

Photon Science and Technology

at the Australian National University

VISION

While the 20th century was the “century of the electrons”, the 21st century is considered to be the “century of photons”. The photonics revolution, involving the manipulation and application of light, is leading to developments in all fields covering astronomy, biology, chemistry, communications, quantum optics, materials science, medicine, physics and electronic engineering. ANU’s vision is to position itself as the “hub” of photonics research and development in Australia with an emphasis on new technologies of interest to industry. ANU is already a global leader in many areas of photon science and technology with many world firsts. The frontiers of research breakthroughs are expected to occur in emerging interdisciplinary areas such as bio-photonics, nano-photonics and the ANU is in a strong position to exploit its research strengths to make a global impact in these emerging fields.

Photon science has been a research priority within ANU for a considerable time and it has established itself as the premier Australian University in this field. There are over 150 staff and 50 postgraduate students with primary interest in photon science and the recurrent funding in the area is \$15M with a further \$4M attracted from outside sources and competitive grants. The accumulated unique and specialized facilities have a replacement value of \$100M. The researchers interact with other Australian Universities, CSIRO, DSTO and overseas institutes. The ANU has a major node of Australian Photonics CRC, with a budget of \$2M per annum. A spin-off company, Redfern Polymer Optics, is now established on campus.

Some examples of the research programs and highlights are given below:

Optical Communications

- Innovative growth and processing of optoelectronic devices such as lasers, detectors and modulators for use in communication systems as well as high speed optical signal processing
- Modelling and design of optical fibres, waveguides and light processing devices for telecommunications

Photon Science, Materials Science and Nano-Science

- Development of new compact pico- and femtosecond mode locked, diode pumped lasers for applications in biological, medical and material science
- Novel light emission and nonlinear optical properties in new material systems such as plastics, nanocrystals, quantum dots and carbon foam
- Application of photon science and technology either to create nanostructures or for their analysis at nanoscale
- Major astronomical research facilities at Mt Stromlo & Siding Spring Observatories, and innovative instrumentation development for the Gemini 8 metre telescopes.

Solar Energy Conversion

- Photovoltaic solar energy conversion by means of concentrating and non-concentrating solar cell devices and systems
- Solar thermal energy collection for thermochemical energy storage, electricity production via steam and solar hot water production

Exciting new areas in Photon Science

- Solitonic propagation in optical fibers and novel materials and Photonic bandgap crystals for manipulation of light
- Study of quantum behaviour of light for teleportation and computing applications
- Use of light for manipulating biological molecules such as DNA, drugs for medical applications



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