACI
Chair, Advisory Board