



2007 – Year of Women in Engineering

Microelectronics for snowboarding

Researchers from Griffith University and the Australian Institute of Sport have trialed a micro-electric device which is worn by snowboarders to electronically monitor their movements during the sport.

While riding in a competition, snowboarders from the Ski and Snowboard Australia National Squad wore the device, which measures acceleration, rotation, and air time to provide an electronic record of a person's performance across a range of aerial tricks. The competition was held at New South Wales' Perisher Blue ski resort.

The device is being developed by engineering student Jason Harding, who is completing a PhD at the university's Centre for Wireless Monitoring and Applications.

He is working with the Olympic Winter Institute of Australia and the Australian Institute of Sport.

"The device won't replace human judges – we will use it alongside top professional judges, who assess the competitors from a subjective viewpoint," he said.

He said judges traditionally used a hand-written memory board to record notes on performance, faults and technique throughout a run.

"This means they have to look down, so can miss key parts of a run. This effectively provides an electronic memory board so they can keep their eye on the competitor.

"At this elite level the competitors' skills are so evenly matched judging can come down to a matter of opinion.

"This technology provides a way to objectively assess a performance."

Project supervisor Dr Daniel James said snowboarding was just one of a variety of sports where it could be applied.

"Engineers from the university are working on a system to monitor Olympic swimmers' stroke speed and efficiency, while others are developing a cricket-bat mounted device that measures stroke acceleration and power at different phases of a batter's swing," he said.

James said the new microtechnology devices are ideal for sports such as swimming and surfing that are difficult to monitor from a distance.

"This technology provides a way to objectively assess a performance."

He said they had clear advantages over previous lab-based monitoring systems, and they can be adapted to most sports.

"We just need to work with sport scientists and coaches to find a way to get the specific information they need.

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Training indigenous engineers

Engineering firms are supporting programs designed to get more indigenous Australians into engineering.

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"The system gives the opportunity for assessment during training and actual competition, whereas lab systems are difficult to move to the performance environment."

The engineering team has adapted the technology to Japanese swordfighting, an art in which competitors take years to perfect their swing.

"Elite sport is a high stakes environment, adoption of technology has historically encountered some resistance from athletes when integrating technology into time-honoured sports and arts.

"Many coaches are retired athletes who use the methods they were trained with," James said. "But once they see the gains that could be made, they embrace it. For example in cycling and rowing it's now rare to get an athlete who is not monitored in some way."

He said while technology was a powerful tool, it wasn't a magic bullet for aspiring athletes.

"Electronics will give them the edge by helping them train smarter, but it's always going to be up to them to put in the work!"



Final year electronics engineering student Jimmy Small (l) and PhD engineering student Jason Harding with the device that is worn by snowboard riders to measure their technical performance.

Promoting council engineering

Kogarah Council has signed an agreement with the University of Technology Sydney to develop a Public Works Engineering Program. The program aims to promote the study of public works engineering among engineering students.

The program will offer traineeships for UTS engineering students completing their final-year projects. Recently, one of the students completing a traineeship had developed a decision support tool for stormwater pit drains. Another had worked on a project for asset management for roads.

The council had been providing traineeships for final-year students from other universities, including UTS, for several years. But it decided to sign a formal agreement with UTS in order to commit to a more structured program.

The council's intake for traineeships is

typically about three to four students per semester. After completing their traineeships, the students may be employed on a casual contract basis.

Project engineer Paul Croft studied a diploma of engineering practice in civil engineering at the University of Technology Sydney. After beginning his traineeship in 2004, he worked for six months as a private works inspector before being offered part-time employment until he finished his university course.

Since completing his university studies in 2006, he works in the roads and traffic section.

His capstone project was called "The development of a two-storey residential dwelling".

The project involved using Kogarah Coun-

cil's development control plan to develop a new dwelling that complied with the design controls and standards set by the council.

It included the required plans, drawings and other material required to prepare and

After completing their traineeships, the students may be employed on a casual contract basis.

submit a development application.

"This was a highly beneficial project as it allowed me to use the theory learnt at university and apply it into a practical situation," Croft said.

An engineering student's Eureka moment

PhD engineering student Nick Palousis from the University of South Australia has won the \$10,000 British Council Eureka Prize for Young Leaders in Environmental Issues and Climate Change at the Australian Museum Eureka Prizes. His prize is a \$10,000 study tour to the UK.

Palousis received the award for his activities in the development, implementation and communication of sustainable manufacturing.

With European car makers, Palousis recently developed software that compels engineers to consider sustainability issues at every stage of car design.

The program has applications beyond the car industry.

"Engineers need to think about making products like cars in a whole new light," Palousis said.

"Energy efficiency, CO₂ emissions, envi-

ronmental impact and disposal issues such as toxicity and landfill are all on the agenda. These are now strategic considerations to minimise business risk."

The British Council Eureka Prize for Young Leaders in Environmental Issues and Climate Change is awarded to a young Australian aged 21-30 for scientific or technological leadership in response to the challenges that threaten our environment and our climate.

University receives carbon dating instrument

The Research School of Physical Sciences and Engineering and the Research School of Earth Sciences at the Australian National University in Canberra have installed a particle accelerator for measuring radiocarbon in materials.

The \$1 million instrument is a single stage accelerator mass spectrometer (SSAMS) which can perform carbon 14 dating and analyse samples containing a radioactive isotope to determine its age.

Most of the funding came through an ARC Linkage Infrastructure grant. The remainder came from the university, six other Australian universities and CSIRO Land and Water.

The high throughput capability of the SSAMS (potentially several thousand samples per year) coupled with its high precision will allow the completion of projects that require 100 or more precise measurements for useful results.

"This opens up a whole raft of possibilities," said Prof Keith Fifield, a researcher in the department of nuclear physics in the Research School of Physical Sciences and Engineering. "Stalagmites for example, are archives of past climates, and the C-14 in the stalagmite itself can provide the chronology for high-resolution records of climate proxies such as oxygen and carbon isotopic ratios.

"Similarly, marine cores are archives of climate, sea-surface temperatures and salinity and require detailed C-14 dating to put the

records into a chronological framework."

Another emerging area of application is tracing the carbon cycle in soils – different fractions can have different residence times which is linked to the ability of soils to sequester CO₂.

A detailed study would require measurements of C-14 in various compounds at a range of depths.

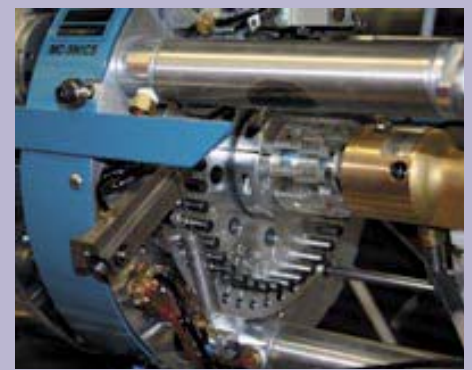
"We'll also be using the instrument to push the frontiers of what's possible with radiocarbon dating," said Dr Stewart Fallon, a researcher at the RSES.

One aspect of this is research into using CO₂ as the carbon source rather than converting the CO₂ into solid carbon.

"The idea of doing it this way is to be able to measure very small samples because very small samples don't always graphitise and that's our normal source.

The high throughput capability coupled with its high precision will allow the completion of projects that require 100 or more precise measurements.

"To give you some idea on this, you normally need about a milligram of carbon to work with.



The sample wheel of the single stage accelerator mass spectrometer at Australian National University. It can hold 39 samples.

"Wood for example is 40% carbon so you need around 4mg, corals are 10% carbon meaning you need about 10mg. However, what we're talking about for very small samples is things in the order of 10 micrograms.

If we begin working at that level it'll open wide the field of carbon dating and allow some amazing things including dating of single compound extractions.

"At the moment there are only a few places in the world that are directly using CO₂ samples for radiocarbon dating so our research will be at the leading edge." Fallon said.

School students challenged

Students from 26 high schools across NSW converged on the University of Newcastle last month to take part in a three-day science and engineering competition.

More than 800 students from as far afield as Broken Hill, Narrabri, Tamworth and Cobar joined Year 10 students from several local high schools for the University of Newcastle's 2007 Science and Engineering Super Challenge.

The students competed in a range of challenging activities including Hover frenzy, where students used a range of materials to construct a small hovercraft, Mission to Mars which involved building an all terrain vehicle, and the World sailing spectacular which required making sails and rigging for a boat.

The competition is the culmination of a series of regional science and engineering challenges run across NSW. Schools are competing for a place in the grand challenge, the national championships, to be held in Toowoomba

next month.

The competition was created by the Faculty of Science and Information Technology and the Faculty of Engineering and Built Environment at the University of Newcastle.

It was created as a way of addressing Australia's skill shortages in the engineering fields by sparking student interest in studying science and engineering-related subjects.

Bob Nelson, the challenge team leader for the University of Newcastle, said the competition developed students' problem-solving abilities and their capacity to work as part of a team.

"The key message we want kids to take away, is science, IT and engineering are challenging, but they are also heaps of fun."

The competition is supported by local communities through Rotary International, Engineers Australia, and the Department of Education, Science and Training.

Subscriptions

Student members can subscribe to the printed version of *Engineers Australia* magazine at the special student rate of \$35.20 for 12 issues.

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Engineering student goes to Paris

University of Wollongong engineer Rhyannon Ratz has won first prize as best student and the prize for writing the best journal at the course run by the International Institute of Women in Engineering in Paris.

This year's course topic was "Women in global engineering: Creating an energy efficient future". 47 engineering students, male and female, from 17 countries attended the course.

Financial support for Rhyannon's trip came from the Faculty of Engineering and Study Abroad.

During her three weeks in Paris she attended seminars by engineers from a range of countries and participated in three industry visits.

The main seminar material was on history and cultural dimensions of engineering, sustainability in engineering and business in different global regions, negotiation skills and women in engineering.

The industries that she visited were IBM France, Schlumberger and Peugeot. There were also other industry visits for groups of students to L'Oréal and Société Générale.

These industry visits gave an introduction to the different companies and allowed the students to talk with the engineers, particularly the women, and hear how they have developed their careers.

The faculty members also took the students on a tour of Sceaux Park which is a public park designed to function sustainably. They also visited the Musée des Arts et Métiers, a museum of engineering history and development.

Students also had to prepare three pres-



Engineering student Rhyannon Ratz recently visited Paris for a conference discussing the role of women in the profession.



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entations and a reflective journal during the course.

Each student prepared a personal poster presentation to introduce themselves and their country to the other course members.

They were also divided into area groups based on geographic region and energy groups made up of students from different regions.

The area presentations were to research and present the origins and development of engineering and education in different regions of the world and how each country will approach engineering in the future.

"The energy assignment was to develop an area for a client that promoted energy efficiency and would be functional considering climatic uncertainty," Ratz said.

"I felt that the course was very worthwhile for my engineering studies and it was a lot of fun. It was good to meet other young engineers from all parts of the world, to visit industries and hear from female engineers about their experiences in the engineering world."

Computing student wins scholarship

Master of engineering studies student Barsha Karki of the University of Technology Sydney was one of 10 students to receive the Grace Hopper Celebration of Women in Computing scholarship beating close to 900 applicants.

The scholarship will allow her to travel to the Grace Hopper Celebration of Women conference in Florida, US in October which is designed to highlight the research and career interests of women in computing.

Presenters are notable figures in their respective fields, representing industrial, academic and government communities. Researchers present their current work, while special sessions focus on the role of women in today's technology fields, including computer science, information technology, research and engineering.

The scholarship will cover conference registration, airfares and accommodation.

Criteria used to assess applications include academic achievement, potential in the field, and the quality of a submitted essay.

The conference will be presented by the Anita Borg Institute for Women and Technology and the Association for Computing Machinery.



Engineering student Barsha Karki will visit the US next month.

Lecture system acquired by US company

The US-based company Anystream has acquired a system developed at The University of Western Australia which records, presents and manages lectures online.

The Lectopia system allows students to access recordings at any time for revision and review.

Lectopia is also the name of the operating division of the university which developed the system.

Lectopia will combine with Apreso, the

higher education division of Anystream and become Echo360.

"We carried out a rigorous selection process for a high volume, low maintenance solution to support five universities and partners," said Dave Wolfendale, assistant director for customer services at Newcastle University. Apreso and Lectopia were shortlisted."

The new product will capture classroom audio, video and projected visual aids, to create a multimedia experience, viewable from

any computer.

Mobile students can also download lectures to their iPod or MP3 player.

Lectopia founder Mike Fardon will lead the integration efforts as vice-president of product management, reporting to Mark Jones, senior vice-president and general manager of Echo360.

Fardon will also head Echo360's Australian office and continue to manage existing Lectopia licensees.

Centre for mine automation

Rio Tinto has announced funding of up to \$5 million a year for a centre for mining automation at the University of Sydney.

The facility, which will be led by Professor Hugh Durrant-Whyte, will be based at the university's Australian Centre for Field Robotics (ACFR) with the aim of performing robots research and developing and implementing fully autonomous and remotely operated mining processes.

The centre will support 28 fulltime staff and ten research students. It is expected to operate for five to ten years.

A technical management group, including representatives from Rio Tinto and the University

of Sydney, will guide strategic direction and monitor research performance.

Welcoming creation of the new centre, Prof Durrant-Whyte, said: "This facility will allow us to realise a long-held vision for developing and applying robotics and autonomous systems research in mining.

"The work produced here will have a major impact on the economic and social well-being of Australia, where mining continues to play a major role."

Rio Tinto's head of technology and innovation Dr Grant Thorne said: "By developing technology, research and training in mine automation, the company expects to add value to its existing

mine operations, to deliver a long term competitive advantage, and to increase knowledge of new systems within its operations.

"The centre aims to provide a substantial improvement in safety, predictability, precision and efficiency of mining through the development of automation and remote operation across mining systems," Thorne said.

The ACFR is a partner in the Australian Research Council's Centre of Excellence for Autonomous Systems, hosts the Defence Science and Technology Organisation's Centre of Expertise for Uninhabited and Autonomous Systems, and is a partner in the Cooperative Research Centre for Mining.

Students help Papua New Guineans

A group of engineering students from Queensland University of Technology got together this month to dismantle medical equipment donated by a Queensland hospital that will be shipped to needy communities in Papua New Guinea.

The students belong to the university's chapter of Engineers without Borders whose Medical Equipment Mission for Communities In Need (MEMCI) project is well under way to deliver the equipment to hospitals in Papua New Guinea's East Sepik province.

MEMCI project leader and biomedical engineering graduate Achi Kushnir visited villagers around the towns of Maprik and Wewak in June. He was shocked at the lack of basic medical equipment.

"We realised there was a lot of redundant medical equipment in Queensland that could do a lot of good in the under-resourced clinics and hospitals," he said.

The students dismantled and packed 25 hospital beds, 20 hospital mattresses, six examination beds, three wheelchairs, two ambulance trolleys and a lot of other medical furniture that was donated by Greenslopes



Engineering students (l-r) Justine Yeong, Bertrand Bapst (kneeling), Luke Joplin, Jason Almeida, Jonathan McCallum, Achi Kushnir, Samuel Baker and Jessie Reeve.

Private Hospital.

Kushnir said the MEMCI team would welcome business, marketing, finance, film and television and IT students to participate and use their skills to support the project.

"It's not just for engineering students. It is

such a large scale project it requires support from a lot of other disciplines," he said.

"MEMCI is also looking for investors and sponsors who wish to come on board."

Those interested in joining the project can contact memciqut@gmail.com.

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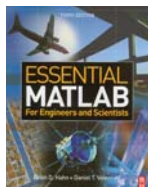
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ILLAWARRA REGIONAL GROUP

Contact Elaine Bailey on 02 4221 4086, email ebailey@engineersaustralia.org.au.

NEWCASTLE

Meetings: Young Engineers Newcastle meet on the first Monday of every month at 122 Parry St, Newcastle West, Engineers Australia Newcastle Division office at 6pm. All welcome. Contact Sam Wong on 02 4964 5597, email samuel.wong@defence.gov.au.

NORTHERN

Meetings: YEA Northern Division committee meetings are held on the first Wednesday of each month at the Northern Division Offices of Engineers Australia, 14 Shepherd Street Darwin at 5.15pm. Contact Ben Hawkes at hawkes@conwag.com.

QUEENSLAND

Meetings: YEA Queensland holds its meetings on the first Monday of the month at Engineering House, 447 Upper Edward Street, Brisbane. Contact Laura Winkle on qld.rep@yea.au.com, web qld.engineersaustralia.org.au/jetspeed/?zone=groups.

SOUTH AUSTRALIA

Meetings: YEA-SA meetings are held on the first Monday of every month at Engineering House, 11 Bagot St, North Adelaide. Contact Nick Harley nicholas.hj.harley@gmail.com, web sa.youngengineers.com.au.

SYDNEY

Meetings: YEA Sydney committee meetings are held on the second Monday of each month at the Sydney Division office, 118 Alfred Street, Milsons Point, starting at 5.30pm. Contact Anny Joseph on Anntonette.Joseph@commerce.nsw.gov.au, web syd.youngengineers.com.au.

TASMANIA

Contact Nicholas Dwyer on dwyern@hobartcity.com.au.

VICTORIA

Meetings: YEA-Victoria committee meetings are held on the second Tuesday of each month at the Victoria Division Office in the Boardroom, Level 2, 21 Bedford Street, North Melbourne, commencing at 6pm. Contact vic@youngengineers.com.au, web vic.youngengineers.com.au.

WESTERN AUSTRALIA

Meetings: YEWA hold their meetings on alternate Tuesdays and Wednesdays once a month at the Engineers Australia Office, 712 Murray St, West Perth. Contact Karyne Wong on yeawa@engineersaustralia.org.au, web wa.youngengineers.com.au.



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