

Outreach Activities

Founder's Day

The School's **Founder's Day** was held on 14th October with invited guests from the ANU, government organisations, industry and the media, as well as former employees. It is a day of celebration of our Founder, Sir Mark Oliphant. The following members of staff were Founder's Day speakers:

Dr Christine Charles, Plasma Research Laboratories

Plasma Power: To Mars and Beyond or Just to the Shops

Dr Steve Cavanagh, Atomic and Molecular Physics Laboratories

Looking Deep Inside Chemical Reactions: Using a Physicists Tool Kit

Dr Ying Chen, Electronic Materials Engineering

Rags to Riches: Nanoparticles to Nanotubes

Dr Matthew Sellars, Laser Physics Centre

Stopped Light

Professor Allan Snyder, Centre for the Mind

Mind Physics

Dr Ilya Shadrivov, Non-Linear Physics Centre

A New Material for Perfect Imaging

Dr Adrian Sheppard, Applied Mathematics

Finding Patterns in the Disorder of a Complex Material

Dr Steve Tims, Nuclear Physics

A Silver Lining to the Nuclear Test Cloud?

Professor John Love, Optical Sciences Group

How to Make a Microscope out of an Optical Fibre

Dr Peter Bouwknegt, Theoretical Physics

String Theory: A Theory for Everything?

Workshops and Conferences

The **16th Australian Institute of Physics Congress** was held in Canberra from 30 January to 4 February and was the flagship event launching the 2005 Einstein International Year of Physics in Australia. The Congress was chaired by Dr Ken Baldwin and the Program Chair was Professor Hans Bachor. Numerous members of the School contributed to the Congress organising and program committees.

The focus of the International Year enabled the Congress to attract a record number of physics-based societies, attendees, sponsors and exhibitors. Fifteen physics conferences combined to yield a total of 765 contributed paper submissions and 958 registrants (including 349 student/teacher/retiree registrations) – the largest ever gathering of Australian physicists. The Congress theme *Physics for the Nation* attracted 21 sponsors, with 23 exhibitors displaying their products.

Prior to the commencement of the Congress, a well-attended ***Physics in Industry*** forum was held on Sunday, January 30 where ten speakers discussed applications and unsolved problems requiring a physics solution. In parallel with this, a special ***Young Australian Physics Researchers Forum*** – run by postgraduate students – gave eight enthusiastic young physicists the opportunity to present and discuss with their peers and senior colleagues some cutting edge insights into physics issues arising from their studies.

The Congress program featured nine plenary speakers and included two Nobel Prize Winners. Some 74 keynote speakers were also invited to present the state of the art in 18 topic areas. These highlight presentations led the topic areas in six parallel sessions, with 228 contributed talks and 467 poster papers being presented. All told there were 778 presentations at the Congress, many of which were published in the refereed Congress proceedings.

As part of the International Year of Physics, the Congress also presented a wide-ranging public outreach program and media campaign. Highlights included a presentation by Rod Home on the life of William Sutherland, a televised address at the National Press Club by Professor Graeme Pearman on the physics and public policy of climate change, and a public lecture at the Questacon National Science and Technology Centre on the asymmetry of matter and antimatter by Professor Helen Quinn. The climax was a public outreach session held in Llewellyn Hall aimed primarily at High School students, followed by the Congress Dinner with parliamentarians and senior science and education officials in the Great Hall at Parliament House,

The Workshop **Next Generation of Plasma Sources for Nano and Bio-active Material Processing** was jointly organised by Professor Rod Boswell and the Korea Advanced Institute of Science and Technology in Yong Pyong, Korea, from 22 to 24 February. The Workshop was specially arranged to allow the Australian delegation (from The Australian National University, The University of Sydney and University of Queensland) to present their research to Korean scientists and industrialists. Following the Workshop, a special visit was arranged along with an invited talk at Jusong Engineering who employ over 300 engineers. This was the first of a series of workshops involving Korea, China and Australia.

The **1st Australia-Japan Nuclear Physics Workshop on Near-barrier Reactions** was held in the Department of Nuclear Physics from 14 to 18 March. It was attended by staff and students from Tohoku University (Japan) and the ANU, and included a presentation by Professor Igor Bray of Murdoch University (WA) on his new techniques in electron-atom collisions for solving 3-body quantum problems. Attendees participated in intensive discussions following presentations of each attendee's most recent results. Topics covered included fusion barrier distributions, quantum tunneling, dissipative reactions and quantum modeling of the 3-body problem of projectile breakup in the field of the target nucleus.

Professor John Love was the Director for the **30th Australian Conference on Optical Fibre Technology (ACOFT) held at Star City** in Sydney, 4 – 6 July. This conference was held jointly with the **OSA Topical Meeting on Bragg Gratings, Poling & Photosensitivity**. The combined event attracted 220 national and international delegates.

The **Integrated Assessment of Climate Change Impacts Workshop** held from 4 to 5 July was organised by staff from CRES and SRES, including Dr Frank Mills (RSPHYSSE and CRES), as part of an ANU consultancy for the Australian Greenhouse Office (AGO). The Workshop attracted 45 registrants from across Australia with representatives from the national government, several state governments, CSIRO and several universities.

The Workshop brought experts in integrated assessment methods and in climate change impacts together with key State and Federal stakeholders to address the following three main aims.

1. Identify the main methods for integrated assessment of the impacts of climate change.
2. Assess the strengths and weaknesses of these approaches for the assessment of climate change impacts and adaptation options with reference to key Australian sectors.
3. Identify 3-4 regional case studies to test these approaches in the Australian context.

A detailed synthesis of the Workshop outputs, including a review of current literature, was sent to the AGO for comments and a final report for the consultancy is in preparation.

Professor John Love was the Director of the **14th International Workshop on Optical Waveguide Theory & Numerical Modelling (OWTNM)** held at Star City in Sydney, 7 – 8 July. This was the first time that the Workshop has been held outside of Europe. It was run in parallel with a second workshop on **Photonic Crystals: Fundamentals to Devices** and the combined event attracted 146 national and international delegates. Professor Love also received a \$38,830 grant from the Department of Education, Science and Training to help support the event.

The **2nd Australia-Japan Nuclear Physics Workshop on Near-barrier Reactions** was held in the Department of Nuclear Physics from 19 to 23 September. It was attended by staff and students from Tohoku University (Japan), Kyoto University (Japan) and the ANU. Student presentations were an important part of the program. Sessions were devoted to approaches to calculate quasi-fission competition in heavy-element formation, reflecting the interests of new attendees.

The **5th Annual Nuclear Physics Workshop in Nuclear Techniques** held from 26 to 29 September was attended by 21 students from the University of Wollongong's Medical Physics Program. Dr Hans Frimmel accompanied them. This Workshop coordinated by Professor Aidan Byrne is designed to actively engage students in the fundamentals of the measurements of nuclear radiations and the elements of isotope production using accelerator facilities. Students participated in an intensive four-day program that included experiments on the 14UD heavy-ion accelerator. Topics covered included radiation safety, detector design and operation, isotope production and accelerator operation.

A one-day workshop on the **Ion Channel Modelling**, as part of the **Australian Society of Biophysics Meeting**, was organised by the members of the Biophysics Group, Department of Theoretical Physics. The Workshop was held at the Computer Laboratory at the Australian National University on 27th September, attracting 23 participants. The subjects covered at the Workshop were three computational tools commonly used in modelling ion channels. These are the Poisson-Nernst-Planck theory, Brownian dynamics and molecular dynamics. A brief introductory lecture on each of the computational method was followed by a step-by-step instruction on how to run the executable program using a supercomputer.

Antimatter Matters: A Workshop on Positron Applications from Atoms to Materials to Cells held from 9 to 11 November was organised by Dr James Sullivan and Professor Stephen Buckman from RSPHysSE and Anita Hill from CSIRO. The Workshop was held at the Shine Dome with 62 registrants from around Australia and overseas. The scope of the Workshop was quite broad, covering areas of research from basic atomic and molecular physics to materials science and biological applications. The common theme was the use of positrons in the various areas of research. The Workshop was held to celebrate the official opening of the Australian Positron Beamline Facility which has been constructed at RSPHysSE and to start to bring together the various researchers that may be able to make use of this novel experimental facility.

The **International Conference Econophysics Colloquium** was organised by Dr Tiziana Di Matteo and Dr Tomaso Aste and was held at the Research School of Physical Sciences from 14 to 18 November (<http://www.rsphysse.anu.edu.au/econophysics/>). It has been the first conference on econophysics in Australia. The aim of the Conference was to bring together researchers from different communities (physics, economics, finance, mathematics and engineering) in order to review recent results, exchange ideas and methods and confront different view points on common problems linking economics and physical sciences. Conference topics included:

- Agent-based Models: Theory and Simulations
- Econophysics
- Information, Bounded Rationality and Learning in Economics
- Markets as Complex Adaptive Systems – Evolutionary Economics
- Multiscale Analysis and Modelling
- Non-linear Dynamics and Econometrics
- Physics of Risk
- Science of Networks
- Statistical and Probabilistic Methods in Economics and Finance

The Conference has been very successful attracting more than 100 scientists of which half were international from 18 different countries, as well as 15 from private sectors. The Conference has been externally supported with about \$100,000 in grants and sponsorship. The Proceedings, edited by Dr T. Di Matteo and Dr T. Aste will be published as a special issue of *Physica A*.

The **ARC Centre of Functional Nanomaterials Annual Conference** was held at Twin Waters Resort, Maroochydore, from 30 November to 2 December. The Conference had about 110 participants including 15 invited speakers. Dr Ying Chen from EME was the Chair of the Nanotube session. In this session, Professor D. Tomanel from the University of Michigan, USA gave a planetary lecture and Dr A. Krasheninnikov from the University of Helsinki, Finland gave an invited talk.

Materials and Complexity III was held from 6 to 9 December at the Kioloa Campus, ANU. This annual meeting encompasses a wide range of topics from the forefront of materials science research. There were talks on networks and porous media, Theory and properties of crystalline frameworks, granular matter, soft matter and self assembly, dynamic surface interactions, and surface forces. The workshop was organised by Dr Vanessa Robins and received financial assistance from the Australian Research Network for Advanced Materials.

The program featured invited talks from seven Australian and international researchers and presentations from all doctoral students in attendance. Participants included members of Applied Mathematics, scientists from the CRC for Functional

Communication Surfaces, UNSW, University of Melbourne, University of Queensland, CSIRO, and visitors from the USA, Germany, and Italy. As in previous years, the Workshop was a resounding success and has already led to new collaborations between participants.

Science Schools

Siemens ACT Science and Engineering Experience, ANU, 5-7 October 2005

Professor John Love directed this annual event with the administrative support of the ANU Centre for Continuing Education that attracted over 80 year-9 students from the ACT and country NSW to three days of lectures, visits and hands-on activities at ANU, the University of Canberra and the Canberra Institute of Technology. The Public Lecture entitled *Nuclear Physics – Fact & Fiction* was given by Professor Aidan Byrne (NP). Members of the School who supported this event with talks included Dr Greg Lane (NP), Dr Christine Charles (PRL), Dr Jodie Bradby (EME) and Professor John Love (OSG) together with support from Ms Anna Cirjak (Admin) and Dr Tim Wetherell (Admin).

Colloquium Speakers

Professor Claude Fabre, University Pierre et Marie Curie, France

Enhancing Information Extraction from Optical Images Using Quantum Light

Professor Rafi Kalish, Technion, Haifa, Israel

Diamond: A New High-tech Semiconductor with Outstanding Properties

Dr Andrei Rode, Laser Physics Centre

Unconventional Magnetism in All-carbon Nanofoam

Professor Klaus H. Ploog, Paul Drude Institute for Solid State Electronics, Germany

Ferromagnet-semiconductor Nanostructures for Spintronics

(jointly between RSPHysSE and ARCNN)

Professor Sander Bais, University of Amsterdam, The Netherlands

Topological Interactions

Professor Howard Wiseman, Griffith Centre for Quantum Dynamics

Quantum Measurement and Feedback Control

Professor Keith Nugent, ARC Centre of Excellence for Coherent X-ray Science

Coherent X-ray Optics: An Interface between Physics and Biology

Professor David Sherrington, University of Oxford, UK

Magnets, Microchips, Memories and Markets: Statistical Physics of Complex Systems

