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FROM THE VICE-CHANCELLOR

This issue of Horizons continues our exploration of the fascinating range and high quality of research being undertaken at the University of Waikato. From coastal research in the Bay of Plenty to the archeoastronomy of Ancient Rome via the monitoring of the quality of the water in Chinese lakes, Horizons provides you with a summary of the global reach and impact of our research.

Key to success in our research effort is a very high level of engagement with the application of academic knowledge to the solution of practical, real-world problems. Our approach is exemplified by Professor Chris Battershill’s work at the University’s coastal marine station in Tauranga, where work on biodiscovery for medicine and agriculture from marine organisms is combined with work on the harbour ecosystem, aquaculture and the environmental response to the vessel Rena running aground on Otaiai (Astrolabe Reef). This feature article is supported by other notes on the development of the University’s wider presence in Tauranga, and its growing engagement with the Bay of Plenty region.

Other articles cover our engagement with historical aspects of astronomy, with Professor Robert Hannah’s work on the links between astronomy and the design of Roman buildings such as the Pantheon profiled alongside Associate Professor Rangi Matamua’s investigations of traditional Māori understanding and use of astronomy. Ecology, the use of nanotechnology to clean polluted waters, pastoral drought resistance, genomics, and sustainability are also profiled. In each case, a key component in the research effort involves working with external partners on identifying interesting problems. That approach is also reflected in the experience of our students, with almost 20% of our undergraduate students having some workplace experience as part of the degree, and a very high proportion of our masters and PhD students following the lead of their supervisors in engaging with organisations and problems outside the University.

Throughout the articles, we have the email address of our Research Office team who manage enquiries from potential research partners. The question “[Are you] Interested in working with Waikato?” is a very genuine invitation to engage with us and to become part our research agenda or other activities. While I am Vice-Chancellor the University will remain committed to the highest levels of external engagement and to quality research that has a real impact on the world outside the University. We look forward to your support for the University in advancing this mission, and continuing to build our national and international profile as one of the great applied research universities.

PROFESSOR NEIL QUIGLEY
HORIZONS – RESEARCH WITH IMPACT

A WORLD OF SCIENCE IN THE BAY
Professor Chris Battershill says he’s in the best place to ‘do science’.

The University of Waikato professor is the Bay of Plenty Regional Council Chair in Coastal Science, based in Tauranga, and he heads the University’s Coastal Marine Research Field Station there. He’d only been in the job a few months when Rena ran aground on Otaiti (Astrolabe Reef) and he found himself at the forefront of the environmental response.

“The University has had a presence in the Bay, doing research for more than 25 years, but our rapid response to Rena showed that we can respond quickly to highly relevant issues. It brought us into people’s living rooms, to public lectures and increased our working relationship with iwi,” Professor Battershill says. “Our student numbers also increased. In fact this year we’ve had eight students complete their masters degrees, mostly focussed on issues around Rena.”

His own research focus is biodiscovery for medicine and agriculture from marine organisms, by mimicking the chemicals that marine microbes, plants and animals use for their own well-being.

Right now the professor is tackling the problem of sea lettuce. People don’t like it because it makes swimming and boating less enjoyable, and the Bay of Plenty Regional Council has asked him to investigate ways that might reduce the blooms that occur mostly during El Nino summers.

“We have links with the Yantai Institute of Coastal Zone Research and other Chinese Academy of Sciences’ institutions where they are investigating algal biotechnologies and we also work with colleagues in Australia. It could be that sea lettuce can be used as a ‘scrubber’ to bioremediate sewage, dairy and abattoir waste, so that’s something we’ll be looking at.”

With colleagues at Manaaki Te Awanui, also based at the Field Station, Waikato marine scientists are looking at the impact that deepening Tauranga harbour will have on the harbour ecosystem and kaimoana stocks, and how the run-off from catchments affects marine life and harbour function. With iwi and industry in the wider Bay of Plenty, the coastal team is also examining potential for new species and enhanced traditional aquaculture, as well as using marine sources of bioactive chemicals to help control PSA, and sea sponges for use in pharmaceuticals.

Biosecurity is growing and is now major part of the scientists’ working brief; the most pressing issue being research that will help control the spread of Mediterranean fanworm.

“In time we’ll be venturing into environmental engineering - that’s very fertile territory,” says Professor Battershill who came to Waikato from the Australian Institute of Marine Science where he was Principal Scientist and Research Team Leader (supporting sustainable use of marine biodiversity).

“What I like about Waikato University is that it’s easy to work across disciplines, across the pure sciences, as well as social sciences, economics and law, with a drive for the best science while also delivering tangible relevant outcomes to key environmental issues. Rena has borne that out. It creates more opportunities for meaningful research.”

This cross-disciplinary approach is what attracts doctoral students to the Intercoast Programme, where students from Germany’s University of Bremen come to Waikato for a period of study and Waikato students spend time in Germany. The German government funds the Bremen students while the University of Waikato’s Environmental Research Institute, Bay of Plenty investors, MBIE and the Royal Society of New Zealand are supporting the New Zealand students with their research.

Some students who study marine sciences at Waikato start their tertiary study at the Bay of Plenty Polytechnic, completing a two-year Diploma in Marine Studies, which requires them to obtain high-level PADI dive qualifications, before completing a Bachelor of Science in conjunction with Waikato University.
Professor Battershill expects student numbers to increase further when the new University of Waikato campus is built in downtown Tauranga. “We are fortunate to already have a large number of students, including a large proportion of Māori students, studying with us, and I think we’ll attract even more as the overall student population grows and as we develop new courses of high relevance to regional New Zealand.”

Two recent masters students said it was a lecture by Professor Battershill that convinced them to take up further study. They’re Sam McCormack and Ashleigh Browne. “In my final BSc year, I did an aquaculture paper with Professor Battershill who gave a lecture on biodiscovery and how much can be discovered in nature, and the ocean in particular,” says Ashleigh. “I was hooked and since then I’ve wanted to do my masters in that area.” She’s looking to the ocean for potential solutions to manage the vine disease Psa.

Zespri, kiwifruit farmers, and the government are all keen to ensure Psa (a Pseudomonas pathogenic bacteria) never occurs again on a scale that wiped out thousands of orchards in 2010 and 2011. Scientists are exploring a number of methods that might contain the bacterial disease, knowing it’s unlikely they’ll be able to eradicate it altogether and that no individual biological control agent is likely to provide complete control of Psa.

Funded by Zespri, Ashleigh and her supervisors Professors Battershill, Drs Mike Clearwater, Michele Prinsep and Joel Vanneste, are searching for an environmentally friendly agrichemical solution that might target the disease by using marine bioactive compounds that perform similar roles in nature.

Marine organisms produce compounds in their environment for defence from pathogens, Ashleigh says. “Some are known to block the communication pathway of other bacteria, while others are known to show antibiotic activity for other Pseudomonas pathogenic bacteria. So I’m examining whether these marine species will also work on Psa.”

So far, Ashleigh has made targeted collections of seaweed by diving in the wider Tauranga area. She then takes the samples to Dr Prinsep’s chemistry lab at the University of Waikato and extracts the potential compounds of interest. Then she crosses the road to Plant and Food Research at Ruakura to carry out further testing in the lab of Dr Vanneste, a recognised expert in Psa research.

"It could be that sea lettuce can be used as a ‘scrubber’ to bioremediate sewage, dairy and abattoir waste, so that’s something we’ll be looking at.”

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“In the lab, I test each of the seaweeds extracts for anti-Psa activity. Any extracts that have shown to be promising will require further research to identify the specific compounds that are active. This step will possibly require aquaculture to generate more of the marine species sustainably for future research, as opposed to sourcing them from the wild which isn’t very sustainable.” She says so far, the results of her research are encouraging.

“Professor Battershill made sea sponges sound extremely interesting,” says Sam. “He thinks big and presented evidence highlighting the importance of sea sponges for all sorts of things such as anti-cancer drugs, which have been extracted from New Zealand sponges. That’s what really got me going.”

Sam’s was the first study of sea sponges in the Bay of Plenty and he found 32 new and undescribed species in just four dives in the Tauranga Harbour, making him somewhat of a sponge taxonomy specialist.

Taxonomists identify species and classify their characteristics. “Sea sponges are at the bottom of the marine ecosystem but they filter huge amounts of water. They’re important for nutrient recycling, and act as a refuge for juveniles of many species, so they have an important role in the marine ecosystems,” Sam says.
“Because they’re high in chemical diversity, they have a lot of bioactives, which means they can potentially be used in drugs, including painkillers, anti-cancer drugs and antimicrobials.”

To extract the compounds, Sam used liquid chromatography–mass spectrometry (LC-MS) to detect, separate and identify the chemicals. Professor Battershill is glad Sam’s doing this work because taxonomists are thin on the ground, so it’s a niche the University can fill, and even better, Sam’s considering studying for a PhD. “It’s one of those things, the more you know about something, the more you like it and the more you want to find out,” Sam says.

In 2014, more than $174,000 in scholarships was awarded to Māori Science and Engineering students from the University of Waikato. The 17 scholarships ranged from $250 to $20,000, and came from a variety of supporters, including the University, private trusts, iwi and leading New Zealand companies. One of the recipients was masters student Te Puea Dempsey (Ngāti Maniapoto/Ngāpuhi/Waikato) who received an iwi graduate award, a Rona Scholarship and a Rena Research Scholarship.

Supported by local iwi, Te Puea’s research was to find out what effect, if any, heavy metals released from the Rena had on reef water and subsequently, marine organisms. Specifically, the research needed to address the state of water quality lying over the reef surface and the longevity of kaimoana, both in the short term and into the future where juvenile stages settling on the reef had to transition through possibly contaminated water.

Te Puea selected three sample sites for her research, one within the debris field of Otaiti (Astrolabe Reef), one on outer Otaiti reef and the last a reference site on Mōtītī Island.

“It took us about six months to get near the reef. The salvors were reluctant to let us work there as they were under pressure to clear the wreck and debris, but once we got the all clear, we dropped our DGTS sampling devices.” Diffusive gradient in thin films samplers, or DGTS, have a chelating resin that attracts metal ions from the water column. Te Puea says it’s like measuring metal bioavailability without using biota such as mussels.

A week later, on the one calm day between storms, she lifted the samples and took them to the chemistry lab, taking guidance from her masters supervisors Drs Phil Ross, Adam Hartland and Professor Battershill. “The weather had managed to rip out some of the resins, or they’d been eaten, but we had enough samples to work with, finding significant elevated levels of manganese and copper in the immediate debris field.”

The mostly heavily tainted samples had increased levels of copper, aluminium, iron and zinc and were in a reef valley, nearby the core debris field and where 23 tonnes of copper was lost off the ship.

In the lab, Te Puea tested paddle crab larvae with different concentrations of Rena contaminant water, and found the higher the contaminant concentration, the faster larvae died, which was to be expected. Furthermore, the behaviour of mysid shrimp, used as a proxy for zooplankton, was observed in a choice experiment and they demonstrated significant avoidance behaviour from contaminant water. These were interesting results.

We need to continue monitoring the water, Te Puea says, to determine what realistic concentrations might be and to then extrapolate the longer-term consequences for the reef recovery.

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**CBD CAMPUS PLANNING UNDERWAY**

Tauranga’s CBD will feature a university-led campus by 2020 with work well underway to make the long-term vision a reality.

The University of Waikato is leading the development of the central city campus on behalf of the three other parties in the Bay of Plenty Tertiary Education Partnership: Bay of Plenty Polytechnic, Te Whare Wānanga o Awanuiārangi, and Waiairiki Institute of Technology.

The region has long sought a university-led campus and in May this year the University of Waikato’s Council signed the Heads of Agreement document which spells out the conditions around the regional contributions towards the project – land from Tauranga City Council, $15 million from the Bay of Plenty Regional Council, and $15 million from the Tauranga Energy Consumer Trust.

Senior Deputy Vice-Chancellor Professor Alister Jones says the world-class university-led campus will play a major role in supporting growth by providing jobs and education that attract people and businesses from all over the world, and mean students don’t have to leave the region to attend university.

The University is now recruiting an Academic Director for the campus and is appointing a project management company to look after the design and build aspect of the development.

The campus will provide purpose-built space for leading academics and researchers, postgraduate and undergraduate students, and for industry and community collaborations and commercialisation activities.

It will focus on programmes that relate to areas of regional activity, including marine, ICT and logistics.

Further courses will be developed over time to support areas of economic and industry needs.

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**SCIENCE IN THE HOUSE**

Every week in Tauranga between 700 and 1000 school children are doing science with resources supplied by Tauranga’s House of Science.

Based at the University of Waikato’s Coastal Marine Research Field Centre at Sulphur Point, the House of Science (HoS) is geared up to get children interested in science at a young age and keeping them interested.

HoS director is Chris Duggan, a former science teacher who was driven to start the House after surveying more than 100 students at a careers expo and finding many were disengaged even before they’d entered secondary school.

“New Zealand needs more scientists and people working in science-related fields, so it was imperative to find ways to improve this situation,” she says.

Local businesses have provided $35,000 worth of resources that are loaned to primary schools in the region. Seven times each term, Ms Duggan runs professional development days for secondary school science teachers and technicians. She runs community open days in conjunction with the University’s Field Station, hosts school holiday programmes and supports students competing in the international robotic challenge. She calls in University of Waikato scientists to run scholarship sessions for high school students, and buddies up Year 13 students with younger students.

“We want our young people to stay in the region to live and work and if we can show them a clear pathway, if they’re aware of the potential and variety to be found in the sciences, then we have a better chance of keeping them here,” Ms Duggan says.
The first fruits of a six-year, multi-million dollar cyber security project are beginning to take shape.

The ground-breaking STRATUS (Security Technologies Returning Accountability, Transparency and User-centric Services in the Cloud) project – funded by the Ministry of Business, Innovation and Employment (MBIE) – is hoped to provide a significant boost to New Zealand’s fledgling cyber security industry.

STRATUS – a collaborative project between the University of Waikato, Auckland University, Unitec and the Cloud Security Alliance – will develop and deliver tools that could be used by security companies operating in the cloud, cloud service providers and people who depend on cloud services.

Project head Dr Ryan Ko from the University of Waikato says the key aim is to empower cloud users to have control over their data by reducing reliance on third parties and enabling people to know how to help themselves when they get hacked.

The first year of the project has focused on assembling the right people and engaging with the cyber security industry. “It’s important we get the foundations right,” he says.

The project’s initial industry partners are Aura Information Security, Gallagher, Layer X and Virscient and Dr Ko says maintaining close links to the industry will be vital to STRATUS’ success.

“With an IT project such as this, engagement is crucial because it is such a fast-changing industry,” Dr Ko says.

“We have quarterly meetings with industry reps and we send teams to demonstrate ideas to industry partners.”

The STRATUS team has also developed an IP model which will deliver long-term benefits to all parties. The project has four research aims: transparency and accountability; privacy and utility; real-time situation awareness and business continuity.

The first developmental tool to come from the project is aimed at providing transparency for users by enabling them to know where their data is being stored, who has accessed it and what changes have been made. It will also provide the ability to reconstruct data to its original form.

The tool – dubbed Progger – works by recording the movements and changes to every file stored in the cloud and Dr Ko says it will also allow users to be notified of, stop or reverse unauthorised changes to their data. This data provenance is important, Dr Ko says, for issues such as forensics, auditing and data analysis.

STRATUS researchers are also working on encryption systems which may enable things such as secure electronic voting.

Dr Ko says by providing real-time awareness, users will be able to know when something happens to their data and be able to reverse any actions taken.

Ultimately the project will provide security tools that are as easy to use as sending a text message and which become an integral part of computer systems.

**PROGGER SPELLS PROGRESS FOR CYBER SECURITY PROJECT**

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Economists are using social media to gather survey responses about preserving native species in exotic forests.

In a study funded by Scion and Future Forest Research, University of Waikato economics professor Riccardo Scarpa and Dr Richard Yao from Scion have been working together to find out people’s willingness to pay to conserve native plants and animals.

“A lot of people still think of our exotic forests as biological deserts where nothing but pine trees grow, but that certainly isn’t the case,” says Dr Yao, who completed his doctorate in environmental economics at Waikato University.

New Zealand’s 1.7 million hectares of exotic planted forests provide a habitat for at least 118 native species threatened with extinction, and studies suggest that forests could be better managed to increase the population of many of these species, but that would come at a cost.

Scion resource economist Dr Yao and his team conducted a nationwide survey of more than 200 people asking participants to place a value on the benefits they derived from an increased presence of native species. They identified five species and centred the survey questions around them – the brown kiwi, bush falcon, Auckland green gecko, the giant kokopu (fish) and the kakabeak (plant).

“Results of the completed study suggest that a typical respondent in the survey sample would be willing to pay approximately $50 a year for a proposed five-year programme that would guarantee the enhancement of native biodiversity in New Zealand’s forests through an increase in income tax. On average, respondents placed a higher value on conservation of birds over other species, and results suggested people living closer to forests were willing to pay more.

But the study’s authors said that given the small sample size of their first survey, the results could “not be aggregated over the total New Zealand population”, so they employed a student, Matthew Gibbons, on a Waikato University Summer Research Scholarship to get a bigger sample, which he did by inviting people across New Zealand to complete an online survey.

The recently collected data are currently being compiled and will be jointly analysed by Dr Yao and Professor Scarpa over the next few months. The two have already been invited by an editor of an international journal to submit a completed article from this ongoing research.

Results from a paper published in Ecological Economics have already been read and noted by the Department of Conservation’s policy and science teams and included the key points in their discussions for the development of new conservation policies and programmes around the valuation of ecosystem services. Dr Yao expects that, eventually, there will be increased partnerships between DoC, the forest industry and the general public, based on current trends and initiatives.

Interested in working with Waikato?
Email research@waikato.ac.nz
The International Olympic Committee is keen to know how young people view the Olympic Games and two University of Waikato sport and leisure academics are about to find out.

Dr Holly Thorpe and Associate Professor Belinda Wheaton have won an Advanced Olympic Research Grant Programme 2015/2016 Award for a project titled Youth perceptions of the Olympic Games: Attitudes towards action sports at the Youth Olympic Games and Olympic Games.

The pair research action sports, such as skateboarding, surfing, BMX, snowboarding, parkour and kite-surfing, and have written widely about youth participation and attitudes to action sports, the culture and the politics.

Dr Wheaton joined the University of Waikato from University of Brighton in the UK in February this year. The two academics met and worked together in 2010 when Dr Thorpe was doing graduate studies in the UK, a recipient of a Leverhulme Fellowship, and they've worked together on a number of projects since then.

“This study will be the first in-depth sociological investigation of how youth perceive the Olympics,” says Dr Thorpe, once a competitive snowboarder. “We applied for the programme knowing the IOC is facing a significant challenge - how to stay relevant to contemporary youth amid changing sport participation and consumption patterns and growing competition from mega-events such as the X Games.”

Dr Thorpe says it’s exciting for her and Dr Wheaton “to get a foot in the Olympic door”. There were more than 40 applications received from 24 countries for this round of grants and only seven were awarded.

“I think we were fortunate in that the IOC had read some of Belinda’s and my previous research. We’ve examined how sports such as wind-surfing, BMX and snowboarding were included in the Olympic programme and the how the different sports reacted. I think this new research follows on quite naturally from that.”

During the next year the researchers will carry out online surveys, media analysis and interviews that they hope will provide rich and nuanced insights into the experiences of action sports participants. Dr Wheaton says they’ll be covering five continents and surveying in six languages, working with action sports representatives and media houses to generate responses.

“We want to know the attitudes, opinions, debates and politics that influence youths’ current and future participation in, and consumption of, the Olympic Games. What do they want from these events, what are they watching at the Olympics, what changes would they like to see? This research should give us a good overview of world trends,” says Dr Wheaton.

Interested in working with Waikato?
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Technology based on modern gaming is being used to solve historical mysteries.

Professor Robert Hannah from the University of Waikato has been working with academics at Indiana’s Ball State University in the US where classicists have been recreating a virtual Ancient Rome. Theirs and Professor Hannah’s work featured in the History Channel’s recent episode ‘Roman Engineering’.

Professor Hannah, an archaeoastronomer and Dean of the Faculty of Arts and Social Sciences at Waikato, and his international colleagues are working to prove the Romans were masters at using the sun and the fall of light in the design and construction of their buildings.

The professor’s focus has been the Pantheon in Rome, the best-preserved ancient building in Rome and the ancestor of many domed buildings down to the present day, and how the light falls through the roof’s oculus (lightwell) at crucial times in the Roman calendar – during the equinox, and on April 21, the birthday of Ancient Rome.

“On that day, at midday, the sun strikes the doorway entrance. On the days of the equinox in March and September, half way through the sun’s annual cycle, the sun strikes half way up the building at noon, which is half way through the daytime.

“I was convinced that was no fluke, but that the building was a monument of extremely clever design, concentrated for some reason on time and the calendar,” says Professor Hannah.

Knowing that equinox dates change over time, Professor Hannah was able to test his theory at the Institute for Digital Intermedia Arts Lab at Ball State University where they have the capacity to simulate any date and time over 20,000 years.

What they found was the massive size of the dome and the oculus counteracted any slippage in time and would last millennia. Professor Hannah says by using a form of sundial called a hemicyclium, which measures light, not shadow, he thinks the building’s architects would have monitored the movement of the sun over the course of a full year before design and construction.

People’s connection with the sun and stars was very strong in Ancient Rome, he says. Astrology and astronomy were not separate in the ancient world, and the zodiac signs helped mark out the seasonal and agricultural year. People timed things by the sun and the constellation it was tracking through.

Professor Hannah believes the Pantheon was not the only building built to honour the sun, and he’s continuing his research by investigating other buildings from 2000 years ago. He’s curious to know the thoughts and concepts that drove the ancient city’s rulers and how they viewed their connection with the sun and their gods.

In August the professor headed to Sicily to work with local archaeologists at Agrigento to carry out a thorough survey of ancient temple alignments.

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Between 1898 and 1931 Rangi Matamua’s great great grandfather kept a 400-page manuscript tracking the stars, and the whānau’s interest in astronomy continues today.

Associate Professor Matamua (Tuhoe), Director of Research in the School of Māori and Pacific Development at the University of Waikato, leads a Marsden-funded project that’s examining Māori beliefs, practices and observations in relation to astronomy, ecology and ritual.

Dr Matamua comes from Ruatahuna in the Urewera Ranges, where the night skies are breath-taking and where astronomy was “something we did”.

“There are thousands of stars all with their own stories, and our ancestors used the position of the sun and the stars for agriculture, to understand the migration of species, the weather. Māori make reference to the stars in their buildings, in their songs, their carvings, their chants and their stories,” says Dr Matamua.

And rather than clashing with Western science Dr Matamua says ancient knowledge and science aren’t enemies at all. “The story of Rangi and Papa for example can be likened to science’s big bang theory and most cultures have a similar story to explain the creation of the universe. What concerns me is the rapid advances we’re making in technology that’s causing us to move away from our connection with the environment. I hope that my work will help to develop a new generation of Māori astronomers. We need to ensure the ancient knowledge isn’t lost.”

For their Marsden project, Dr Matamua and his team – Drs Hēmi Whaanga and Ann Hardy from Waikato, Dr Pauline Harris from Victoria and Dr Kaliko Baker from the University of Hawai’i at Manoa – will be using archaeoastronomy, cultural astronomy, oral histories, semi-structured interviews, surveys and environmental observations to complete their research project. They have about 3000 entries on the database so far, but Dr Matamua estimates they’ll end up with well over 10,000.

Dr Matamua is also planning a book, giving himself a 2016 deadline to complete the manuscript and collect photographs and illustrations. “It’s such a visual project, the night sky is a fantastic canvas to work with,” he says.

Interested in working with Waikato?
Email research@waikato.ac.nz
Doctoral student Jack Pronger wants to improve pastoral drought resilience. He’s researching the differences in seasonal water use between mixed sward pasture systems (a combination of different grass, legume and herb species) and ryegrass/clover pasture systems under dairy grazing. It’s research that could have a significant impact on farm production.

“With the economics of farming practices changing, and the ongoing issue of climate change, identifying ways to combat the effects of drought is more important than ever,” Jack says.

He’s been awarded a Top Achiever Doctoral Scholarship from the University of Waikato, a one-off payment of $5000 to accompany his Flower Doctoral Fellowship in Agribusiness, worth $30,000 a year for three years – all going a long way to relieve the financial pressure for Jack and his young family.

“The current knowledge of paddock-scale water use and water uptake efficiency is pretty limited,” he says. “To cope with the increasing incidence of drought, farmers need pasture species that can access water deeper in the soil, and/or reduce paddock-scale water use while maintaining agronomic production.”

Jack says there’s been little research into paddock-scale water uptake of managed pasture systems in New Zealand, a gap he feels is worth addressing and he hopes his current research project will contribute to an improvement in pastoral drought resilience.

Compared to traditional pasture systems of perennial ryegrass and white clover, mixed sward pasture systems have been shown to increase dry matter production during dry periods, while maintaining similar cumulative dry matter production year-round.

“Mixed sward pasture systems might also potentially reduce some of the negative environmental effects of farming through reduced nitrate leaching and nitrous oxide emissions and increased soil carbon sequestration,” says Jack.

“The knowledge gained through my research will hopefully contribute to more efficient water usage of pastoral systems, and increased pastoral production that will likely benefit the economy down the track.”

Jack’s doctoral research is being supervised by Professor Louis Schipper and Dr Dave Campbell from the School of Science at the University of Waikato.

New kiwi, good flavour
The flavour of kiwifruit is all important, and University of Waikato Masters student Danielle Lelievre is researching the development of flavour in the G3 cultivar of the fruit.

Danielle’s been awarded a National Agricultural Fieldays Sir Don Llewellyn Scholarship Scholarship worth $22,000 to assist her research. The cultivar was introduced by the New Zealand kiwifruit industry as a replacement for the Hort16A kiwifruit that had been severely impacted by the Psa virus.

“The G3 cultivar is really important for the industry because it’s more resistant to Psa,” says Danielle. “It’s important that the G3 kiwifruit are consistently producing high quality fruit in order to stay ahead of international competition.”

With her research Danielle’s hoping to understand the on-orchard factors that contribute to the flavour of the G3 kiwifruit.

“My research will look at the development of flavour components (sugars, acid and starch) from flowering right through to maturity. This will provide a better understanding of the fruit and the pre-harvest factors that influence size and flavour, and will assist growers in minimising production of small and poor-flavoured fruit.”

Danielle’s project is part of a larger collaboration research programme with the University of Waikato, Plant and Food Research and Zespri.
The University of Waikato has been awarded $100,000 from the Ministry of Business, Innovation and Employment’s Vision Mātauranga Capability Fund for a 12-month project entitled Te Waka a Tama-rereti: Networking Māori Expertise in Genomics, Informatics and Technology.

MBIE’s Vision Mātauranga policy aims to unlock the science and innovation potential of Māori knowledge, resources and people for the benefit of New Zealand.

The project, led by Maui Hudson, aims to bring together Māori experience in genomics, computer science and technology. The project team includes researchers from University of Auckland and University of Otago, Ngā Pae o te Māramatanga, and two National Science Challenges - Biological Heritage led by Landcare Research, and Science for Technological Innovation led by Callaghan Innovation.

Their aim is to develop a one-week summer internship programme for Māori students to run over the 2015/16 summer. Mr Hudson says the programme is modelled on a similar one operating in the US called SING – Summer Internship for Natives in Genomics. He hopes it will be established on an ongoing basis.

“There’s a lot of research money going into genomic science and technology, and we want to create more opportunities for Māori to engage and develop technology-based research programmes.”

Genomic science aims to increase understanding of the genetics of organisms to support agricultural or horticultural development and biosecurity or biodiversity outcomes.

“Māori share similar interests in maintaining the integrity of the environment and are beginning to engage and involve themselves in this area of science,” Mr Hudson says.

“The network is about bringing together Māori researchers and Māori stakeholders with an interest in using genetic/genomic technologies and information science to advance their environmental and economic objectives.”

Increasingly, research and development organisations are recognising the cultural and spiritual links between indigenous species and tangata whenua. This project will build on the collaborative spirit of the National Science Challenges and the Māori research excellence fostered by Ngā Pae o te Māramatanga to create a network of Māori expertise in genomics, informatics and technology to initiate Vision Matauranga-inspired research programmes and support knowledge transfer into the Māori sector for commercial and environmental outcomes.

Mr Hudson says it’s proposed this network be an independent “go to” network to provide expert advice and technical support for Māori communities regarding modern genomic technologies.

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One of the biggest crowdsourcing projects undertaken in New Zealand will create a valuable war history resource.

The Measuring the ANZACs project will see thousands of people transcribing and indexing scanned documents from World War I and the South African War.

These images of historical documents – which are held by Archives New Zealand – have become a key resource for historians and others, yet much of the information is hard to access without transcription and indexing.

The project has volunteers identifying things such as names, next of kin, jobs, birthplaces, health at enlistment, key events in the soldiers’ service, and dates of death.

University of Waikato economics professor Les Oxley says the project will provide a searchable database available to everyone. Citizen scientists will classify document types within personnel files, and transcribe key information about the ANZAC soldiers. Each piece of information will be collected by four people to increase its accuracy and the information will be hosted on the world’s largest citizen science web portal, Zooniverse.org

Professor Oxley is working with Assistant Professor Evan Roberts from the University of Minnesota and Professor Kris Inwood from Canada’s University of Guelph.

The documents include 140,000 sets of records and include 4 million scanned images. They have done 22,000 of the files, first used for the ANZAC weight, height project, which was funded through Marsden and Health Research Council grants.

Do time with an offender rehabilitation programme showed University of Waikato masters graduate Murray Riches how difficult it is for criminal offenders to shake-off the criminal label and assimilate in their communities upon release from jail.

For his degree, Mr Riches spent a year looking at how mainstream media was reporting crime and criminality and the ideologies surrounding that reporting. He spent another year as a participant-observer in an offender rehabilitation programme for men serving jail terms of up to 20 years, deemed high risk.

“The media have fear-based sensationalised responses to crime,” he says. “I found two key themes embedded in mainstream media reporting: otherisation, and crime and punishment.”

Otherisation refers to the ways in which people identified as criminal by the media are marginalised through the use of a number of linguistic tools and core assumptions or constructions, such as constructing single dimension identities, depicting criminals as different from ‘us’, stereotyping and constructing a unified criminal identity, racial profiling, using dehumanising language, and disregarding offenders’ privacy, safety, or human rights.

Mr Riches says otherisation is reinforced and maintained by crime and punishment - the way the media creates ‘common sense’ ideas about appropriate responses to crime. His thesis argues for a shift away from fear-based sensationalised responses to crime, and a need to understand a person’s full story to break down fears and prejudices about those deemed criminals if they are to successfully reintegrate into communities and thus reduce reoffending.
Businesses Resist Sustainable Practices

The latest study on business and sustainability shows businesses are concerned about water supply but that concern hasn’t translated into action.

Professor Juliet Roper and Associate Professor Eva Collins from Waikato Management School have been surveying New Zealand businesses over a decade, monitoring attitudes to sustainability and changes in practice, focussing on carbon, waste and water. It’s part of a Marsden-Funded research project examining sustainability practices.

Their latest survey shows that 72% of businesses are concerned about New Zealand’s water supply and the likelihood of future droughts and changing rainfall patterns, but of the 520 businesses surveyed, fewer than a quarter have targets to reduce water consumption.

“Most businesses don’t perceive water issues as relevant to their own operations, or feel they cannot individually make a difference,” Dr Collins says.

“We live in a country with so many rivers and streams that it’s hard to believe water is a finite resource. Many businesses struggle to understand how water issues will ever impact their business operations, so it’s not a high priority for them. But when you look down the value chain, New Zealand exporters rely heavily on water as a raw component in our key export products, such as milk, wine and fruit.”

Some businesses felt the solution would be to charge everyone for water, while others said there would be opposition to such a move. Many were looking for the government to show more leadership.

In fact, businesses want the government to show greater leadership all round. Climate Change Issues Minister Tim Groser has described the government’s 11% target for the reduction in greenhouse gas emissions on 1990 levels as “fair and ambitious”, but the researchers say lack of direction from government, making only minor commitments, means businesses are reluctant to invest in more in sustainability initiatives.

“The government needs to step in to provide long-term regulatory certainty – lack of leadership has seen companies stop measuring their carbon footprint or put their carbon strategies on hold,” says Dr Collins.

“We actually found strong evidence that business is looking for the government to lead the way on sustainability issues through ‘smart regulation’, because they don’t like uncertainty. But individually, businesses find it hard to justify the cost of environmental gains within the short-term reporting cycle that drives most business decisions – even if it makes good sense in the long-term.”

The top motivating drivers for a company to adopt sustainability practices were to preserve its reputation and brand (cited by 65% of businesses), followed by cost savings (40%) and the views of employees (40%).

Conversely, the biggest barriers to adopting sustainability practices were cost (cited by 70%), and lack of management time (47%).

The full survey results are available online at waikato.ac.nz/go/sustainability-report
Advocating for 1.5 million refugees to access basic education and trying to find ways for quake-ravaged Nepalese communities to get their schools back up and running are among the early challenges Associate Professor Sandy Morrison faces in her new role as global head of the International Council for Adult Education (ICAE).

A senior University of Waikato academic, Associate Professor Morrison has spent more than a decade involved in adult education and is the former president of the Asia South Pacific Association for Basic and Adult Education. She was recently elected to her new role at the ICAE World Assembly in Montreal.

Her job is to represent “a strong civil society movement committed to highlighting the key role of adult learning and education – including adult literacy – into global agendas.”

“ICAE recognises the value of education as a tool for development and essential for sustainability.”

ICAE was created in 1973 and as seven regional bodies – Africa, Arab Region, Asia, Caribbean, Europe, Latin America and North America - representing more than 800 NGOs in more than 75 countries. It advocates for youth and adult education as a universal human right and as a path to secure healthy, sustainable communities.

Waikato University doctoral student Gemma Collins is the recipient of the $40,000 Antarctica New Zealand Sir Robin Irvine Scholarship, offered to one PhD student in New Zealand every two years.

Gemma’s PhD will focus on the ecology of springtails, small bugs that live in Antarctic soils, and their ability to perform in a changing environment. She hopes her research will provide insights into how biological systems may be affected by climate change. “Climate change is going to affect populations around the globe and because Antarctic organisms live in such a harsh environment, we’d expect any increase in temperature or rainfall to have a big impact on them,” Gemma says.

The Antarctica New Zealand scholarship will cover two trips to Antarctica and a stipend for the first two years of Gemma’s PhD. She’s no stranger to the ice, having conducted research in Antarctica for her masters degree.

Meanwhile, the New Zealand Antarctic Research Institute (NZARI) has appointed University of Waikato Professor Craig Cary as one of two part-time deputy directors to help deliver the NZARI Science Programme. Professor Cary and Dr Vonda Cummings from NIWA in Wellington are well-known to the Antarctic science community and Antarctica New Zealand, which have supported their work on the ice over many seasons.

Professor Cary is a member of the Royal Society Expert Panel on Antarctic Sciences, and earlier this year was elected Chief Officer for a new action group for the Science Committee on Antarctic Research to establish a trans-Antarctic land and nearshore climate monitoring network.
Using nanotechnology to clean polluted waters is being investigated by Chinese and New Zealand freshwater scientists.

The quality of freshwater is high priority for both governments, and representatives from both countries are working together on a number of projects focused on water management and treatment.

In April, the University of Waikato hosted a Joint Commission Meeting in Freshwater Research Workshop where scientists and government representatives from New Zealand and China met to summarise the status of water research and policy development in the two countries, and to identify common areas and themes for future beneficial collaboration.

In July, a delegation from New Zealand, including Professor David Hamilton and Chris McBride from the University of Waikato, and NIWA scientists and managers, including Max Gibbs, whose PhD is from Waikato, visited several water research institutions from the Chinese Academy of Sciences.

“We have been working with China for nearly a decade, building and providing high-quality monitoring equipment for Lake Taihu in eastern China, which has major algal bloom issues,” says Professor Hamilton. “Our equipment provides real-time data for the water quality of the lake and the information also feeds into the Global Lakes Ecological Observatory Network (GLEON), an international network of lake scientists.”

Professor Hamilton says China has a large water programme that will extend to 2020. “And while much of their current water pollution is point-source because of the difficulty of dealing with wastewater treatment for its increasingly urban-dwelling population, diffuse pollution is only going to increase as their agricultural production intensifies. We have extensive experience in lake restoration and policy development, and hope to collectively upskill computer models for analysis and assessment.”

He’s excited by the potential for nanotechnology to assist freshwater clean-up.

“It’s still very much in the test tube, but through the Center for Eco-Environmental Sciences in Beijing, local soils are being modified by adding nano-bubbles of oxygen, which stay in the sediment and allow the oxygen to process some of the contaminants. We’ve now got to see if we can scale up the testing to ponds and lakes.”

There are five priority areas for research that would benefit the two countries Professor Hamilton says. They’re lake management, diffuse pollution control, lake (and catchment) modelling, water quality monitoring, and lake and stream restoration.

Professor Hamilton is Bay of Plenty Regional Council’s Chair in Lake Restoration and for the last five years has headed LERNZ, Lake Ecosystem Restoration New Zealand, a MBIE-funded programme that’s involved a team of researchers from across New Zealand, working with iwi, regional councils, DoC and other end-users to clear lakes of pest fish and algal blooms. “We’ve had success at ground level, and we’ve been able to influence freshwater policy at a national level. Working across these scales has its challenges, but we’ve had some excellent results,” says Professor Hamilton.

Funding runs out at the end of September, but a team from University of Waikato, NIWA and Cawthron has applied to MBIE for funding for another four years. “Further work is still required to ensure widespread improvements in knowledge and capability of stakeholders.”
Designing a new national flag

As the debate for and against changing the New Zealand flag heats up, the University of Waikato let flag designs play out virtually at its interactive stand at this year’s National Agricultural Fieldays.

The flag-making software was the brainchild of Professor Geoff Holmes, Dean of the Faculty of Computing and Mathematical Sciences, alongside Associate Professor David Bainbridge.

Dr Bainbridge says having the project featured at Fieldays was quite timely, given the referendum on changing the flag will be underway this year and the beginning of next.

“The idea for the flag-making software came about before the government announced the referendum. We were waiting for our summer student scholarship programme to start to get the software development underway when the Prime Minister announced the referendum, making the project particularly fitting,” he says.

The flag-making software walks users through a step-by-step process to create their vision of a new flag for New Zealand. Users select a colour scheme and choose from a range of images to incorporate on their flag, or draw a design free-hand. In the final step, they see it flying virtually above the Beehive before sharing on their social media pages.

The programme, which is managed by the University’s digital library software Greenstone, guides users based on the principles of vexillology – the scientific study of the history, symbolism and usage of flags.

The researchers and their students have since written about their work for the International Conference on Theory and Practice of Digital Libraries.

Taking Great War research on the road

Amidst the fighting and horrors of WW1, soldiers and civilians alike still found time to celebrate the works of the bard. The year 1916 marked the 300th year of Shakespeare’s death. In New Zealand during the war, there were active Shakespeare clubs whose members gave public readings and used their performances to fundraise for the “boys”, sending moneys raised overseas.

“We tend to think of our soldiers away busy fighting,” says English Professor Mark Houlahan. “But they certainly made the most of their two weeks’ annual leave ‘in Blighty’. When in London, a lot of them stayed at the Shakespeare Hut - a sort of backpackers for New Zealand soldiers, run by the New Zealand YMCA and built on land that had been intended for a Shakespearean national theatre.”

Professor Houlahan and fellow Waikato University academics took their WW1 research on the road in a public lecture series to commemorate the 100th anniversary of the Great War.

They spoke in Tauranga to full houses and followed that up with three lectures at the Te Awamutu RSA.

Dr Kirstine Moffat talked about Commonwealth poetry and protest during the war, and how, as the war progressed, the works increasingly became a protest against the cost of war.

French lecturer Nathalie Philippe looked at how New Zealand soldiers liberated the French town of Le Quesnoy and how the New Zealand Expeditionary Force’s last battle was depicted in various media.
The University of Waikato has launched a new initiative with the secondary schools and communities of Tokoroa and Putaruru.

Te Ara ki Angitū: Pathways to Excellence is a programme designed to widen the pathway to university study by alleviating barriers of affordability and transport, and installing quality support to guide students through the transition to university.

The initiative will include heavily subsidised bus transport between the University of Waikato and four high schools in Tokoroa and Putaruru, fees scholarships, university learning hubs in the high schools, and the provision of student learning devices.

University of Waikato Vice-Chancellor Professor Neil Quigley says choosing university study can be financially challenging for students and families. “And in these communities the challenge is compounded by the fact that there’s no public transport option that runs between these towns and the University on a daily basis. We want students who have the potential and aspire to attend university to also have access to the opportunity that makes it a realistic and viable option. This requires positive collaboration between the University, the schools, families and the communities.” ANZ is a key sponsor of the programme which will start in A Semester 2016.

New qualifications at ICT graduate school

The University of Waikato has teamed up with the University of Auckland to establish one of the country’s three new ICT Graduate Schools.

The purpose of the new grad schools, announced by Tertiary Education, Skills and Employment Minister Steven Joyce, is to meet the growing demand for industry-ready ICT graduates who have a mix of ICT, critical thinking and other complementary skills needed to drive innovation in New Zealand.

Waikato’s Dean of Computing and Mathematical Sciences Professor Geoff Holmes says Waikato and Auckland universities will offer a Postgraduate Certificate in Information Technology and a Masters in IT and hope to have them fully up and running by early next year.

“Students who do well in the PGCertIT will have the opportunity to join with students with an IT background on the one-year masters which will develop their IT skills further and add capability in entrepreneurship, intrepreneurship, communication and the like,” says Professor Holmes. “Part of the degree will be an industry-funded compulsory internship.”

The government has committed $28.6 million for the development and delivery of the three schools over four years. Once fully established, the schools are expected to train in excess of 350 students each year.

The other ICT grad schools will be in Christchurch and Wellington, and were selected following a competitive procurement process.

The certificate, offered in Auckland and Hamilton, will be a 12-week semester-long programme directed at people who are graduates from non-IT areas who need IT skills to complement their bachelor qualification.

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A n economist who mostly works “down on the farm” is the University of Waikato’s new chair in environmental economics – a four-year position jointly funded by the Ministry for the Environment and the University of Waikato’s Management School.

Professor Graeme Doole’s research focuses on farms and catchments. “I look at how farms cost-effectively respond to challenges such as reducing nutrient loss to waterways and herbicide resistance, and at catchment level I focus on how to design economic policies that meet environmental goals without putting undue economic pressure on the agricultural sector.”

His appointment comes in the wake of the government’s new National Policy Statement for Freshwater Management, which requires regional councils to introduce rules for managing freshwater assets by 2025, in consultation with community stakeholders.

He’ll be providing independent economic advice to regional councils across New Zealand as they develop new policies to improve the water quality of our rivers, lakes and streams.

“This heralds a new approach for water management, and communities across New Zealand are banding together to identify how best to manage these resources,” says Professor Doole.

“My role is about helping people make more informed decisions about the costs of achieving water quality targets in a specific catchment area, in a way that seeks to balance the competing interests of environmental, social, cultural and economic goals.”

He says a leading cause of water quality deterioration in New Zealand is the loss of nutrients and microbes from farmland. “So if we want to improve the water quality of our rivers and streams, we’re going to have to radically change the way that we’re managing land, and that can be very costly in some circumstances.”

Decisions around water are tough, because they involve making difficult trade-offs between important values that vary among different stakeholder groups, Professor Doole says. “This is not easy work, and the courage being shown by the people getting involved and representing their constituents is amazing.”

A key aspect of Professor Doole’s role is to increase skills capacity across New Zealand by training regional council and central government staff how to conduct high-quality economic analysis of proposed plans for managing water resources – such as using less fertiliser on farms or building a new wastewater treatment plant.

**Engineering appointment**
The University of Waikato will soon have a new Chair in the School of Engineering. Long-time supporters of the University of Waikato, Glenice and Dr John Gallagher, through their Foundation have made a significant gift to fund the chair, to be known as the Dr John Gallagher Chair in Engineering. The appointment will be made later this year.

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WHAT’S ON AT WAIKATO
The University of Waikato links with the community on and off campus

GALLAGHER GREAT RACE
Saturday 12 and Sunday 13 September
University of Waikato men’s and women’s eights will row against crews from the universities of Harvard and Cambridge, Sydney and Melbourne in this annual rowing challenge, 3.85 kilometres upstream on the Waikato River. There’ll also be corporate and secondary school races over the two days.
Visit thegreatrace.co.nz

KĪNGITANGA DAY
Thursday 17 September
10am-3pm
New Zealand’s foremost Māori military historian Dr Monty Soutar ONZM (Ngāti Porou, Ngāti Awa, Ngai Tai) will be the keynote speaker at the University of Waikato’s Kingitanga Day — an annual celebration of the University’s distinctive heritage, history and relationships.
For more information, and to see the full seminar and speaker list, visit waikato.ac.nz/events/kingitanga

DISTINGUISHED ALUMNI AWARDS
Friday 25 September
The University of Waikato is presenting three Distinguished Alumni Awards in 2015. They are Peter Churchouse, financial analyst, publisher and investor; Hinewehi Mohi, singer/songwriter and co-founder of the Raukatauri Music Therapy Centre; and Rob Waddell, former Olympic rower and the New Zealand Olympic Committee’s Chef de Mission. They will receive their awards at a black-tie event on September 25.

APPLICANT DAY
Saturday 19 September
10am-3pm
For people interested in starting university next year, or who’ve already applied and still have questions, the University of Waikato is holding an Applicant Day for people to come along to talk to advisers and faculty staff, choose their papers and complete the application proves. Undergraduate, postgraduate and mature applicants are all welcome. Visit waikato.ac.nz/go/applicants
WHERE THE WORLD IS GOING
TE AHUNGA O TE AO