

# FACULTY OF ENGINEERING

JUNE 2008

## Welding Technology Institute of Australia Awards

At the recent Welding Technology Institute of Australia (WTIA) Annual Awards Dinner, held at Darling Harbour, a number of Faculty staff were recognised as having made significant contributions to welding research and innovation.

John Norrish was the recipient of the prestigious "2007 Dr Wilfred Chapman Award" for outstanding achievements in fundamental research into welding science and technology at Australian and international levels. The main criterion for this award is that the recipient has made an outstanding pioneering contribution to welding progress in Australia.



John Norrish

Adjit Godbole, Paul Cooper and John Norrish were awarded the "Sir William Hudson Memorial Award" for best published research paper 2007. The paper "Computational fluid dynamics analysis of on-torch welding fume extraction" was published in the Australian Welding Journal Vol. 52, 2007 Welding Research Supplement.

Alex Nicholson, John Norrish and Rian Holdstock received the "A. Ramsey Moon Award" for best published Industry Paper 2007. The paper "Feasibility of robotic weld repair of live pipelines" was presented at the WTIA 55th Annual Conference 2007 and 5th Asian Pacific IIW International Congress held in Sydney in March 2007.

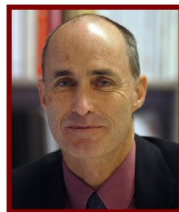


Ajit Godbole and Paul Cooper receive their WTIA Award

## Dean's Spot

The Australasian Institute of Mining and Metallurgy (AusIMM) is the leading organisation in Australia representing professionals in the minerals, mining, minerals process and metallurgy sectors. It supports these professionals with information, seminars and events and by promoting constructive interaction between Industry and the community. Because the mining industry is such a large and vital part of the Australian and world economy, we all have a stake in making sure this industry is healthy. Universities have a major role to play by providing trained and skilled professionals, and in carrying out research and development to help the industry operate efficiently while paying attention to its environmental impacts.

The AusIMM also reviews and accredits courses of study and grants recognition to those courses, such as those offered by the Faculty of Engineering at the University of Wollongong, which equip graduates with the necessary knowledge and skills to become world class professionals. Our mining engineering courses, having achieved AusIMM recognition (in addition to Institution of Engineers accreditation), are consequently clearly identifiable to prospective students, employers, educators and the



wider community as producing internationally excellent graduates.

AusIMM also offers a variety of prizes, awards, and scholarships to support young talented people undertake engineering degrees at Universities. For example, it offers Endowment Scholarships, worth \$8,000 per year, organises a nation-wide 'Mining Games' each year, awards prizes to research papers delivered by students and so on. Wollongong University students and Graduates have been very successful at winning these highly competitive awards. For example, this year two University of Wollongong mining students gained AusIMM scholarships (out of the 13 in Mining awarded nationally), and Wollongong students have in the recent past received many other awards such as AusIMM Young Professional of the Year, an AusIMM sponsored metallurgy/materials plant tour to Tasmanian industry, and the Best Paper Award, presented by an undergraduate student at any AusIMM event. Also, this year we are running the AusIMM New Leaders Conference and Mining Games, to be held in mid July - the first time this event has been held in NSW.

So even though the University of Wollongong is by no means the largest University in Australia, our students receive national recognition out of all proportion to their numbers. We are very proud of our students for such outstanding performances and congratulate them for their successes and welcome the ongoing support of professional bodies such as the AusIMM.

## Contents

Faculty ARC Linkage Project Success	2
Online Quiz in Basic Mechanics	2
Online Journal Publication	2
Engineering Excursion	3
ISEM Excellence in Post-graduate Student Training	4
Learning and Teaching Council Success	4



## Faculty ARC Linkage Project Success

UOW was awarded funding from the ARC for 8 Linkage Projects in Round 2 (2008). The Faculty of Engineering received funding for three of these projects. The successful Faculty applicants are:

Prof Buddhima Indraratna and Dr Cholachat Rujikiatkamjorn with external collaborators for the project entitled:

“Advancement of Vacuum Pressure Application via Prefabricated Vertical Drains for Stabilising Soft Ground”. Partner Organisation(s): Roads and Traffic Authority; Queensland Department of Main Roads; Coffey Geotechnics; Douglas Partners Pty Ltd.

This soft clay improvement project funded in Civil Engineering is about an innovation in ground improvement using vacuum technology, and closely related to the improvement of heavy infrastructure development employing a novel technology, championed at UOW in vacuum technology capturing Ballina Bypass construction, Brisbane Gateway and Port of Brisbane reclamations, which are the largest earthworks projects that Australia has undertaken in the past decade.

Dr Brian Monaghan and external collaborators for the project entitled: “The Fundamentals of Liquid Flow through a Reactive Packed Bed”. Partner Organisation: Bluescope Steel.

This investigation is focussed on developing a fundamental understanding of reactions and flow that occur between liquids, coke and biomass supplements in the lower zone of the blast furnace. The blast furnace is the primary liquid iron production unit for the majority of the world's steel production. It is the single largest contributor to greenhouse gas emissions (between 60-80%) within a steel plant. To date there is no viable alternative to the blast furnace that can produce the tonnages required for world markets. It is therefore imperative that



ARC Linkage Stars: Buddhima Indraratna, Cholachat Rujikiatkamjorn, Andrzej Calka, Elena Pereloma, Druce Dunne and Brian Monaghan

research be conducted that focuses on understanding changes in blast furnace performance as a result of utilizing biomass to assist in reduction in a blast furnace's greenhouse gas footprint.

Prof Elena Pereloma; Dr Andrzej Calka; Prof Druce Dunne; Dr FJ Barbaro for the project entitled: “Advanced Testing and Structural Analysis for Assessment and Control of Hydrogen Damage in Structural Steels”. Partner Organisation: Bluescope Steel

The world's developed economies are promoting hydrogen-based energy systems as a means of mitigating climate change, improving energy security, de-

creasing transport energy costs and reducing energy poverty.

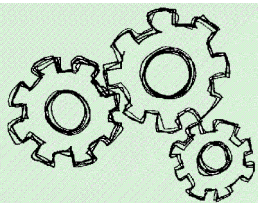
However, the provision of a safe, reliable and low cost hydrogen distribution infrastructure is a major techno-economic challenge. The project aim is to develop a comprehensive knowledge base for predicting steel behaviour under the influence of high pressure hydrogen and to develop alloy design guidelines that ensure the integrity of pipelines and transportable vessels used in hydrogen delivery applications. This project is focused on the effect of hydrogen on the properties of C-Mn structural steels used in Australia for pipelines and other pressure and structural applications.

### Online Quiz in Basic Mechanics

Dr Richard Dwight writes that students enrolled in ENGG101-Foundations of Engineering this session, must achieve either 60% in their mid-session quiz or 100% in an on-line quiz which will test their fundamental mechanics knowledge. The students can re-sit the quiz an indefinite number of times and obtain support to understand where they require further skill development.

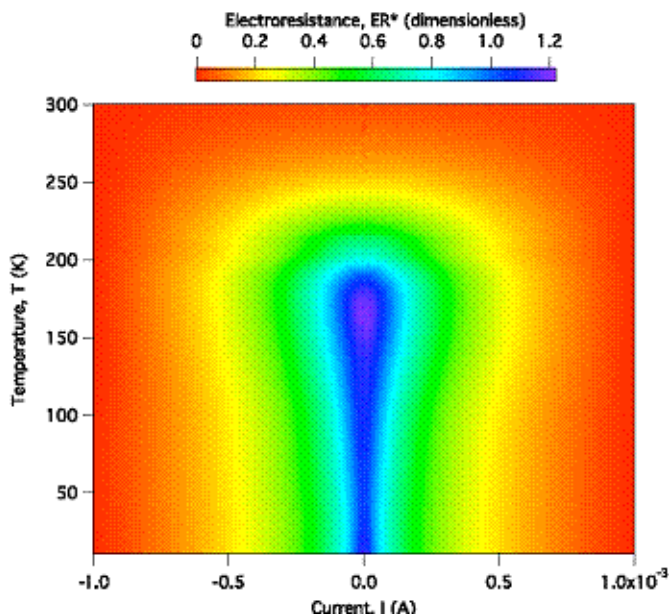
The quiz examines basic information that currently persists as a problem from ENGG101 to ENGG152, ENGG251 and beyond into mechanics application subjects such as design.

We hope that as a result, staff will have greater confidence that students have achieved a minimum platform of knowledge on which subsequent subjects can be built and students will understand the importance of learning certain fundamentals. Of course the jury is still out on this. So far students have had a relatively positive approach to the process.



## Online Journal Publication

A team from the Faculty of Engineering has published the first-ever scientific article in a new journal. PMC Physic B is “an international, peer-reviewed, open access journal that publishes articles on condensed matter, atomic, molecular and optical physics ...”. The work is on the controversial topic of electroresistance. The work was performed by Jonathon Knott, an engineering thesis and summer student; Daniel Pond, a research assistant and former summer student; and Roger Lewis, Professor of Physics. The team investigated electroresistance in the electronic oxide material lanthanum-calcium manganite. “We have many graphically-intensive results to report, for which PMC Physic B is an ideal publishing platform,” said Dr. Lewis, “it is an added bonus to have been chosen as the first scientific report



to appear in the journal”. The article may be freely downloaded from [www.physmathcentral.com](http://www.physmathcentral.com). Earlier this year Jonathon Knott gave a well-received student talk on the same subject at the annual national condensed-matter meeting held at Wagga

Wagga. A related article by Daniel Pond and Roger Lewis has been accepted to appear in the proceedings of that meeting. Further articles by Roger Lewis have followed. The Journal of Alloys and Compounds will publish an article on the small electroresistance observed in lanthanum-strontium manganite (available online 13 May). Applied Physics Letters has published (9 May) data demonstrating that electroresistance occurs over a large temperature range in lanthanum-lithium manganite and is not directly correlated with magnetoresistance in this material.

## Diary Dates

**7-20 June** Exams

**24 June** School Assessment Meetings

## Engineering Excursion



Students and staff from the School of MMM, recently visited the National Manufacturing exhibition held at Darling Harbour, Sydney. The excursion was organized by Nathan Howell, Gursel Alici and Weihua Li on behalf of the ‘Mechatronics Society’ and funding support from the School of MMM. There were approximately 400 manufacturing industry exhibitors displaying new technology in manufacturing from all over the world including Europe, America and Asia.

The aim of the excursion was to provide the students with an opportunity to gain knowledge on advanced manufacturing and possible job orientation through discussion with the various vendors.

## ISEM Excellence in Postgraduate Student Training

One of the main goals of the Institute for Superconducting and Electronic Materials (ISEM) is 'Excellence in Postgraduate Student Training'.

Many ISEM PhD graduates have already proven to be very successful in their research endeavours after completing their PhD studies at ISEM.

Two of our excellent students, Mr Qiwen Yao and Ms Rashmi Nigam, are new additions to our success stories.

Mr. Qiwen Yao has been conducting his PhD research on magnetic materials and was recently offered a position as a Materials Engineer at a very well-known company - Mesaplexx. Mesaplexx design, manufacture and market RF solutions, mainly for the wireless telecommunications market worldwide. His excellent skills in materials engineering and science have been acknowledged by company representatives and consequently Qiwen will be working in materials research, identifying appropriate materials for manufacturing.

Another PhD student success story is Ms. Rashmi Nigam. Her PhD subject is complicated in terms of materials preparation and fundamental issues. However, she has always shown a great deal of motivation and dedication towards the subject and so far has achieved outstanding results. She has published papers in internationally renowned journals and was recently successful in receiving access to the neutron diffraction facility at Berlin Neutron Scattering Centre (BENSFC) located within the Hahn-Meitner-Institute, for her project titled "Neutron Diffraction studies of RuSr<sub>2</sub>Y<sub>1.5</sub>Ce<sub>0.5</sub>Cu<sub>2</sub>O<sub>10</sub> and Ru<sub>0.9</sub>YSr<sub>2</sub>Cu<sub>2.1</sub>O<sub>7.9</sub> superconducting ferromagnets". Rashmi's proposal got an

excellent rating and was awarded 10 days of neutron beam time to conduct measurements. She was also awarded a grant valued at \$11,000 for international travel support under the Access to Major Research Facilities Programme (AMRFP). This grant scheme is very competitive, as only the best researchers from Australia are selected to access international

facilities. The grant is awarded by the Australian Nuclear Science and Technology Organisation (ANSTO) under the Department of Education Science and Training (DEST) funding scheme.

"It was a wonderful experience for me to work on highly sophisticated instru-



Rashmi Nigam

ments at BENSFC that require neutron beam produced from a nuclear reactor for measurements. It was a great opportunity to learn a lot about the specialised research techniques, which are otherwise not readily available to us" said Rashmi.



Qiwen Yao

## Learning and Teaching Council Success

Researchers from the Faculty of Engineering have recently been awarded an Australian Learning and Teaching Council (ALTC) (formerly the Carrick Institute) research grant worth almost \$150,000 from the Council's Competitive Grants program. The project will be led by Prof. Timothy McCarthy, with Mr. Tom Goldfinch as Project Officer. The project also brings collaborative partners from the University of Technology, Sydney and the University of Tasmania, including former UoW academic - Dr. Anna Carew. The proposal, titled A Pro-Active Approach to Addressing Student Learning Diversity in Engineering Mechanics, was one of seven applications awarded unconditional approval from 88 applications nationwide and is due to commence at the end of 2008.

The project aims to improve learning in Introductory Engineering Mechanics by researching the diversity amongst engineering students and designing a process for targeting new learning resources to address specific learning areas for individual students. The project will also de-

velop a set of tools to provide effective, targeted and efficient supplementary learning experiences for students while minimising the time burden on educators. The project builds upon a current ESDF funded research project involving the same team of researchers. The ESDF project is already identifying statistically validated predictors of poor student performance in introductory mechanics.

This grant from ALTC follows a previous Carrick Research Grant led by Dr Carew, Prof. McCarthy, A/Prof. Paul Cooper and A/Prof. Sharon Nightingale and places the Faculty of Engineering at the forefront of Australian engineering education research.



Tim McCarthy and Tom Goldfinch