InSCight

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Like a fish needs a bicycle

A clear vision of the future

The mathematics of mind-bending spaces

Around the Faculty

THE UNIVERSITY OF AUCKLAND
FACULTY OF SCIENCE

InSCight

The University of Auckland
Faculty of Science alumni magazine

2010

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If you are a Faculty of Science graduate and have a story to tell about your experiences or achievements, or would simply like to re-establish contact, please get in touch.

We also welcome feedback and suggestions about this publication. If there's something you would like to see in the next issue, don't hesitate to contact us.

InSCIght is available electronically – please email us if you would prefer to receive the magazine in this format.

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A word from the Dean

Welcome to the 2010 issue of InSCight magazine and my first as Dean of Science at The University of Auckland.

Professor Grant Guilford, Dean of Science

Over the past year there has been growing awareness of the importance of science and innovation to New Zealand's future. As the country's leading and most comprehensive science faculty, we play a major role in New Zealand's sustainable development.

The Faculty is also well positioned to assist with many of the key challenges facing today's world including climate change, loss of biodiversity, food and water security, clean energy, the data deluge and the rebuilding of public trust and confidence in science.

This year's issue of *InSCIght* illustrates the breadth of the faculty's research from the fundamental to the applied, and its commitment to high quality research-rich teaching. Special congratulations are due to our researchers, teachers and students who have won national and international recognition for their work.

Developments such as the establishment of university-wide research initiatives like the Food and Health Programme and Biopharma Sector Development Initiative; the continued success of the Centres of Research Excellence such as the Maurice Wilkins Centre; and proposed Joint Graduate Schools with Crown Research Institutes, are fostering an integrated and collegial approach. Links to business and the economy are rapidly growing, due in no small part to the success of the Institute for Innovation and Biotechnology and Auckland UniServices Limited, as well as new outwardly looking ventures such as the Photon Factory.

In addition to interdisciplinary and national collaboration we are actively promoting international relationships. A recent stocktake shows that faculty members have more than 900 active and valuable links with overseas academics. Initiatives such as improvements to the faculty website and new outreach events such as Talking Science will help us to further communicate our strengths and the value of science in society.

Major construction projects at the School of Biological Sciences and Leigh Marine Laboratory described in last year's magazine are proceeding to schedule, and further improvements to faculty buildings are planned. A 70 percent refurbishment of the mathematics, statistics and physics building is due to begin in November and a major redevelopment of the chemistry and geology building has entered the concept design stage, with the aim of modernising teaching and research facilities, co-locating staff, and accommodating expected growth in staff and student numbers.

Progress has also been made in several areas that will help our students make the most of their university experience, including the appointment of our faculty Kaiārahi, the introduction of a specialist professional teaching career path (the Professional Teaching Fellow), growth in the Women in Science and science communication programmes, and university-level initiatives such as internships and interfaculty sports events.

Looking back on my first year as Dean, it has been an absolute pleasure to work with the creative and innovative staff of the Faculty and to witness their dedication to their students and the pursuit of world-leading research. I am very pleased with the progress that has been made and anticipate another busy year ahead.

PROFESSOR GRANT GUILFORD
Dean of Science
The University of Auckland

Leading creativity and innovation in the sciences

Under its new name, the School of Environment intends to operate as a more integrated entity.

Around the Faculty

School of Environment

Last year the School of Geography, Geology and Environmental Science was renamed the School of Environment, indicating its intention to become a more integrated entity. "Our former three-barrelled name connoted very much a 'silo effect' and we wanted to break away from that," says Professor Glenn McGregor, Director of the School. "Having a single-barrelled name was one step in that direction."

"Notice we are The School of Environment, not The School of the Environment. There's a subtle difference. The addition of the word 'the' would imply we are focusing on the biophysical aspects of the earth. Whereas we hope our new name conveys our interest in the forces and factors that shape the earth's surface and shape people's lives. It reflects our place in contemporary social science thinking."

The school continues to conduct research and offer research-based academic programmes in environmental science and environmental management, physical and human geography, geographic information science, and geology. Alongside changing its name, the school has taken the opportunity to discuss new overarching research themes such as "globalising processes", "Pacific futures" and "environmental change".

www.env.auckland.ac.nz

Thematic research initiatives

This year the university approved $4.8 million in additional funding to boost research capability in three major areas. The three thematic research initiatives are designed to operate across faculties and disciplines to examine major issues of importance to New Zealand.

One of the initiatives, Biopharma Sector Development, is to be co-hosted by the Faculties of Science and Medical and Health Sciences. It seeks to advance research into therapeutic agents, medical devices, and diagnostics by building on the University's existing strengths in drug discovery and development. It will provide funding for scientists to progress their work from discovery stage through to grant application and commercialisation, as well as drug development workshops to encourage the establishment of specific research collaborations.

Other thematic research initiatives approved in 2010, and which draw upon the expertise of faculty staff, include Auckland: a Sustainable City, to be hosted by the National Institute of Creative Arts and Industries and addressing issues around sustainability, social equity and economic development, and Te Whare Kura: Indigenous Knowledges, Peoples and Identities, a broad theme that will bring together a diversity of academics from within the university, and will be hosted by the Faculty of Arts.

In addition to these thematic research initiatives the university has established a Food and Health Programme, which will examine how food impacts upon human health. The major transdisciplinary research and teaching programme will draw on expertise in food science, process engineering, nutrition, health, social sciences, business and commercialisation. It aims to encourage collaboration both within the university and with other research and education providers and industry groups, to develop fundamental knowledge within the disciplines, and produce high-quality graduates. Ultimately it is hoped that the programme's work will lead to improved health outcomes, greater innovation and growth in the New Zealand food and beverage sector and the identification of new ways to add value to New Zealand's primary products.

There will be two interconnected 'nodes' of food science and process engineering, and nutrition and health, drawing principally on the Faculties of Science, Medical and Health Science and Engineering and the Liggins Institute, with expertise from the Business School and Auckland UniServices Limited being integrated into both nodes. The steering group is chaired by Dean of Science Professor Grant Guilford.

The Microfabrication Facility is one of the facilities available to students and researchers across the university.

New leadership for centre of health research excellence

Professor Ted Baker (Biological Sciences) handed over leadership of the Maurice Wilkins Centre for Molecular Biodiscovery to Associate **Professor Rod Dunbar** (Biological Sciences) at a celebration event in August 2009. The current and former directors are two of the centres' principal researchers, specialising respectively in structural biology and human immunology.

The Maurice Wilkins Centre is one of eight government-funded Centres of Research Excellence in New Zealand. It brings together more than 200 researchers from universities and research organisations across the country, with expertise in biology, chemistry, bioengineering, and mathematics. Its aim is to combat serious human disease, ultimately developing new treatments for diabetes, cancer, heart disease, and infectious disease.

Twelve new associate investigators from the Universities of Auckland and Otago were also welcomed to the centre at the celebration event, and fourteen further researchers have subsequently joined the ranks from Auckland and Otago, Massey University and Industrial Research Ltd.

www.mauricewilkinscentre.org

New and improved major research facilities

Additions and upgrades to major research facilities housed in the Department of Chemistry were celebrated this July. Operating at the intersection of chemistry, physics, biology, and engineering, the facilities are available to students and researchers from across the university as well as to external academics and industry, and are already being used in this capacity.

The Photon Factory is an established laser facility for basic and applied research. It produces short, high-energy laser pulses that allow scientists to monitor reactions produced by light as they occur. A new micromachining stage means that the lasers can also be used to carve materials or build components on the micron scale. Current applications include manufacturing cutting-edge optics for physics research and helping to make solar roofing tiles a reality.

A new cleanroom-based Microfabrication Facility offers services such as micro-scale lithography, characterisation and testing of tiny devices, imaging, and metal evaporation. Current projects include developing conducting-polymer micro-devices for the controlled release of drugs and manufacturing miniature fluid-channel devices.

The Nuclear Magnetic Resonance Centre, used by chemists to determine the content and purity of samples or their molecular structure, has acquired several new instruments including a robotic sample changer that allows the facility to be used almost around the clock. The capability of the X-Ray Diffraction Laboratory, used to determine the structures of small molecules or powders, has been extended with a donation from Rio Tinto Alcan of a second powder x-ray diffractometer. The Free Radical Research Facility, which examines how exposure to free radicals affects samples, can now produce free radicals on an extended time scale or as the reaction occurs and the applications range from food science to drug development.

www.che.auckland.ac.nz
(see: research: research facilities)

Centre for e-research

The Centre for e-Research, hosted by the Faculty of Science, was established in 2009 to assist researchers across the university, from social scientists to high-energy physicists.

"The centre has a leadership role in establishing best practice in the use of advanced information technology for research. The idea is to continue ramping up the skills and technology available on campus," explains **Mr Nick Jones** who co-directs the centre with **Professor Mark Gahegan**. "We provide a variety of services, from web-based collaboration systems to high-performance computing and data-intensive science. We work directly with researchers to either develop systems from scratch or help them adapt existing solutions."

Examples of current projects include working with the Auckland Cancer Society Research Centre and Bioinformatics Institute to develop high-throughput three-dimensional molecular modelling pipelines for drug discovery, and with scientists in the Department of Physics to establish a computational cluster that allows them to participate in Large Hadron Collider research.

While the centre was formally established last year, e-research activities have been up and running in some form since 2006, starting with leadership of the national distributed computing service BeSTGRID. The centre is now leading a bid that would see it working with other universities and Crown Research Institutes to develop a shared national infrastructure for high-performance computing and e-research. Meanwhile in the last week of October the centre is hosting the inaugural New Zealand e-Research Symposium in Auckland.

Paul Nolan, supervisor of the Cardiac Rehabilitation Clinic, at the 10-year anniversary event with Jane Liggins (left) and Fiona Mills, the cardiac nurses who helped to establish the clinic.

Cardiac rehabilitation clinic celebrates 10 years

The Cardiac Rehabilitation Clinic celebrated its 10-year anniversary at Tāmaki Campus in March. Part of the Health and Performance section of The University of Auckland Clinics (see update on page 17), the Cardiac Rehabilitation Clinic helps people recover from heart disease through supervised exercise. The clinic offers personalised fitness programmes and a safe gym environment in which to exercise. It helps clients with cardiac conditions ranging from heart attack or stroke to heart surgery, stable angina or arrhythmias. Some people who have not developed a cardiac condition also attend the clinic to help combat risk factors such as high blood pressure or cholesterol, weight problems and diabetes.

The anniversary event, held in the clinic gym, was an opportunity for current and former clients, university staff and students, and representatives of the National Heart Foundation to reflect on their success. Since it opened in November 1999 with just 6 members, the clinic has grown to its current membership of around 60 clients and has helped 400 people improve their cardiovascular fitness and overall health. The Clinic operates from the Unisports Training Centre at 71 Merton Rd, Glen Innes, with aerobic training sessions on Monday, Wednesday and Friday mornings and resistance training on Tuesday mornings.

www.clinics.auckland.ac.nz

Construction update

The two major construction projects described in last years' magazine are progressing according to schedule.

The upgrade of the Leigh Marine Laboratory continues apace. Completion of the second phase of the project – a new research building comprising specialised laboratories and offices – was celebrated this August. The next phase will see construction of a new Interpretive Centre giving the thousands of people who visit Goat Island Marine Reserve every year the opportunity to learn more about the marine environment and the work of our scientists.

www.marine.auckland.ac.nz

Construction of the extension to the Thomas Building to house the Institute for Innovation in Biotechnology (IIB) and expansion of the School of Biological science will be completed late this year. Industry involvement has also grown, with Comvita New Zealand Ltd, well-known for its natural therapeutic products, joining the companies co-located on site. The IIB is New Zealand's first biotechnology incubator, bringing together university scientists and students with industry in the same space to share knowledge and facilities.

The extension to the School of Biological Sciences will be completed late in 2010.

www.biotech.co.nz

Staff news

New leadership for the Faculty

Professor Grant Guilford became Dean of Science in August 2009, succeeding Professor Dick Bellamy who retired at the end of 2008. In announcing his appointment, Vice-Chancellor Professor Stuart McCutcheon noted Professor Guilford's considerable experience in university education, research management and the commercialization of intellectual property.

Before coming to the university Professor Guilford held senior management roles at Massey University, most recently as Head of the Institute for Natural Sciences. He had previously spent ten years as Head of the Institute of Veterinary, Animal and Biomedical Sciences, during which time the institute became the first veterinary school in the southern hemisphere to win accreditation by the American Veterinary Medical Association. He also led the creation of the Hopkirk Research Institute, a multi-million dollar joint venture between Massey University and AgResearch.

With a Bachelor of Philosophy and Bachelor of Veterinary Science degrees from Massey University and a PhD in Nutrition from the University of California, Davis, Professor Guilford is an accomplished researcher who has published widely and is experienced in establishing research consortia and partnerships for research excellence. Several successful commercial products have been developed from his research, and he has led or participated in the commercialisation of nine start-up companies.

New Professors

In addition to the Dean of Science Professor Grant Guilford, the Faculty has seven new professors by promotion or appointment.

Professor Bill Barton (Mathematics) is an expert in ethnomathematics – the relationships between mathematics and culture, and specifically between mathematics and language. He is an internationally recognised mathematics educator, President of the International Commission for Mathematical Instruction, and leader of the Klein Project to inspire secondary school teachers with contemporary mathematics.

Professor Stuart Bradley (Physics), Head of Department of Physics, is a world leader in acoustic technologies for measuring wind and air turbulence. He has designed instruments used to locate and optimise the performance of wind turbines, help astronomers counteract the effects of atmospheric turbulence on their telescopes, and understand vortices produced by aeroplane wings. He is also investigating the use of the technology to design more sustainable cities.

Professor Penny Brothers (Chemistry) and Professor Stuart Bradley (Physics) are among eight new professors in the Faculty.

Professor Penny Brothers (Chemistry) is an expert in the chemistry of porphyrin complexes (porphyrins are the molecules which give hemoglobin its red colour). Her current research brings together her interests in porphyrin chemistry, the main group elements and organometallic chemistry. She investigates how porphyrins can be used to modify the chemistry of elements such as boron and bismuth, and has discovered unusual structures and chemical reactions involving main group porphyrins.

Professor Linda Cameron (Psychology) specialises in health psychology and in particular the psychological aspects of cancer and cancer screening. She is especially interested in how people cope with cancer treatment and decisions around screening and detection, and how they respond to health threats. She also works in environmental psychology, examining how to promote environmentally responsible behaviours.

Professor Brian Carpenter (Computer Science) joined the university in 2007 after ten years with IBM working on Internet standards and technology and almost 20 years at CERN, the European Laboratory for Particle Physics, in networking and process control systems. Professor Carpenter's research focuses on internet infrastructure issues including routing and addresses, as well as internet protocol design.

Professor Gillian Dobbie (Computer Science) specialises in data management systems. Her work ranges from the most effective way to structure data to the most efficient way to access data. She also investigates how to extract meaningful information from very large sets of data.

Professor Fred Seymour (Psychology) is a practicing psychologist whose research focuses on the area of child, adolescent and family mental health and wellbeing, particularly child abuse, parents' separation effects on children, adolescent suicidal behaviour, and behavioural and developmental problems in children. He is also interested in psychology and legal processes.

Psychology lecturers honoured for excellence in teaching

Five outstanding teachers from across the university received teaching excellence awards as part of the 2010 autumn graduation, including two people from the Department of Psychology.

Associate Professor Niki Harré received a Sustained Excellence in Teaching Award. Niki was a secondary school teacher before completing her doctorate in psychology at the university in 1997 and joined the faculty shortly thereafter. She teaches social and community psychology and says that she hopes her lectures help people to see through a slightly different lens - one that has become more thoughtful and compassionate through exposure to the possible reasons why people do what they do.

Dr Nickola Overall received an Early Career Excellence in Teaching Award. Nickola is a senior lecturer who joined the faculty in 2005 and has quickly become a valued member of the department. Her interests are in the area of experimental social psychology with a focus on interpersonal processes and close personal relationships. Her approach to teaching is described as vibrant and innovative, reflecting her own passion for social psychological theory.

Associate Professor Nikki Harré (Psychology) has received a Sustained Excellence in Teaching Award.

Early career research excellence

Early career researchers in the faculty have received national and university awards in support of their work.

Dr Julie Lim has received a 2010 Sir Charles Hercus Health Research Fellowship, and the 2010 Zonta Science Award.

Dr Julie Lim (Optometry and Vision Science), a molecular biologist who studies how medical therapies may be used to delay or prevent the onset of age-related cataract, received a 2010 Sir Charles Hercus Health Research Fellowship. The fellowship will support her research developing antioxidant strategies to prevent eye disease and investigating whether the lens is able to supply antioxidants to other tissues in the eye.

Julie also received the 2010 Zonta Science Award, presented biennially to an emerging scientist who is a role model and advocate for women in science. The award will support her research towards developing a hyperbaric oxygen model of nuclear cataract in the laboratory, as well as travel to attend an international conference, develop collaborative partnerships, and learn new skills and techniques.

Dr Esther Bulloch (Biological Sciences) received a Postdoctoral Fellowship from the Foundation of Research, Science and Technology that will support her work developing new biotechnology to isolate proteins for research. She aims to use a high-throughput screening method to test millions of proteins for their suitability in research, and will apply the technique to the study of paramyxoviruses. Ultimately her work may lead to the development of drugs against this family of viruses, which cause acute respiratory disease in children.

Dr Stéphane Guindon (Statistics) and **Dr Chris Sibley** (Psychology) were among just six promising young academics from across the university to receive 2010 Early Career Research Excellence Awards at the Celebrating Research Excellence function during autumn graduation. The awards recognise excellence and research leadership potential among researchers not more than eight years post-PhD. They enable outstanding young researchers, selected in a highly competitive process, to further their current research, establish stronger links with the international research community, or embark upon new fields of research. Stéphane was recognised for his research interpreting spatial information about species distribution and Chris received the award for his work on discrimination and well-being in a representative New Zealand sample.

Recognition for excellence in research

Faculty staff members have been recognised by their peers both nationally and internationally for the excellence of their research.

The faculty is home to three of the ten new Fellows of the Royal Society of New Zealand elected in 2009. **Professor Eamonn O'Brien** (Mathematics) was honoured as a leading international algebraist focussing on computational algebra and group theory. **Professor Allen Rodrigo** (Biological Sciences) was recognised for his international reputation in bioinformatics and the development of computational methods to infer evolutionary patterns and processes, including for viruses like HIV, SARS and influenza. **Professor David Williams** (Chemistry) received the distinction as a leading international figure in electrochemistry, with notable contributions on the pitting corrosion of stainless steels and successful commercialisation of gas sensor devices. Fellowship of the Royal Society of New Zealand is conferred for distinction in research or the advancement of science or technology, and the election of ten new Fellows in 2009 brings the total to 347.

Associate Professor Ian Smith (Environment) has been elected a Fellow of the Geological Society of Australia, a distinction that recognises extensive professional experience and significant contributions to the science of geology or related fields. Ian specialises in volcanic materials, studying the magma that erupts from volcanoes to better understand how volcanoes behave and the hazards they present.

Professor Margaret Brimble (Chemistry) was awarded the 2010 Natural Product Chemistry Award from the Royal Society of Chemistry in the United Kingdom. Her research involves the chemical synthesis of complex natural products that have important biological activity and may be used for the development of new pharmaceuticals. The award recognizes her outstanding contributions to the field.

Professor Ross Ihaka (Statistics) and **Robert Gentleman** of Genentech Inc were named joint recipients of the American Statistical Association's inaugural Statistical Computing and Graphics Award, in recognition of their work initiating the R Project for Statistical Computing. R is an open-source computer language, developed by the pair in the early 1990s that has since been adapted and used by academics and high-profile companies around the world.

Dr André Nies (Computer Science) received the 2009 New Zealand Mathematical Society Research Award, recognising his contributions in mathematical logic. Mathematical logic, sits at the intersection of mathematics, computer science and philosophical logic. Dr Nies is a world leader in the subfield of computability and the related area of algorithmic information theory.

Professor Richard Le Heron (Environment) received a Distinguished New Zealand Geographer Medal in late 2009. The award from the New Zealand Geographical Society recognises outstanding contributions to geography and society. Richard is an economic geographer who focuses on the changing international connections of agriculture, food and fibre, and was the first person to examine the emerging influences of globalisation using both economic and institutional perspectives.

Student news

Department of Physics welcomes Prime Minister's prize winner

This year the Department of Physics welcomed 18-year old undergraduate student **Stanley Roache**, winner of the inaugural Prime Minister's Future Scientist Prize for his groundbreaking discoveries about the physics of light. The prize is awarded to a secondary school student for their achievements in carrying out a practical and innovative research or technology project. While attending the 2009 International Young Physicists Tournament as a student of Onslow College in Wellington, Stanley developed a model for how rings of light inside a shiny tube distort as the viewer moves from side to side. The model is believed to be a world first and may have important practical applications, such as in medical imaging. Stanley is studying for a Bachelor of Science degree majoring in physics and mathematics and plans to continue with a PhD in physics but has not yet decided on an area of specialisation.

Prime Minister John Key with Stanley Roache, winner of the inaugural Prime Minister's Future Scientist prize and student in the Department of Physics.

Doctoral research honoured

Doctoral students from across the faculty have been honoured at a university and national level for the excellence of their research.

Three of the five Vice-Chancellor's Prizes for Best Doctoral Thesis awarded in 2009 went to science students:

Jennifer Kruger (Sport and Exercise Science) received the prize for her thesis on pelvic floor muscle function in elite women athletes, supervised by Dr Bernadette Murphy. Her research used the latest ultrasound and magnetic resonance imaging technology to examine how changes to pelvic floor muscle function resulting from long-term high impact exercise may cause difficulties giving birth.

Jeremy Corfield (Biological Sciences) won the award for his thesis on the evolution of kiwi brain and sensory systems, supervised by Dr Stuart Parsons. His research examined how the brain and sensory structures of the kiwi have evolved to accompany the unique behavioural strategies it adopts in its nocturnal, ground-dwelling ecological niche.

Richard Espley (Biological Sciences) a scientist at Plant & Food Research who completed his PhD at the university supervised by Associate Professor Jo Putterill, received the award for this thesis revealing the genetic basis of red pigmentation in apple flesh. The work was done with a view to developing new varieties of fruit with enhanced aesthetic and health properties.

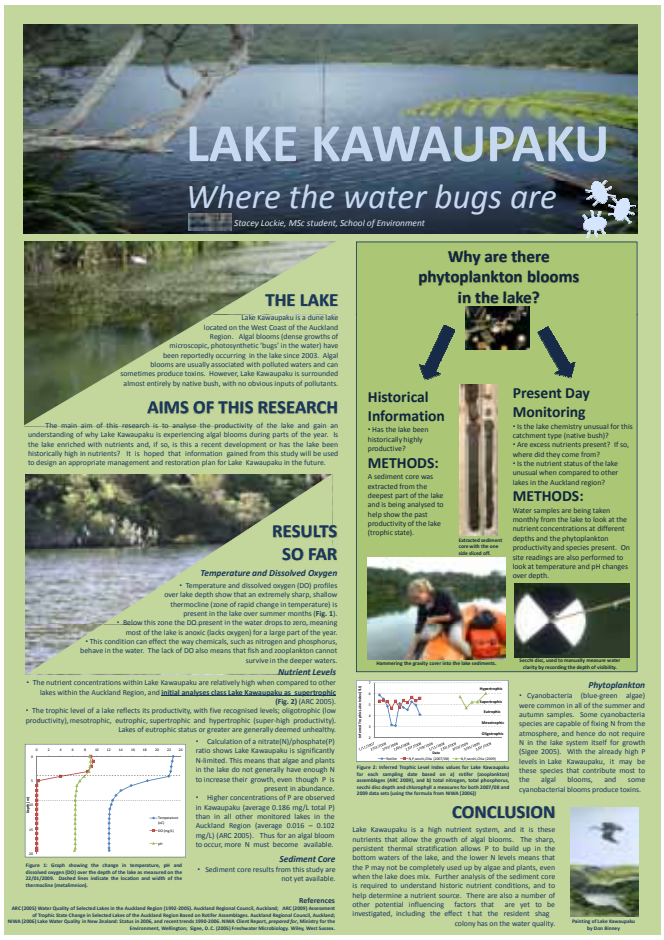
(From left to right) doctoral candidate in computer science Tobi Vaudrey (Runner up: Future science and technologies category), doctoral graduate in biological sciences Richard Espley (Winner: Adding value to nature category; also Winner: Commercialisation Award) along with doctorate of medicine candidate Nathan Kerr (Runner up: Advancing human health and wellbeing category) and medical student Dasha Nelidova (Finalist: Advancing human health and wellbeing category

Richard's doctoral research was also recognised at the 2009 MacDiarmid Young Scientist of the Year Awards, where he receiving the Adding Value to Nature category as well as the Commercialisation Award for the research most likely to result in new commercial opportunities.

Tobi Vaudrey (Computer Science) was similarly honoured at the MacDiarmid Awards as runner-up in the Future Science and Technologies category. His research, supervised by Professor Reinhard Klette, involves developing computer vision systems that allow cars to help their drivers avoid accidents.

Brendan Harvey (Chemistry) received a 2009 Top Achiever Doctoral Scholarships from the Tertiary Education Commission. His work developing catalysts for green chemistry, a rapidly growing area of research that aims to invent new industrial processes to prevent pollution, is supervised by Associate Professor James Wright.

The MacDiarmid Young Scientist of the Year Awards and the Tertiary Education Commission Top Achiever Doctoral Scholarships were awarded for the last time in 2009. At a national level young scientists will now be recognised through the newly established Prime Minister's Science Prizes.



Stacey Lockie (Environment) won third place in the University-wide Exposure postgraduate research exposition in October 2009.

Postgraduate poster competitions

Students from across the faculty took the opportunity to showcase their research late last year in the annual science postgraduate poster competition and the university-wide Exposure competition.

Doctoral students took out the top places in the faculty competition last September with first prize going to **Suzanne Ackerley** (Sport and Exercise Science) for a poster on her research in the movement neuroscience laboratory investigating how non-invasive stimulation can prime the brain to improve motor recovery after stroke. **Mandy Herbst** (Chemistry) from the wine science programme won second place for her poster on factors influencing the stability of characteristic passion fruit aromas in New Zealand Sauvignon blanc. **Sairam Iyer** (Physics) was awarded third place for his poster on improving optical coherence tomography – an imaging technique that uses light to 'see through' objects.

Students who received high distinction awards for their posters included doctoral candidates **Megan Marcotte** (Biological Sciences) whose research on pigeons and sharks suggested a common navigational method in vertebrates; **Andrew Pegman** (Environment) who studied seed dispersal by New Zealand pigeons in puriri and miro trees; **Raoul Peltier** (Chemistry) who studied growth habit modification of ice crystals; **Zoe Wilson** (Chemistry) working toward laboratory synthesis of the natural chemical berkelic acid; and Masters student **Carl van Roon** (Sport and Exercise Science) whose research measured the effectiveness of self-talk for athletic performance.

Masters student **Stacey Lockie** (Environment) received a merit award in the faculty competition and went on to win third place for a poster in the university-wide Exposure postgraduate research exposition last October. Her work examined the productivity of Lake Kawaupaku in order to understand why it experiences algal blooms at certain times of the year.

Computer science competition winners

Postgraduate students from the Department of Computer Science have excelled in national and international competitions.

Itamar Amith, together with 'Citrus Celebration' team members **Glen Robertson** and **Ronald Chan** from the Faculty of Engineering, placed second in IEEEXtreme 3.0, one of the world's most intense programming competitions. The challenge saw 700 teams from 40 countries programming for 24 hours straight. Teams were given 12 coding problems to solve in the fastest time possible, submitting answers as they went to an electronic judge. Any wrong solutions incurred a time penalty. Citrus Celebration was one of only three teams in the world to successfully solve all twelve problems within the 24 hours. Fifteen teams from The University of Auckland entered the competition this year. The overall winning team was from the University of Moratuwa in Sri Lanka.

Feixiang Ren, Jinsheng Huang and **Ali Al-Sarraf**, competing as Team Enpeda, were one of four teams in the New Zealand finals of the world's largest technology competition, the Microsoft Imagine Cup. The competition challenges students with engineering, software or technical backgrounds to develop solutions to the world's toughest problems, and teams must demonstrate they can turn their ideas into reality. Team Enpeda devised a low-cost, working prototype of a computer controlled driver assistance system that can be installed in a mobile phone and uses cameras to collect information from the environment ahead. The project is supported by the wider Environment Perception and Driver Assistance (.enpeda..) project overseen by **Professor Reinhard Klette**. The New Zealand finals were won by Team One Beep, a group of engineering students from the university who developed a system for transferring data over radio waves.

Science students take out interfaculty twenty20 cricket tournament

Students representing the Faculty of Science won the university's inaugural interfaculty twenty20 cricket tournament, beating the Faculty of Law by 11 runs. The final was held at Colin Maiden Park at Tāmaki Campus in March this year. The science team completed 20 overs with a score of 182/5 and bowled out their competition for 171 runs.

Both teams had been unbeaten after three days of heats leading up to the finals. Science won matches against the Faculties of Engineering, Arts and Medical and Health Sciences to earn their place in the final. Vice-Chancellor Stuart McCutcheon presented the winners with the trophy after the final match.

The interfaculty competition is part of a wider university initiative to develop a vibrant and supportive campus environment, and help students get the most out of their university experience. The first interfaculty sports event was a rugby tournament in 2009 and this year a programme expanded to include cricket, basketball, soccer, and netball.

www.auckland.ac.nz/sport

Like a fish needs a bicycle

New Zealand fish are being put through their paces in a custom-made swim tank at Leigh Marine Laboratory to help scientists understand how they respond to exercise and how this might benefit aquaculture.

Aquaculture has the potential to become much larger industry in New Zealand and there are many excellent candidate species such as kingfish and hapuku, and even the herbivorous butter fish, says Dr Neill Herbert who leads the exercise research.

At present the industry is heavily weighted toward shell fish such as green-lipped mussels and oysters, and the fin fish market is dominated by a single species – the Chinook salmon. Understanding how to optimise conditions for currently farmed species, and helping farmers to bring new species on line, will play a key role in developing the industry.

Learning more about the relationship between exercise and growth may be particularly important. "Encouraging exercise isn't really a strategy that is used by fish farmers at present but there is growing awareness of the benefits and we need to look at how it can be introduced," says Neill.

"Internationally the research has shown that exercise can increase productivity and flesh quality as well as improving animal welfare, which are all very important considerations for farmers. I'm certainly an advocate of exercise for aquaculture."

"When fish are encouraged to swim they can grow larger and to a more uniform size, producing more muscle with higher muscle fibre density and reduced flesh lipid levels. They can also convert food into energy much more efficiently, which translates into cost savings for farmers."

The gains, which are primarily seen in species that are naturally faster growing and more active, can be substantial. Neill explains that research which began to appear in the 1980s and 1990s showed that if fish were held at a steady swimming speed their growth could be boosted 30 to 40 percent while their food requirements dropped around 20 percent.

"It has also become clear that the animals have reduced stress levels and recover from stress faster – possibly because swimming reduces aggressive territorial behaviour – and are therefore likely to be less susceptible to disease," he says. "In fact, as long as you are exercising fish at a reasonable level there are many benefits and very few negative effects."

While working for his thesis in experimental biology investigating how stress affects visual performance, Neill took an interest in the aquaculture research and also learned about the optomotor response which prompts fish to start swimming when they see movement. He realised that the response might be used to encourage fish to swim in a farm environment, helping aquaculturalists to realise the benefits of exercise.

During post-doctoral appointments in Denmark and Scotland, Neill worked with colleague Felicity Huntingford to develop a novel device which encourages fish to swim, using columns of light that appear to move in the water. The intellectual property has now been patented and commercialised through spinout company OptoSwim Technologies Limited.

The researchers' entrepreneurship received recognition in the United Kingdom with commercialisation partner Sunil Kadri winning the O2 X Male Entrepreneur of the Year 2009 award (see page 15) and they hope that the supporting research, based on trials with Atlantic salmon, will be published in an academic journal this year.

Neill, who retains an interest in OptoSwim, returned to academic research at the Leigh Marine Laboratory in 2008 and says that we now need to learn more about the basic physiology of candidate species for aquaculture.

"One of the great things about pure research is being able to take the kind of growth response that we've seen with OptoSwim and go back to try and learn more about it. I'm now looking at the basic physiological processes involved, to understand the constraints which determine whether or not fish grow, with a view to advising farmers and developing new technologies."

"My main interest is in the physiology of swimming – what happens to fish as they swim and how they can grow while swimming. There are a lot of really interesting bioenergetic questions about how fish use the energy they derive from food to fuel exercise and how the energetic costs of exercise can be balanced against the benefits of exercise-induced growth."

Since fish use physiological strategies very different from those of mammals, researchers cannot rely on much of the existing knowledge about the relationships between growth and exercise. In humans for example, muscle growth following exercise is a periodic response whereas in fish the benefits are seen when they swim non-stop for extended periods, and each species responds differently.

"Until now we've really only investigated the energy costs of basal metabolism and of swimming. We are starting to look more at the costs of growth, and we need to understand the optimal conditions for growth such as how temperature and food affect metabolism. My focus is on trying to partition the energy budget in more detail and reconcile all of the different components."

One of the main pieces of equipment used in Neill's research is a closed swimming channel called a swim flume respirometer – custom-built by workshop staff at the Leigh Marine Laboratory – which directs water over an individual fish at a set rate, causing it to swim at a constant speed and allowing the researchers to measure its metabolism by tracking water oxygen depletion.

Neill's masters student Elliott Brown recently completed his thesis research investigating the mechanisms of exercise-induced growth in New Zealand yellow-tail kingfish, using the respirometer to examine energy use. Neill says that the kingfish is an excellent candidate species that has been farmed here commercially in the past and continues to have potential. Elliot's work, and that of other researchers, provides evidence of growth benefits with current-induced exercise and the next stage will be to look at exercise trials to determine optimal swimming speeds for the species.

Neill is also interested in the relationships between long-term swimming and the energy costs of food processing. Just as humans find it difficult to exercise after a meal because of the amount of energy required to digest their food, the metabolic costs of food processing may determine how a fish responds to exercise stimuli. To find out more about this relationship, experiments are planned to monitor the metabolism of fish that will be fed while swimming at optimal speed.

Other research in Neill's laboratory is looking at the effects of environmental stress on fish physiology and behaviour, such as how animals respond to reduced oxygen levels. He says that ultimately all of the work will feed back into the aquaculture industry, by building understanding of the metabolism and basic physiology of candidate species and how they respond to changes in their environment.

Dr Neill Herbert *earned his PhD in experimental biology from The University of Auckland in 2002, having previously graduated with a BSc from the University of Wales and MSc from Plymouth University.*

He joined the Leigh Marine Laboratory as a lecturer in 2008 and his research is supported by a Faculty of Science research development grant which allowed the construction of the swim flume respirometer.

A clear vision of the future

Scientific advances in the treatment of myopia, the biology of eye disease and the neuroscience of vision are being made by researchers in the Department of Optometry and Vision Science.

Developing the department's research capabilities, particularly over the last eight years, has been a deliberate strategy that is already paying dividends. Head of Department Professor Paul Donaldson explains that optometry students are learning more about the research underpinning their clinical decision-making and bringing the latest developments to their patients, including in the department's teaching clinic. New research careers are being created as are opportunities for lifelong learning through research, and research from the department is being commercialised.

Paul leads the molecular vision laboratory studying the cellular and molecular bases of ocular diseases like cataract. A scientist in his team who has been particularly successful of late is Dr Julie Lim, whose research on antioxidant strategies for the treatment or prevention of cataract has won her prizes for health research and women in science (see page 5). As well as learning about potential medical uses for antioxidants she is investigating whether the lens naturally supplies antioxidants to other tissues in the eye and the implications of removing the lens during cataract surgery.

Dr Monica Acosta, who leads a second biomedical research laboratory examining the biology of the retina, studies how to protect against glaucoma and age-related macular degeneration. She is investigating the causes of blindness and the properties of the tissues involved, with the aim of finding new ways to intervene.

She works closely with Professor Colin Green in the Department of Ophthalmology, who has developed an experimental treatment for wound healing that prevents chemical signals spreading between cells and promotes repair. Monica is investigating how the treatment may be used to combat age-related macular degeneration – a disease that results in retinal cell death and is the biggest cause of vision loss in older people. This collaboration between the Departments of Optometry and Vision Science and Ophthalmology is a result of the recent formation of the New Zealand National Eye Centre, a cross-faculty research centre at the university.

Scientists in the visual neuroscience laboratory led by Dr Ben Thompson study the relationship between the brain and visual defects, such as in amblyopia. Commonly known as lazy eye, the condition is caused by abnormal processing of visual information in the brain.

While current treatments are highly effective in children they do not work for adults and the loss of brain plasticity (the ability to make new neural connections) with age is thought to be responsible.

Ben and his team are investigating how to stimulate the adult brain to be more responsive to rehabilitation, and one notable method is the use of antidepressants. The drugs are believed to promote neural plasticity and if they are found to assist in lazy eye, the results may have implications for many other situations requiring new neural pathways, such as rehabilitation following stroke or even recovery from depression itself.

An exciting development for the department has been the commercialisation of a new contact lens to control myopia (short-sightedness) in children. With 20 to 30 percent of the global population affected by myopia the product's potential is enormous.

Developed by Dr John Phillips who leads the myopia laboratory, it is the first contact lens that not only corrects vision but actually slows abnormal growth of the eye. Children who use the lenses will still require vision correction once they finish treatment, but their prescription will be much milder than if their myopia progressed unabated.

Results from an early clinical trial by one of John's doctoral students, optometrist Nicola Anstice, caught the attention of contact lens manufacturer CooperVision in 2007. A licensing agreement was reached and the product was released in Hong Kong earlier this year, marketed as a daily disposable lens under the brand-name MySight. Nicola has just been appointed to a lectureship in the department and will continue her interest in children's vision.

The strengths the department has developed in each of these areas builds on a long tradition of clinical research. Research has been an integral part of the optometry programme since it was first offered at the university in 1964, with some of the earliest studies providing data on the visual characteristics of New Zealand children and challenging conventional wisdom about the cause of age-related changes in astigmatism. Over the years, researchers involved with the programme have studied such diverse topics as the effects of hypoxia on colour vision, prevalence of myopia in Sherpa children, and visibility of forestry workers' helmets.

The introduction of prescribing rights for optometrists in 1996 meant that students required broader and more complex training, with an even stronger foundation in science. The basic optometry qualification was extended by one year and a compulsory research component added. Paul explains that this created new opportunities for students interested in a research career as well as giving future optometrists a stronger evidence base for their practice.

The appointment of the first research professor in optometry was another key development. The new role reflected university-wide promotion of research-led teaching and was supported by a bequest from the estate of optometrist Robert G. Leitl. Optometrist and biomedical scientist Professor Michael Kalloniatis took up the chair in 2002 and drove changes in the department's research profile.

"In the past all of our teachers were optometrists," explains Paul. "They did some excellent research but the intensity of the curriculum and modest nature of professional funding meant they didn't have the time or resources to support their work. We now have a diversified staff of clinicians, clinician-scientists, and dedicated scientists and are delivering a research-led curriculum to produce graduates who not only dispense glasses but are primary eye care practitioners. Our researchers contribute their expertise, reputation and access to research funding, allowing the department to expand its research activities and in turn support and drive the clinical training programme."

The department is now firmly research-focused and the optometry programme is still evolving and growing. In the future Paul anticipates that optometrists may consider sub-specialisation, requiring advanced training. One way to meet this need would be through a postgraduate residency programme underpinned by research, such as in a proposed myopia control clinic using the latest research to slow myopia progression in local children.

A more immediate goal is developing a program of ongoing community vision screening and research by securing sponsorship for a mobile clinic with dedicated personnel. Paul explains that the department would like to do more screening in schools to identify and treat children with vision problems and feed their findings back into clinical research programmes. From past experience, the ability to visit schools fully equipped and ready to go, and make no call on school resources, is essential for this to this succeed.

Professor Paul Donaldson *is Head of Department of Optometry and Vision Science and Director of the Molecular Vision Laboratory. He studied at the University of Otago and after postdoctoral roles at Yale and the University of Texas came to Auckland to study lens biology in the then Department of Cellular and Molecular Biology. He joined the Department of Physiology in 1997 and established the Molecular Vision Laboratory there, and was subsequently promoted through the ranks.*

We gratefully acknowledge the assistance of Associate Professor Robert Jacobs who provided information about the history of the department.

The mathematics of mind-bending spaces

Imagine being in a room that twists and distorts around you, stretching in some parts, shrinking in others, and folding upon itself until it looks like it belongs in a sketch by M. C. Escher – but being told that the geometric relationships between objects have somehow remained unchanged.

This is the mind-bending world in which mathematician Professor Rod Gover works and, surprisingly, the mathematical equations that describe this kind of space can be used to explain the behaviour of many natural phenomena, from cell membranes to photons of light and aspects of gravity.

The kinds of geometry Rod studies are – quite obviously – very different from the simple equations that most of us remember from school. They no longer deal with easily recognisable shapes made up of fixed angles and lines. In fact, the subfield of conformal geometry, which is used to study spaces like our imaginary room, focuses purely on the angles between objects so that the lengths between them become irrelevant.

Rod explains that if our room contained a desk on which we had drawn a series of lines that cross each other at certain points, the conformal transformation that we have imagined could stretch and warp the surface of the desk so that the lines change in length and become curved, but at the points where the lines intersect the angles between them would remain the same.

"After going through this kind of transformation the room would no longer resemble a room at all – it would look like a complete disaster. But the interesting thing is that the equations which describe many phenomena in the real world, for instance the equations for massless particles, look pretty much the same before or after going through this kind of transformation," Rod explains.

This means that understanding more about such equations is not only a fascinating mathematical problem but is also of direct relevance to other fields of science such as physics.

Rod gives the example of light passing through the galaxy. He explains that as far as photons of light are concerned the distances between objects are essentially unimportant and if the galaxy were to go through the same kind of conformal transformation as our imaginary room, the equations describing light would be unchanged. Another way of saying this is that the geometric equations describing how light behaves as it travels through empty space-time can be understood without the notion of length or distance.

In fact, says Rod, there is an idea that at a very early stage – not long after the big bang – the whole universe was conformally invariant, meaning that in a sense length did not exist. In this theory the break in conformal invariance is believed to have something to do with the introduction of length and mass, although physicists do not yet understand how.

Another example is biological cell membranes, which prefer to maintain a shape that is close to a perfect sphere. It has recently been discovered that cell membranes arrange themselves so as to minimise their so-called Willmore energy. While a perfectly spherical cell membrane has a Willmore energy value of zero, if it is forced to distort from that shape – for example due to pressure from neighbouring cells – its energy increases.

Perhaps unexpectedly, mathematicians have found that the equation controlling Willmore energy is conformally invariant, meaning that while cells try to minimise their Willmore energy and make themselves as much like spheres as possible, they could theoretically be pulled and twisted in the same way as our imaginary room without suffering any change in energy. Learning about this apparent paradox can help biologists understand more about how cells organise themselves into tissues.

Rod explains that one starting point for mathematicians in studying conformal geometry is to begin with a 'sane' world that we can recognise, with lengths and angles that make sense, and put it through a conformal transformation to see what effect it has. The aim is to look at which aspects of the geometry remain unchanged by the transformation. Taking a less "naïve" approach however, a key objective in conformal geometry is to develop theory that finds or predicts those aspects that will not change, without needing to do the transformation.

Rod has studied not only conformal geometry and the related fields of projective differential geometry and CR geometry, but also the larger class of parabolic geometries within which these three subfields sit. Parabolic geometries are in turn a subclass of differential geometry, the initial ingredients of which he describes as a kind of mixture of geometry and calculus.

It was a relatively recent realisation for mathematicians that, to an extent, the parabolic geometries could be studied simultaneously in an effective way. Rod's own research has contributed to this process and a book on the subject, published by his international collaborators a short time ago, draws heavily on his work.

Part of the reason for the grouping together of the parabolic structures was that it became clear that all of the subfields could be treated in a uniform way. In other words, it was possible to do things that applied to the whole class in the same way, or to see that something done in one subfield gave the same results across all subfields.

Rod says that parabolic geometries are also used to simplify and introduce geometry into the study of natural partial differential equations (also known as natural equations), which play a key role in almost every endeavour to describe the fundamental structure and behaviour of our world, from engineering and mechanical systems to biology.

His work involves developing new methods to treat natural equations. While it can be considered "pure" science, in the sense of working in generalities rather than with specific examples like cell membranes, it is a powerful approach because it produces results that can be applied simultaneously to many or all such equations.

Most often the results are used by scientists involved in pure research, especially physics; however, they are also used in more applied situations. Rod gives a recent example of applied mathematicians using theoretical research from his own field to study linear elasticity, which is important in practical applications such as the construction of oil rigs.

Rod says that while few mathematicians in New Zealand are working in similar areas, conformal geometry overall is a very large field and there is rapidly growing international interest in the new approach via parabolic geometries.

Conformal geometry is also entering many other fields, with vast numbers of people using conformal geometry to some degree in their work. Rod enjoys this overlap and the exposure that it gives him to different fields, citing the example of a physicist he is collaborating with who studies the fundamental physics of the universe, looking at questions such as string theory and quantum gravity.

Professor Rod Gover *began his academic career studying undergraduate physics and mathematics at Canterbury University and earning a masters degree in general relativity. He chose to build up his mathematical background for his PhD, studying in Roger Penrose's group at Oxford University (supervised by M.G. Eastwood) where he says conformal geometry reigned supreme. He worked in Australia before coming to The University of Auckland in 1999.*

The reference to the work of artist M.C. Escher in the opening paragraph of this article is no coincidence. Escher was considered a genius in mathematical art who was inspired by the work of Roger Penrose and his father Lionel Penrose.

Supporting students

Women in Science

Encouraging young women to study science is a major part of Dr Belinda Bray's role.

Women in Science Officer **Dr Belinda Bray** leads a range of initiatives to help women enrol in and complete science qualifications, with a focus on physics and the computational sciences (mathematics and computer science), in which women are underrepresented.

Encouraging young women to study science is a major part of Belinda's role and she frequently visits secondary schools to talk about what it is like to be a physics or computational science student. She also hosts the annual Futures Evening and Girls into Science events at the university, featuring speakers who have studied science and gone on to a wide variety of careers.

She has recently began a research project that aims to increase the number of female students who choose physics and calculus at secondary school. She is working with teachers to learn why girls may be discouraged from these subjects and to help them trial initiatives to counter this pattern at their schools.

Belinda also supports women enrolled in science degrees, providing one-on-one advice and assistance, and information about events and careers. A major new initiative is a pilot e-mentor programme, in which students in physics and computational science will be matched with women alumni who can encourage them to have confidence in their studies, by showing them what they can achieve.

A common theme across the initiatives is helping women to appreciate the wide range of careers a science qualification can offer. Belinda says she is always looking for women who have studied physics or computational science to any level, who can provide their stories or suggestions, speak at events, or take part in initiatives like the e-mentor programme, and that their level of involvement is entirely flexible. She would also like to hear from teachers interested in her work. Belinda can be contacted on (09) 373 3599 extension 83034 or b.bray@auckland.ac.nz.

Science communication

Dr Belinda Bray is also a lecturer in science communication in the School of Environment and her interest in equity has influenced her approach. The suite of papers that she teaches has developed from a general education course at stage 1 first offered in 1993 through to a stage 3 course taught for the first time this year, and Belinda hopes to establish a post-graduate level paper in the near future.

Equity has become a particular focus for the stage 3 course, in which students explore different perspectives of science and what this means for communication and management in their future careers. Belinda gives the example of a graduate who goes on to work in local government and needs to understand Māori perspectives and consult with iwi in developing a water management plan. To assist with this part of the paper she would like to hear from anyone who can offer their own experiences of working across cultural boundaries.

The course helps students develop key skills that have been identified by employers as universally important, including communication, time management and project management. An exciting component is the opportunity for students to work with organisations such as Auckland Museum, MOTAT and Supporters of Tiritiri Matangi, on real science communication projects ranging from signage to web content, to gain practical experience before graduating.

The courses at first and second year, which have been running for several years, are more general but equally practical. The stage 1 paper, which is now available to any university student, focuses on how to communicate expert knowledge to a variety of audiences and in different formats. The stage 2 paper places greater emphasis on science students exploring the business world, focusing on innovation and entrepreneurship. Real world case studies are a valuable part of the course and Belinda always appreciates hearing from business people who can contribute their experiences or ideas.

Michael Steedman (Ngāti Whātua) provides guidance to Māori and Pacific students studying science.

Māori and Pacific students

Sport and Exercise Science alumnus **Michael Steedman** (Ngāti Whātua) describes the role of Kaiārahi – a new position which he took up in April this year – as someone who provides guidance or looks for a way forward. His goal is to support Māori and Pacific students to enrol in and complete science qualifications. He will provide coordination and leadership across the faculty, working alongside existing programmes and developing new initiatives.

As a student Michael took part in the School of Biological Sciences' Tuākana programme, a mentoring initiative that has now spread university-wide and which draws on a Māori and Pacific philosophy of supportive relationships between older and younger people. Coming from a small rural town, he credits the programme with making a major difference in his university experience by helping him to develop networks and access academic support.

Michael began his career by establishing a sports and exercise programme for an Auckland training provider and gained experience in management and mentorship, before becoming a Māori language teacher at Sacred Heart College. He then moved to the Ministry of Education working in a support role for students who had become disengaged from school.

"I've worked with Māori and Pacific students for many years, and I'm passionate about seeing people achieve what they're capable of and helping them along the way. As someone who believes fundamentally in the philosophy of Tuākana/teina and as Ngāti Whātua linked with Auckland, I feel that I have a double responsibility." he says. Michael has two children with his wife who is of Cook Island Māori descent.

Some of the first tasks Michael has set himself include evaluating current support programmes to ensure as many Māori and Pacific students as possible are involved, and learning what the barriers may be to Māori and Pacific students choosing science degrees. The faculty also looks forward to learning more about the perspectives Māori and Pacific students can contribute.

Alumni news

Getparticipants website wins acclaim

Sports and Exercise Science alumnus **Jamie Mannion**, who graduated in 2008 with a Masters degree in Exercise Rehabilitation, won national acclaim late last year at the launch of his new website www.getparticipants.com. The site, created by Jamie and his mother Jude Mannion, helps health researchers find volunteers to participate in their studies.

The Minister of Research Science and Technology, The Hon Wayne Mapp, spoke at the launch, congratulating Jamie and Jude on their entrepreneurship. He noted that around 4,000 health studies receive ethical approval to recruit participants in New Zealand every year but that up to three quarters of studies fail to recruit on time. By helping to address this problem the website will save researchers time, effort, and money and give willing New Zealanders the opportunity to take part in important health research.

Jamie developed the idea while completing his Masters degree and, like many of his peers, struggling to find people to take part in his research. The idea won first place at the 2008 SPARK Entrepreneurship Challenge at The University of Auckland, which provided funds to help develop the website. The site asks volunteers to register and provide basic information that links them with relevant research programmes and informs them of opportunities to get involved.

O2 X Male Entrepreneur of the Year 2009

Dr Sunil Kadri, who graduated with a Bachelor of Science in Zoology in 1986 and continued his studies in Scotland, received the 2009 O2 X Male Entrepreneur of the Year Award. The award recognised his work at Glasgow University with colleagues Dr Neill Herbert (now of the Leigh Marine Laboratory) and Felicity Huntingford in establishing OptoSwim Technologies Limited, to commercialise a novel light-based system that encourages farmed fish to swim at optimal speeds and promotes growth (see research feature on page 8. The O2 X Awards are a prestigious small business competition in the United Kingdom, and the prize recognises the potential of the OptoSwim device to transform the aquaculture industry. Dr Kadri maintains links with the university through his ongoing work with Dr Herbert, and returned to give a guest lecture at the Leigh Marine Laboratory in February this year.

Boltzmann Prize

Physics alumnus **Dr Andrew Daley** won the 2009 Boltzmann Prize in recognition of his research on quantum computing at the University of Innsbruck in Austria. The prize, which is awarded every two years by the Austrian Physical Society, is for an outstanding piece of research in theoretical physics by a person under 35 years of age, and is considered the highest Austrian award for young physicists. Dr Daley is believed to be the only non-European to win the prize since it was first awarded in 1957. He received the prize for research with colleagues from Innsbruck and Colorado proposing a new method to build a quantum computer. Dr Daley graduated from The University of Auckland in 2002 with a Masters degree in physics and moved to the University of Innsbruck after winning a doctoral scholarship.

Rutherford Scholarship

Physics alumna **Yvette Perrott** has been awarded a Rutherford Scholarship to support her PhD at the University of Cambridge. She completed a Bachelor of Arts and Science at the university in 2008, majoring in Italian, Spanish and Physics, followed by a Bachelor of Science with Honours. While completing her studies she also participated in the international Microlensing Observations in Astrophysics (MOA) project, searching for planets outside our solar system. As part of the MOA since 2007, she has already contributed to the discovery of one planet, and is in the process of finding more. Ms Perrott will undertake her PhD at the prestigious Cavendish Laboratory once led by Lord Ernest Rutherford, the New Zealand scientist renowned for splitting the atom, and after whom the Rutherford Scholarship is named.

Distinguished Alumni Award

Faculty alumnus and renowned geologist Emeritus **Professor Richard (Rick) Sibson** FRS, FRSNZ was one of five recipients of The University of Auckland's Distinguished Alumni Awards for 2010. The awards are for graduates of the university who have made outstanding contributions to their professions, their communities and the nation. Professor Sibson is recognised internationally for his pioneering research linking the structure of crustal fault zones to the mechanics of shallow earthquakes. His work on the factors governing the depth of seismic activity in deforming continental crust and also on the role of faults as intermittent conduits for fluid flow are not only of scientific interest but are widely utilised by the mineral industry.

Professor Sibson completed a BSc with first class honours in geology at the university in 1968. He then moved to the United Kingdom and completed his MSc and PhD at Imperial College, London. He subsequently taught at Imperial College, the University of California, Santa Barbara, and the University of Otago.

Professor Sibson's distinguished career is marked by awards and distinctions including elected fellowships to the Geological Society of America, the Royal Society of New Zealand, the American Geophysical Union, the Royal Society, London, and the American Association for the Advancement of Science. Most recently, he has been awarded the 2010 Wollaston Medal, the highest award of the Geological Society of London.

Bryce Brown completed the PGDipSci – Wine Science in 2008 and is now the Assistant Winemaker at Mission Estate.

Alumni profile

Name: **Bryce Brown**

Position: **Assistant Winemaker, Mission Estate, Hawkes Bay**

Class of: **2008 (PGDipSci - Wine Science)**

As assistant winemaker I manage the cellar operations and winemaking production process. I have previously worked as the assistant winemaker at Coopers Creek Vineyard in Huapai and am now at Mission Estate Winery in the Hawkes Bay.

Learning about wine and winemaking is a continual process, and a hands-on role like mine is the best way to learn. In the future I intend to be the head winemaker in a winery, making the ultimate decisions about production and style.

The postgraduate diploma in wine science at The University of Auckland is a very practical and hands-on course. It teaches the realities of winemaking, which suits people who like getting their hands dirty – it's not all about drinking Chardonnay in the sunshine! It gives an excellent background in the winemaking processes and the chemistry of wine, and an absolute highlight is the intensive wine appreciation module - an opportunity to taste some amazing wines.

I graduated with a BSc from Victoria University in 1993 and was interested in winemaking even then, but initially moved into the financial markets and sales before deciding to retrain. Returning to university as a mature student I found that I had a very different perspective on study. I found it relaxed and really enjoyable, and that the university was well set up for students of all ages.

There was a fantastic core of twelve students in my year – 2008 – and everyone got along well. The students were of all ages and backgrounds, from lab work to Pilates, but everyone had the pre-requisite science slant.

Wine is a global business so there are a lot of career opportunities and you can travel all over the world. Students from my year are involved in every aspect of the industry, from winemaking and viticulture to sales and retail, and quite a few have headed overseas, to America, Germany and Australia. But the industry is also small enough in New Zealand that you can make contacts that really help in your career.

Community links

Careers and internships

Alumni who completed an internship (industry placement) as part of their studies will recall the advantages they offer – from the opportunity to try out potential careers, to developing skills and experience, and making key industry contacts. Internships Coordinator **Christine Basham** says that for graduates entering the workplace it is especially valuable to earn industry references and be able to demonstrate transferrable skills such as team work and problem solving.

Employers also have a lot to gain however. Many companies make use of the internship programme to connect with future employees, to get help with small but significant projects, or to develop relationships with university researchers. Internships are also an important way for the university to connect with employers and ensure that graduates meet their future needs.

Typically they are funded by the host organisation, but support for some projects may be available through TECHNZ or the university's summer studentship programme. Internships offered through the faculty of science are usually research based, and each student has an academic mentor as well as a workplace supervisor.

Christine would like to hear from anyone who wants to know more or would consider offering an internship. She can be contacted on (09) 373 7539 or c.basham@auckland.ac.nz

www.auckland.ac.nz/employers

Talking Science

The faculty hosted its inaugural Talking Science event this month, on the topic "Global warming – why can't scientists agree?" The informal evening was an opportunity for the university's leading environmental scientists to present their perspectives and for alumni and members of the public to participate in a lively discussion. Talking Science will be held twice per year – keep in touch to find out about upcoming topics.

Alumni support

The Leading the Way campaign is the first major university-wide fundraising campaign. It aims to help us build a world-class university in New Zealand by generating the resources needed to attract and retain the best people, and capitalise on the best ideas. Key areas the campaign seeks to support include: the health of our nation, the development of our children, the growth of our economy, the future of our cities, and the expression of who we are.

The campaign was launched in late 2008 with a fundraising target of $100 million. By July this year, a series of major gifts had seen the total surge to more than $71 million.

If you would like to support the university there are many different ways to contribute, from participating in Women in Science events (see page 14) to donating to the Science Student Support fund through the faculty's annual appeal or the Leading the Way campaign towards groundbreaking research and programmes, postgraduate scholarships or infrastructure and development such as the South Pacific Centre for Marine Science.

For more information please contact Anita McKegg on 09 373 7599 ext 81848 or a.mckegg@auckland.ac.nz or visit **www.givingtoauckland.org.nz**

Speech Language Therapy is one of the services offered by The University of Auckland Clinics.

The University of Auckland Clinics

The University of Auckland Clinics – comprising clinics in audiology, optometry, psychology, speech-language therapy, and sport and exercise science – was launched in March this year with a celebration event at Tāmaki Campus. The launch brought together members of academic staff and university supporters with representatives of the local community.

The university has a long history of providing high-quality clinical services as part of its teaching and research programmes. As well as offering important health services to the local community, the clinics allows students to gain real-world experience and connect health researchers with potential study participants.

In the past the clinics have operated independently within academic departments in the Faculties of Science and Medical and Health Sciences. Under the new centralised model they are managed and operate as a single entity with shared services such as reception and booking. The objective is to streamline and improve service delivery and, over time, allow the expansion of clinical services.

www.clinics.auckland.ac.nz

Incredible Science

Incredible Science was a great success again this year with around 3,000 children and family members visiting the university. The free annual one-day festival introduces primary and intermediate-aged children to the fun and excitement of science. Short videos from the event will be featured on the Incredible Science website **www.incrediblescience.co.nz.**

Alongside perennial attractions such as the slime-making table and the chemistry magic show, children had the opportunity learn about issues in their world like volcanoes and tsunamis, and discover how science fiction is becoming science fact with interactive displays of robots, 3D face mapping, smart cars, and a lesson on how to survive an alien encounter. This year the annual children's challenge took the form of a science-based board game competition. The judges were extremely impressed with the quality of the entries and the amount of work that went into them.

Incredible Science will take a different format in 2011, because the change in school holiday dates to accommodate the Rugby World Cup means that there is no opportunity for children to visit the campus while university students are away. Details about the 2011 event will be released later this year, through direct contact with schools and publication on the Incredible Science website.

– See over page for Alumni Events

Alumni events

Upcoming alumni events for your diary include:

- Wellington Alumni and Friends Reception, Parliament, Wellington, Thursday 26 August. Keynote speaker: Prime Minister's Chief Science Adviser, Professor Sir Peter Gluckman
- Golden Graduates Alumni and Friends Luncheon, Hyatt Regency Hotel, Auckland, Wednesday 8 September. Speakers: Emeritus Professor Ray Meyer, former Dean of Engineering; and Professor Charles McGhee, The Maurice Paykel Foundation Professor and Chair of Ophthalmology and Director of the New Zealand National Eye Centre
- New York Alumni and Friends Reception, Millennium UN Plaza Hotel, New York, Monday 13 September. Keynote speaker: Administrator of the United Nations Development Programme and former Prime Minister, the Right Honourable Helen Clark

Please visit the alumni website for more information or to register for these events, or to find out about events in Whangarei, Boston and at the university later in the year.

www.alumni.auckland.ac.nz

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