

Matter of Fact

Newsletter from Science & Engineering and Computing & Mathematical Sciences



THE UNIVERSITY OF
WAIKATO
Te Whare Wānanga o Waikato

Autumn 2010

Chef-turned-chemist wins top fellowship

After trading in his chef's hat for a lab coat, University of Waikato chemistry student Sam Pachal has won a Te Tipu Pūtaiao Fellowship to begin Masters-level research on ways to add value to the titanium by-products of iron sand mining.

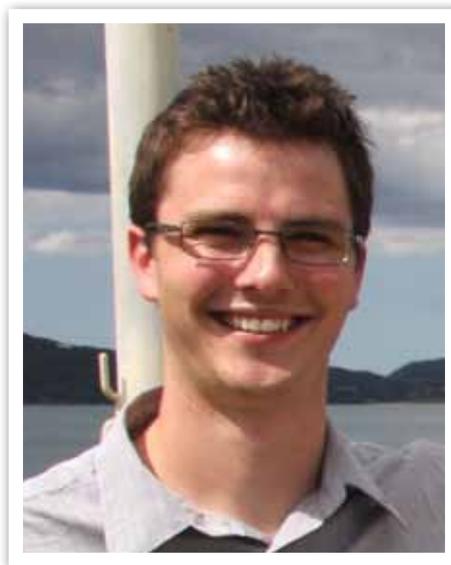
Up to 20 TTP Fellowships are offered by the Foundation for Science, Research and Technology each year with the aim of strengthening Māori knowledge, people and resources.

Pachal, who's of Ngaiterangi descent and has just completed a chemistry degree, will be working with the Māori-owned Taharoa mine site, south of Kawhia, where currently the titanium content of the iron sands is not being used.

"The Taharoa iron sands contain relatively high levels of titanium – 7% - which actually causes some trouble during the steel-making process," he says. "Currently it's too expensive to extract, so in this project we're focusing on ways to add value to the titanium so that it becomes worthwhile to extract – which in turn will boost the Taharoa mine's potential."

Titanium is used commercially in high-value products such as medical implants, and Pachal's project aims to enhance its use in these and other applications. Working under the supervision of Dr Graham Saunders, who has pioneered technology in this field, Pachal will look at ways of coating titanium and titanium dioxide to make the surface super water-resistant (superhydrophobic).

"Superhydrophobic titanium and titanium dioxide powder can be used to make textiles waterproof, a bit like Goretex, and can also improve medical implants such as stents, used to prevent blood



vessels and other organs from collapsing," he says. "Stents tend to clog up and then need replacing, so making them superhydrophobic would extend their life and reduce the need for further surgery."

The former Whangarei Boys' High School student nearly turned his back on science when he dropped out of his science degree at Waikato in 2003, and went home to do a cooking course at Northland Polytechnic. "I thought science wasn't for me, but after working in restaurants as a chef for two and a half years, the grind of it wore me down."

He went back to university, and hasn't looked back since. "I'm having a lot of fun doing what I'm doing now, there's something new every day, and I enjoy not knowing what's going to happen."

Pachal's TTP Fellowship is worth \$34,500 over two years.

Student's academic paper judged best at US conference

An engineering student has taken out best paper award at an international conference for his first scholarly publication.

Shane McClure, who'll be graduating with a Bachelor of Engineering (Honours) in May, won best overall paper at the Image Processing: Machine Vision Applications III conference, held in San Jose, California, earlier this year as part of an international symposium on electronic imaging.



McClure's paper was based on his final-year project which looked at ways to resolve depth-measurement ambiguity using 3D range imaging cameras.

McClure, a former student of Mt Maunganui College, was one of four Waikato students presenting papers at the symposium.

"3D range imaging is a relatively new technology with huge possibilities for use in medical imaging, robotics and gaming interfaces, but it's still in the early stages of development," he says. "My project focussed on ways to extend the camera's maximum useable range."

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Down and dirty with shellfish

Summer conjures up images of sun-soaked beach holidays, but for two University of Waikato biology students it was a chance to get stuck into some serious mud.



Lisa McCartain (left) and Rebecca Gladstone-Gallagher get to work in the field.

Rebecca Gladstone-Gallagher and Lisa McCartain spent their summer holidays analysing samples of juvenile shellfish collected from three sites in Whangarei Harbour. The study was part of a wider estuarine restoration research project looking at the natural colonisation of shellfish beds by juveniles.

The students were recipients of Summer Research Scholarships, awarded annually to promising undergraduate, honours and first year masters students. They are for ten weeks and come with a \$5,000 stipend for the student and provide supervisors with an extra pair of hands for their research projects.

The researchers used the sample results to calculate the rate and direction of movement of the juvenile shellfish. "The information we gathered show which shellfish bed sites need reseeded and which sites can be colonised naturally through tidal flows," says McCartain, who spent nine months last year on a work

placement at NIWA as part of her biology and earth sciences degree.

Shellfish beds play a vital role in the functioning of estuarine eco-systems, which are at increasing risk from urbanisation, agricultural and storm water run-off, industrial discharge, deforestation and soil erosion.

Most of the work involved sifting through hundreds of muddy sediment samples. "It took us a few weeks to be able to pick out the juvenile shellfish under a microscope," says Gladstone-Gallagher, who's part way through her biology degree. "They're between one and five millimetres long, and to begin with it was slow work. But by the end of the project we were able to process ten samples a day."

The students also had an opportunity to join PhD students on fieldwork trips to Tauranga Harbour. "It was a great opportunity to find out about post-graduate work," says McCartain. "I'm definitely interested in going on to do a Masters degree."

Wildlife webcam project

A team of computer science students from the University of Waikato have made it into the finals of the Microsoft Imagine Cup

Team eUtopia will now compete with three teams from Auckland for the opportunity to represent New Zealand at the worldwide finals in Poland in July this year.

The Microsoft Imagine Cup is the world's largest technology competition, challenging students from around the globe to develop technologies to help solve the world's toughest problems.

More than 300,000 students from 100 countries are participating in this year's competition, with the theme based on the United Nations Millennium Development goals. Teams have to develop projects using Microsoft technology, and present them to judging panels composed of Microsoft executives and industry experts.

eUtopia is the brainchild of Waikato students Laura Bock, Matt Bird, Carlo Meister and Gabe Young. Their project aims to harness the power of 'human computing' to protect wildlife and help preserve the world's biodiversity.

Using a live video distribution system, or liVID, with webcams in, for example, safari parks, zoos, marine reserves or native forests, the project will link conservation organisations to the public and allows for remote monitoring, private research and even surveillance of animals.



eUtopia team members, from left, Carlo Meister, Laura Bock, Matt Bird and Gabe Young. The team is in the New Zealand finals of the Microsoft Imagine Cup 2010.

"People who want to be involved in the project can have the live webcam feed constantly running in a corner of their screen as they work on other things," explains team member Matt Bird, who's starting his honours year. "Watchers can 'tag' the video when something interesting or unusual happens, like a kiwi egg hatching or a poacher entering a wildlife reserve. These tagged bits of video can then be put together for educational or research purposes."

One thing that really impressed the judges was how the team had approached conservation organisations for their input into the project as possible users.

"We've been talking to Hamilton Zoo and the Otorohanga Kiwi House," says third-year student Gabe Young, who's a Hillary Scholar at the University of Waikato. "Hamilton Zoo are interested in using the webcam for research purposes, such as seeing what's happening in the zoo at night, while the Kiwi House sees it as a way to better engage with the public."

A better thinking battery

An intelligent battery meter for electric vehicles could prevent drivers running out of charge and coming to a standstill at inappropriate times.

Waikato University electronic engineering student Philip Rowe has been working on producing an intelligent battery meter, part of an honours project that won the annual design competition sponsored by the Waikato branch of IPENZ (Institute of Professional Engineers NZ).

"We were set a challenge: to replace something that's flawed," says Rowe. "The voltage method of measuring battery power levels is only any good when the machine isn't moving. We wanted to develop a meter that worked more like a petrol gauge on any lead acid battery."

The battery meter project was started by Kyle Pennington who created a bench prototype, and a working model has since been installed and tested on a motor scooter belonging to Professor Jonathan Scott – Rowe's supervisor.

"The idea is that the meter gets to 'understand' the battery so it can give an accurate indication of how much power remains," says Rowe. "We combined three different measuring methods, found they complemented each other and by switching between them we could get a meaningful read out."

Professor Scott, himself a scooter owner, says battery meters have been a weak point in the world of electric vehicles for many years. "So much so, people are sceptical about our claim to have a practical, workable solution to the problem. It's time for this technology to cross the divide into the commercial arena, with serious investment and rigorous testing."

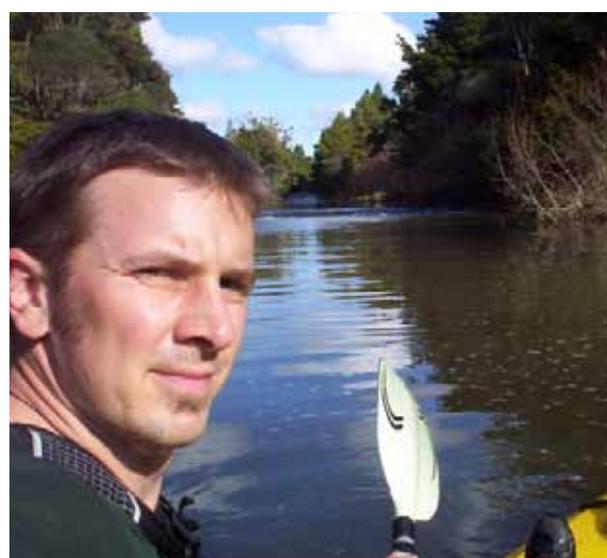
Long term, Rowe would like to think the meter could be manufactured for common use. It has potential to be used in golf carts, mobility scooters and other electric vehicles. In the meantime he's begun studying for his PhD, working at Plant and Food Research at Ruakura full-time to develop optical sensors to determine the properties of fruit.

Rowe says he's pleased he decided to study electronic engineering. "It offers a huge variety of different areas to work in – and there's a great sense of achievement in developing something that is practical and useful."



Electronic Engineering student Philip Rowe with the scooter used to test his intelligent battery meter.

Graduate Profile - Engineering Geologist



Kori Lentfer, Bachelor of Science (Technology) graduate, now works as an Engineering Geologist for Coffey Geotechnics.

Kori Lentfer likes to get his hands dirty. The Engineering Geologist's fascination with soil and rocks has taken him around the world as a consultant, including work in the United Kingdom and a stint in the Middle East working on large infrastructure projects.

Now based in Tauranga, his job with global specialist ground engineering consultancy Coffey Geotechnics is just as varied. He works on multiple projects, from small-scale construction sites to his current project, the 28-turbine wind farm Meridian Energy is building inland of Raglan. Here, Coffey Geotechnics is responsible for earthworks construction monitoring and certification, along with investigating opportunities during the project for design refinement that will reduce construction costs.

Like every project, it began with a blank slate. "You start off not knowing anything about a project or particular site and you have to do your research, investigation and testing to develop a ground model, and then continually prove and refine your model. It's really satisfying."

Congratulations

Solid Start to University



Former Hamilton Boys' High School student Sam Waetford is one of eight first-year university students to be awarded a Solid Energy Scholarship.

Solid Energy's tertiary scholarships are open to students from its mining regions -- the West Coast, Southland and the Waikato -- and are awarded annually.

Sam's enrolled for an engineering degree at Waikato and the scholarship will give him \$2000 a year for four years.

"My family and friends all told me to apply -- said I had nothing to lose, and they were right. The money covers a decent chunk of my fees," says Sam. The 18 year old plans to major in mechanical engineering. "Maths and physics are the subjects I do best in; I got 96 per cent for maths in the Cambridge Exams and 86 per cent in physics." He also got a string of excellences in NCEA Level 3 for calculus and statistics.

"Engineering's probably in the blood. Dad was an aeronautical engineer in the air force and he now does software engineering, so I've always seen it as a potential career with a variety of opportunities."

Hill Laboratories Waikato Science Summer School

The Science Summer School is a unique week long science experience at Waikato University held each December. The Summer School is open to Year 12 students who have an interest in science, and who will be going on to study Year 13. All participants will stay in a Hall of Residence at the University. Information will be sent out to high schools in Term Three.

MEET LIKE-MINDED SCIENCE STUDENTS. GET TO EXPERIENCE UNIVERSITY LIFE FIRST-HAND. USE THE LATEST SCIENTIFIC TECHNIQUES. SEE HOW ALL THE SCIENCES ARE INTERRELATED. WORK AS A TEAM. MAKE NEW FRIENDS. HAVE A FANTASTIC TIME.



Students experience Biochemical Engineering in the Waikato University labs during the 2009 Science Summer School.

What's on

8-9 JUNE

Waikato Experience Biology Days

Come along to the Department of Biological Sciences' WEB days, for Year 13 Biology students and teachers. Seminars and lab work cover topics including DNA technology, human evolution, biotechnology, and animal behaviour/plant responses to the environment. Contact biology@waikato.ac.nz

10-11 JUNE

Osborne Physics Lectures

Upper high school students and teachers are invited to lectures and demonstrations relevant to the Physics curriculum and current research. Contact engineering@waikato.ac.nz

16 JUNE

Analytical Chemistry Competition

Teams of Year 13 students are set an analytical task, requiring accurate and careful analysis of an unknown substance. The results will be judged, with prizes and trophy awarded on the day. Contact chemistry@waikato.ac.nz

15 JULY

Engineering Open Day

Prospective students are invited to find out what engineering is all about, what study options are available, and to participate in hands-on workshops at Waikato University. Numbers are limited so early registration is advisable. Contact science@waikato.ac.nz

19-20 OCTOBER

Engineering Design Show

Members of the public and industry are invited to come and see 3rd and 4th year engineering students display their research and design projects. Contact engineering@waikato.ac.nz

20 OCTOBER

ChemQuest

A fun chemistry quiz evening for Year 12 students. Secondary schools are invited to send their best teams of chemistry whizzes. Contact chemistry@waikato.ac.nz

For all Waikato University events, visit events.waikato.ac.nz

Contact us

Science & Engineering

Phone +64 7 838 4625

Fax +64 7 838 4218

Email science@waikato.ac.nz

Toll free 0800 438 254

www.sci.waikato.ac.nz

Computing & Mathematical Sciences

Phone +64 7 838 4322

Fax +64 7 838 4155

Email scms@waikato.ac.nz

www.scms.waikato.ac.nz