Student News
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ENGINEERS AUSTRALIA

2007 – Year of Women in Engineering

Celebrating multidisciplinary education

Thirty eight students from three faculties have worked together to construct an enormous sculpture of a snake on the UNSW campus. The sculpture was built as a symbolic entrance to a multidisciplinary design education conference being held at the university this month.

The ConnectED conference at UNSW brings together international and Australian delegates to discuss research and strategies that address the promise and possibilities of design education that crosses disciplinary boundaries.

The design and construction of the snake was itself part of a multidisciplinary course undertaken by engineering, architecture and

Students work on the tri-wall multicell cardboard cladding supplied by Visy Board.

Construction boom in the sunshine state

With a rising population and an expanding economy, Queensland is experiencing strong growth. Justin Liew visited the state recently to report on how engineering is contributing to the state's development.

Click here to view the online copy of the magazine.

Student News

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fine arts undergraduate students. The course commenced in January where a mix of students from the three faculties - Faculty of Engineering, Faculty of Built Environment (architects), and College of Fine Arts, were given the project brief to come up with a sculpture to celebrate the ConnectED Conference. In the first half of the semester, one concept was chosen and the students were asked to perform detailed design, calculate the budget and help source sponsors and materials.

During the second half of the course and into the holidays, the project has moved into the construction phase. Team project manager Daniel Jones, a final year civil engineering student, said: "Even though we tried to solve everything before building it, obviously things come up during construction and the sketch pads would come out again with everyone working together trying to come up with a solution."

With project sponsors Boral Timber supplying the structural timber and ply, Visy Board supplying the tri-wall multi-cell cardboard cladding, OneSteel the steel, NRMA the batteries for the PV powered lighting, and financial contributions from the Ove Arup Foundation and the three UNSW faculties, the snake twists 40m up the university's Kensington Campus Mall, with three arches and 5m-tall head dwarfing passing students and staff.

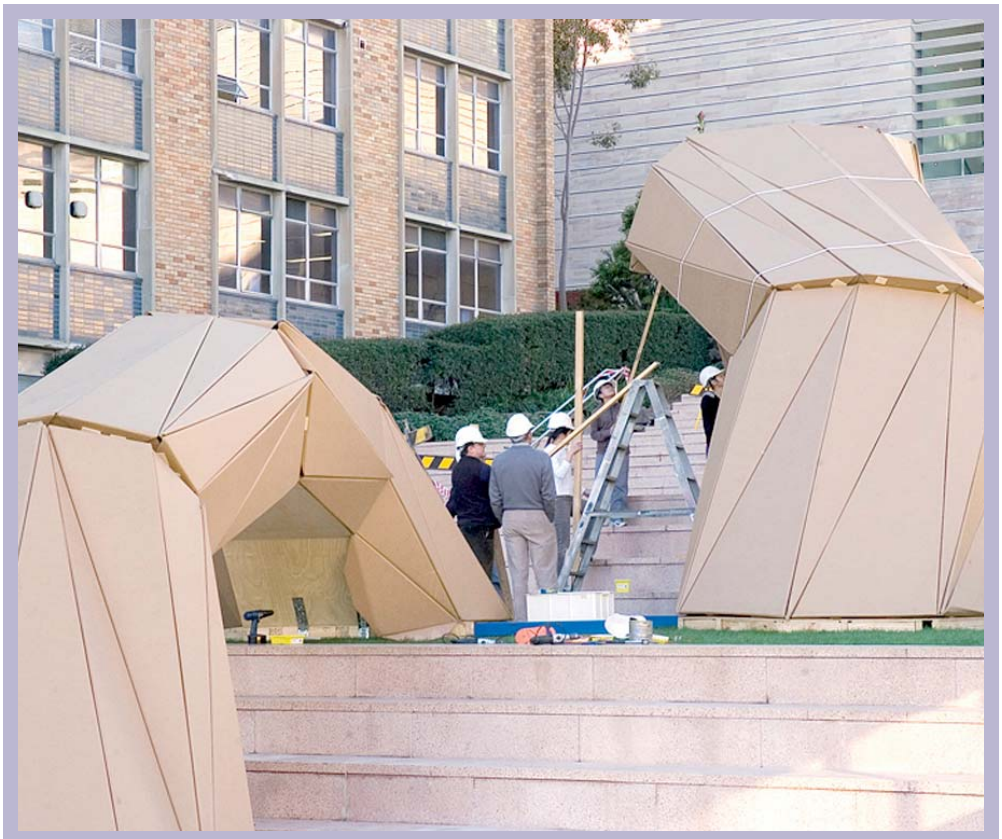
Of the multidisciplinary approach, course co-ordinator Graham Bell said: "There were some philosophical differences as the students developed the frame and tried to make it structurally sound while maintaining the integrity of the design, but overall we are finding that the students like working together and have learnt a massive amount from each other."

Jones concurred: "It was an iterative approach that goes round and round the table to come up with a good solution – the engineers, architects and artists coming up with a concept and solution together."

The July winds prior to the conference have been quite extreme, but Jones said the structure was holding tight. Being interviewed while he lay inside the belly of the beast screwing in some cladding he said: "The temporary fencing has been blown down but in the sculpture we have about 8t of sand weighing it down. I can hear the wind howling outside and this isn't even budging."

While lifting the 10m arches into place with a 20t crane, Boral Timber were onsite and were impressed with the students' result.

Jones said while the engineering and design has been an important facet of the project, the hands-on construction of the sculpture has been just as rewarding. "The hands-on component and knowing what limitations some materials have has been a valuable experience."



The sculpture celebrates multidisciplinary design education. UNSW is hosting a conference on the new education approach this month.

Thirty eight students from three faculties have worked throughout the first semester in a course encouraging teamwork, cooperation and working together on shared innovative visions.

Modelling cell walls

by David Salt

This is an extract from an article from the June issue of ANU Centre for Science and Engineering of Materials publication Materials Monthly.

Students in biology and materials engineering at ANU are combining forces in multidisciplinary research that is discovering a better understanding into how a plant grows. The team is investigating the mechanical properties of the materials that make up the cell wall.

Professor Richard Williamson of the Cell Wall Laboratory at the Research School of Biological Sciences (RSBS) has been researching the biosynthesis of cell walls and has pioneered the use of cell wall mutants in investigating the composition and properties of cell walls.

A large part of a plant's growth is generated through the expansion of its cells. As the contents of a cell expand, there's increasing pressure on the cell walls. This forces the cell walls to stretch.

"An understanding of the cell wall's mechanical properties is central to understanding plant growth since it's the mechanics of the primary wall that largely shape the cell that develops during growth," Williamson said.

"The structure of cell walls has been extensively studied by biologists but how this structure determines wall mechanics has not received the same attention. This is in part because biologists are not well skilled in studying the mechanics of composite materials."

Consequently, Williamson has been working with engineers to model the mechanical properties of cell walls. Dr Shankar Kalyanasundaram, a materials engineer with expertise in the areas of mechanics and fracture of composite materials, computer modelling and finite element analysis, said: "The mechanical properties of any material always reflect its underlying structure.

"We're developing a computational model for simulating primary wall structure that will allow us to explore the relationship between wall structure, mechanical properties and growth."

The project has recently been supported with an ARC Discovery Grant. With this support, the researchers have recruited Dr Hung Kha (based in the Department of Engineering and RSBS) as a postdoctoral research fellow to carry out the computer modelling and analysis.

"For modelling cell walls we have adopted a micromechanical approach based on finite element analysis to predict the effective mechanical properties of the cell wall consisting of a cellulose microfibril and xyloglucan network and pectin," explained Kalyanasundaram.

Shankar Kalyanasundaram, Hung Kha and Richard Williamson gaze at a tray of plants being studied to understand the structure and mechanics of cell walls.

The group has developed a comprehensive, structure-based model for predicting the mechanical properties of the primary cell wall.

"The model generated is still relatively simple but our measurements of real cell wall materials are indicating that our approach works," he said. "Being structure based, the finite element model can predict how removing or modifying one component affects the mechanical properties of the cell wall.

A model validated in this way can be used to explore how changes in wall microstructure affect mechanical properties."

Williamson outlined the potential for the multidisciplinary approach: "Down the road it's expected that there could well be a wide range of important industrial applications flowing from this research.

Paper, timber and cotton are basically processed plant cell walls. The better our understanding of how these cell walls are shaped and formed, the greater the potential for us to modify their growth to produce a wide range of biomaterials with enhanced properties."

The research will also provide material scientists with insights into a composite material selected by the forces of natural selection, a material that shows high performance in terms of tensile properties together with remarkable flexibility in its properties.

The research offers potential insights into how properties of composites can be regulated during forming to control final shape.

Scholarship gives helping hand

The University of Melbourne has awarded the inaugural Paterson Scholarship to Marita Cheng, a first year student of mechatronics engineering combined with computer science. The Paterson Scholarship provides students with financial assistance through the length of an undergraduate degree.

Cheng is enjoying her engineering degree combined with college life. She said it would be a shame if anyone with aspirations to become an engineer was not able to pursue engineering because of financial reasons. "I am very grateful to the Patersons for providing me with this opportunity," she said.

Originally from Cairns, Cheng has established herself in Melbourne and balances her academic achievements with table tennis, strength and resistance training, and volunteer work with refugees at weekly tutorials in Carlton. Her first language is Cantonese, and besides English she also speaks Japanese.

The Paterson Scholarship will be awarded each year to highly talented and dedicated students who undertake an undergraduate degree in engineering.

Bob Paterson (BE (Civil) 1949) and his wife Helen, have established the scholarship to provide ongoing support of up to $5000 per year to engineering students who are in financial need, disadvantaged or have demonstrated academic merit in year 12 of secondary school.

Paterson started his career as an engineer with Ingersoll Rand in 1949, and moved into executive roles in England, South Africa and throughout Australia. For the past 20 years he has been involved in the development of renewable energy projects. The Paterson family have maintained a strong relationship with the University of Melbourne and endeavoured to give back something in return for their professional and personal successes and good fortune.

Bob Paterson explained that after the experience of a distant relative who received financial support to complete his studies as an adult, and who was able to achieve his dream of becoming an engineer, he and his wife were encouraged to establish the scholarship.

"It highlighted to us that there are many students who have the potential to be talented engineers but who lack the financial resources and the family support to continue their education.

"We hope that through this scholarship we can help some of those students fulfil their potential," said Paterson.

Engineers Without Borders chapter for UQ

After 900 University of Queensland students participated in the Engineers Without Borders (EWB) Challenge in March, where students created design solutions for a children's home in India, the university has launched a new partnership with EWB Australia.

Head of the UQ School of Engineering Professor Jim Litster with Engineers Without Borders education, training and research director Lizzie Webb and Engineering Without Borders Australia president Daniel Almagor. PHOTO CREDIT: JEREMY PATTEN, THE UNIVERSITY OF QUEENSLAND.

The School of Engineering is now housing its own chapter of the organisation, which was founded in 2003 to help disadvantaged communities through education and sustainable engineering initiatives.

Head of the school of engineering Professor Jim Litster said: "All the big issues of the 21st century require engineering input on a local and global scale.

"This collaboration enables our students to use their skills and work on projects that will make a significant difference in the lives of others."

EWB president Daniel Almagor said: "EWB-UQ will be raising awareness about the issues and values EWB promotes and encouraging people to commit to being part of the solution."

Almagor commended the university for its support and said he hoped it inspired others to become involved.

"It is crucial for the next generation to take on the ideas of sustainable and appropriate engineering," he said.

Launched recently in front of industry partners at the School of Engineering, the UQ chapter is the newest in the EWB network, joining more than 20 others nation-wide.

Current projects involving UQ students include building sanitation facilities in Papua New Guinea and teaching refugees computer skills.

Those interested in finding out more about EWB initiatives can call 03 9696 9040 or visit http://www.ewb.org.au/main/.

Creating a virtual university

Organisers are gearing up for Australia's 10th National Science and Engineering Week to be held between 18 and 26 August and the UWA School of Computer Science and Software Engineering (CSSE) is creating a virtual universe to allow people to participate in Engineering Week activities online as avatars.

The Virtual Universe being constructed will allow avatars to explore the virtual University of Western Australia (UWA) science faculties situated in virtual City of Perth.

After logging in through the web, participants will be able to explore a detailed campus model, interact with other avatars and objects such as buildings, and obtain information by clicking on them.

A "Science Guru" avatar will also exist to quiz participants on science questions of significance to Australia. The project will educate those logging in as to Australia's scientific accomplishments. After the event, it is planned that the universe will continue to have a life to advertise the university and the school of computer science and software engineering.

National Science Week provided the initial $1000 grant that instigated the start-up of the project. Having now received $23,000 to date Jay Jay Jegatheva Jegathesan, school manager of computer science and software engineering, said: "That is a very small amount for what we are going to be doing. The commercial value would be well over $150,000."

The School of Computer Science and Software Engineering at UWA is creating a virtual universe starting with their very own computer science building.

The school is running the project with partners around the globe providing additional supporting server resources as required. Jegathesan said people in Asia and Europe are working on various aspects of the project including building 3D models, texture mapping and creating avatars.

"This started with a dream I had and (PhD student) Chris Thorne said that he and friends around the world had always thought of creating a virtual universe somewhere but had never got started," Jegathesan explained.

Challenge in game development

Following the annual Australasian game development competition Interzone Nullarbor in April, some of the best entries were hand picked to compete in the Interzone Nullarbor Deconstructor competition at the end of May. The Deconstructor competition allowed for an in-depth look at the entries by a diverse panel of expert judges comprising representatives from Interzone, Edith Cowan University, Murdoch University and UWA.

In a battle for the top spot, first year student Scott Kerr, from the UWA School of Computer Science and Software Engineering, took out the honours with his program "Last Dawn", holding off "Zyberflux" the creation of UWA computer science students Jason Wong, James Strauss, Minh Tran and Anthony Prior.

This made it a quinella for UWA, beating entries from as far afield as New Zealand and outpacing others including entries such as "Dust", "Dave's Challenge" and "Return to Zero".

Kerr's "Last Dawn" is a game about surviving in a zombie infested world, scavenging for supplies and trying to defend your base from zombies until you are rescued.

The game was built on an engine made from scratch over a period of months. Working alone, he faced many challenges and spent many hours perfecting his game which won praise for its innovative gameplay and stylised graphics.

The runner-up game "Zyberflux" is set in another universe and the game players' ship flies on a flux/rail while navigating a myriad of obstacles and survival is by destroying and shooting down enemies in order to reach the end of the level where "The Big Kahuna" awaits.

Due to the depth to which the games were examined at the Deconstructor competition, judges noted the quality of all the entries as well as the difficulties and challenges faced. Judges looked at the tools and technology used and examined motivation and creative inspiration as well.

School manager Jay Jay Jegathesan said: "These results come at an opportune time, as the School of Computer Science and Software Engineering, has just launched new majors in entertainment technology and web technologies and units such as game design and multimedia within the flagship Bachelor of Computer Science Degree program."

"Last Dawn" can be downloaded in its entirety from the Awesome Animations website of the School of Computer Science and Software Engineering.

A preview of "Zyberflux" is also available from the same site http://www.csse.uwa.edu.au/awesome/index.php?show=9

by Nick Harley
Chair, National Committee
Young Engineers Australia

Eager for online comment

For Nick Harley's column, please visit his online blog where he awaits your comments:

www.engineersaustralia.org.au/fusetalk_standard/blog/index.cfm?forumid=18

New centre for automation

by Kirill Reztsov

The establishment of a new centre for mining automation is set to generate new opportunities for students contemplating postgraduate study. The new centre, based at the University of Sydney's Australian Centre for Field Robotics (ACFR) and funded largely by Rio Tinto, will be one of the world's largest civilian robotics research centres. The centre also has partner university relationships with the University of New South Wales and the University of Technology Sydney.

Rio Tinto announced this month that it would commit $21 million over five years to the centre. The initial agreement has the potential for extension by agreement following mutually satisfactory technology and innovation outcomes. A technical management group with representatives from Rio Tinto and the ACFR will monitor the centre's performance and guide its direction.

Tom Albanese, chief executive of Rio Tinto, said funding an Australian university research centre would help establish a strong relationship between the company's technical and innovation activities and Australian academic and research institutions.

Rio Tinto's group executive for technology and innovation, Grant Thorne said: "The Centre for Mine Automation aims to provide a substantial improvement in safety, predictability, precision and efficiency of mining through the development of automation and remotely operated mining processes."

Thorne envisaged that Rio Tinto's iron ore group, headquartered in Perth, would be the first to trial a range of equipment and the remote operation control of mines, processing plants and trains.

A spokesperson for ACFR, Olga Sawtell, said they are looking for high-quality graduates to supplement the 130 research PhD students they already have. She said there will be 28 new jobs and ten new scholarships. "In the past we only looked at honours graduates," she said, but now they are looking at a broader intake.

In addition to graduates from different branches of engineering such as aeronautical, mechanical and electrical, the centre also welcomes those with degrees in mathematics or IT.

Traditionally, the university's undergraduate engineering courses have served as feeders for ACFR. The centre will now be looking at students from partner universities.

ACFR has long been involved with the mining industry, focusing mainly on improving safety and precision. Amongst their many developments are automated diggers and different kinds of radar.

Geothermal funding for Adelaide

To enhance the capability of geothermal energy research in South Australia, the state government has announced a grant of $250,000 to the University of Adelaide as seed funding for the development of a major international research facility.

The agreement will allow the university to host Australia's first research cluster examining all aspects of hot rock enhanced geothermal systems.

Professor Richard Hillis, head of the university's Australian School of Petroleum said the purse of money will support about five projects with priority projects directed by the Australian Geothermal Energy Group. Hillis said he was hopeful that the government money will be matched by industry.

The projects will most likely research geothermal exploration processes which currently use the same geophysical investigation tools that the minerals industry use, hence the crossover with the university's Australian School of Petroleum.

Hillis explained that research is a mix of geology and petroleum engineering, so undergraduate engineers don't have specific courses to complete to progress into geothermal study, but come along through the minerals engineering route.

Seismic and electromagnetic mapping looks for high heat producing rocks – hot radioactive granite covered by an insulating layer of sediment.

South Australia is fast becoming the centre for Australian geothermal energy research with 80% of all geothermal exploration licences located in the state.

A group of 17 companies currently exploring for hot rock in South Australia includes Scope Energy which is exploring Mount Gambier, Petratherm whose main project is exploring hot rock in the Flinders Rangers, and Geodynamics whose principal project is located in the Cooper Basin.

Hillis said South Australia is the focus because it has the best geological formations as well as the best licensing system.

Australia-wide, 27 companies have applied for 166 geothermal licences. Between 2002 and 2012 these companies are currently expected to invest more than $650 million in exploring and undertaking proof-of-concept projects in their licenses.

On presenting the funding to the university, Paul Holloway, South Australian minister for mineral resources development, said: "South Australia represents Australia's hot rock haven for renewable, emissions-free power which could provide a very significant part of Australia's base load power needs by 2030."

The South Australian government has a target of a 60% reduction in greenhouse emissions by 2050 and Holloway said the establishment of a Research Centre of Excellence in Geothermal Energy in South Australia is an important step in realising the commercialisation of geothermal energy in Australia to work toward this target.

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Division News

Electronic copies of Engineers Australia's Division newsletters are posted on each Division's website. These newsletters keep members informed of the issues pertaining to their Division, and to notify members of upcoming events.

Access your Division newsletter by clicking on the links below:

Canberra | Queensland | Tasmania

Newcastle | South Australia | Victoria

Northern | Sydney | Western Australia

YEA Activities

CANBERRA

Contact Nathan Munro on 02 6285 1822, email nmunro@northrop.com.au, web can.youngengineers.com.au.

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.

Visit www.engineersaustralia.org.au/youngengineers to keep updated on the latest news and events for Young Engineers Australia. Also check out the extensive list of links to recruiting firms and other engineering organisations from around the world.