

Auckland October 2010 NOW

Chemical wizardry

Mimicking nature to make medicines

Heart matters

Our MRI capability

OneBeep

A winning invention



THE UNIVERSITY
OF AUCKLAND

NEW ZEALAND

Te Whare Wānanga o Tāmaki Makaurau



Pacific engagement

The University of Auckland's iconic Fale Pasifika is a traditional meeting house on a grand scale – and it brings together students and staff as part of the Centre for Pacific Studies.

"In the same way that the central Samoan village fale invokes a sense of belonging, ownership and community, our centre aims to be a focal point for Pacific initiatives, activities and research underway at the University," explains its director, Walter Fraser (pictured above).

Based in the world's largest Polynesian city and with 3,000 Pacific student enrolments, Auckland is New Zealand's leading Pacific university playing a key role in Pacific issues, and in engaging with Pacific communities.

Auckland is the only university in the world teaching Tongan and Cook Island Māori at degree level and one of only three teaching Samoan, which makes it a key player in the Government's Pacific Island Language Strategy. As part of this, the Centre is developing new multi-media technologies to teach Pacific island languages and is establishing a programme of Visiting Distinguished Pacific Leaders and Scholars as well as a Heritage Artist-in-Residence scheme. Staff are also compiling an encyclopaedic dictionary of the Tongan language that draws on old sources and remote villages to find forgotten words.

The Centre has been charged with acting as a focal point for the wide range of Pacific-related research being undertaken across the University. For example, the South Pacific Centre for Marine Science at Leigh tracks large fish such as marlin, blue fin tuna, stingrays and great white sharks, which are all important to the Pacific fishery. The researchers have developed a small computer chip that is inserted in the fish or attached by tag to pass data via satellite back to the scientists. "As top predators, all of these species provide us with key insights into the health of the Pacific ocean," says Professor John Montgomery, Director of the Leigh Marine Centre.

Back on dry land, the Pacific Health Section of the School of Population Health has launched the Kids in Action obesity programme, aimed at overweight children in South Auckland. "This is part of a range of projects researching health issues for Pacific people in both New Zealand and the Pacific islands," says director Dr Teuila Percival. Another project focuses on the health of Pacific Island mothers and their young children.

Researchers in the Faculty of Education are working to understand and break down barriers to tertiary education for Pacific Island students. They are finding it isn't just a matter of encouraging high school students. Issues like poor health and nutrition at an early age are also factors that need to be tackled. "Solutions will be found through multi-faceted, integrated approaches," says Dr Airini, Head of Critical Studies. Tuākana mentoring for Pacific students (see our story "Lifetime opportunity") is one initiative that has already made a huge difference.

As the Prime Minister of Papua New Guinea, Sir Michael Somare, noted on a recent visit to the University: "The Pacific region is going through rapid changes that are bringing about new and more complex challenges for our countries". Through the Centre for Pacific Studies, and across the University, we are making a major contribution to addressing those challenges.

www.arts.auckland.ac.nz/uoa/home/about/departments-and-schools/centre-for-pacific-studies

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Nature's medicines

Professor Margaret Brimble is a modern-day alchemist, turning natural products such as shellfish toxins and compounds isolated from rare fungi into new drugs to fight cancer, Alzheimer's and heart disease.

The natural products her research is based on are produced by microorganisms that inhabit extreme environments, including an abandoned copper mine in Montana where the pit has filled up with a soup of acidic, metal-laden water. "This is an incredible source of fungi that produce anti-cancer compounds," she says. "From these we are making compounds based on a unique natural product called berkelic acid, which works on enzymes involved in the spread of cancer."

Margaret and her team at The University of Auckland's Medicinal Chemistry Laboratory study and construct the cancer-fighting molecules synthetically. "Nature throws up complicated chemical structures that have evolved over thousands of years for a specific purpose. If we can fine-tune their molecular structure we can create potential drugs even better than nature can provide."

The laboratory is also studying the potential of natural products produced by marine algae during coastal algal blooms. "The algae produce natural toxins as a defence mechanism against predators but these toxins also activate specific receptors in the human brain," explains Margaret. "This has implications for people suffering from schizophrenia and Alzheimer's so we're synthesising the toxins in the laboratory. We then model the active features of the molecule and try different versions, in different positions, until we come up with the ideal drug."

About 60% of all new drugs approved by the US Food and Drug Administration are inspired by or made from natural products. Margaret compares creating a synthetic compound from nature to composing a piece of music or creating a beautiful artwork. "It

demands academic and manipulative rigour, creativity, dedication, persistence and hard work."

A trailblazer for women in science, Margaret was the first New Zealander to become a L'Oreal-UNESCO Women in Science laureate in 2007, and remains the only one. She has now been recognised internationally as one of the top in her field by winning the UK Royal Society of Chemistry's 2010 Natural Product Chemistry Award.

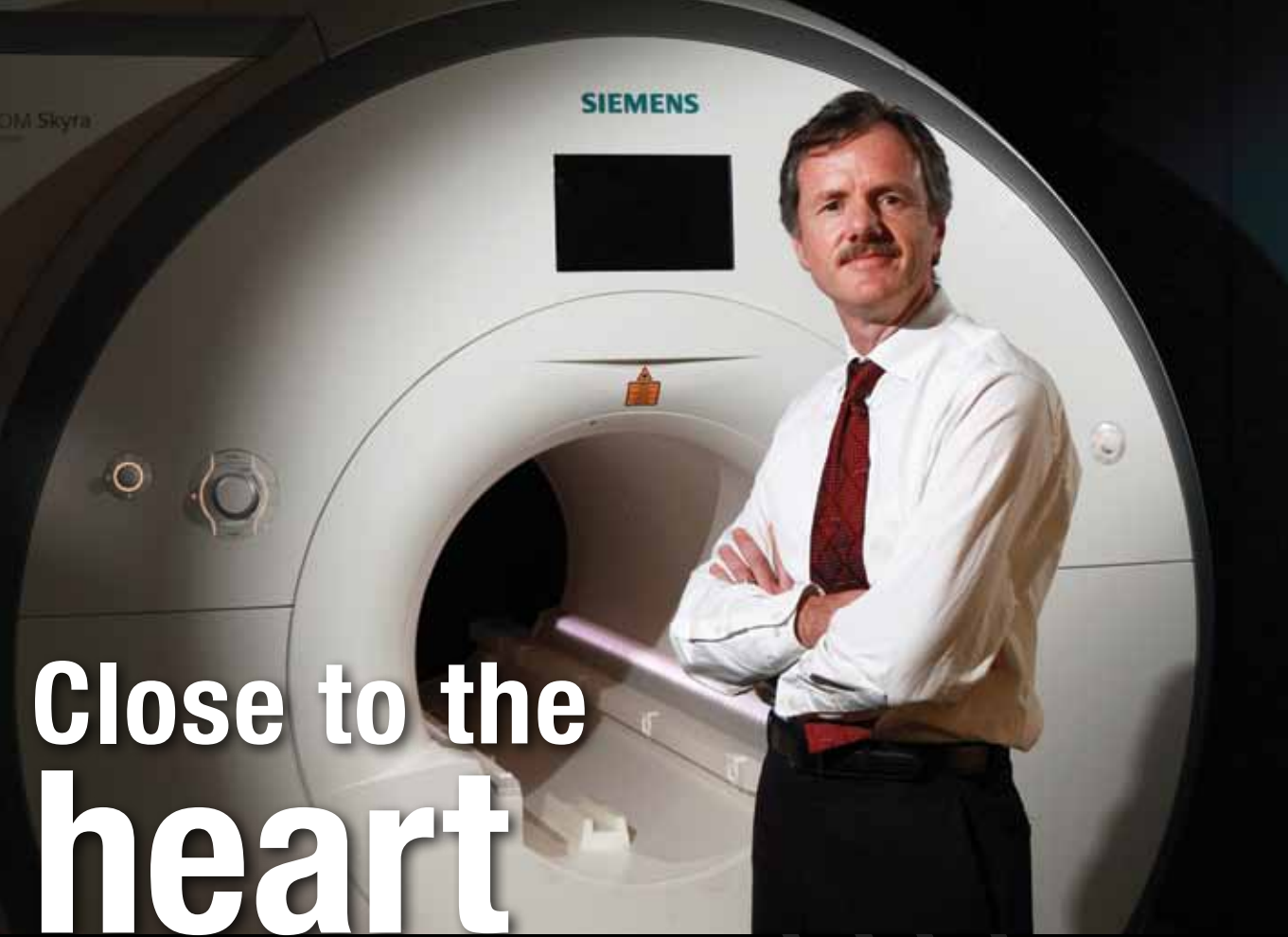
More than 20 top PhD students work in Margaret's laboratory, collaborating with researchers in Hong Kong and China to come up with new drugs for neurodegenerative diseases.

Through a contractual agreement with Auckland Uniservices Limited, the lab has already delivered a commercial drug candidate called NNZ2566 for the New Zealand biotechnology company Neuren Pharmaceuticals. NNZ2566 protects brain cells from dying after traumatic head injury. With \$18 million in funding from the US Army, the drug is now in phase 2b human clinical trials and is being tested in trauma centres around the world.

"If it goes to the market it will be the first drug for traumatic brain injury," says Margaret. "It will put The University of Auckland and New Zealand on the international map as a world class hub for drug discovery and development."

www.che.auckland.ac.nz/staffsites/BrimbleM/margaretribmble

Photo: Third-year PhD student Tsz Ying Yuen, Margaret Brimble, second-year PhD student Orla Finch.



Close to the heart

Every day in New Zealand a baby is born with serious congenital heart disease. Before cardiologists decide on a course of treatment most of these babies will be scanned at The University of Auckland's Centre for Advanced MRI (Magnetic Resonance Imaging).

Here, using the world's most advanced research scanner and leading-edge software developed by University researchers, cardiac radiologists will get a very clear picture of each baby's heart. They'll see arteries and veins in the chest which may have abnormal connections or narrow regions in them, and they'll be able to measure heart performance and function, determining blood flow and how well the heart chambers are pumping blood.

Building on New Zealand's reputation for pioneering heart research, the University's MRI centre is a world leader in cardiac imaging research and has been singled out by Siemens Medical Systems, the largest global MRI providers, as a place to develop new cardiac imaging equipment. As a result New Zealanders are benefitting. Each year more than 250 Auckland adult heart patients, as well as children from all over the country and the South Pacific, are scanned at the Centre.

"Although we can scan all areas of the body we specialise in congenital heart disease in adults and children, adult-acquired coronary artery and heart diseases, and complex brain tumours," says the Centre's Director, Dr Brett Cowan (pictured above).

Both Brett and colleague Alistair Young are Associate Professors in the University's Department of Anatomy with Radiology. Working with cardiac radiologist Dr Chris Occlshaw, they have combined their expertise (Brett has engineering and medical degrees and Alistair has a PhD in Engineering and has done a postdoctoral fellowship in MRI) to pioneer the development of software for analysing cardiac MRI images. One product, now being distributed around the world is called CIM (Cardiac Image Modeller). It allows the rapid visualisation and functional analysis, in 3D space and through time, of the hundreds of cardiac MRI

images typically collected when a patient is examined.

"Cardiologists like pictures, but they like numbers better," says Brett. "CIM converts the pictures into numbers by measuring heart size and the amount of blood pumped with each heart beat. The heart fills with blood before each beat, and if a picture shows it pumped 50% of this into the body last year and only 25% this year - then that's very important information."

Brett and Alistair also have a research grant from the prestigious US National Institutes of Health to create a cardiac atlas data base. This will enable thousands of patient images and data to be available for use by the international research community. "A lot of research projects use the data only once so this is a way of efficiently recycling it."

Since 1996 when the Centre was established, it has done well over 8,000 scans, 3,000 of those for research.

"The research performed at the Centre benefits patients all over the world," says Brett, "but it benefits children born with heart disease and the wider public of New Zealand first."

www.mri.auckland.ac.nz



Jeremy Hema (pictured) grew up in Orewa and went to Hato Petera Māori Boarding School. He then began tertiary study, completing a one-year Health Sciences foundation course for Māori and Pacific students at The University of Auckland. While studying for his Bachelor of Science he became involved with the University's Tuākana programme - a learning community for Māori and Pacific students. Now Jeremy is the Equity Advisor for Tuākana.

For decades equity programmes have been breaking down the barriers to recruit and retain more talented Māori, Pacific, low-decile students and those with disabilities.

Now a innovative life-cycle approach to achieving equity outcomes is taking this further and aims to have a positive impact on children's lives from before they're born through to tertiary education and employment.

"The evidence is unequivocal," says Pro Vice-Chancellor (Equity), Trudie McNaughton (pictured). "To make a difference to equity groups the University needs to have an impact at each stage of the life-cycle, by enhancing a healthy start to life; raising aspirations and knowledge; increasing success at school and accessibility to university for students and staff."

University research is already helping to reduce inequities in New Zealand and is contributing to the life-cycle approach. For example, the Liggins Institute is a world leader for research into fetal and child health. *Growing Up in New Zealand* is the first longitudinal study to reflect the ethnic diversity of babies born in New Zealand. It aims to refocus strategies into spending that reaps benefits for all our children.

The Faculty of Education's Woolf Fisher Research Centre has raised literacy levels among Māori and Pacific and low decile school children, while the Starpath project concentrates on helping

more Māori and Pacific secondary school students into tertiary education.

LENScience is a unique University programme that links school teachers and students with scientific research communities.

The University has recruitment equity initiatives such as the Undergraduate Targeted Admission Scheme. "Increasing participation of equity group students is not enough though," says Trudie. "Equity work also focuses on academic success and the University's Disability Services and Tuākana programme are examples of effective strategies."

Research shows that success in the first year of tertiary study - particularly in the first semester - is critical for the retention and completion of equity group students. In 2009, 75 per cent of all Māori and Pacific undergraduates took part in programmes conducted by tuākana (senior students) to help teina (new students).

"Tuākana provides students with a sense of belonging on campus," says Jeremy, a fluent Māori speaker. "It also allows them to make cultural connections that they might not have experienced before and it helps them achieve the best grades possible through tutorials, mentoring sessions, workshops, study groups and academic retreats."

The University is also working on student aspirations beyond graduation and into employment with a range of staff equity strategies.

"An integrated life-cycle approach will allow us to be even more effective in achieving our equity goals," says Trudie. "These include people being able to use their talent, achieve their potential and contribute in every facet of society."

www.auckland.ac.nz/uoa/home/about/eo-equity-office



Beep Beep

A laptop, a cheap transistor radio and four enterprising engineering students hold the key to getting educational information to children in the poorest parts of the world.

University of Auckland engineering students Steve Ward (top back) Chanyeol Yoo (top right) Vinny Kumar (front right) and Kayo Lakadia (front left) came third in Microsoft's international competition which involves 300,000 students worldwide and aims to find ways to solve the world's toughest problems using technology.

Their OneBeep software solution can transmit information to laptops in countries that lack broadband connection. The software converts digital files into beeps of information that are broadcast over the radio. At the other end the person receiving the transmission plugs their radio into the laptop and the file is converted back to its digital form.

"We wanted to create something that isn't reliant on infrastructure, something that just works on its own," says Kayo. "This is a step to

helping the billion children living in poverty get access to knowledge. It can help communities learn about Aids and malaria, or send out civil defence warnings."

Much of the work was done in the lab during their holidays but the OneBeep team is now looking for possible partners to help turn the unique software into a viable business.

With more than 2.6 million laptops in digitally disconnected parts of the world such as Peru, Afghanistan and Rwanda, and more being distributed by the OLPC (One Laptop Per Child) and Intel's World Ahead programmes, OneBeep has already attracted interest from several governments.

"This concept is a game-changer in terms of access to information," says Rt Hon Mike Moore, New Zealand Ambassador to the United States. "It can have a profound impact in developing countries."

www.onebeep.org