

Auckland

MAKING AN IMPACT

NOW

ISSUE 12 | April 2013

Engineering growth

Undergraduates enrolled in Engineering reach all-time high

Helping farmers

High-tech agriculture

Worlds apart

Working on *The Hobbit*



THE UNIVERSITY
OF AUCKLAND

NEW ZEALAND

Te Whare Wānanga o Tāmaki Makaurau



ENGINEERING GROWTH

First-Year Engineering students: Alyssa Ong, Caleb Perry (on cover) and Josh Pollock

As the engineering and construction industries learn valuable lessons from the Christchurch earthquakes, 18-year-old engineering student Caleb Perry is hoping to be part of a better prepared future.

Caleb, from Wanganui, is doing an Accelerated Pathway programme at The University of Auckland’s Faculty of Engineering. He aims to complete his Bachelor of Engineering in three instead of four years, specialising in Civil Engineering. “I’ve always been fascinated with buildings and infrastructure and how things are put together,” he says.

Last year Caleb had a placement with Wanganui structural engineers BPL Group and helped assess the earthquake compliance of historic buildings in the city. “We found a lot that aren’t compliant. It’s going to take years to remedy this,” he says. “The challenge for engineers will be to keep the look of buildings and strengthen them at the same time.”

Caleb is one of about 800 new students starting the Bachelor of Engineering programme this year. This intake is not only the largest ever, but also includes record numbers of female and Māori and Pacific Island students. Like Caleb, most will have prepared for an engineering degree at school and will have marks well above the minimum entry threshold.

The University’s outreach programme works with maths and physics teachers in high schools to encourage their students to start thinking about an engineering career as early as Year 11. “For many years we have been responding to signals from Government, IPENZ [Institution of Professional Engineers New Zealand] and industry that New Zealand needs more professional engineers,” says Acting Dean of Engineering, Professor Gordon Mallinson.

The University has launched a \$200 million redevelopment of engineering facilities on campus including building a new research centre to cater for more than 3,000 undergraduate and 700 postgraduate students.

The Government’s decision to fund an additional 150 undergraduate places from this year is particularly welcome and will enable the faculty to maintain future entry levels. “The demand for BE graduates is expected to remain very high,” says Gordon. “Companies like Beca, Fisher and Paykel and Fletchers are employing a lot of our graduates each year and many top New Zealand business executives now have engineering degrees too.”

The Faculty of Engineering is ranked one of the best engineering schools in Australasia and is 68th in the QS World University Rankings. It has world-leading expertise in areas such as composite materials, inductive power transfer, yacht and sail design, medical applications and earthquake engineering.

One of the big growth areas is mechanical and mechatronics engineering. “Everything we use has a mechanical device and the interface between that and robotics is where engineering is really growing, particularly in the medical field,” says Gordon.

The faculty is renowned for its strong emphasis on design – introducing students to design principles and concepts as early as the first year – and for Systems Engineering courses that show how engineering fits into the world. Last year 500 students tackled the problem of what to do if a cruise ship knocked out the centre span of Auckland’s harbour bridge. This real-life approach appeals to Caleb as he prepares for his new career. “My dream project would be to head engineering for a new construction. In making a building as safe as you can you’d know you’d made a difference.”



COMMERCIAL OUTCOME

Dr Mark Sagar and Dr Peter Lee

When electrical engineers at The University of Auckland made electricity jump over a gap by intersecting two magnetic fields they achieved what had eluded others for centuries and made it a commercially viable process. With a lot of creativity and innovation and the backing of the University's commercialisation company, Auckland UniServices Limited, their inventions for Induction Power Transfer (IPT) were protected in over 30 different patent families, and then for more than a decade have been progressively applied to an ever-increasing range of industrial and consumer products.

This reflects the strong focus the University and UniServices have on commercialising research results. In a recent US survey the University ranked second only to the Colorado School of Mines for the percentage of its research which is sourced commercially. The survey by the North American Association of University of Technology Managers measured how much commercial work was being carried out at universities. In North America the average is 7 percent; at The University of Auckland it is 42 percent.

UniServices is like a matchmaker – it finds ways to marry up the University's research and innovation with companies in New Zealand and around the globe that are looking for new ideas, expertise and solutions. "We run UniServices as a business," says former CEO, Dr Peter Lee. "We provide a full, independent commercialisation service from contract research, licensing, spinout incubation and financing."

UniServices works alongside academic staff to secure patents, find business partners, set up companies and negotiate licence agreements. In 2011 Qualcomm, a world-leading provider of wireless technology and services bought the University's IPT technology for the wireless charging of electric vehicles. It was undoubtedly the most significant technology transfer deal ever

achieved by a New Zealand university. "We can look back with pride and pleasure at how our two organisations worked diligently to achieve a wireless power win-win-win solution," says Andrew Gilbert, the executive Vice-President of Qualcomm Europe Inc.

Since 2005 UniServices has started 15 new companies and issued more than ten times that many licences to existing companies. Examples include PowerByProxi, which is applying IPT technology to deliver wireless power solutions across a variety of lower power applications, and Neuren Pharmaceuticals, a biopharmaceutical company developing drugs for brain injury and neurodegeneration. Last year UniServices generated \$135 million in revenue (some \$46 million from overseas).

UniServices employs 700 staff who work with New Zealand businesses as well as with projects ranging from geothermal prospecting in Rwanda to applying educational tools in Saudi Arabia. New opportunities include working with Academy Award winner Dr Mark Sagar at the University's Laboratory for Animate Technologies who is taking computer animation to a new level: "Imagine a machine that can express what is on its mind." His laboratory aims to create an experience that would allow visitors to engage with technology such as an information panel that appears conscious, emotive and thinking. This would be valuable for education, advertising, and the entertainment industry and UniServices will be part of the process to link the research to the companies that could use it.

"Research is not only good for business," concludes Peter Lee, "but research is a good business."

www.uniservices.co.nz



HIGH-TECH AGRICULTURE

Dr Cather Simpson

Making sure sperm is correctly sorted for artificial insemination of cows, sheep and cattle is vital for farmers.

Now science and engineering students who are part of The University of Auckland's Photon Factory in the Faculty of Science have come up with a simple method so farmers can choose whether to produce male or female animals. Using high-tech laser technology, they have invented a device that is being patented and developed by spin-out company Engender Technologies.

"This new approach lowers the cost to farmers," says Dr Cather Simpson, head of the Photon Factory. "It causes less damage to the sperm, so it's likely to be very attractive to industry."

Another University project that will benefit New Zealand agriculture is work by Distinguished Professor of Organic and Medicinal Chemistry Margaret Brimble to determine whether the common garden potato could play a key role in treating Psa - the bacterial pathogen which has been infecting kiwifruit vines throughout the country and threatening exports.

With funding from kiwifruit industry organisation Zespri and in collaboration with Plant & Food Research, Margaret and Dr Paul Harris have chemically synthesised an antibiotic agent that may be effective in treating Psa.

"The genomes for potatoes and kiwifruit are very similar," she says. "Both have similar anti-microbial peptides [antibiotics] and in potatoes these natural antibiotics are known to fight fungi and bacteria that cause disease. We can mimic this as a potential treatment for kiwifruit."

Margaret's laboratory is also working with international agricultural company Bayer to create an antibiotic to treat mastitis in cows. "It will allow us to cross the blood/milk barrier when there is severe infection."

A growing number of University of Auckland science researchers are using their high-tech expertise to help New Zealand farmers and growers.

Projects at the School of Biological Sciences include looking at toxins to control pastoral pests; research into yeast varieties for New Zealand's winemaking industry; natural fungicides and the health of stream ecosystems. "And that's only a half of it," says Gillian Lewis, Head of School.

Dean of Science Professor Grant Guilford says the University's agricultural research takes a broad approach, from cow genetics to helping farmers deal with stress.

Last year a Joint Graduate School in Dairy Research and Innovation was launched with DairyNZ, farmer co-operative Livestock Improvement Corporation and AgResearch. The school fosters post-graduate research that contributes to sustainable productivity on the farm. "We want to create a focus on the dairy industry to help it recruit top talent," says Grant.

The Faculty of Engineering robotics team is focused on increasing mechanisation on farms and automating ways to assess animal health and welfare. Meanwhile researchers at the Faculty of Medical and Health Sciences are studying the effects of infection on cow conception rates and how to improve herd fertility.

And the benefits from the University's research extend beyond the farm gate, says Grant Guilford. "We make a significant contribution to the primary sector - our researchers enhance the economic value of primary sector products, optimise food process engineering, hone logistics and supply, and develop smart marketing."



GOING GREEN

Reduce, Reuse, Recycle – these are the usual 3 Rs. But The University of Auckland’s pioneering sustainability and environmental programme has added another one: Rethink.

From simple steps such as giving staff paper recycling trays, to the large initiative of monitoring energy use in all its buildings, the University has made significant strides in using energy, water and paper more efficiently.

“We’ve already made considerable progress in energy saving,” says Lesley Stone, manager of the University’s Sustainability and Environmental Programme. The energy use per square metre of floor area is well below the average for New Zealand universities. The University uses 47% less energy per student than when monitoring began in the late 1980s and has shaved a total of \$100m off its energy bill since then.

Lesley (pictured) says the key to this success has been having a dedicated Energy Manager and installing meters to monitor what is happening in each building. That information is used as part of a central building management system. “We have 200 buildings and now we can shut down or put to sleep the heating or cooling systems as needed.”

Campaigns to engage staff and students have also paid off – small steps such as switching off the computer before going home become meaningful when there are over 13,000 computers on campus. A similar campaign to turn off the lights adds to the savings and cleaners have been contracted to work earlier rather than late at night to save on electricity.

Another simple measure – switching printers to double-sided printing – has been part of the drive to save paper along with putting more course material online and giving staff tiny rubbish bins on their desks. Since 2006 these changes have saved a

colossal amount of paper, equivalent to reams of paper stacked up to the height of four Auckland Sky Towers.

“Our recycling has tripled in the last five years,” says Lesley. “A lot of this comes from engaging and motivating people through the Sustainability and Environmental programme and building awareness, involvement and responsibility with senior managers and academic staff.”

Water efficiency has improved by 63% since 1980 thanks to replacing corroded pipes, putting in a ring piping system on the City Campus, having urinals that flush only when needed and reusing water in cooling systems and monitoring soil conditions so sports fields are only watered when necessary.

As part of rethinking and reducing the University’s CO₂ emissions, senior students have paired up with academic staff in “Living Laboratory” projects. PhD student Bingqin Xu measured how much carbon is absorbed and stored by the trees on the University’s City Campus. She found that 400 heritage trees in the Conservation zone next to Old Government House could play a role in offsetting the University’s carbon emissions. The trees store 737 tonnes of carbon dioxide at the moment, and that’s expected to rise to 800 tonnes by 2031.

Some of those trees were planted back in the 1860s and Lesley and her team want to emulate that foresight by working to improve the University environment for future students. “From initial savings in energy and waste disposal to the gradual development of a sustainability-savvy organisational culture, the University has set ambitious targets for becoming more sustainable as part of its 2013-2020 Strategic Plan,” she says.

www.auckland.ac.nz/environment

A photograph of Samuelu Siilata, a young man with his arms crossed, standing in a movie set. To his left is a full-body prop of Gandalf the White from 'The Hobbit'. The background features a large sign that says 'THE HOBBIT' in gold letters, with 'NEAR EXPECTED JOURNEY' written below it. The setting is a dark, forest-like environment with green foliage.

WORLDS APART

When Samuelu Siilata was growing up in Samoa he had two favourites places – the tropical forest and the main library in the centre of Apia where he would immerse himself in mythology and ancient cultures.

“One day it was the Vikings, the next it was the Ancient Greeks. My dream as a boy was to have my own set of encyclopaedias,” he laughs.

As he grew up Samuelu, now 26, also began to dream about making films that would take his audience to those ancient civilisations. After moving to New Zealand with his family and attending Auckland Grammar, he completed a Bachelor of Arts at The University of Auckland majoring in Film, TV and Media Studies, with minors in Anthropology and History.

“I learnt a lot of theory that helped me understand film, think analytically and construct story lines,” he says of his time at the University. “And I did some amazing papers on Bollywood, British cinema and the South Seas on screen.”

In 2010 Samuelu received the first Prime Minister’s Pacific Youth Award for Creativity and was offered a paid internship at Weta Studios in Wellington.

“I submitted a portfolio of my creative work: art, film, photos and

a traditional Maori patu [club] I’d carved while on a course at the University. I think this caught the eye of Weta Founder Sir Richard Taylor.”

Samuelu was placed in the props department for *The Hobbit* and ended up working for two years through to the end of the film. His team created all the weapons for the orcs, dwarves and elves and he also worked on costuming and in the leather department.

“I helped with armour, hammering rivets, wearing down leather, spray-painting stuff. Weta don’t just make things, they think how something would be used and designed at that time. Everything is supposed to have a story and all the details are carefully thought through.

“We were creating an environment, actual worlds or cultures. You can delve into any space, futuristic or historical, and actually create these worlds to be believable.”

Samuelu finished at Weta late last year and he’s building on that experience and his University degree with two of his own projects: writing an action screenplay based in the Bronze Age, and writing a history of ancient Samoa.

“I want to show and share these worlds that no one has ever seen before.”

Auckland
NOW

Auckland Now: Produced by The University of Auckland **Editor:** Tess Redgrave

Art Direction/Design: Justin Marshall (Central Marketing) **Photography:** Dean Carruthers. Special thanks to ECC Lighting for location inside cover

Auckland Now showcases the impact The University of Auckland has on Auckland, New Zealand and the international community through its teaching, research and community service. For more information contact us at: aucklandnow@auckland.ac.nz