

Improving IV infusion

THE humble drip has given way to hi-tech infusion pumps in hospitals in New Zealand and around the world – but software glitches and issues around the usability of the new devices have raised questions about safety.

“Hospitals don’t let the manuals for these devices get anywhere near their staff,” says Dr Judy Bowen, an expert on the design of safety-critical interactive systems in the Department of Computer Science at the University of Waikato.

“The Waikato District Health Board develops some of its own training materials and uses those developed by pump distributors – and when you look at how these devices work, you can understand why.”

Dr Bowen and Professor Steve Reeves of the Formal Methods Group are working with the DHB’s Biomedical Division at Waikato Hospital to “reverse engineer” some of the pumps used in the hospital.

Dr Bowen is focusing on the user interface by mathematically modelling the instructions in the manual and seeing what divergences there are with the device’s actual behaviour.

“We’ve found some interesting and unexpected behaviours,” she says. “For example, when you hit



PUMP PRIMING: Dr Judy Bowen and Professor Steve Reeves say medical infusion pumps are a prime candidate for formal software modelling techniques to improve safety.

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Waikato to Washington: SIFE students take on the world

A GROUP of Waikato University students is off to Washington DC in September to represent New Zealand at this year’s SIFE (Students In Free Enterprise) World Cup.

SIFE is a global umbrella for tertiary students to work as a club to use their learning to enhance their local community through economic, social and environmental initiatives.

Eight students from the 44-strong Waikato SIFE team presented the group’s key projects at the SIFE National Awards in Auckland in July, beating other finalists AUT and Massey University to win the national title for the second year running.

They now go on to compete with the national champions from 39 countries at the SIFE World Cup in Washington DC.

SIFE team member and Waikato Management School student Gina Milicich says representing New Zealand will be a great honour.

“Our performance at the Olympics has proven that New Zealanders, especially those from



KIWI DIGGERS: Gina Milicich (left) with members of the SIFE Waikato Ripple Effect team working to clean up our waterways.

the Waikato, can punch well above their weight on the world stage. We will be up against the top teams from some pretty big universities, but I think we are up to the challenge.”

One of SIFE Waikato’s three key projects is the Ripple Effect, an environmental initiative encouraging Waikato farmers to plant native trees

around waterways to reduce nitrogen leaching into the water, together with research into the eradication of the pest koi carp.

The other two projects are Easy Rider, which provides business advice to a local transport company for the disabled and elderly, and the Phoenix Project, which works with Hamilton’s Richmond Centre and Kauri Centre to support at-risk youth in education.

The team will also have to complete a series of challenges at the SIFE World Cup, and showcase New Zealand at a cultural exhibition.

Ms Milicich says the real challenge will be finding the funding to take a team of 10 to the US. “We are looking for sponsorship from willing businesses to allow Waikato to take on the world.”

The SIFE World Cup takes place on 30 September – 2 October in Washington DC. If you are interested in sponsoring the Waikato team please contact SIFE at sife@waikato.ac.nz

Threshold concepts

Opening the door to understanding in science and engineering.



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Back to the future

Looking to whānau traditions for better child rearing.



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Win some, lose some

How migration to New Zealand stacks up for Pacific Islanders.



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Making music in cyberspace

Teleperformance: It’s music, Jim, but not as we know it.



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From the Vice-Chancellor

By PROFESSOR ROY CRAWFORD

AT THE University of Waikato, our mission is to add value – whether that be through cutting-edge research leading to the development of new technologies, the rigorous analysis of current trends informing policy and practice, or turning out a new generation of highly skilled, well-informed and work-ready graduates.

As a young university, we believe we punch above our weight in the contribution we make to New Zealand Inc. Waikato was placed top among New Zealand universities in the latest Times Higher Education world rankings for universities under the age of 50. We also made it into the top 60 worldwide – a result that reflects our commitment to excellence in teaching and research.

In this issue of *re:think* you can read about some of the many ways in which the University of Waikato is engaging with a range of partners to add value.



We have researchers working with a local company to develop nutraceuticals to enhance digestive health, while others are developing three-dimensional camera technology that works at the speed of light.

A group of computer scientists is working with the Waikato DHB to apply formal software modelling techniques to ensure the new generation of hi-tech medical devices are user-friendly and error-free, while a long-running research project on mild traumatic brain injury is now focusing on the impact of these common injuries on children and young people.

The University of Waikato is also leading key research which aims to enhance Māori health and wellbeing. Te Kotahi Research Institute, established last year, and the Māori and Psychology Research Unit are spearheading studies on childrearing practices, men's health and ethics in genomic research in a Māori context.

Many of these projects also offer opportunities for our students to engage with real-world problems, and develop analytical and research skills that they can take into the workplace.

I believe this is exactly what a modern university should be offering to its local, regional and national community, and we are always interested in further opportunities to share our skills and expertise.

About re:think

re:think is published by the University of Waikato to highlight our research, innovation and entrepreneurship. We welcome feedback, comment or inquiry about any of the issues raised in this publication. Contact us at rethink@waikato.ac.nz

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©The University of Waikato, September 2012.

ISSN 2253-4709 (Print)
ISSN 2253-4865 (Online)

Research wins for Waikato

THE University of Waikato's WAND Network Research Group has been awarded almost \$1.5 million in government funding over four years to develop models and tools to monitor the performance of internet networks across New Zealand.

It's one of two University of Waikato-led projects to win funding in the first tranche of the 2012 Ministry of Business, Innovation & Employment research funding round.

The network infrastructure monitoring project is being led by Dr Richard Nelson, and will involve the first-ever comprehensive measurement of the performance and topology of the network infrastructure across the whole country.

"We're aiming to build a distributed platform to monitor the links between all the different networks, which will allow network operators to detect problems in service without having to wait for users to alert them," says Dr Nelson.

He and his colleague Associate Professor Tony McGregor will use the technology developed through the project to build better tools for service providers themselves to monitor their networks.



ACTIVE AGEING: Waikato researchers will look at ways to keep New Zealand's older people independent and productive.

It's envisaged the monitoring platform will be able to automatically identify and locate network problems which will help improve the resilience of New Zealand's digital infrastructure.

The second project involves finding ways to keep older people in our communities more independent, productive and digitally 'connected'.

The two-year \$687,000 investigation will be led by Professor Peggy Koopman-Boyden from the National Institute of Demographic and Economic Analysis (NIDEA) at Waikato.

"Almost half the labour force is already 40 or older and by mid-century the labour force will not be replacing itself," she says.

"Skills shortages are already emerging so we need to be thinking about improving and maximising the potential of older workers. If they can't contribute to their full economic capacity for any number of reasons, then there are implications not only for their individual futures but for business and society as a whole."

Digital technology links to that, says Professor Koopman-Boyden. "There's the risk of social isolation if people don't have access to the internet, and the lack of computer skills may also create barriers to working."

The second tranche of MBIE research funding is expected to be announced in mid-September.

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PROFESSOR PEGGY KOOPMAN-BOYDEN: Maximising the potential of older workers.



DR RICHARD NELSON: Monitoring the internet infrastructure.

Waikato researchers are also involved in collaborative projects being led by other universities and CRIs.

- » Earth scientist Professor Craig Cary will work on a \$1 million project with GNS Science to produce the biggest repository of geochemical and genetic data ever collected in New Zealand.
- » Professor Barry Barton of Te Piringa - Faculty of Law is part of the Energy Cultures project, led by Otago University, looking at the future of transport.
- » NIDEA's Professor Natalie Jackson and Professor Jacques Poot and Waikato Management School economist Dr Michael Cameron will work on Massey University's project, Nga Tangata Oho Mairangi: regional impacts of demographic and economic change, which is worth \$800,000 over two years.
- » Dr Cameron will also contribute to Waikato University's independent ageing study, and is part of a four-year \$7.2 million NIWA-led project, New Zealand climate changes: impacts and implications.

Improving IV infusion

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the on/off button during set-up, the pump reverts to its initial settings, so the operator would then need to reset the infusion rate, volume and time. But there's nothing in the manual to warn you about this."

Any user struggling to set up a smart TV system or home wireless network will sympathise. The problem, says Dr Bowen, lies in the process typically used in software development.

"Once the requirements are developed, they're given to the software developer and the technical writer, and then they go away to their separate corners and never speak again.

"But there's an alternative way to develop software – and that's by using mathematical modelling. We want to find out if we can take our formal models and use those to derive the manual. That way we can guarantee the two will match."

Josh Farrington, biomedical engineering manager at Waikato Hospital, says the project has already come up with some useful insights for the DHB.

"Judy's modelling revealed some surprising functional discrepancies between the user manual and how the infusion device actually operates," he says. "From what we've seen, using formal modelling

techniques like these to derive user and service manuals would provide us with more accurate information for safer operation of the device."

Formal software modelling is already being used in safety-critical areas such as aerospace, networks, mass transit systems and car manufacturing, and Professor Reeves says there's no reason why it can't be applied to the relatively young medical device industry.

"With formal modelling, we can guarantee that the device will do exactly what it's meant to do," he says. "There are none of the bugs you inevitably get with conventional software development because you can use the model to generate exhaustive tests.

"We've got the means to add failsafe software to these small, high-value devices, which could potentially open the door

to a lucrative niche export industry for New Zealand."

Back at Waikato Hospital, the researchers are now using their initial findings to advise on where and how the devices can be safely used.

Says Dr Bowen, "These pumps are expensive, upwards of \$2,500 each, so while they're bought in for a specific purpose, the DHB typically will want to use them in a variety of environments.

"For example, hospital staff may want to know if they can use a particular pump in a rescue helicopter situation. So we can incorporate environmental aspects into our models – which will allow us to check if the alarm system is operational in a very noisy, vibrating environment like a helicopter."

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Big business – but what about safety?

THIS year the medical equipment sector is set to generate more revenue than the entire pharmaceutical industry, according to the Association for the Advancement of Medical Instrumentation.

Yet the industry continues to be plagued with problems including malfunctioning equipment and usability issues. Infusion pumps – which are widely used to deliver

food, fluids and medication intravenously – are among the biggest culprits.

US Food and Drug Administration statistics show more than 700 patient deaths were linked to problems with infusion pumps between 2005 and 2010. In some cases this was due to software problems, in others, patients received drug overdoses because of operator error.

Creating 3D images at the speed of light

STUMPY the garden gnome seems an unlikely test bed for cutting-edge imaging technology being developed at the University of Waikato, but he takes pride of place in the Chronoptics Group lab in the Faculty of Science & Engineering.

“Stumpy is an ideal test model,” says Dr Adrian Dorrington, the Group’s lead researcher. “He’s painted in all different colours, he has different textures, smooth and rough, and he’s rigid – which is what you want when you’re testing range imaging cameras.”

Unlike regular cameras, range imaging cameras measure depth to build a 3D image of a scene, allowing computers to perceive the world in the way we humans take for granted. This facility is a key component of natural user interfaces which do away with mice or even touch screens and can “read” the user’s gestures instead.

Working out of a couple of small labs, building their own research cameras and testing them on models like Stumpy, Dr Dorrington’s group has developed a full-field time-of-flight (ToF) range imaging system that has achieved unparalleled resolution, precision and accuracy.

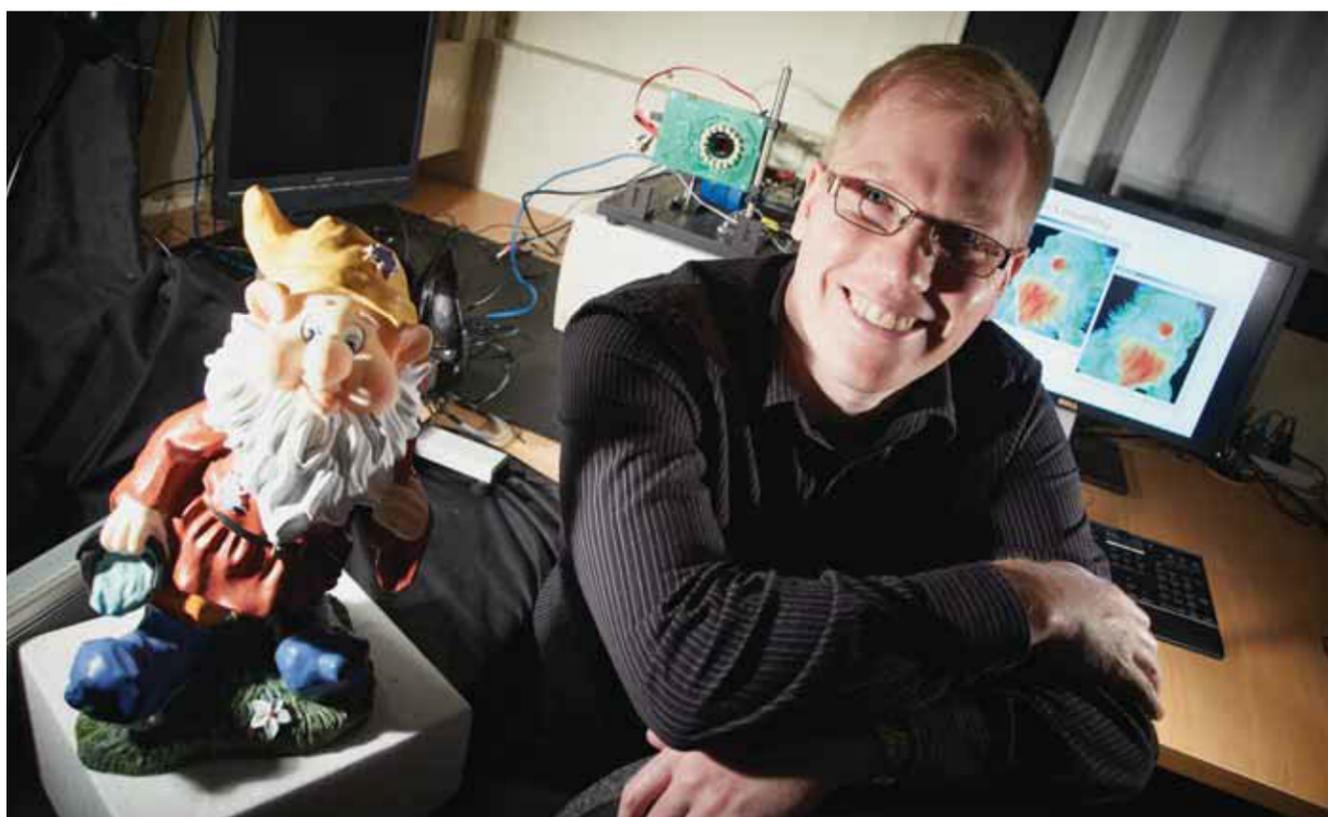
Current gesture recognition systems mainly use triangulation to determine depth in creating the 3D image, but ToF technology promises higher quality images capable of recognising more detailed gestures, literally through the speed of light.

It works by projecting light on to a scene and then measuring the time it takes for the light waves to return. With this data for each pixel a 3D scene can be reconstructed in real time.

“At the moment, natural user interfaces for gesture-based applications are a bit coarse,” says Dr Dorrington. “The technology only recognises large gestures, but it’s getting better all the time.”

“We’re now working with an international commercial partner looking at ways to overcome some of the existing limitations of ToF technology. Currently the technology is quite expensive and only works well in a constrained environment.”

While the project is still under wraps for now, Dr Dorrington says some of the challenges include developing algorithms to correct distortions from reflections that can contaminate the image, improving accuracy, and correcting motion blur.



GNOMIC INSPIRATION:
Dr Adrian Dorrington of the Chronoptics Group with Stumpy, used to test time-of-flight range imaging cameras.

But there’s certainly growing commercial interest in ToF technology.

The Chronoptics Group has worked closely with the University’s commercialisation arm, WaikatoLink, to take out half a dozen patents on its findings, and the team is now working on getting its technology into commercial range imaging cameras manufactured in the USA, Switzerland and Germany.

Discussions are currently underway with a New Zealand-based industrial partner to implement a ToF-based solution for a “seeing eye” robotic vision system with the aim of improving safety in industrial applications.

The Group is also developing a joint project with Birmingham University using range imaging cameras for internal medical imaging.

But local funding to take the technology to the next level remains an issue.

“Gesture-based applications are going to be the next revolution after touch interfaces,” says Dr Dorrington.

“We have an incredible opportunity here to be in at the ground floor with a cutting edge technology that could form the basis for a new hi-tech industry. But if we want to retain the IP within New Zealand, we’re going to have to find some funding onshore.”

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Time-of-flight technology

» Time-of-flight range imaging cameras use the speed of light to perceive depth and create 3D images.



» 3D imaging is helping improve robotic vision for industrial applications and medical imaging systems.

» The technology is also part of the latest generation of gaming devices with natural user interfaces that can recognise human gestures.

Protein engineer turns detective

FORGET the ivory tower, there’s a sea change going on in universities around the world as researchers adapt to an increasingly commercially-driven funding environment.

Associate Professor Vic Arcus at the University of Waikato knows this first hand. A Waikato graduate, he won a Prince of Wales scholarship to do a doctorate in molecular biology at that most ivory of towers, Cambridge University, but then chose to come back to New Zealand.

“At Cambridge, I had the luxury of specialisation,” he says. “I knew there weren’t the resources to allow me to carry on working on my doctoral research back in New Zealand, but I actually enjoy working in lots of different areas – it makes life complicated but interesting.”

Dr Arcus’s current research spans recreating billion-year-old ancestral enzymes, investigating how the bacteria responsible for tuberculosis can lie dormant, making the disease very difficult to eradicate, and identifying enzymes in a cow’s rumen that will break down feedstuffs more efficiently – resulting in fewer greenhouse gas emissions.

Molecular biology is a very interdisciplinary field, he says, requiring expertise in biology and chemistry, as well as maths, physics and computer science. “We routinely go over to Australia to run our samples through the synchrotron there, and then we use software to analyse the results.”

It also helps to have a medical bent. Dr Arcus’s work on the TB bacterium is funded by a grant from the Royal Society of New Zealand’s prestigious Marsden Fund.

TB claims the lives of two to three million people every year, and is classified as a “global health emergency” by the World Health Organisation.

“We are on a bit of a detective hunt,” says Dr Arcus, who’s collaborating with a consultant at Waikato Hospital as well as scientists elsewhere in New Zealand and in the USA.

“The enigma of the TB bacterium is that it can sit idle and not grow – which means that the immune system can’t ‘see’ it, and neither can antibiotics, which target actively growing cells.”

That means TB sufferers must undergo treatment for up to 12 months in order to remove the very last vestiges of TB cells.

“We’re studying a group of proteins that control a bacterium’s metabolism and slow its growth, and we want to see if these proteins in the TB bacterium are performing the same functions. If we can increase our understanding of the biology of organisms like these, then the chances of developing new therapies are greatly improved.”

Dr Arcus is also the brains behind Obodies, a research spin-out company with majority shareholder WaikatoLink, the University’s commercialisation arm.

Obodies specialises in engineering special proteins that can bind to foreign objects such as bacteria, just like antibodies do. It’s early days yet, but this kind of ‘protein engineering’ may deliver a new generation of diagnostics and drugs in the future.

Dr Arcus says he puts on his business hat for the Obodies work. “It’s a different way of thinking. You have to put your feet in the shoes of the commercial world, and understand the different drivers for that particular sector.”

He accepts for the older generation of academics that can be a hard thing to do. “But the next generation of researchers will have very few problems. The boundaries between



ASSOCIATE PROFESSOR VIC ARCUS:
“I actually enjoy working in lots of different areas – it makes life complicated but interesting.”

academics, entrepreneurs and the commercial world will have disappeared.”

And that, says Dr Arcus, will favour the polymath over the pure specialist. “That’s what we need to be encouraging in schools, and it’s what I aspire to and encourage my students to become.”

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At the threshold of understanding

TWICE as many New Zealand university students choose to study creative arts over information technology, and preliminary Tertiary Education Commission figures also show that only 6% of students choose engineering – despite a global shortage of technicians and engineers.

Attracting and retaining bright students in disciplines such as engineering is a worldwide problem says Associate Professor Bronwen Cowie, who heads the University of Waikato's Engineering Education Research Unit (EERU) with Professor Janis Swan of the School of Engineering.

"There's worldwide concern about student retention issues in the STEM (science, technology, engineering and maths) subjects," Dr Cowie says. "In engineering education at tertiary level, there's international interest in making the teaching and learning experience more interesting and effective."

So what is it that makes students 'switch off' from science and engineering?

Jonathan Scott is the Foundation Professor in Electronic Engineering at the University of Waikato, and has taught engineering undergraduates for more than 20 of the past 35 years.

There are no two ways about it, he says, a lot of engineering concepts that students have to get their heads around are difficult.

"There are certain crucial ideas in any discipline that you can't learn by simply memorising facts from Wikipedia," he says. "They're what we call threshold concepts, and they literally change the way you think about things."

Examples include the concept of opportunity cost in economics, Freud's model of the mind in psychology, indirection and pointers in computer science, and even the concept of sterility and hygiene.

"You may think the concept of hygiene is obvious – what's to know? It's become second nature for us because of our childhood experiences. But historically it took a long time for surgeons to accept the need for cleanliness."

Professor Scott has worked with Dr Cowie, Ann Harlow and Dr Mira Peter from the EERU to identify threshold concepts for electronic engineering and develop effective ways to teach these concepts.

The results, he says, are encouraging.



HANDS-ON LEARNING: Professor Jonathan Scott says you can't pick up threshold concepts from books.

"Threshold concepts is a theoretical tool that allows me to adjust the curriculum so it's challenging but not too hard. It also allows me to refine the assessments so that I'm not testing memorisation but can cut to the nitty gritty of threshold concepts."

Professor Scott says there are five threshold concepts in electronic engineering that students must fully grasp before they can move onto 'the fun stuff'. But you can't rush the learning.

"For the practitioner, a threshold concept is conspicuously obvious, but it's not for students. Two threshold concepts per semester gives a good, hard course. Any more, and the students tend to lose heart and give up."

Professor Scott has been collaborating with his EERU colleagues to develop teaching and assessment techniques to ensure students grasp the key threshold concepts.

"The curriculum doesn't always match students' natural cognitive processes," says senior research fellow Dr Mira Peter, who has a research background in human behaviour.

"Some students don't master these concepts until their second year; some take even longer. So it's important to flag up the

threshold concept, explain that it can be difficult to grasp, and keep coming back to it in lectures and in the lab sessions."

Ann Harlow is a senior educational researcher with an interest in student-centred learning approaches, and says one of the common problems with subjects like engineering is finding ways to get students to articulate their understanding.

"These students tend to be more comfortable with formulae than with essay writing, so it can be hard to establish just how much they understand. We've found it helps to get students to work together in groups, so that they verbalise their learning and test their understanding against their peers."

Another technique is the use of multiple-choice scratchie cards for assessment. "The beauty of this is that the learner gets instant feedback and the lecturer can see what the students don't understand," says Ms Harlow.

For Professor Scott, it's about turning out good engineers that employers want to hire. "The key is to ensure students have their heads around the threshold concepts they need; everything else they can pick up from books."

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Better education for engineers



Headed by Associate Professor Bronwen Cowie (pictured), the Engineering Education Research Unit aims to improve learning outcomes for engineering students.

The Unit's collaborative research covers:

- » Impact of threshold concepts on the teaching and learning of electronic engineering.
- » Using software tools to improve engineering education experiences.
- » E-learning practices in engineering education.
- » Learning communities in engineering.

The Unit is available for external contract work, and is keen to work with the engineering community to provide a more relevant and engaging curriculum for future engineers.

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Fast cars and a degree on top

IT'S NOT every first-year uni student who gets flown in and out of race car meets of a weekend, but then 22-year-old Michael Paaymans isn't just any student.

He was the MTA's 2011 Apprentice of the Year and a former New Zealand race car champion, and he's now embarked on a mechanical engineering degree at the University of Waikato.

"It took me a while to get used to sitting and studying again," he admits. "But I can follow most of the theory. And I'm looking at working on the WESMO race car project next year, if my motorsports commitments give me time."

WESMO – the Waikato Engineering Formula SAE Team – competes in an international competition where students must design and build their own car. Competitions are held in Australia, United Kingdom and Japan.



Photo courtesy of Geoff Ridder

Mr Paaymans got the racing bug early. Originally from Hawke's Bay, he raced mini stockcars from the age of 12 to 16, building the race cars together with his father, who's a structural engineer.

"I was New Zealand junior stockcar champion in 2006, and then I moved to Hamilton to do the introduction to motorsports course at Wintec.

MICHAEL PAAYMANS:
"It's important to get qualified."

I worked for John MacIntyre Racing at the first Hamilton V8s in 2008, and that's how I got my apprenticeship with Lodge Auto Centre in Hawke's Bay, as they're heavily involved in motorsports."

As MTA Apprentice of the Year last year, he won a trip to Australia to work with Greg Murphy's Supercar team at Sandown, a cash prize and a study grant.

"I'd always planned to do a degree, and now seems like the right time," says Mr Paaymans. "The Waikato engineering degree looked like a good choice."

He now juggles uni with being head mechanic for John MacIntyre Racing in Taupo – and spends his weekends fixing and fine-tuning race cars.

His aim after graduating is to work for a motor racing team overseas, and then come back to New Zealand and design high-end performance automotive products for export.

"I'll look to pick up some management papers at uni on top of my engineering degree, maybe during summer school," he says. "It's important to get qualified; I've met a lot of people who wish they'd gone on to study but left it too late. I didn't want to make that mistake."

Towards a STEM step change

COMMENT

By PROFESSOR ALISTER JONES

THE GOVERNMENT'S push to increase investment in science and engineering tertiary programmes has received a cautious welcome from universities, including the University of Waikato.

We're proud of our research and teaching record in STEM subjects (science, technology, engineering and maths), and value our close relationships with the businesses and organisations that offer internships to our students, enabling us to turn out work-ready graduates.

But while we support greater investment in STEM subjects as one means of enhancing economic development, we think it's important to consider the pipeline into and out of these programmes.

We need to find ways to encourage able secondary school students into these subject areas, as well as creating an environment where scientists and engineers are valued for their contribution to economic and social development.

One policy lever may not create the step change that we require as a nation.

Not so long ago, the government significantly reduced funding for science and technology advisors in schools. As a result, the University of Waikato had to make a number of these advisers redundant or redeploy them. We have yet to see how this move will impact on the numbers of students choosing science and technology at university level.

While New Zealand students perform well in science by international standards, students indicate that they are not necessarily



PROFESSOR ALISTER JONES is Deputy Vice-Chancellor of the University of Waikato, and the former dean of Waikato's Faculty of Education. He has a science and teaching background and long-standing research interests in curriculum and teacher development.

engaged in science or future study in science. Those who often opt for the health sciences rather than the physical sciences – even though employers say they are crying out for graduates with engineering and IT qualifications.

Yet many teachers and careers advisers remain unaware of the career opportunities in these fields – and many graduates find they have to go overseas to develop their careers.

We need to be clear about what sort of science and technology graduates we want to turn out, and we also need an integrated policy on STEM initiatives that stretches right through from the school system into the labour market.

Take for example the government-funded Science and Biotechnology Learning Hubs, based at the University of Waikato. This initiative is engaging with primary and lower secondary school teachers to enhance their understanding of contemporary,

New Zealand-relevant science and technology.

We believe it's exactly this kind of targeted professional development that will help drive the cultural shift that's needed in our society towards valuing the contribution science and technology can make to our economic and social development.

But we would also sound a note of caution about focussing funding on STEM subjects at the expense of other areas which make a valuable contribution to our economy.

The University of Waikato is a comprehensive university, preparing graduates with a broad skill set to meet the needs of the country. In our region, as well as nationally, it's clear that employers want graduates with business, analytical, policy and educational skills, who can solve real-world problems.

In recent years, the University has been increasing its investment in interdisciplinary courses to enhance our graduates'

employability and meet the needs of a changing world. These include programmes in agribusiness and creative technologies.

Switching the focus of tertiary funding to a narrower range of options could put at risk the ability of universities like ours to respond to students' and employers' needs.

Education matters. In times of austerity, it's still important to invest in the next generation to deliver economic benefits and growth in future years. We in the universities must do our bit to create a comprehensive teaching and research environment that will help develop the skillsets New Zealand needs in the future.

But let's also work to ensure schools are equipped to properly prepare students for entry to university-level study, and let's engage with employers so that the graduates we produce have adequate opportunities to contribute their skills and talents.

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Programming without tears

THE NEW NCEA programming and computer science achievement standards in digital technologies came into effect last year. University of Waikato PhD student Michael Walmsley was trying to help his brother come to grips with Level 1 programming, but his brother kept ditching the learning for computer games – which he'd spend hours playing.

"I could understand why," says Mr Walmsley. "The tools for learning were nowhere near as much fun as the games. Any good learning sites were pitched at too high a level. So I decided to design a site that taught JavaScript programming and web development skills that were more 'gamified', more addictive.

"I have a big family and they became my guinea pigs. I'd test it on them, then modify, adapt and rewrite to target absolute beginners."

The result is codeavengers.com, and since it went live in April this year, the site has had 45,000 hits from around the world with 150,000 tasks completed.

The Level 1 course covers the New Zealand Year 11 curriculum and is done in 40 short lessons that take about 10 hours to complete. Mr Walmsley says he added variety to the learning with bug-finding lessons, a robot challenge, which requires students to write to code to move a robot to its goal, and

review quizzes that require you to zap the correct answers as they whiz around the screen. The system also provides two views that give live feedback on students' progress.

"The summary view makes it easy for teachers to identify individuals that are struggling. The teacher can sort the list alphabetically and based on progress."

At present, the Level 1 courses are free, but Mr Walmsley will charge for Level 2 and Level 3 JavaScript courses that cover the Years 12 and 13 New Zealand curriculum.

Mr Walmsley says that the hundreds of positive comments received from all over the world helps keep him motivated. Many learners have commented on how fun and easy Code Avengers is for novices in comparison to other sites.

"Not all teachers have sufficient skills to teach programming and some are reluctant take on the new NCEA modules. But I've received great reviews from teachers who have tried the site with their classes.

"One teacher commented, 'I have now introduced each of my Year 9 classes to Code Avengers with huge success. The progression in difficulty and level of repetition to embed the skills and concepts is perfect.'"



Mr Walmsley's PhD supervisor Professor Ian Witten is keen to use his framework to create similar teaching materials for other programming languages.

For his PhD, Mr Walmsley is developing a computer program to assist with second language learning.

www.codeavengers.com

CODE AVENGER:
PhD student Michael Walmsley is developing programs to teach NCEA programming.

Kingfish farming – less sex, more growth

FISH FARMING in New Zealand is currently limited to salmon, oysters and mussels, but scientists at the University of Waikato and Bay of Plenty Polytechnic are keen to see kingfish added to the list of commercially farmed fish.

Dr Steven Bird, a molecular biologist recently arrived from Scotland and Dr Simon Muncaster, a New Zealander who completed his doctorate in Norway, have teamed up to discover the finer detail required to successfully breed kingfish in captivity.

Dr Bird says kingfish are already farmed in Australia and Japan, but there are still a lot of issues around deformity and disease in the farming environment. “So we’re trying to find out the ideal conditions for breeding – things like water temperature, diet and how the fish respond to stress.”

Dr Muncaster is a specialist in fish reproductive physiology. He has a good working relationship with scientists at NIWA in Northland who have been breeding kingfish and supplying him with fertilised eggs for research.

“Kingfish grow quickly, which is good for commercial farming, but there are usually a few challenges associated with developing new aquaculture species and this is where we are interested in focusing our research efforts.”

For example, growth often slows down in farmed fish because they reach maturity early under farmed conditions, and this

means that a lot of their energy is wasted on reproduction rather than growth before the fish are harvested.

“It is often more evident in one sex than the other. One of our interests is to investigate the process of sexual differentiation in kingfish to see when and how they start developing either male or female characteristics. This could help us to produce fish of the same sex to maximise growth and to stop unwanted breeding, which can be important from an environmental point of view.”

Dr Muncaster says this is already being done in other successfully farmed species and has nothing to do with genetic modification.

“To achieve this though, we will need to rear more kingfish in our Tauranga aquaculture facility. This is a job that requires a skilled team as kingfish larvae are fairly basic and very fragile to start with. We have to produce two different types of zooplankton to feed the larvae and take great care over their environmental conditions so they can successfully metamorphose into juvenile kingfish.”

At Waikato University, Dr Bird is using biomarkers – traits that can be used to identify the progress of a disease or condition – and testing genetic level responses to external changes in the environment. The University has provided preliminary funding to obtain the biomarkers that will allow them to look at the genes.



AQUACULTURE IN ACTION: Dr Simon Muncaster is part of a team fine-tuning fish farming practices to breed kingfish for commercial farming.

“With this technology we can get results in months not years,” says Dr Bird. “The information we get allows us to monitor responses to environmental changes and in turn fine-tune farming practices during the different growth phases.”

Dr Bird says if New Zealand wants to expand its commercial aquaculture base, then it needs to increase the number of species being farmed.

“Ideally, industry players would come on board to support the research but I’m also aware that there will be RMA issues and other consent processes that could potentially detract from expanding fish farming here. But there are also very real opportunities and what we learn in our study could be applied to other species.”

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In the Bay, for the Bay

A unique tertiary partnership has been developed to increase tertiary education opportunities in the Bay of Plenty. The University of Waikato, Bay of Plenty Polytechnic and Whakatane-based Te Whare Wānanga o Awanuiārangi offer a range of individual and jointly developed diploma and degree programmes, as well as research and development programmes to support the needs of the region.

Students can enter bridging, certificate, diploma and degree programmes, with pathways to lifelong learning opportunities for school leavers, mature students new to study, or people well on the way towards reaching their career goals.

New courses are being developed with industry and community input to ensure students are well equipped to take advantage of regional employment opportunities.

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Why chemistry is good for your health

RESEARCH by a University of Waikato postgraduate student is behind a new health drink being launched in the health-conscious Asian markets by a Hamilton-based company.

Developed by New Zealand Yacon Ltd (formerly NZ Biotechnologies), the prebiotic drink is a mix of blackcurrant juice and syrup made from yacon, a tuber originating from South America that has proven digestive health properties.

Waikato student Maria Revell spent a year working with New Zealand Yacon analysing the particular sugar that gives the tuber its prebiotic properties as part of her Masters degree in chemistry.

Her work was funded by a \$20,000 TechNZ government scholarship designed to boost R&D capability in businesses.

“The sugar found in yacon is called a fructooligosaccharide or FOS sugar,” explains Ms Revell. “It’s a natural prebiotic, and even diabetics can have it as only a tiny proportion is actually digested by the body – the rest stays in the gut and is metabolised by the ‘good’ bacteria there.”

FOS sugars aren’t particularly sweet to taste, and Ms Revell’s main task was to see what happened when yacon syrup was combined with blackcurrant juice under different storage conditions.

“It was a lot of work,” she says. “My findings are commercially sensitive, but we can say that blackcurrant juice and yacon syrup together provide a health benefit that they don’t separately.”

Her research earned her first-class honours for her Masters, and has led to a whole new product for New Zealand Yacon.



SUPER TUBER: Dr Robert Welch of New Zealand Yacon Ltd, Associate Professor Marilyn Manley-Harris and TechNZ researcher Maria Revell with yacon in its raw state.

The company’s director Robert Welch says they’re now working on packaging and marketing serving-sized portions of the new health drink, and will initially target the Korean and Japanese markets where yacon is very popular.

“Yacon is one product where if you have a gut problem you feel a benefit,” he says. “Maria’s work has been hugely helpful in identifying the best mixes and how to store them so they retain maximum biological activity.”

Dr Welch says New Zealand Yacon has worked closely with University of Waikato scientists and students for some years now.

“The TechNZ scholarships are invaluable for start-ups like us. We’ve repositioned the whole company thanks to R&D work by Waikato research students like Maria. When we started, we were just supplying yacon juice; now we’re moving into supplying complete products.”

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Therapy’s loss, chemistry’s gain

MARIA REVELL can thank a bout of glandular fever for setting her on the chemistry path.

“I began training in radiation therapy, but had to take a break for two years when I got sick. I went back to the training, but then I had my first child and decided this wasn’t the kind of work you could do with children.”

She returned home to her family in the Waikato, and signed up for a biology paper at the University. “Then I went to a lecture by Associate Professor Marilyn Manley-Harris and I knew that organic chemistry was for me. The way she teaches, you want to learn. I’d get 98% in my tests – and I’d never been able to do that before.”

With a Masters now under her belt, Ms Revell is embarking on a PhD, partly under Dr Manley-Harris’s supervision, focusing on manuka honey.

“I’ll be looking at what lies behind the different levels of DHA – the precursor responsible for bioactivity – in the honey, so I’ll be analysing mānuka trees and nectar to identify any factors that can explain the variation.”

Prebiotic or probiotic?

A prebiotic nourishes the “good” bacteria – or probiotics – in your gut that can help protect against infections caused by “bad” bacteria such as salmonella and e.coli.

Liquor outlets: What’s the damage?

AS PARLIAMENT considers the Alcohol Reform Bill, the impacts of liquor outlets on communities throughout the North Island are being studied.

The North Island study stems from one done in Manukau by the National Institute of Demographic Research (NIDEA) at the University of Waikato, and funded by the Alcohol Advisory Council (now part of the Health Promotion Agency).

University of Waikato economist Dr Michael Cameron, social scientist Dr Bill Cochrane, Dr Craig Gordon from the Health Promotion Agency and Dr Michael Livingston from the Turning Point Alcohol and Drug Centre in Melbourne are the leading researchers on the new project.

The Manukau research found that off-licence liquor outlets tended to be located in high-population, high-deprivation areas, and were associated with significantly higher levels of crime, including violence, sex, drugs, alcohol and property offences as well as motor vehicle crashes.

The bill before Parliament proposes allowing local authorities greater scope to consider the effects on the community before new liquor licences are granted. “And if people are going to oppose applications, they will need evidence of the harms that might result,” says Dr Cameron.



MAKING THE LINKS: Dr Michael Cameron is part of a team looking at the impacts of liquor outlets in communities.

“We’re looking at six years’ worth of data, looking at numbers and density of outlets (off- and on-licensed premises) and every police event in that time – several million events – finding out when and where incidents happen and whether incidents increase as outlets increase. The information will give local authorities more information with which to create their own alcohol policies.”

On-licence outlets, such as bars, clubs, restaurants and cafes are also associated with a range of social harm. “So we’re offering a University of Waikato summer research scholarship for a student to investigate on-licensed premises in Hamilton and

Manukau to find out how the competition between them affects how much they charge for a drink and how late they stay open.”

Dr Cameron says we already know that lower drink prices lead to more drinking, which leads to more violence and other negative social harms. “With this project the student will help find out qualifying data for the two cities, measuring how densely each CBD is populated with on-licensed premises and how price is affected through competition.”

Health Promotion Agency General Manager Research, Policy and Advice Dr Andrew Hearn said the research would give

North Island local authorities an evidence base to determine the impact of new liquor outlets on their communities.

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University of Waikato Summer Research Scholarships are worth up to \$5,000 and students complete their research over the summer study break. Applications are open to undergraduate and first-year masters students from anywhere in New Zealand, and close on 30 September.

Please visit the Scholarships web page to apply online:

www.waikato.ac.nz/research/scholarships/

Positive relationships a boost for Māori men



GOOD MĀORI MEN: Mohi Rua (holding daughter Anaia) is looking beyond Māori male stereotypes.

RESEARCHERS from the Māori and Psychology Research Unit (MPRU) at the University of Waikato want to look beyond the stereotypes of what it means to be a Māori man.

Mohi Rua and Professor Darrin Hodgetts are leading a two-year study to extend our understanding of the nature of wellness-promoting practices among three naturally occurring yet diverse groups of Māori men who forge supportive and positive relationships with their partners, families and communities.

“The majority of research on Māori men is illness focused, reflecting the abundance of negative health and social statistics, but presents very few answers,” says Mr Rua. He says Māori men are bombarded with negative messages about who they are and who they should be, including that they are in jail, broke, beneficiaries, and mad.

“But this project is not about illness or negative Māori stereotypes and characterisations, it’s about health and wellness and the relationships that are necessary for sustaining it.”

The \$650,000 study is being funded by Ngā Pae o te Māramatanga and significant research assistance will be provided by Tom Roa and Professor Ngahuia Te Awakotuku

from the University’s School of Māori & Pacific Development, Associate Professor Linda Waimarie Nikora (MPRU) and Wilf Holt from the Auckland City Mission.

The researchers will study Māori men engaged in traditional practices in their home settings, those who have migrated to an urban centre and work to maintain links back home, and those who are experiencing street homelessness.

It will involve some senior Ngāti Maniapoto men who occupy important leadership roles on their respective marae, a group of Tuhoë men living in Hamilton who maintain their links back to their iwi, and a group of homeless men who participate in the Auckland City Mission’s drama and gardening clubs.

“This study will extend our understanding of human relationships as a resource for optimising Māori men’s health and wellness,” says Mr Rua.

“I believe that if people can build strong relationships, networks and sense of self, their health will be better. This study has the potential to buffer against some of the negative health issues that continue to plague Māori men.”

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Māori and Psychology Research Unit

The Māori and Psychology Research Unit (MPRU) drives research that focuses on the psychological needs, aspirations, and priorities of Māori people. The Unit draws together skilled and experienced interdisciplinary researchers from inside and outside the University of Waikato to deliver high-quality research.

MPRU also provides an advisory service to researchers, anchored by the principles of the Treaty of Waitangi, on culturally appropriate research methods and ethical standards to maintain when working with Māori.

MPRU research covers issues related to:

- » Homelessness
- » Medications
- » Death, grief and dying
- » Sustainability
- » Positive Māori and indigenous psychology
- » Māori mental health and health inequalities
- » Māori migration.

www.waikato.ac.nz/wfass/subjects/psychology/mpru/

Indigenous rights presented on a global platform

UNIVERSITY of Waikato senior law lecturer Valmaine Toki says Māori have rights to water, and she wants to see more discussion between Māori and government around water rights, aboriginal title and tikanga Māori.

The Waitangi Tribunal is urging the government to halt its planned asset sales until the tribunal has properly reviewed the issue of Māori water rights.

“The United Nations Declaration on the Rights of Indigenous Peoples clearly provides that Māori, as indigenous people, have the right to maintain and strengthen their distinctive relationship with their traditionally owned water, and the government should consult and co-operate with Māori to obtain their free prior and informed consent prior to the approval of any development, utilisation or exploitation of water,”

says Ms Toki. “The government should not act in a way that is inconsistent with these rights.”

Ms Toki led a discussion on environmental resources and energy and the law at a recent World Indigenous Lawyers’ Conference held at the University of Waikato. And as a vice-chair of the United Nations Permanent Forum on Indigenous issues, she will also take her message into the international arena, when the Forum next meets.

Ms Toki was one of the 45,000 delegates who attended June’s Rio+20, the UN Conference on Sustainable Development – the once-in-a-decade meeting aimed to reconcile the world’s economic and environmental aspirations. She described the conference as “intense, challenging, frustrating and amazing”.



WATER RIGHTS: Valmaine Toki is taking her message to the UN.

What resulted was a 53-page non-binding declaration. “We didn’t get everything we wanted relating to indigenous issues but we did manage to have new issues included such as the importance of human rights; the importance of Mother Earth; and the importance of the UN Declaration on the Rights of Indigenous Peoples. The challenge, of course, is the political will to meaningfully engage and implement the Rio+20 declaration ‘The future we want.’”

At Rio+20, the University of Waikato became a signatory to the Commitment to Sustainable Practices of Higher Education. The commitment pledges the University of Waikato to further incorporate sustainability into its teaching, research, operations and community outreach.

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Te Reo Māori excellence

NEWS that Māori Television is increasing its broadcast hours to focus on language revitalisation has been welcomed by Māori academic Korohere Ngāpō (pictured) from the University of Waikato. Earlier this year, Dr Ngāpō became the first person at the University of Waikato to defend their PhD in Te Reo Māori.



His thesis is titled *Te Whare Tāhuhu Kōrero o Hauraki – Revitalising ‘Traditional’ Māori language of Hauraki*.

“This was a subject close to my heart,” says Dr Ngāpō. “There are no native speakers left in Hauraki, and it concerned me that a lot of the ‘traditional’ language – the more formal aspects of our language – was being lost and, for many reasons, I think we need to keep it alive. It seemed natural for me to write my thesis in Māori.”

He’s a former school teacher who’s worked for six years in the Faculty of Education’s Te Kākano Rua programme, and he is also an inductee of an elite group of Māori scholars named Te Panekiretanga o Te Reo Māori. Led by Dr Timoti Kāretu, Dr Te Wharehuia Milroy and Professor Pou Temara, Te Panekiretanga is for people who are fluent in Māori – taking scholars to higher levels of fluency to reach excellence in Māori language.

Dr Ngāpō has facilitated wānanga reo throughout Hauraki marae for more than 15 years and that, coupled with support in Hauraki from a hard core base of family members and kaumātua, assisted his research.

Customary law in a unitary state

MĀORI CUSTOMARY law and the New Zealand legal system are not always compatible bedfellows, but the latest Yearbook of New Zealand Jurisprudence has addressed a number of issues surrounding custom and state.

Published by Te Piringa - Faculty of Law at the University of Waikato and edited by honorary lecturer at Waikato Dr Richard Benton, the articles in the book are based on a symposium on custom and state that took place in 2007. That was called Tūhono and means linking together or bonding.

The papers from symposium have been updated, and in some cases reconsidered for this current publication that covers three major themes: finding Māori custom, understanding custom, and applying custom. While the focus is primarily Aotearoa New Zealand there are also wider views covering the South Pacific and Hawai’i.

“The content of the book is relevant as the country deals with issues such as water rights, asset sales and resource management,” says Dr Benton. “We have to understand old and new meanings

of custom and customary law, and how to apply Māori customary law in a unitary state. What we’re striving for is a cohesive New Zealand jurisprudence.”

Dr Benton says the book will be valuable for judges, legal scholars, advisers to government and members of the public with a general interest in the relationship between custom and state in Polynesia (including Aotearoa New Zealand) and the southwest Pacific.



Chapter authors include Dr Alex Frame, Hon Justices Sir Edward Taihakurei Durie, Paul Heath and Sir David Baragwanath, along with Hon Deputy Chief Judge Caren Fox, Dr Guy Powles and other jurists from Samoa, Fiji, Hawai’i and Australasia. Dr Robert Joseph and Wayne Rumbles from the University of Waikato have also contributed chapters.

Tūhono: Custom and State, The Yearbook of New Zealand Jurisprudence Volumes 13 and 14 (combined) 2010 and 2011 is available from Publications Assistant, Te Piringa – The Faculty of Law, The University of Waikato, Private Bag 3105, Hamilton 3240.

Looking to tradition for good child rearing



A NEW study into Māori child rearing aims to investigate traditional forms of child rearing and examine how they might be applied in a contemporary context.

Dr Leonie Pihama, a senior research fellow at the University of Waikato's Te Kotahi Research Institute is leading the two-year study funded by Ngā Pae o te Māramatanga – the Auckland-based Centre of Research Excellence that undertakes and invests in Māori community research.

"It's a project that seeks to provide knowledge and information to whānau, hapū, iwi, Māori providers and agencies that work with whānau across a range of sectors," says Dr Pihama who was prompted to focus on the subject during the anti-smacking debate and subsequent legislation.

"Smacking doesn't align with traditional ways of bringing up children; that was a learned behaviour and there's long been a denial of the cultural

knowledge and practices that facilitate wellbeing for tamariki, yet it is in these cultural notions that answers may be found for successful ways to raise our children."

The research project is called Tiakina Te Pā Harakeke: Māori child rearing within a context of whānau ora. Te Pā Harakeke is a metaphor for whānau wellbeing. "Harakeke, meaning flax, and the way it thrives and grows in ways that show the relationship between generations is how we see the wellbeing of tamariki and whānau."

Joining Dr Pihama on the project are Donna Campbell, internationally renowned weaver and faculty member of Waikato's School of Māori and Pacific Development; Māori language lecturer Heneitimoana Greensill; postdoctoral fellow Ron Ngata; Rihi Te Nana, director of Kakariki Consulting, and Dr Jenny Lee, director of Māori research and publishing company Rautaki Ltd.

KEEPING IT IN THE WHĀNAU: Researchers are looking at old ways to improve Māori child rearing practices.

"Whānau is the cornerstone of a healthy and functioning society, economy and culture. For a range of reasons there's been a disruption in the intergenerational transmission of mātauranga (knowledge) and tikanga (culture) for many whānau, and we need to fix that," says Dr Pihama.

The researchers are gathering their data by carrying out in-depth interviews, six hui and two weaving wānanga. "You might ask why weaving, but it's an important part of our culture and the wānanga will help us explore the notion of Te Pā Harakeke, its relationships to whānau and the place of tamariki within it."

The information gathered will be shared with whānau and those working alongside whānau to provide insights into how tikanga and traditional knowledge can enhance and support child rearing today.

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Ethical guidelines for genomic taonga



MAUI HUDSON: Investigating Māori views on biobanking and genomic research.

RESEARCHERS at the University of Waikato's Te Kotahi Research Institute have been awarded a major research contract to investigate Māori views on biobanking and genomic research.

Biobanking is where large amounts of human tissue and genetic material are stored for scientific research.

Maui Hudson, a specialist in Māori ethics and new technologies and deputy director of Te Kotahi, will lead this three-year project funded by the Health Research Council.

"We're aware that genomic research can contribute to improving Māori health outcomes – that there are good reasons for doing it," says Mr Hudson, "but it's also important that due regard is paid to Māori cultural practices in this high-tech environment and that we develop mechanisms to address sensitive issues and protect communal interests."

The research team comprises academics and community researchers from the University of Waikato and across the country, and will focus on Māori and indigenous experiences through international connections with other indigenous groups that are also being studied in Hawai'i, North America and Australia.

Mr Hudson says this new research builds on earlier work he and his colleagues were involved with. In 2010 they wrote *Te Ara Tika – Guidelines for Māori Research Ethics*. "And now this project will enhance our

understanding of Māori ethics in the area of biobanking and health research. It will position Māori to lead the development of mechanisms for enhancing consent processes and producing guidelines that support culturally appropriate conduct, analysis, dissemination and knowledge translation in the context of genomic research."

The research will include interdisciplinary panels, workshops and community symposiums. "We'll be working with key people from Māori, biobanking and genomic research communities. And we'll be testing our guidelines across these communities. I think there's been interest among Māori about what's happening to their taonga. Issues like the Wai262 claim and the 'warrior gene' have brought it into focus, so it's important we work to address these issues in a sensible and proactive manner.

"In the end, what we want is for every biobank and genomic research study to respect Māori values and interests, and ensure their research translates into Māori health gains."

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Focus on Te Kotahi Research Institute

TE KOTAHI Research Institute at the University of Waikato was established in October 2011 to enhance engagement in research and development that promotes innovation, wellbeing and inspiration. The Institute also provides a front door for iwi, Māori and indigenous communities wanting to access research capability that supports their development aspirations.

TKRI offers research, consultancy and capacity building services, collaborating with researchers from other universities, Crown Research Institutes, Whare Wānanga, Māori organisations and iwi providers to undertake projects on a 'best team' basis.

Research focuses around themes of economic development and inter-generational sustainability; environmental and iwi well-being; solving complex social challenges; mātauranga, tikanga and reo; and leadership, kaitiakitanga and rangatiratanga.

The Institute's director is Professor Linda Smith who is also Pro Vice-Chancellor Māori at the University of Waikato. She is a leading international authority on indigenous education and health.

www.waikato.ac.nz/rangahau/en

Is migration good for your health?

TONGAN adults migrating to New Zealand report feeling happier and less downhearted, but also have higher blood pressure, while their children tend to be taller and heavier than those who stayed in the islands.

These findings from the Pacific Island – New Zealand Migration Study (PINZMS) come from a set of surveys of more than 500 households in New Zealand and the Pacific designed to gather information on the broad effect that migration has on families and communities.

PINZMS is providing unique insights into some of the less well-known health consequences of migration – especially as migrants become exposed to unfamiliar conditions such as asthma and hypertension.

The longitudinal study, headed by the University of Waikato's Professor John Gibson, began in 2005, and is funded by the Royal Society of New Zealand's Marsden Fund with additional support from the World Bank, Stanford University and Waikato Management School.

Professor Gibson says the big strength of the study is its ability to compare like with like.

"What's unique about PINZMS is that we can compare immigrants coming into New Zealand through a random ballot – the Pacific Access Category immigration ballot – with those unsuccessful in the same ballot," he says. "This means we can be very sure that the differences we see are due to migration rather than to self-selection bias."



Photo courtesy of Jimi Jawi

GRUB'S UP: University of Waikato researchers are looking at the health and nutritional consequences of Pacific migration.

Almost one-quarter of New Zealand's population is now foreign-born, and the evidence worldwide is that migration brings real welfare gains for both the host country and country of origin. But in health terms, the picture is more mixed.

"Our data shows migrating causes a significant rise in blood pressure – the incidence of hypertension goes up by more than 10 percentage points compared to

the incidence among unsuccessful ballot applicants in Tonga," says Professor Gibson. "It's likely that more salt in diets and the greater stress of living in New Zealand are behind this change."

Yet alongside the stresses, there are some positives. The mental health of Tongan migrants – particularly women and those with lower levels of mental health – shows an improvement. Migrants said they felt

Migration choices

Studies of migration decisions usually assume that potential migrants are well informed about wages and employment in different labour markets, and decide whether or not to migrate on this basis.

But the Pacific Island – New Zealand Migration Study show sizeable gaps in information about employment and earnings abroad, despite a large emigrant network and quite high levels of communication between New Zealand and Tonga.

"We found Tongans wanting to migrate to New Zealand underestimate the available wages by almost \$150 per week, based on the average of wages expected by unsuccessful applicants in the Pacific Access Category ballot," says Professor John Gibson.

With more accurate wage expectations, he says, more people might apply to migrate to New Zealand.

happier, more cheerful, less nervous and less downhearted; but they also reported feeling less calm and peaceful.

PINZMS has also found that children left behind in Tonga show a decline in height-for-age and weight-for-age, in contrast to those who migrate to New Zealand.

"It's perhaps not surprising that kids who migrate tend to be taller and heavier," says Professor Gibson. "Their diet changes when they move to New Zealand, they tend to eat more dairy, meat and fats.

"The ones who stay behind however appear to lose ground, although this finding comes from the first year of migration, and so this picture may change as households adapt to the absence of family members who've migrated."

Professor Gibson says information from PINZMS is invaluable for informing policy. "Our earlier reports on the cost of remitting money home to the islands led to changes in banking regulations to enable innovative products that reduce those costs.

"Our current focus is on health issues, and in our next set of surveys later this year we'll be looking at housing, especially heating and dampness – which may be key factors in the incidence of asthma."

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<http://wms-soros.mngt.waikato.ac.nz/Marsden+Fund+Project/Home/default.htm>

Researcher sees grassroots impact of migration

OVER the past eight years, post-doctoral research fellow Dr Halahingano Rohorua and her team of eight research assistants have travelled the length and breadth of the Tongan archipelago surveying migrants' family members who've stayed behind in the islands and also families of those who've been unsuccessful in the migration ballot.

"For each survey, we spend about an hour with the family," says Dr Rohorua. "We measure the height, weight and waist circumference of all family members, and do a peak flow measurement test for asthma. We also check the blood pressure of all the adults, and collect detailed information on yesterday's family meal."

The surveyors also collect information on the migration process, remittance transfers and future income expectations.

The findings are compared with survey results from Tongan migrant families now in New Zealand.

"Overall, the impact of migration for Tonga has been very positive," says Dr Rohorua. "I see it face to face in the families I visit – thanks to remittances, they have new houses, boats, outboard motors, kerosene stoves and radios.

"But the biggest change is at the community level. For example, we find seasonal migrant workers pooling their earnings to benefit their village, providing new washing machines for the local hospital, funding scholarships for local children to attend high school, paying for diesel to power the water supply."

Dr Rohorua says PINZMS regularly reports back to survey participants so they too can benefit from the study's findings. "They look at migrating to New Zealand as heading to



DR HALAHINGANO ROHORUA: "Overall, the impact of migration for Tonga has been very positive."

the bright lights," she says. "So it's important they understand some of the other impacts of migration, particularly on health."

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Being a bloke

A FASCINATION with Formula 1 motor racing, and with 1997 world champion Jacques Villeneuve in particular, was the inspiration for a doctoral thesis and then a new book.

It wasn't just the racing that interested Dr Damion Sturm, the fans did too. "And for my PhD, I looked at three key angles; how the sport was represented, the driver as a star, and fan or audience engagement with the sport. I wanted to know why and how people formed attachments to the sport in a largely media-driven high-tech environment."

It turned out that Professor of Screen and Media Studies Dan Fleming was researching similar themes. They put their heads together and in six months had a publisher and a first draft ready to go. *Media, Masculinities, and the Machine* is



SPLASH OF COLOUR: Co-author and skydiving thrill seeker Dr Damion Sturm has looked at why men form attachments to 'boys' toys'.



Fantasizing Technology at its Limits, the authors extended their research from motor racing to look at the long-running Transformers franchise, especially how boys who played with the toys became adult fans of the blockbuster movies. Using what's called 'affect theory', the authors tracked the masculinity theme through TV, cinema, toys, magazines, merchandising, the culture of the gadget and sport. The main focus was on images of

the result – a book that focuses on the complex relationships between men and machines. It looks at the representation of masculinities in the media and why men form attachments to products and to media stars or celebrities.

Subtling their book

high-tech in popular culture and what the authors call 'automobility'.

Affect theory looks at the emotional investment, intensity and energy people put into their activity. "If you think of life being a flat grey plane, then sport, toys, movie-going, cars, high-tech gadgetry and other related activities are what bring the splashes of colour for many men," says Dr Sturm. "But what brings colour to one person doesn't necessarily do it for another.

"What we found in our research is that you cannot categorise masculinity. It's a constantly shifting and splintered terrain, and with technology becoming ever-more sophisticated and media becoming more diverse, masculinities are getting harder to define culturally and much more complex to navigate."

Media, Masculinities, and the Machine is published by Continuum, New York.

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Made in Hamilton, played in Beijing

UNIVERSITY of Waikato musicians in Hamilton used breakthrough internet technologies to link high-definition digital video and audio to open last year's Asian Telemusic Concert at the MUSICACOUSTICA11 festival live in Beijing.

And they're planning to go even higher-tech at the 2012 festival next month.

Composer Associate Professor Ian Whalley and research assistant Hannah Gilmour played with musicians who were physically in Singapore and China for the 2011 performance.

They used five digital video channels and multiple stereo channels to link the performers in the three countries in real-time performance. Mr Whalley's new work for the event, *KishiKaisei*, also used multiple data control channels from Singapore to trigger electronic instruments built in the Hamilton studio, and the live performance was watched on a large screen by the audience in Beijing.

The technology was enabled through the not-for-profit Internet2 consortium, which is developing next-generation internet applications.

Ian Whalley says combining audio and data control interactively through a high speed network allows for new forms of music and performance, but the new medium is still relatively under-explored.

"With high-speed broadband, physical location becomes less important than telepresence. It's about what we can make live in the new physical-virtual space, and how we can combine the input of others in a meaningful way across countries."

Ian Whalley has teamed up this year with Professor Andrew Brown and Dr Toby Gifford from the Queensland Conservatorium Research Centre, Dr Michael Young of Goldsmiths, University of London, and Associate Professor Francois Pachet of Sony Computer Science Laboratories in Paris to investigate the relationship between musicians and interactive computers. This is a three-year project funded by the Australia Research Council.

Their goal is to develop a music system that 'listens' to a performer and responds in real-time. "There is scope for digital systems to become more sophisticated and to demonstrate a sense of autonomy," says Mr Whalley.

The first stage of the research involves measuring human gestures and interactions and transferring that knowledge to computer systems to make sure the technology can anticipate the actions and movements of human performers and intuitively respond.

The next stage is to implement more autonomous machines using intelligent agent technology. "More broadly, the discoveries made by this project will have relevance to the phenomenology of human interactions with autonomous computer systems."

Mr Whalley is currently developing an interactive graphic musical scoring system that can be altered in real-time by globally distributed players. The system will be premiered as part of his new net-based composition for MUSICACOUSTICA12 in Beijing next month.

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ONE COMPOSITION, THREE COUNTRIES: Musicians in three locations perform *KishiKaisei* for a Beijing audience at MUSICACOUSTICA11.



MUSIC AND THE MACHINE: Hannah Gilmour and Associate Professor Ian Whalley in performance.

Mixing it up

A CD that mixes new music and taonga puoro – traditional Maori instruments – has been nominated for Best Classical Album in this year's Vodafone New Zealand Music Awards.

Toru (three in Māori) is the work of Waikato University composer Associate Professor Martin Lodge. He has a long and strong track record of contemporary composition and in this CD of chamber music has blended Western instruments with taonga puoro.

"There's a lot of cross fermentation going on with music at the moment," says Dr Lodge. "Music is getting harder to segment and with new technology there's a lot of opportunity to experiment."



UNIVERSITY OF WAIKATO research associate Richard Nunns, QSM, considered a world authority on taonga puoro, plays a pūtōrino (flute/trumpet).

The title track is a trio for clarinet, cello and taonga puoro and features Waikato University research associate Dr Richard Nunns on the

ancient instruments, Peter Scholes on clarinet and James Tennant on cello.

"The music on this CD is distinctly New Zealand," says Dr Lodge. "It's clean and clear, you can hear the creaks and rattles of the bush, the wind and sea, waiata, and hints of geothermal activity as well as beautiful instrumental playing."

For classically trained musicians reading a Lodge score can be a challenge. "In some pieces there is room to improvise because there's less specific instruction. There may not be a time signature or key signature. In works like that the musician is more like an actor – given a script and asked to bring their character to life."

Many of the musicians on the 11-track CD are based at the University of Waikato. "There's a lot of cello because James Tennant is staggeringly good, and so are his students Edward

King and Santiago (Cañon-Valencia)," says Dr Lodge. Lara Hall and Katherine Austin from New Zealand Chamber Soloists also feature along with Dr Rachael Griffiths-Hughes and PhD student Jeremy Mayall.

"Rachael plays the harpsichord in a piece where we stuck a microphone inside the instrument. The harpsichord is not a complicated instrument, so we recorded all the groaning, scraping and rubbing – small, internal noises that are always there but overlooked, amplified them and then added them to the music being made from the keyboard. The aim was to integrate the public and private voices of the ancient instrument."

Toru is produced by Atoll Records and is available from Marbecks.

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Have piano, will travel

THE EARLY settlers brought their pianos with them to New Zealand and for a century the instrument was at the heart of celebrations and entertainment.

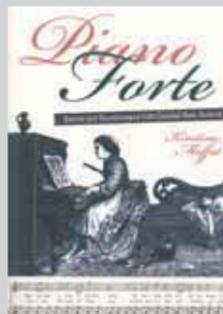
University of Waikato Convenor of English and keen amateur pianist Dr Kirstine Moffat travelled throughout New Zealand to discover how the piano was significant in the private, social and cultural lives of New Zealanders. The results of her five-year investigation have been turned into a book *Piano Forte: Stories and Soundscapes from Colonial New Zealand*.

"I visited museums all over the country, going through books, documents and oral histories, and while we tend to associate the piano with gentlewomen playing in parlours, and that did happen, there were plenty of men playing the piano in the home and in

public, and by the turn of the century it was a treasured possession of people from all classes in all walks of life."

Dr Moffat was awarded a Marsden fast-start grant from the Royal Society of New Zealand which enabled her to travel during university breaks to do her research.

"I wanted to find out who was playing pianos, where they were played and the cultural impact they had. They turned up in unexpected places. Many shops had pianos, even the Government Kiosk in Rotorua had one, so did a Turkish bath house in Wellington, and in hotels and pubs people were thumping out all kinds of tunes."



FROM PARLOUR TO BATH HOUSE: Author Dr Kirstine Moffat at her original square piano which was made around 1835.

She also found that troop ships going off to the Boer and First World wars carried pianos, and in the First World War ANZAC troops were blamed for a bit of a rumble in Cairo when a piano was thrown out of a brothel window. Māori also adopted the instruments and the Ngāti Poneke concert party was known to use them as an accompaniment to waiata and poi.

"Local composers started to write piano music with New Zealand themes, music that reflected Māori myths and the New Zealand landscape, and there were plenty of songs written about sport and patriotism, but by 1930 in the family home, the piano was giving way to the phonograph and radio."

Piano Forte is published by Otago University Press and retails for \$45. Kirstine Moffat will be appearing at Auckland's Going West festival in September.

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“Invisible epidemic” study focuses on children

IT’S BEEN CALLED the “invisible epidemic”. Mild to moderate traumatic brain injury (TBI), as concussion is technically called, can happen to anyone at any time – in a car crash or while playing sports, as well as through assaults and falls.

But there’s very little information available on the longer term social and healthcare implications for sufferers and their families. And there’s even less understanding about the effects of TBI on the developing brains of children and young people.

A group of researchers at the University of Waikato is hoping to find some answers in the latest in a string of studies into the wider impact of brain injuries.

The \$350,000 three-year project, funded by the Health Research Council and the Lotteries Grants Board, is the first longitudinal study of children with mild TBI, and involves more than 100 children and young people in the Hamilton and Waikato district.

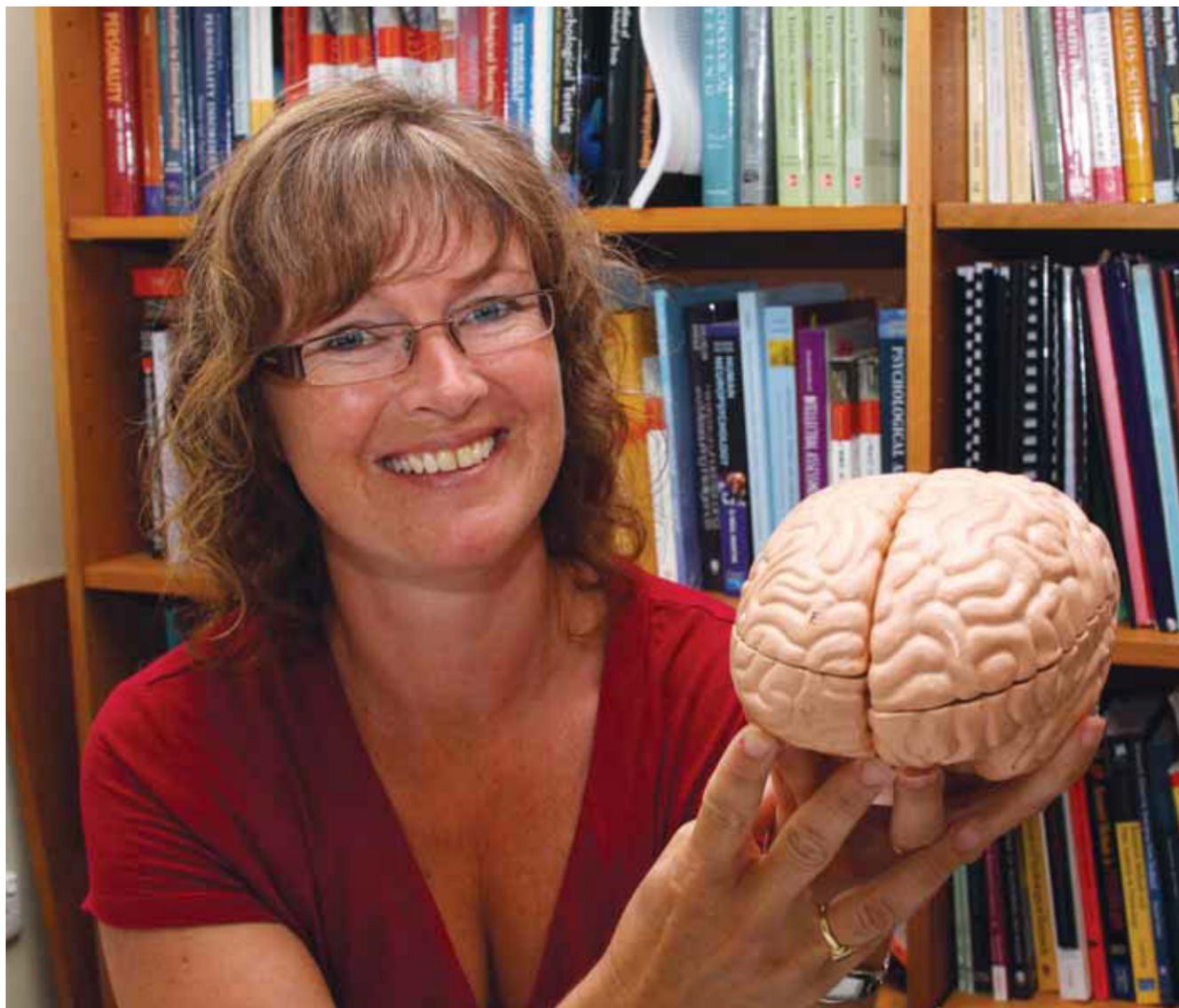
“Brain injuries in children may alter normal brain development, and the impact of the injury may not be noticed until much later,” says lead researcher Dr Nicola Starkey of the University of Waikato’s School of Psychology. “We’re also interested in what happens with repeated TBI, as there’s some evidence that the cumulative effects are greater than for separate injuries.”

The researchers have found those most at risk from mild TBI are toddlers and older teenagers.

“Among the younger children, injuries are mainly due to falls, while the older teenagers are mostly injured in fights and car accidents. The children in the middle tend to come in with recreational injuries, from playing sport for example.”

One part of the study is focusing on 8- to 16-year-olds, looking at social behaviour and school-related functioning for up to two years after the initial injury.

“Social behaviour is very complex, and deficits resulting from TBI can have a big impact on children and adolescents,” says Dr Starkey. “They can end up in the wrong crowd, where they are more at risk from drugs, alcohol and crime.



“We’re looking at how these kids manage their emotions, how they cope with planning and organisation. The injury may not alter their behaviour at the time, but it may have an impact further down the line.”

Another part of the study is examining the impact of brain injury on school-related functioning in younger children, aged five to 11.

Research officer Rosalind Case, who has been awarded a \$250,000 HRC clinical research fellowship to conduct the study with Dr Starkey, is working with local schools to follow the progress of children with mild TBI compared with a matched control group of unaffected children.

“We’re collecting information from teachers and parents on the children’s classroom behaviour and academic achievement,” says Ms Case. “The schools have been hugely supportive of what we’re doing. Previous research indicates that TBI can prevent children from reaching normal developmental

milestones, so we hope this study will add to what we know about the long-term impact of TBI.”

A third part of the study, funded by the Waikato Medical Research Foundation, is looking at very young children, those who were under the age of two at the time of the injury.

The researchers are currently analysing the first year’s data, and expect to report on their findings later this year.

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DR NICOLA STARKEY: Looking at the impacts of mild brain injury on the developing brains of children and young people.

What is traumatic brain injury?

- » Up to 95% of head injuries are in the form of concussion – mild or moderate traumatic brain injury or TBI as it’s technically known.
- » Mild or moderate TBI affects around 24,000 New Zealanders each year.
- » Symptoms include seeing stars, loss of consciousness and not remembering what happened.
- » Long-term effects can include fatigue, poor memory, long-lasting headaches, irritability and inability to concentrate.

Wanted: Student to help track modern-day Mozzies

MOVE OVER GC, here comes FIFO. One-fifth of all Māori now live overseas, many drawn by work opportunities, and in recent years there’s been a rise in the numbers of Māori men taking fly-in/fly-out (FIFO) jobs in Australia.



OPPORTUNITY KNOCKS: More and more Māori are taking jobs in Australia’s lucrative mining sector.

It’s a phenomenon that interests demographic researcher Dr Tahu Kukutai, who’s an expert on the dynamics of Māori transnationalism.

Dr Kukutai (Waikato, Ngāti Maniapoto, Te Aupōuri) is based in the National Institute of Demographic and Economic Analysis (NIDEA) at the University of Waikato.

“Māori are one of the most geographically mobile indigenous peoples in the world, and while it’s well known that a lot of Māori live and work in Australia, we don’t yet know what the consequences of FIFO migration will be,” she says.

An increasing number of Māori men, particularly from areas with high Māori concentrations such as Northland and Huntly, are taking up FIFO work in Australia, says Dr Kukutai.

FIFO workers are typically male heads of households, flying in to work in remote locations where work, food and lodging is provided for workers, but not families.



DR TAHU KUKUTAI: Tracking Māori FIFO workers in Australia.

Dr Kukutai plans to investigate the potential challenges for whānau members that remain in New Zealand, and is currently looking for a Summer Research Scholarship student to study this modern-day Māori migration.

“One thing we don’t track is ethnicity data through arrival and departure gates, so the successful student will be studying recent Australian census data, reviewing the existing international research on FIFO workers, and looking at methods for the indirect estimation of Māori temporary labour migration to Australia.”

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University of Waikato Summer Research Scholarships are worth up to \$5,000 and students complete their research over the summer study break. Applications are open to undergraduate and first-year masters students from anywhere in New Zealand, and close on 30 September.

Please visit the Scholarships web page to apply online:
www.waikato.ac.nz/research/scholarships/