Links and Commercialisation

The richness and strength of the CUDOS research program comes from the links across researchers in different universities, states and countries, and increasingly between industry and academia.

Our research links are so strong and extensive that during 2010 less than 30% of our publications were written by authors at a single node of the Centre. The great majority of the publications were cross node (20%), involved a Partner Investigator (15%), or an external collaborator (35%). Many of the external collaborators were visitors attracted by the strong reputation and culture of collaboration within the Centre.

Many of these research links are built using the usual academic networks built through conferences and trade exhibits. The prominence of the Centre's researchers at these meetings, and the number of prestigious post-deadline papers presented, has dramatically influenced the effectiveness and spread of these linkages.

Our Annual Workshop provides a superb opportunity to develop and cement the collaborative links between the Centre as a whole and our Partner Investigators. We were delighted once again to see a number of our collaborators and Partner Investigators at our 2010 Workshop including Professors Krauss, Kuipers and Leuthold. We expect over 140 attendees at our 2011 Workshop, including all but four of our fifteen Partner Investigators.

The Centre has built strong collaborations with the Australian National Fabrication Facility (ANFF), an entity established by the Federal Government to oversee the NCRIS program in providing national access to leading-edge research facilities for a range of activities including nanofabrication. CUDOS relies upon access to such advanced facilities for the production of photonic crystals, nanowires and other planar structures with sub wavelength features and has built up strong working relationships with the ANFF nodes at the ANU and at the University of NSW. In each case our researchers make use of advanced electron beam lithography and ion etching capabilities to fabricate these advanced structures.

Bandwidth Foundry International P/L, part of the ANFF Optofab node, will soon be taking delivery of an i-line (365 nm) optical lithography reduction stepper tool to be installed at the company's premises at the Australian Technology Park, Redfern. Centre staff (Walsh, Madden) were actively involved in the selection of this tool and we anticipate that the capabilities of this tool – sub micrometre writing capability over large field sizes – will be well-suited to the task of writing the long waveguides used in a number of our Flagship projects.

Internationally, the Centre is a formal collaborator in the European Union project SOFI (http://www.ihq.uni-karlsruhe.de/research/projects/SOFI/), a strategic program of research across six European partners and only one non-European participant, CUDOS. The aims of the project are very synergistic with those of the Centre. SOFI focuses on a proof-of concept implementation of ultra-fast ultra-low energy optical phase modulator waveguides for optical communications, with an ultimate aim of demonstrating an integrated circuit to aggregate low-bit rate electrical signals into a 100 Gbit/s OFDM data-stream with energy consumption of only 5 fJ/bit.

Conference and Workshop Activities

AIP/ACOFT

The major photonics conference in Australia was the Australian Conference on Optical Fibre Technology (ACOFT), held as part of the Congress of the Australian Institute of Physics in Melbourne. CUDOS played a large role in the conference, with our researchers presenting over 20% of the contributed papers and making 4 of the 6 post-deadline presentations.
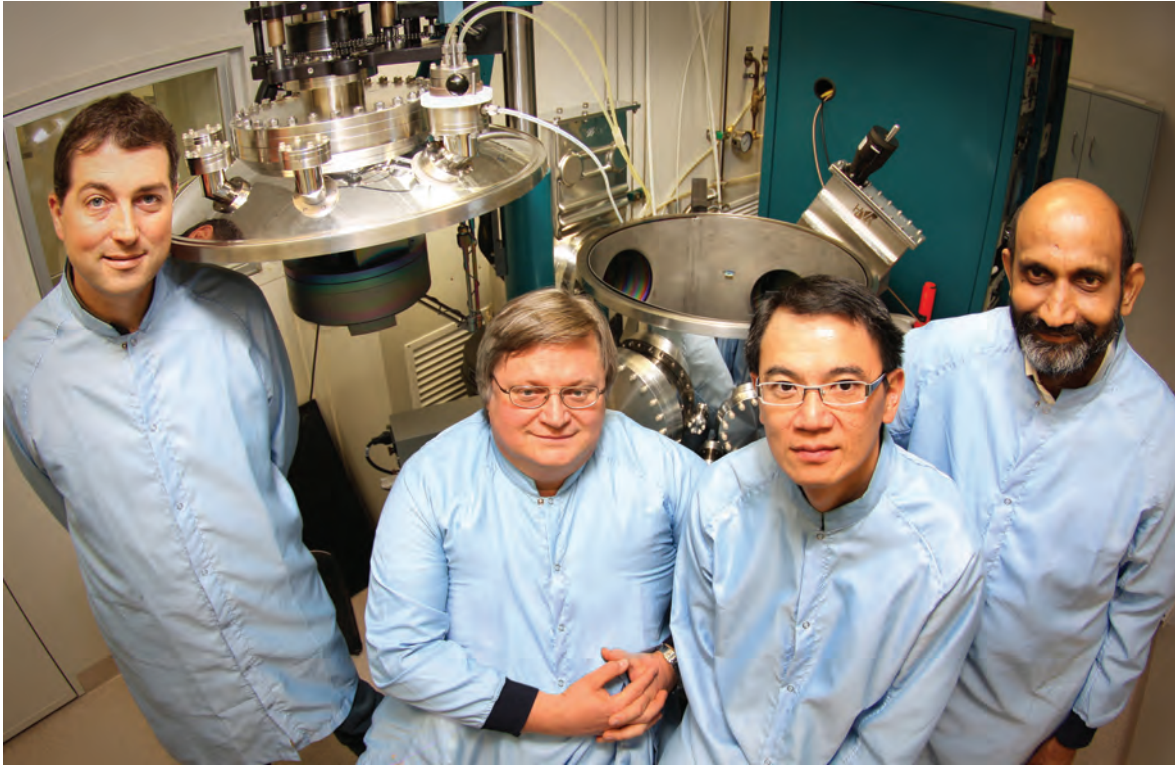
Commercialisation

The Waveshaper (www.waveshaper.net), commercialised by Finisar P/L following a collaborative project between the Company and Centre researchers, is now the basis of a small business unit within Finisar that employs over 12 engineers. This product grew out of the results of a collaborative project funded under a Linkage grant but which drew substantially on CUDOS facilities and the expertise of CUDOS researchers.

2010 Workshop photo of visitors.

Photograph of CUDOS researchers with ANFF facilities.

During 2010 we built strong links at a research and commercial level with Monitoring Division (a spin off from NICTA Melbourne) and with the microfabrication foundry group at Homebush Bay of Silanna. We also continued our strong collaboration with Finisar.

These relationships developed to the degree that each company is now participating in the new Centre (commencing 2011) with Dr Steve Frisken (Finisar), Dr Steven Duvall (Silanna) and Mr Trevor Anderson (MDI and NICTA) as Partner Investigators.
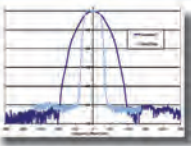
WAVESHAPER

The WaveShaper family of Programmable Optical Processors provides a range of programmable optical filtering and switching options for optical R&D and production test applications. Based on Finisar's high-resolution, solid-state Liquid Crystal on Silicon (LCoS) optical engine, the WaveShaper family provides extremely fine control of filter characteristics, including center wavelength, bandwidth, shape and, for WaveShaper 1000 and 4000, dispersion and attenuation. The WaveShaper range includes a Channel Selector (WaveShaper 100S), Gain Equaliser (120S), Programmable Optical Filter (WaveShaper 1000S) and Multiport Optical Processor (WaveShaper 4000S). OEM versions of the WaveShaper platform are also available.
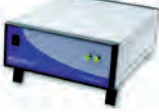
WaveShaper 4000S
Multiport Optical Processor

Extends the capability of the WaveShaper 1000S including the ability to direct different portions of the spectrum to different output ports with different, arbitrary user-generated channel shapes for each portion of the spectrum.

Example filter shapes generated with WaveShaper 1000/4000 Programmable Optical Processor

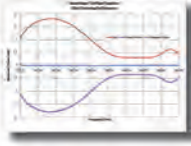**WaveShaper 100S**
Channel Selector

Fully programmable, DWDM channel selector with user-selectable band-pass (Flat-top) and Gaussian filter shapes. The filter bandwidth is programmable in 1 GHz increments from 25 GHz up to 200 GHz, with the center frequency programmable in 1 GHz increments over the whole C- band. Ideal for production test applications

WaveShaper M Series
For OEM Applications

OEM versions of the WaveShaper family of Programmable Optical Processors and are designed for embedding into third party equipment and instrumentation. The provide full WaveShaper functionality but with reduced size.

WaveShaper 120S
Gain Equaliser

Programmable equaliser which allows arbitrary attenuation shapes with 0.1dB resolution in the range of 0 - 10 dB over the whole C- band. Optimised for gain-flattening of high-performance EDFAs. Gridless operation for next-generation transmission system development.

WaveManager Software
Easy-to-use User Interface

All members of the WaveShaper family can be controlled through the WaveManager Application Suite which provides an intuitive user interface for real-time control of up to four separate WaveShapers. The Flexgrid™ option simplifies the emulation of flexible bandwidth WSS for advanced network development.

WaveShaper 1000S
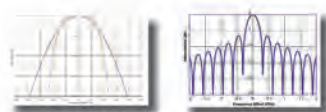Programmable Optical Filter

Supports arbitrary user-generated channel and filter shapes with bandwidth from 10 GHZ to 5 THz. The required filter shape (both amplitude and phase) can be generated by the user and then loaded into the WaveManager software which translates the user specification into the required optical shape. Band-stop and optical comb filters are also supported as is optical power control over a range of 35 dB for all filter types.

Full API plus LabVIEW™ Drivers
For Test Automation

Control software is also provided for both Windows and Unix (Linux) which allows full control of all aspects of the WaveShaper functionality. A common API across all operating systems makes it easy to integrate the WaveShaper functionality into the users system. LabVIEW™ drivers are provided as well as bindings for common programming and scripting languages such as C, Visual Basic, Python, etc .

Waveshaper information and images courtesy of Michael Roelens of Finisar.