Events Programme

Physics in Industry Forum
Sunday 30 January

1000–1800 hrs
Manning Clark 1 (MC1), ANU

In keeping with the Congress theme Physics for the Nation, the Physics in Industry Forum aims to highlight the application of Physics in the economy. In consultation with industry, a range of Physics contributions with commercial outcomes will be presented, with discussion on enhancing commercialization prospects.

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<td>0930–1000</td>
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MORNING SESSION
Chair: Mark Ridgway

1015–1030
Richard Garrett—“Introduction to Synchrotron Radiation and the Australian Synchrotron—a 10 Minute Primer”

1030–1115
Liz Towns-Andrews—“Industrial Applications of the Daresbury Synchrotron Radiation Source (SRS)”

1115–1145
Gerry Roe—“The Australian Synchrotron—Industry Engagement through the Physics Community”

1145–1215
Chris Davies—“Synchrotron Radiation Investigation of Twinning in Extruded Magnesium Alloy AZ31”

1215–1330 | Lunch |

AFTERNOON SESSION
Chair: John Love

1330–1400
Grant Griffiths—“What is Industrial Physics in the 21st Century?”

1400–1430
Tony Farmer—“Sub-Surface Radar—From Coal to SiroPulse II”

1430–1500
Tony Lindsay—“Self-Organising UAV Formations—DSTO R&D”

1500–1600 | Afternoon tea |

EVENING SESSION
Chair: David Thorncraft

1600–1630
Martin Blaik—“Manufacturing Photonic Components”

1630–1700
Bluescope Steel—Bryan Scott—“From Innovation to Application—a Case Study in Iron Making”

1700–1730
Davies Collison Cave—“Patents and The Real World”

1800 | Welcome Reception |

1030–1115 hrs Liz Towns-Andrews
CCLRC—Daresbury Laboratory, Warrington, Cheshire, UK, e.towns-andrews@cclrc.ac.uk

Industrial Applications of the Daresbury Synchrotron Radiation Source (SRS)
The SRS provides state-of-the-art analytical techniques from infrared to hard X-ray wavelengths. The characteristics of synchrotron radiation are ideal for analytical problems that require high spatial or temporal resolution or problems that are simply intractable using conventional instruments. An increasing number of large scale facilities exist worldwide, but are traditionally used by universities and higher education institutions for pure R&D. In recognition of the needs of commercial customers, Daresbury Laboratory has established DARTS (Daresbury Analytical Research and Technology Service). DARTS offers unique services tailored to the needs of the customer, allowing access to synchrotron analytical facilities and also the significant expertise and knowledge of staff on site. The analytical portfolio offered by DARTS encompasses imaging, spectroscopic and structural characterisation techniques. The nature of problems and issues solved by DARTS is varied and includes: investigations of product failure and non-conformance, manufacturing issues, basic R&D and information used in expert witness cases. This presentation will outline the concept of DARTS and the approach taken at the SRS towards industrial customers. It will provide practical examples and case histories of how an analytical service such as DARTS can help to improve industrial processes in a range of business sectors.

1115–1145 hrs Gerard Roe
Australian Synchrotron Project
department of Innovation, Industry and Regional Development (Victoria), Melbourne VIC
gerry.roe@iird.vic.gov.au

The Australian Synchrotron—Industry Engagement through the Physics Community
The Australian Synchrotron will be a national facility that will provide world class capability to a broad cross-section of Australian scientists and technologists, including the physics community. A synchrotron light source provides the capability to access and manipulate a major part of the electromagnetic spectrum, enabling new research, development and innovation. The Australian Synchrotron Project is committed to driving processes that enable industry users to generate valuable outcomes by engagement with the facility.
The central feature of a synchrotron is an electron storage ring that produces electromagnetic radiation (light) that is many orders of magnitude more intense than from conventional laboratory sources. The light is directed down beamlines to endstations where samples are analysed. The Australian Synchrotron will have capacity for as many as 35 beamlines operating simultaneously and independently. Available measurements will include X-ray absorption spectroscopy, X-ray fluorescence, X-ray diffraction, small angle X-ray scattering, X-ray imaging electron emission and infrared spectroscopy. These techniques can be used to characterise composition and structure, from the atomic level through to the macroscopic, and so a synchrotron provides tools to elucidate relationships between structure, composition, properties and function of samples.

In order for the physics community to deliver value to industry, there must be engagement between the public and private sectors. Communication must be encouraged, and the types of opportunities discussed must be proactively pursued. The Australian Synchrotron will provide a unique forum where scientists and technologists from across sectors and disciplines will interact, and industry programmes will be driven forward. The physics community is a key stakeholder group, and physicists will play crucial roles in the development of this national collaborative research infrastructure.

**Synchrotron Radiation Investigation of Twinning in Extruded Magnesium Alloy AZ31**

If predictions are to be believed, the use of wrought magnesium is set to increase dramatically over the next five to ten years as auto manufacturers and others seek to lightweight components. However, this increased use will rely in part on improved understanding of the deformation of these metals. Many alloys with a hexagonal close packed crystal structure show a marked anisotropy of yield when comparing compression with tension, and while the cause of this anisotropy is known in a qualitative sense, the effect has yet to be adequately quantified. The importance of this can be illustrated by imagining a car component made from magnesium. In an impact the component will typically have a tensile and a compression face, and in magnesium—unlike aluminium and steel—differential yielding will occur, with the compressive face yielding first and a consequent shift in the neutral axis of the component. Car designers must be able to model such behaviour if magnesium is to be used in large volumes in automotive applications.

AZ31 is a commercially available magnesium extrusion alloy containing 3 wt% aluminium, 1 wt% zinc and 0.3 wt% manganese. The initial texture of the bar is one in which the hexagonal unit cell c axes are principally normal to the extrusion direction, but with a slight spread in the extrusion direction, coupled with a component with a significant spread towards the transverse direction. Using synchrotron radiation with an energy of 70 keV, and wavelength 0.196 Å, in situ room temperature tension and compression tests were conducted at HASYLab in Hamburg. The results of these experiments are presented for each orientation, and the implications for the anisotropy of yield in textured magnesium alloys is discussed.

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**1330–1400 hrs Grant Griffiths**

**1400–1430 hrs Tony Farmer**
Events Programme

(cont.) The success of our current product in the market-place will be presented along with future prospects in a range of application spaces.

1430-1500 hrs  Tony Lindsay
Electronic Warfare and Radar Division, Defence Science and Technology Organisation, Edinburgh SA
tony.lindsay@dsto.defence.gov.au

Self-Organising UAV Formations—DSTO R&D

Uninhabited Aerial Vehicles (UAVs) have found increasing utility in Defence and security applications. Technology advances that enable smaller and cheaper payloads (including sensors, processors and communications systems) are stimulating totally new concepts and opportunities. Investigating the trade-offs for utilising small, expendable formations of cooperating vehicles versus large, multifunction vehicles is an area rich in R&D challenges including payload design (eg miniaturisation and system-on-chip integration concepts), autonomous agent algorithms for “swarm” control, technologies for distributed data fusion and algorithms for network optimisation (scheduling strategies for space, time, frequency, . . . (n-dimensional) coverage).

This talk will describe the R&D being undertaken in the field of distributed UAVs for electronic warfare, and the role being played by Australian industry in turning the modelling and simulation into reality.

1600-1630 hrs  Martin Elias
Technical Director, AOFR Pty Limited
Canberra BC ACT Australia
martin.elias@aofr.com, www.aofr.com

Manufacturing Photonic Components

The resurgence of the telecommunications industry is generating increasing demand for fibre optic network components. AOFR has been developing and manufacturing photonic components for 20 years using proprietary equipment designed for high volume, low cost production. The design of the products includes a number of features that ensure high reliability under harsh environmental conditions. Automated manufacturing equipment and processes enable close control of the optical characteristics of the products and flexibility in meeting a wide variety of specifications. The presentation will cover some key aspects of product and process design that enable the company to meet the evolving demands of the market.

1630-1700 hrs  Bluescope Steel
Bryan Scott, Senior Development Engineer, Ironmaking Technology & Development, Bluescope Steel, Port Kembla

From Innovation to Application—a Case Study in Iron Making

There is no single clear path from research innovation to industrial application. Academia is at the forefront of discovering new knowledge, often outside the context of real-world problems and oblivious to potential applications. Industry is in the business of addressing and solving challenging real-world problems, but is often blind to potential solutions already existing in the academic world. Clearly stronger interaction between academia and industry would benefit both parties.

This presentation describes the evolution of an “innovation-to-application” pathway between the Australian National University and Bluescope Steel, in relation to the development of coherence imaging systems, a spin-off from basic plasma physics research, for high-temperature pyrometry within the heavy industry environment of an integrated steelworks. The role of industry in providing focused application (direction) for further development of academic innovation is discussed, together with the equally important and complementary requirement for academia to showcase innovation in a readily accessible and “industry-friendly” way.

1700-1730 hrs  Leon Allen
Davies Collison Cave, Melbourne, VIC
mail@davies.com.au, http://www.davies.com.au

Patents and The Real World

A practical look at the monopoly conferred by patents focusing on the importance of the wording of patent claims and how they are interpreted by the courts. The factors that can determine the final form of claim wording and the consequences for the resulting protection will be examined through some case studies.