

Strong finish for Waikato Formula SAE team

The University of Waikato Formula SAE (Society of Automotive Engineers) team and their car have placed sixth overall in the Formula SAE-Australasia competition in Melbourne. They were also the top ranked team from New Zealand.



The competition, which was held from 12-15 December, included 23 teams and involved static and dynamic events. The team placed fourth in cost and fifth in design. Static events comprised of giving design, business and cost presentations, while the dynamic events included a range of quality tests such as scrutineering, brake, noise and tilt tests. Racing events included autocross (one lap on a track), endurance (30 laps on a track), acceleration and a skid pan event on a figure eight course.

"We had a bit of a scare in the first endurance event when one of the CV joints in the drive train failed, resulting in the car losing power and being stuck off-track on the far side of the course. Fortunately, thanks to the team's persistence we got the car back in the pits and rebuilt the joint with minutes to spare before the next endurance event," says team co-supervisor and Waikato University engineering lecturer Dr Mark Lay.

The 2013 team consisted of Daniel Lamb (team leader), Avinash Chavda, Ben Jackson, Kevin Duncan, Sam Brien, Michael Hoogendoorn, Brad Webb, Mark Shrimpton and Issac Hayes.

The Waikato Formula SAE team was formed in 2006. Each year the team builds an open wheeled single seat-style race car to compete in Formula SAE.



Speed stars: A group of Waikato University engineering students competed in the Formula SAE Australasia competition in Melbourne, scoring sixth place.

This car must comply with the rules outlined by the competition, such as a maximum 600cc engine, 20mm air inlet restrictor and limited track width and wheel base.

Formula SAE is an international competition where university students design and build their own car. Competitions are held across the world, with over 900 universities taking part.

View more photos: www.facebook.com/WaikatoScienceEngineering

Changing environments the focus for Science Summer School



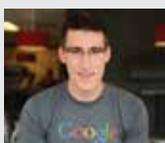
Forty Year 12 students from throughout the central North Island attended the Hill Laboratories Waikato Science Summer School in December last year.

Interactive, hands-on field and lab work were the highlights for students attending the Hill Laboratories Waikato Science Summer School last year.

The week-long action-packed Summer School ran from 1-6 December at the University of Waikato, and gave 40 talented Year 12 students from around the central North Island the chance to get a taste for what it can be like to study science and engineering at a tertiary level.

The journey began with a full-on two day field trip during which students explored the areas of Kawhia and Waitomo. The group searched for fossils at Puti Point, collected zoo plankton samples at the Kawhia jetty and enjoyed a walk through the Ruakuri Caves.

Continued over the page.



Coast to caves: Summer School cont'd

Continued from page 1:

Hamilton student Vaughn Ticar from St John's College said it was the first time he had been in a cave and he found it fascinating to learn about cave environments and how stalactites form.

The remainder of the week was spent in Waikato University's science and engineering labs, analysing samples, conducting experiments and building prototypes to better understand the environmental and social changes the local coastal and cave environments have undergone over time. Group presentations by the students brought the week to an end.

Sponsor Hill Laboratories is the country's largest privately owned analytical testing laboratory. The Summer School included a visit to the company's laboratories for a tour of their facilities.

"For those passionate about science, it is a lifelong journey. We are proud to be supporting these talented young students who have begun their own journey of scientific discovery, and look forward to the contributions they will make in their chosen fields in future years," says Dr Jonathan Hill, Hill Laboratories Environmental Divisions Manager.

Waikato's Summer School is an annual event run by Rotary District 9930 and Waikato University's Faculty of Science & Engineering, with sponsorship from Hill Laboratories.

Applications for the 2014 Hill Laboratories Waikato Science Summer School will open in June.

Find out more: www.sci.waikato.ac.nz/sciencesummerschool

View more photos: www.facebook.com/WaikatoScienceEngineering



Rowan Skentelbery (Mount Maunganui College) with the torch she made in the Electronic Engineering laboratory.



At Puti Point the students searched for belemnite fossils amongst the piles of rock.



The group collected water samples from the hot springs at Kawhia's Ocean Beach.



Georgi Pearson (Mount Maunganui College) and Hayden Kilgour (Cambridge High School) collect zoo plankton at Kawhia Harbour jetty.



Karangawai Paringatai-Hare (Saint Joseph's Maori Girls' College) prepares a sample of zoo plankton in the Biological Sciences laboratory.



Justiss Debenham (Tamatea High School) experiments in the Chemistry laboratory.

Computer Science team off to Russia

Success at solving computer programming problems has guaranteed a team from the University of Waikato's Computer Science department a trip to Russia.

The University team, Trigraph, consists of second-year students Tom Levy, Matthew Law and Ryan Smith.

After placing among the top teams in the regional ACM programming competition, Trigraph has been selected as one of the top two collegiate teams from the South Pacific region to compete in the world finals of the ACM-ICPC (International Collegiate Programming Contest). The other team from the region is from the University of New South Wales.

Ryan says he is happy but surprised the team has made it to the world finals.

"I think it's really amazing that we're going to Russia and will be competing against international teams. We're all shocked but very happy."

The last time the University of Waikato was represented at the world finals was in 2000 when the competition was held in Orlando.

Senior Lecturer in Computer Science Mr Bill Rogers, who will accompany Trigraph to Russia, says the team members are all outstanding students.

"They were all summer scholars in 2012 working for research groups in the Computer Science Department. The world finals will be a great experience for them. Just to participate in this significant competition is what it's all about," says Bill. "This competition is taken very seriously



University of Waikato Computer Science team Trigraph: Matthew Law, Ryan Smith, and Tom Levy with Senior Lecturer Bill Rogers (second from right), have made it into the ACM-ICPC world finals.

in other parts of the world."

The team will head to Ekatarinberg in the Urals for the competition this June where they will be up against 120 teams from all over the world. Teams will have five hours to solve as many programming problems as they can under competition conditions.

ACM, the Association for Computing Machinery, with more than 100,000 members, is the world's largest educational and scientific computing society, bringing together computing educators,

researchers, professionals, and students to inspire dialogue, share resources and address the field's challenges.

The collegiate computer programming competition is hosted by Ural Federal University, sponsored by IBM and is regarded as the oldest, largest, and most prestigious programming contest in the world.

Interested in Computer Science?

Visit www.cms.waikato.ac.nz

Waikato's Cyber Security lab a New Zealand first

New Zealand's first cyber security lab was opened at the University of Waikato late last year, coinciding with the launch of a new qualification, the Master of Cyber Security degree.

The lab will focus on returning control of data to data owners by focussing on research addressing data security from a user-centric perspective. It will develop innovative solutions to allow users to know what happens to their data, particularly when it is stored in a cloud environment.

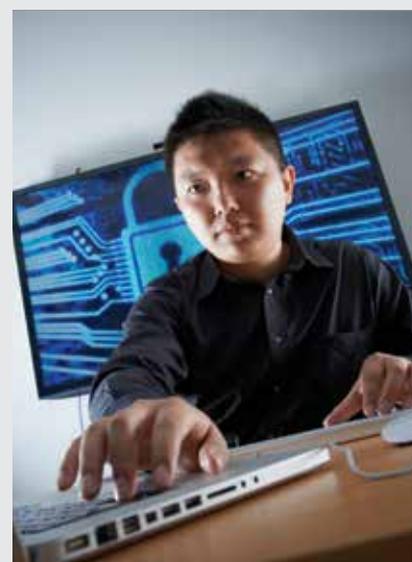
With the increasing dependence on information technology and the global rise of cyber security threats, the launch addresses a growing need to train skilled and ethical cyber security professionals and develop new technology to

protect New Zealand's critical infrastructure and economies.

The lab has a large-scale cloud computing test bed for realistic testing and verification of its tools and senior lecturer Dr Ryan Ko (pictured right) says it will run along six themes: provenance; user-centricity; security visualisation; security economics; hardware security and tools and datasets.

"Data security education is still a fledgling area and a good area for the University to get into early. We want to be one of the top cyber security regional hubs in the Asia/Pacific region in five years," says Dr Ko.

Find out more: <https://crow.org.nz/>



Hydraulic rescue tool set to save lives

Saving lives on New Zealand roads is the goal for University of Waikato mechanical engineering student Andrew Gerbich. His hydraulic rescue tool is designed as an alternative to the commonly known 'Jaws of Life'.



Rather than cutting through the vehicle, Andrew's Car Spreader is designed to straighten bent steel back to its original shape.

"Car versus object impacts tend to bend the vehicle around a roadside installation such as a

power pole, leaving the driver and any passengers trapped inside. The current method of getting passengers out is to use hydraulically powered cutters and spreaders (the Jaws of Life) to disassemble the car's structure," says Andrew.

"While this method works, it can be dangerous to both the passengers and the rescue team. Another problem is that modern cars are made from stronger steels and can contain high current electrical cabling and airbag propellant tanks which can make it unsafe for first responders to cut a car apart."

Andrew, a former Waiuku College student, began with a machine concept from Pukekohe company Belcher Industries. Along with workshop space, the company also provided supervision from Engineering Manager Kael Roberts, who was a co-supervisor of the project alongside Waikato University's engineering lecturer Dr Rob Torrens.

With a concept in mind, Andrew quickly moved into the design phase, during which stress calculations were completed in parallel with a SolidWorks model to find required dimensions and material strengths.

When it came to putting the tool together, Andrew fabricated and welded the device in the Belcher Industries workshop, with guidance from

the company's tradesmen and managers.

"The heart of the machine is a hydraulic ram capable of a 10 tonne retracting force. The frame was profile cut from G350 Mild Steel and is arranged around the ram with adjustability to suit a range of small vehicles."

Following pre-testing with beams of steel, they then tested the spreader on a Ford Telstar sedan that had recently been in a side-impact collision.

"The machine was fixed to the side of the vehicle as it would be used in service and powered by Belcher's mobile hydraulic power pack, which contracted the ram. The force pushed the left and right pillars backward, whilst pulling the centre of the car outward as expected."

Andrew says that testing showed that the pressure required to bend the car was significantly lower than the limits of the machine, which indicates that future prototypes could be produced using smaller components and lighter materials to increase usability.

The prototype was just one of the many designs on show at last year's Carter Holt Harvey Pulp & Paper Engineering Design Show held at Waikato University.

Electric utility van a first for Waikato campus

A University of Waikato van will be silently making its way around campus after four fourth year mechanical engineering students removed its internal combustion engine and replaced it with an electric motor.

The van was originally powered by a 1.3 litre petrol engine, but as part of a year-long Honours project, Mark Shimanski, Tom-John Nelis, Nathan Dibley and Richard Xie (pictured right) re-powered it with an electric motor which is capable of a top speed of about 106km/h and a distance of 120 km on one charge.

The van will be used around the university campus and fleet manager John Ireland says it will be interesting to see what sort of savings are achieved.

"We'll get it painted up and looking good so we can promote their work," he says.

What the students have done is replace the engine with a 70kW continuous DC brushless electric motor, controller and batteries. Apart from removing the engine, petrol tank and exhaust, they have designed a system for coupling the electric motor, to the gearbox, installed a Hamilton built motor controller and designed a battery enclosure that meets New Zealand's electric vehicle requirements.

When complete, it will have 95 cells producing about 300 volts.

Dibley says there are lots of benefits for electric vehicles, particularly in city driving. "We think there's an untapped market for electric utility and courier vehicles".



The students have worked out it will take 4-5 years of use for the cost of converting it to electricity to pay off, but the further it drives the faster the payback.

Their supervisor, Dr Mike Duke says the students have done an excellent job getting the electric van operational in one year. There is a lot of interest in the commercial viability of electric van conversions and they plan to research its performance to determine the economic benefits.

Find out more: www.sci.waikato.ac.nz/engineering

Summer School encourages Māori and Pasifika students into biology

The University of Waikato recently hosted a new event aimed at encouraging Māori and Pasifika students to study biology at a tertiary level. Te Huakirangi Māori and Pasifika Biology Summer School was a week-long biology experience attended by Year 11 students from schools in Hamilton, Te Awamutu and the Waitomo area.

On day four of the event Senior Tutor Tanya O'Neill worked with the students in an environmental sciences lab where they tested the permeability and porosity of various materials by pouring water through sand, gravelly sand and gravel.

Experiencing biology

Students Chloe Punton, Kaarena Riddell and Vada Jamieson said they'd had a "busy, full-on time" and had learned a lot.

"It's one thing to hear about biology, but another thing to experience it yourself," said Chloe.

During the week students experienced aspects of first, second and third year undergraduate science papers that have a biology focus with the hope that they will continue with studies in biology. While at the summer school, students also took part in sporting activities, games, waiata, and trips to Mt Maungatautari and Hamilton Zoo.

Māori and Pasifika world views

"It's incredibly important that all high school students, particularly Māori and Pasifika students, are exposed to settings like this to generate interest in biology in a manner that is more appreciative of Māori and Pasifika world views," says Kevin Eastwood, Māori Student Achievement Coordinator in the Faculty of Science & Engineering.

The Summer School is likely to become an annual event.

View more photos: www.facebook.com/WaikatoScienceEngineering



Kendal Evitts (Nga Taiatea Wharekura) and the group visited the Hamilton Zoo to learn about animal behaviour.



Kendal Evitts and Shania Towers (Hamilton Girls' High School) learn about the processes involved in genetics during the Te Huakirangi Māori and Pasifika Biology Summer School.

Revamp for Waikato Experience Biology Days



Katikati College students (from left) Abby Eagle, Katie Marcroft, Charlotte Bottcher and Jodi Silson at the 2013 WEB Days.

Exciting new workshops and lectures, mixed with some of the tried and trusted favourites is the plan for this year's Waikato Experience Biology (WEB) Days.

Year 12 and 13 secondary school students from throughout the central North Island are invited to join us for our annual two-day biology event, which last year attracted 650 attendees.

Students will enjoy a seminar on human evolution, based on the School of Science's collection of hominid skulls, an interactive lab session, and a series of lectures on other key biology-based topics.

The changes come from new event organiser Dr Linda Peters. Dr Peters hopes to reinvigorate the event with fresh topics, while still keeping the content relevant to the secondary school curriculum.

School students must attend as part of a school group. Teachers can register their school group online. Find out more: www.sci.waikato.ac.nz/webdays

Google internship in New York

Boris Pfahringer is embracing Googlism as he begins an internship with web-giant Google in New York City.

Boris, who has just completed a Bachelor of Computing and Mathematical Sciences (Hons) at the University of Waikato, will be working with the Google search team "writing programmes to extend their analysis capabilities".



"It's my first time in New York," he says. "I'm looking forward to working in the Google environment and also having the opportunity to explore the city."

Google is well-known for its flexible working hours, restaurant-quality food and relaxed way of working. Its New York office is in Chelsea, in the heart of Manhattan.

"I will get good practical experience working with big systems as part of a large group."

The 14-week internship runs from mid-January until mid-April 2014 and is the second Boris has had with Google. The first was over last summer when he was selected for a place with several others from the University's Computer Science Department in Google's Sydney office.

Boris says his internship reselection is partly based on positive feedback that he received from his original Sydney internship.

Find out more: www.cms.waikato.ac.nz

Flash Hawaii job for grad

Simon Williams

Job: Research Assistant, Hawaii Natural Energy Institute, University of Hawaii
Studied: BSc (Physics/Chemistry) & MSc (Chemistry)
School: Tauranga Boys' College

Just three weeks after handing in his thesis, University of Waikato chemistry graduate Simon Williams was on a plane to Hawaii.

Since that day two years ago he has worked as a research assistant at the University of Hawaii's Hawaii Natural Energy Institute (HNEI), in the Renewable Resources Research Laboratory (R3 Lab). The R3 Lab is a test-bed for the development of innovative technologies and processes for the conversion of biomass into fuels and other products.

Flash Carbonization™

Simon has been involved in the laboratory's work on Flash Carbonization™ and studying the thermochemistry of biomass conversion via pyrolysis into biocarbon (charcoal).

"Flash Carbonization™ involves the ignition of a flash fire at elevated pressure in a packed bed of biomass. The elevated pressure allows the fire to quickly spread through the bed, converting the biomass to biocarbon. High carbon yields can be achieved in as little as 20 or 30 minutes. By contrast, conventional charcoal-making methods take from eight hours to several days," says Simon.

Turning waste into fuel

The long term goal is for small communities like those in Hawaii to be able to turn locally produced biomass such as macadamia nut shells, into biocarbon. The biocarbon can be used as a fuel to replace imported fossil fuels, or in agriculture for soil beneficiation and carbon sequestration.

Simon works on a number of projects running in the lab, with a focus on the chemical analysis of the gases produced in the experiments. "I run a piece of equipment called a Micro GC, which is a specialised miniature gas chromatograph used to measure the composition of the gases from our carbonisation experiments."



Waikato a perfect start

He says his Bachelor of Science (BSc) and Master of Science (MSc) degrees set him up well for his role. "I learnt a lot about various instruments and instrument support which is now a significant part of my job."

As a school student Simon attended Tauranga Boys' College and got a head start on university, by completing two level 100 papers at Waikato University while in Year 13. This made the transition to tertiary study easier and allowed him to complete some 200 level papers in the first year of his BSc.

Summer research scholarship

During his study at Waikato, Simon also took the opportunity to complete an Australian National University Summer Research Scholarship, which took him to Canberra to complete research in their chemistry department. He says it was a great chance to make contacts and see how different universities operate.

Find out more: www.sci.waikato.ac.nz/study/student-profiles

Check out the campus at Community Open Day

The University of Waikato will be opening its doors to the public on Saturday 17 May 2014 for its first Community Open Day.

As part of the University's 50th celebrations this year, Community Open Day is being held to showcase the University's campus, research and

facilities to the wider community.

Special lectures, fun displays, performing arts, activities for kids and much more will mean there's something for the whole family to enjoy. The event will run from 12noon to 4.00pm and is in addition to the University's annual

Open Day on Friday 16 May, which focuses on recruitment.

More information about the event will be available online soon.

Find out more: www.waikato.ac.nz/50

Good news for Hamilton kiwi



A trial in the Hamilton Gardens has proved a success for the prototype of a conservation management system designed by three third-year University of Waikato Computer Science students.

During the month-long trial, Jourdan Templeton, Nathan Holland and Stephen Quayle set up a chain of three Goodnature A24 rat traps roughly 50m–70m apart in a gully area in the gardens. Their management system, called Ohiti - the watchful eye on the kiwi - involves a small transmitter being connected to a trap that records each time it is triggered. The collected data is relayed in real time to a base unit. After processing, it is then uploaded to a server on the internet.

"We can collect a wide range of data every time a trap is activated. We use this data to provide information about the environment and the impact of pests in the area. For example, Ohiti could tell you the most active time for rats in summer," says Jourdan.

"Our goal was two-fold. Firstly, we wanted to make it easy to maintain the traps without sending people on a hike to check each one. By reducing operational costs, more money can be made available to protect our kiwi. Secondly, we wanted to provide a portal which would enable conservationists to be more proactive in protecting native species."

Wellington-based company Goodnature designs the humane traps that are now being used by the Department of Conservation to kill possums, rats and stoats. The trap works by luring rats into it with a peanut-based bait. As a rat is drawn to the peanutty delight, the trap is triggered and a CO₂ gas-powered pneumatic bolt fires, killing the rat instantly.

Stephen says the benefits of this trap are that they don't use poison and are self-reloading, firing up to 24 times before needing to be checked and reset.

"At the moment the transmitter technology works best in parks or bushland near built-up areas as it is operating on a 2.4 gigahertz frequency. As the technology evolves, it will be able to be used in a broader range of environments."

One of the challenges for the team was creating a waterproof housing so the electronics would continue to operate effectively, even in the rain.

"The idea was to test the technology in a real world situation, dealing with real problems, and that's what we've managed to do," says Nathan. "We even got to knock off a few rats in the process."

Ohiti demonstrates the potential technology has in aiding the conservation and preservation of kiwi.

Earth Sciences MSc graduates

Lhani Voyle

Graduate Engineering Geologist,
Tonkin & Taylor, Auckland



Lhani has landed a job with environmental and engineering consultants Tonkin and Taylor. She'll be based in Auckland but the company also does a lot of work in Asia and the Pacific, so she's hopeful some travel will be involved for projects offshore.

"Initially, I suspect I'll be doing a lot of EQC work dealing with natural disaster assessment," Lhani says. "But there'll also be site assessments, sampling and testing, mapping, hazard identification and slope stability assessment."

"I can't wait to get to work, using the skills I've learnt at uni and applying them in the field, and working with industry-based professionals."



Kadin Lucas

Graduate Development
Programme, Woodside Petroleum,
Perth

Kadin will be employed by Woodside Petroleum, Australia's largest independent oil and gas company, on their three-year graduate development programme that will have three rotations.

Kadin completed his Master of Science thesis in February 2013. His research involved using seismic interpretation to map the geometry of part of the Taranaki Basin through time. "It's similar to some of the work I'll be doing in Australia," he says.

Aaron Huesser

Australia's Horizons Programme,
Chevron, Perth



Aaron Huesser has been selected for Chevron Australia's Horizons Programme, which will take five years and involve three different assignments.

For Chevron he'll be undertaking exploration, production management, research and development, and reservoir management and development. He's one of three graduate geologists that Chevron's taking on in 2014. "We'll be using advanced geological and geophysical tools and new technologies to find, evaluate and develop oil and gas resources."

Aaron will be the sixth Waikato student in as many years to be selected for a graduate position in Chevron.

Student success stories



Scholarship to investigate changing nature of rocks

Kate Mauriohooho has been awarded the Sir Hugh Kawharu Masters Scholarship for innovation in science to assist her study into hydrothermal alteration mineralogy. The scholarship is worth \$10,000 a year for up to two years and is to support and encourage masters-level study by Māori in the sciences.

When she finished school, Kate worked for four years as a draughtsman on the engineering floor at Hamilton City Council. When she was made redundant she decided to put the money towards study at Waikato. She majored in Earth Sciences for her BSc and also did some Māori language papers.

Kate is Waikato, Ngāti Raukawa, Ngāti Maniapoto and Ngāti Tuwharetoa and while she'd prefer to be out working on the actual volcanoes, she'll mostly be in the lab for her masters research.

PhD student awarded botanical research grant

PhD student Steven Pratt has been named as the recipient of the 2014 Lucy Cranwell Student Grant for Botanical Research.

The commemorative grant of \$2000 was awarded by the Auckland Botanical Society for Steven's research on Conservation genetics and molecular systematics of New Zealand's daphne, *Pimelea*.

Steven is researching the genetic variation between different species of *Pimelea* and looking to develop microsatellite markers to investigate population level variation for conservation purposes.



IPENZ award for engineering students

Recent engineering graduands, Thomas White and Rene Engelbrecht, have been awarded a \$1000 prize for their final year engineering design project.

The award was given by the Waikato/Bay of Plenty branch of Institution of Professional



Engineers New Zealand (IPENZ).

"Our project presented the feasibility, design and cost analysis of a Gas to Liquid (GTL) plant in New Zealand. GTL technology converts natural gas into liquid fuel (diesel)," says Rene.

Hamilton Boys' High School old boy Thomas has already taken up a position at Beca - one of the largest engineering consultancy service companies in the Asia-Pacific region. He is currently based in Hamilton.

Former Sacred Heart Girls' College student Rene has just begun as a graduate process engineer for Technip Oceania based in New Plymouth. Technip offer project management, engineering design and construction for the energy industry, more specifically the oil and gas industry in New Zealand.

What's on

16 MAY 2014

University Open Day

Attend mini-lectures and info sessions on degrees, check out the science and engineering labs and enjoy interactive activities throughout the Waikato University campus.

10-11 JUNE 2014

Waikato Experience Biology Days

Year 13 Biology students and teachers are invited to attend seminars and lab work covering topics relevant to the school curriculum.

Visit www.sci.waikato.ac.nz/webdays

12-13 JUNE 2014

Osborne Physics and Engineering Days

Talks and practical demonstrations focus on applications of physics, and provide students with examples of how the physics they are learning at school can be used in real life.

Visit www.sci.waikato.ac.nz/ospendays

18 JUNE 2014

NZIC Analytical Chemistry Competition

Teams of Year 13 students are set an analytical task, requiring accurate and careful analysis of an unknown substance.

Visit www.sci.waikato.ac.nz/chemcomp

9 JULY 2014

Science Open Day

This event offers students and their parents the chance to explore the areas of science available to study at Waikato University through hands-on workshops.

Visit www.sci.waikato.ac.nz/scienceopenday

10 JULY 2014

Engineering Open Day

Spend the day on campus with staff and students, experiencing engineering through hands-on workshops.

Visit www.sci.waikato.ac.nz/engopenday

Contact us

Science & Engineering

Phone +64 7 838 4625

Fax +64 7 838 4218

Email science@waikato.ac.nz

Toll free 0800 438 254

www.sci.waikato.ac.nz

Computing & Mathematical Sciences

Phone +64 7 838 4322

Fax +64 7 838 4155

Email cms@waikato.ac.nz

www.cms.waikato.ac.nz



www.facebook.com/WaikatoScienceEngineering



<http://bit.ly/14qRoUk>