



What is Outreach? For CUDOS, outreach is telling the community about what we do, and what we hope to achieve. We look to inform the general public of the benefits of strategic research in photonics and ensure that the taxpayer understands the link between such strategic research and the long-term societal benefits that flow from our program: innovation that leads to intellectual property of national importance; education and training that produces world-leading young researchers with skills to strengthen the high technology fabric of the nation; and ultimately, the creation of new value-adding industries to employ the next generation of Australians.

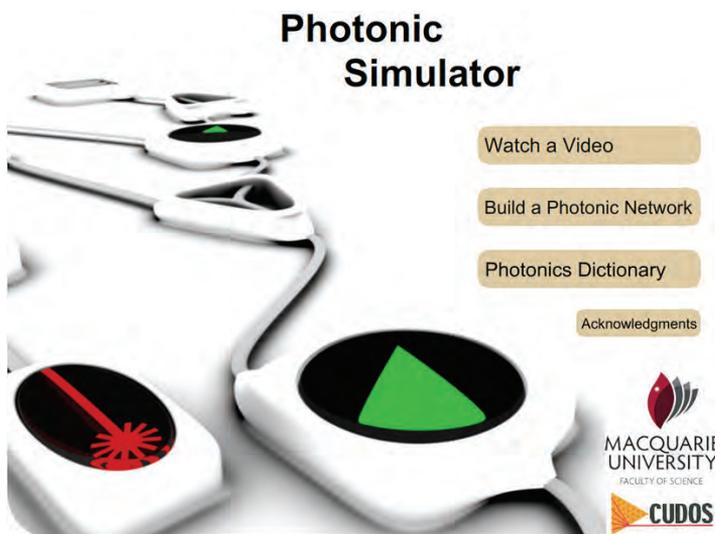
We are committed to enthusing that next generation of Australians is excited by science, and motivated to study it as a pathway to a professional career. To do this we have an active program of outreach in high schools, taught by enthusiastic graduate students with hands-on opportunities to learn more about optics and photonics.

This program is built around a suite of educational tools and presentation material that staff and students have developed to give high school students and the general public a better understanding of photonics and its applications. The chapters of the Optical Society of America (OSA) on each university campus organize and coordinate activities. Most of these chapters were established with CUDOS support, and CUDOS students play prominent leadership roles. Special mentions should be made of students Simon Gross at Macquarie and Irina Kabakova at Sydney, who have coordinated many of the activities discussed here, strongly supported by administrative staff at Sydney (Emily Higginson and Shelley Martin) and Macquarie (Kali Madden).

## Outreach Tool Kit

Our Outreach program for high school students is designed to entertain and inform. To inform, we have several PowerPoint® presentations that directly address the contents of the senior HSC Physics module “The World Communicates”. To entertain and inspire, we have developed four demonstrations that have proved extremely popular with students (and teachers!):

- *The photonics simulator:* This computer game, first described in last year’s report, has been refined and published online (see <http://www.physics.mq.edu.au/community/photonicssimulator/>). The game gives students the opportunity to design their own optical network and teaches them why light is the very best carrier of information over long distances.



### The photonic simulator.

- *Laser Maze:* The laser maze (pictured) is a set of mirrors in a darkened room used to reflect a visible red laser diode. The diode’s power is modulated with music, so provided the beam of light is not interrupted the music will be heard at the receiver. The aim of the ‘game’ is to move through the room without interrupting the beam and hence the music. The game teaches the students that a laser beam carries information, and serves as a useful introduction to the concept and benefits of optical fibres as data transmitters.



Laser mazes. Image courtesy Macquarie University.

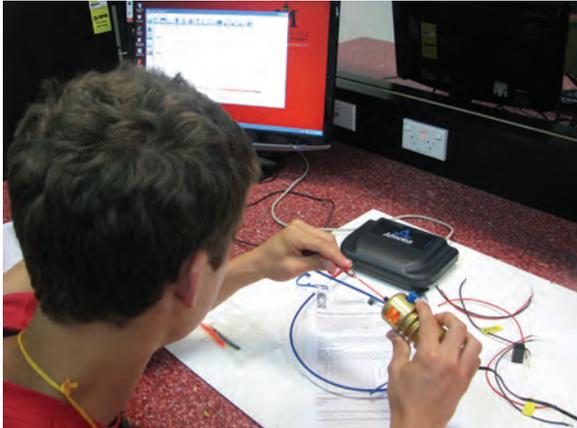
- *Laser Graffiti:* Spray-can graffiti is a social menace that takes weeks to clean up whereas laser graffiti is fun and disappears the moment the lasers are turned off. All that is needed is a laser (preferably a number of lasers with different colours), a wall, a device with scanner mirrors to rapidly deflect the beam in different directions, and a computer to program different shapes into the scanner. Our student groups at Macquarie and Sydney have each developed laser graffiti demonstrations and used them as both outreach entertainment and in competitions. The Macquarie students entered a video of their laser graffiti in a student competition sponsored by the OSA, with entries received from all over the world, and were placed second.





**Montage of laser graffiti from students at Macquarie and Sydney.**

- *Demystifying Lasers:* The Macquarie students used a kit developed by an academic staff member as a demonstration tool to illustrate some of the fundamental principles of light emission and absorption.



**Photonics equipment to help high school students understand lasers and light absorption and emission.**  
*Image courtesy Macquarie University.*

## High Schools

In 2010 Centre students and staff from Macquarie, ANU, and Sydney universities visited twelve high schools in Sydney and Canberra and presented talks on the 'information superhighway'. The talks covered the fundamentals of photonics and used this as a basis for explaining the extraordinary technological advantages possessed by light and fibres for transporting large volumes of data over long distances at unprecedented speeds – the information superhighway. CUDOS's research could then be explained as a breakthrough solution to the challenge of providing technologies for the next generation of internet.

In Melbourne, Prof Mitchell of RMIT opened his laboratory to 75 senior secondary students and instructed them on the basics of making microfluidic chips. In Canberra, Dr Neshev presented a talk on study & career options in science & technology to year 11 students attending the National Youth Science Forum.

A/Prof Judith gave talks at about a dozen schools during 2010. These focused on photonics, and included lasers in medicine. One of her presentations, including the live discussion after the lecture, was filmed by DET staff and put on the website for Laserfest.

## Science for the public

The Outreach tools were a great success at science expos and other public events. Our Laser Graffiti installation was popular with

families with children when exhibited at Macquarie University's Astronomy night and Open Day, and LaserFest, while the Laser Maze was installed at Science Expo, held during Science week 2010. The Demystifying Lasers kit was used in Workshops given to students in the Science Experience (formerly the Siemens Science Experience), as well as to various school groups.

Public lectures – sponsored by institutions like the Australian Institute for Physics or by Universities – are a welcome opportunity to address a large audience of non-specialists. During 2010 Ben Eggleton was invited by the AIP in Queensland to present a public lecture on "Ultrafast photonic integrated circuits: Breaking the Terabit per second-barrier". Martijn de Sterke presented a talk entitled "Nobel Lecture: fibre optics" to the NSW Science Teachers Workshop in November.

## University students

During 2010 the OSA chapter at the University of Sydney ran an active program of lectures for interested undergraduate students. Some talks focused on topics of current interest with the aim of providing an understanding of the scientific principles relevant to, for example, energy consumption in the next generation internet, while others looked at interesting practical applications of advanced photonic technology, femtosecond lasers for example. Macquarie Students introduced several undergraduate lab assistants to the research labs, and gave them a short experience as hands-on researchers.

University of Sydney students organized a careers forum for all students interested to find out the options for further study in photonics and optics. Representatives from industry and academia discussed their career paths and answered questions from the student audience.

The MQ OSA Student Chapter successfully ran their undergraduate research scheme, where we offered 3rd year undergraduates to work with PhD students in the lab. Last year five students took advantage of the opportunity.

## Media

The Centre makes active use of the public media to inform and excite the general public. Press releases accompany the publication of results in prestigious international journals, or major milestones in the Centre – commercial successes, major grants and so on. In 2010 this strategy resulted in twenty mentions in specialist and general media outlets.