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POSTGRADUATE EDITION 2009

Balancing the passion

Research that makes a difference

Harnessing the sun

Food for the future

CREATING LEADERS • CLASSROOM POLITICS • SIGHTS SET ON GOLD

MASSEY UNIVERSITY

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Steve Maharey

World-leading research and scholarship

> "New Zealand's future will be built on research, science and technology. We live in the knowledge age where the smartest will thrive."

Excellent research is essential if New Zealand is to build a better future. Without it all the talk of a knowledge-based, innovative, creative, dynamic market economy and society will come to nothing. Our standing in the world will suffer. Teaching and learning in our universities will be anodyne. There will be no knowledge to be transferred to end users.

It is, therefore, imperative to produce an environment in which excellent research can thrive, research that will display the highest standards of international scholarship.

This is exactly what Massey University is about. As New Zealand's defining university we have always aspired to make a contribution through research and teaching that will shape the nation's future.

While agri-food is often used as the best example of Massey's groundbreaking work, there are many others. At Massey's recent Research and Teaching Awards the outstanding work of people like Professor Peter Schwerdtfeger, from the Institute of Advanced Study at the Albany campus, Professor Anne Noble, from the College of Creative Arts in Wellington, and the Volcanic Risk Solutions team based in the Institute of Natural Resources at the Manawatu campus, led by Associate Professor Shane Cronin, shows that there is excellent work taking place in many areas.

During the past century, Massey developed an enviable reputation for research with impact not only in New Zealand but around the globe. Indeed, it is noticeable that when New Zealand universities are talked about around the world it is Massey that is most often referred to.

But as knowledge and the application of knowledge become ever more important, we do not intend to rest on our record. We aim to maintain a culture where first-class research is the norm, where colleagues urge each other to greater heights and where every researcher feels they are part of a rich intellectual community.

Our research strategy focuses on building a world class research environment, investing in our areas of specialisation, growing our postgraduate programme, increasing private and public sector investment in our research and expanding our reputation world-wide.

These goals reflect the University's belief that New Zealand's future will be built on research, science and technology. We live in the knowledge age where the smartest will thrive.

In this issue of *DefiningNZ* you will find examples of the great work going on at Massey involving staff and postgraduate students.

If you like what you read, do not hesitate to contact us to discuss how we might work in partnership with you, your business or your community to build a great future.

6 COVER STORY

When good proteins go bad

definingnz

OCTOBER 2009: A *DefiningNZ* special postgraduate edition

Editor: Kereama Beal **email: editor@massey.ac.nz**

COVER: Carlene Starck *Photograph: David Wiltshire*

Creating leaders, transforming business

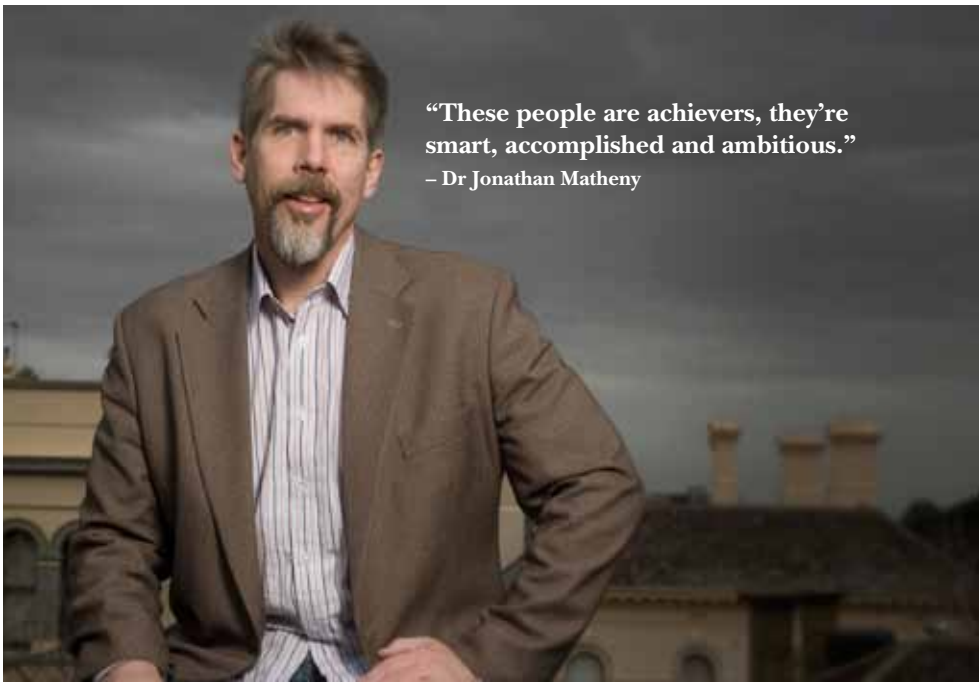
MBA programme leader and acting director Dr Jonathan Matheny talks to Melanie McKay about his greatest job satisfaction – watching his students grow, graduate and take on the business world.

Photographs: Paul Jones

For Dr Jonathan Matheny, helping create leaders and transform business is the reason he gets out of bed every morning. The Master of Business Administration (MBA) programme leader and acting director finds it immensely satisfying to watch the progress of the students who do the tough degree, and see them go back to the business world to take on leadership roles with the additional skills and confidence to implement what they have learned.

"It's the best work that you can do," says the native Texan, "Working with MBA students provides me with the most exciting teaching and learning experience. These people are achievers, they're smart, accomplished and ambitious."

That also means it is a challenge for Matheny and other staff to ensure the internationally-recognised programme is completely relevant in the changing world by encouraging innovation in the curriculum design, course assessment and delivery. The key, he says, is the University's close connection with the industry, moving towards the regional delivery of elective papers, and the addition of a community service element to the programme. "We've taken exceptional measures to get in touch with industry leaders, alumni and students to ensure we're providing the learning experience they want and need."



An example of this is asking students in its latest recruiting round if they would like to see a community service element to the course. The answer was a resounding yes and as part of their strategic management module, students are helping non-profit violence prevention in homes organisation Shine. Study teams have conducted strategic audits of the organisation and will report their findings to Shine's leadership team. Because Shine's staff are so busy co-ordinating and providing services, the students can make a real contribution to the organisation. "Students are getting credit for and being evaluated on their work, and they are also all really enthusiastic about helping out. The work is real and they are helping others so they are really enthusiastic," says Matheny.

While it is one of the most relevant and up-to-date MBAs, the College of Business is also proud that it is one of the longest continuously-running programmes. MBA was launched in 1972, making it one of the pioneers of New Zealand's executive education in business.

To date there are more than 2000 Massey MBA alumni active in business through-out the country and the world. It is a programme that is increasing in popularity, with almost 20 per cent more enrolments this year than last. Next year the roll is expected to grow from 65 to 120.

This, Matheny says, is because of the structure of Massey's MBA. "They want to do it because it is a practical course delivered by internationally experienced academics using research-led teaching techniques.

"An added bonus is that it is offered in executive mode, which is part time and over weekends, so it fits in with their work. Massey is also the only provider in New Zealand with national reach – it doesn't matter where you are in the country, you can do our MBA."

"Rather than just sitting in lectures and absorbing information, we provide so many opportunities for people network and to learn from each other. Our faculty are there to share their expertise and facilitate dialogue and engagement between students so that their own experience adds to everyone else's learning. We select our students in part on what they can contribute. This year the average age of our MBA students is 37-years-old, with 17 years business experience and eight years managerial experience. It's a tough course to get into and we look for people with the right attitude, aptitude and demonstrated leadership potential," says Matheny.

That was not the case when he did his own MBA at the University of Connecticut, and from his experience of working on 10 different MBA programmes around the world from France to China, Massey's is a much more inclusive model. "They're not necessarily environments where you learn from the great minds around you, it's more of a walk in and talk situation. I think what we're doing here is tonnes better," he says.

It was while working in France as a lecturer in international management at the Groupe ESC Reene and for the UK's Open University that Matheny first entertained coming to New Zealand with his wife. Some of the best students he had were on an exchange from New Zealand, and they made such an impression on him that he moved here in 1999. From 2005 he has been at the Albany campus as a senior lecturer in management and international business, and last year also became the MBA programme leader.

Matheny says that if it is one thing that has remained the same over time with the MBA, it is its objective - to develop people who can transform business, think and act strategically, are knowledgeable and effective in international environments, and innovative and entrepreneurial. "I think that with the way Massey has continued to develop it's programme, it is now the country's defining MBA."

When good proteins go bad

MacDiarmid winner Carlene Starck doesn't believe all of life's answers can be found by looking down a microscope, but her passion for making a difference lends itself to groundbreaking research as Bryan Gibson discovers.

– Photographs: David Wiltshire

When Carlene Starck ended her final year at Feilding High School it was veterinary science that drew her to Massey University, as it does hundreds of other first-year students.

But it became clear before she even started that another path beckoned.

"I went and worked on my sister's farm over the holidays, and there was a cow that was dying. I love animals and wanted to help it survive but I realised I was more interested in why it was sick, the details, so I thought maybe I shouldn't be a vet."

That decision led her to study structural biochemistry at the Manawatu campus, and her work has now won the Advancing Human Health and Wellbeing category of the MacDiarmid Awards.

Starck's focus has been on the myostatin precursor protein: the early, immature form of myostatin that inhibits excess muscle growth in humans.

Proteins need to fold into their correct three-dimensional structure to function properly. Starck says misfolding can be genetic but may also be caused by stresses such as pollution and a bad diet as cells cannot function properly when overwhelmed with toxins.

Her research shows that the myostatin precursor protein could be a factor in the development of sporadic inclusion body myositis, a disease that leads to progressive muscle wasting and weakness.

"The findings add weight to the theory that proteins can misfold if they have the conditions to do so, which means that the environment and our diets are likely to play a big role," Starck says. "As well as bringing us one step closer to a cure for the disease, the research highlights the fact that we may have some ability to prevent it through a better lifestyle.

"My passion is understanding how the load we place on our bodies ends up influencing our susceptibility to these types of disease later in life."

Starck's research is supported by the Neuromuscular Alliance of New Zealand, giving her interaction with people who have muscle wastage disorders and their families.

"One of the most rewarding parts of my work is the knowledge that these people consider me a hope for answers and treatments for their debilitating disorders. My research brings together my passion for science and my passion for helping people."

It was a lecturer she encountered in her first year at Massey who encouraged her initial foray into biochemistry. "I did a broad science course and it was Stan Moore who made me fall in love with biochemistry. He was just so passionate about it and he made it all so interesting.

"It combines every part of science; it has all the cool genetics stuff, and then has chemistry and has a bit of maths. It has everything."

But she is not the type of scientist who thinks all life's answers can be found by looking down a microscope.

"I'm into the alternative, holistic approach to life, which is odd for a scientist, apparently, but I don't think so," she says. "I think that true health and wellbeing comes from the inside and is about balance of mind and body and soul."

Sport and the outdoors also play a big role in her life. "I train horses and they are extremely humbling; just when you think you are getting somewhere they do something to make you realise you have so much to learn. You can't take stress to the horse, so you have to leave it at the door and they teach you to be in the now, in reality, because sometimes research can take you completely away from these things.

"Mountain biking does the same thing, but it is an extremely physical workout which I find so fantastic for balancing out the 'mind' stuff. I always say that mountain biking and horse riding are excellent for keeping you grounded – if you think too much you hit the ground, literally."

She also has a love of music and plays the piano, while cooking and travelling are also high on the list of things that help unwind from the laboratory.

"I love trying new things," she says. "Challenges are the good stuff in life, they teach you so much. I think it's so important to always keep pushing yourself out of your comfort zone."

The MacDiarmid award application process brought not only a scientific accolade but also a newfound clarity to her work.

"I often say that I go to work and play. It's like being in a sandpit, making little tracks with tractors. Only now the tracks have real-life consequences."
– Carlene Starck

"It involved communicating your research to the general public," she says. "You have to write an essay and make a poster that a 16-year-old could understand. It made me stop and think about exactly what I was doing and made me think, 'oh, this is why I am doing this research'. It gave me perspective.

"The thing I like the most about my work is also the thing I hate the most, and that is that you can't see what you're working with. It involves constant problem solving and it's not like you go to a book and read up on how to do things. Sometimes you just have to create them for yourself, and figure out how you are going to answer each question. That is the cool thing. I often say that I go to work and play. It's like being in a sandpit, making little tracks with tractors. Only now the tracks have real-life consequences."

Starck will finish her PhD later this year and a job in an offshore lab is the next step, although, typical of her approach to her academic career so far, exactly where is still up in the air.

"This area of research is completely new, and so what I really want to do is go and work in a laboratory that is actively working in these areas, one that's set up to answer all the questions that I've got. I don't know where that's going to be yet."

According to his calculations

Distinguished Professor Gaven Martin discusses quantum theories, hyperbolic crystallography, and materials science while explaining what makes gold shine, implications for modern medicine and computation, and the relevance of Einstein's 1915 General Theory of Relativity. Jennifer Little gains a glimpse into a mathematician's fascinating world...

Signs of Distinguished Professor Gaven Martin's latent mathematical genius surfaced when he began outwitting his maths teacher at the tender age of seven.

He raced home one lunch break when he was a pupil at Malfroy Primary School in Rotorua to work out the exact speed at which the earth moves around the sun, having been less than convinced of his teacher's guess.

"It was a trivial calculation - worked out with the help of my father - given the distance of the Earth to the Sun, something all kids know, and a pencil. The answer is about 18.5 miles a second (it was miles in those days) which is pretty fast!" Monty Python sang about it in "Expanding Universe", which his youngest daughter knows by heart.

This was the first of many such incidences throughout his school days in Rotorua – he remembers discussing the Banach-Tarski paradox (don't ask) with another friend, both aged around ten, while poaching trout in the Ngongotaha stream. Later at Henderson High School and at university he would question the orthodox answer to a maths problem in order to find a different, better one. "The power of even elementary mathematics to describe and analyse the world is truly remarkable – and a great joy to anyone with the skill," he remarks.

This practice is in essence what theoretical mathematicians of his ilk do. Testing existing theories and mathematical models to see if they stack up or can be improved, sometimes discovering new theorems along the way, is what compels and excites that rare breed of human – the pure mathematician.

To say this former West Auckland schoolboy, who grew up tinkering and inventing things out of old speedometers, carburettors and other spare parts in his panel beater father's garage, has had a meteoric rise in his chosen field of academia is an understatement. In 1992, at age 32, he made the New Zealand

Herald front page for being the youngest professor in the recent history of the New Zealand university system.

At the time he had just declined a chair at University of Sydney and was considering chairs at the Australian National University and the University of Auckland. He completed his PhD at the University of Michigan in 1985, and since has been awarded numerous fellowships, research grants and visiting positions at Universities around the world in Europe, the United States, Australia, Israel and including MSRI at Berkeley, Yale, Princeton, the Swedish, Finnish and French Academies. In another rare accolade he was elected a fellow of the Royal Society of New Zealand before he was 40. Most recently he was a James Cook fellow and Miller Fellow (University of California at Berkeley's distinguished visitor programme).

It didn't all come so easily though. A C-average in his first year at the University of Auckland quickly became a straight A+ record. "I learnt how to do exams, I don't think I got smarter!"

Martin became Distinguished Professor when he moved to Massey's Albany campus five years ago. He is founding director of the University's New Zealand Institute for Advanced Study, launched in 2007, and is dedicated to fulfilling its aspiration to be a world-class centre for theoretical research and intellectual inquiry in the sciences through his numerous collaborative research projects with mathematicians around the world.

Along with Professors Paul Rainey (evolutionary genetics) and Peter Schwerdtfeger (theoretical chemistry), Martin is one of its three full-time professoriate members (there are two fractional and four associate members), along with a dozen PhD and a dozen post-doctoral students. Institute staff currently hold six Marsden grants among them.

"These guys are among the very best in the world at what they do and it's a pleasure to be associated with them. We need more of this in New Zealand," he says.

Martin is also the recipient of the Royal Society of New Zealand's 2008 Hector Medal "for deep and wide-ranging contributions to the theory of Kleinian groups, geometric function theory and other fundamental parts of modern mathematics, including the solution of a number of difficult and long-standing problems."

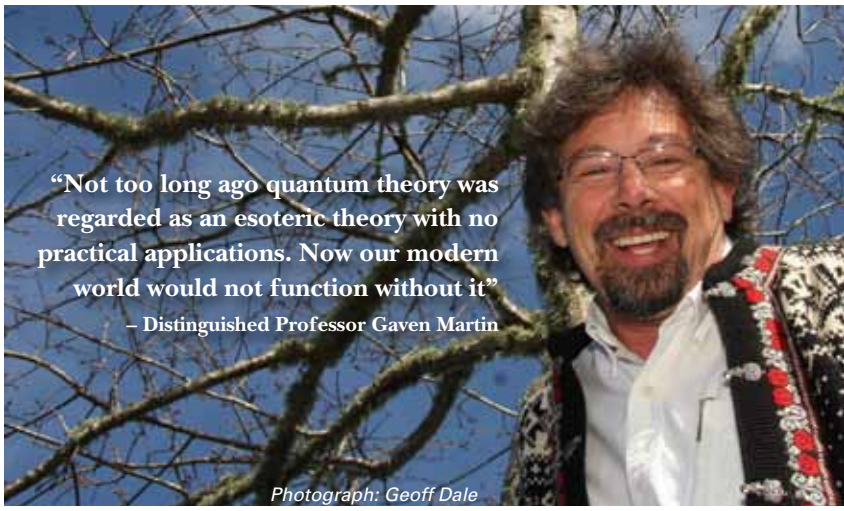
His main research interests include non-linear analysis and materials science (basically studying the differential equations that describe how materials are deformed when stressed), and hyperbolic and arithmetic geometry (a topic he last year gave a public lecture on to explain how "hyperbolic geometry is weird and interesting and offers greater possibilities to explain many features of our universe").

His breakthrough discoveries several years ago regarding the fundamental structure of hyperbolic (curved) space were published as over two hundred journal pages in the world's top mathematics journals and led to further surprising revelations on the connections symmetry, geometry and number theory. "I worked on that problem pretty much nonstop for 15 years."

In geometric analysis, he is studying classes of equations used to model materials in science. One of the seminal achievements of his career has been the development with his long time Polish collaborator Tadeusz Iwaniec of a technique called non-linear Hodge theory.

This has provided solutions to mathematical problems dating back to French mathematician Joseph Liouville in 1850 in understanding the symmetries of physical theories (conformal transformations) such as occur in relativity developed some 60 years later. A case of "mathematicians ahead of the game again," he says. "Indeed, so strong is physicists' belief in conformal symmetry, that they are prepared to concede the number of dimensions we live in, hence the nine or ten dimensions of string theory."

Mathematicians are effectively developing tools to find answers to puzzling questions that underpin our understanding of how the physical world works, says Martin.



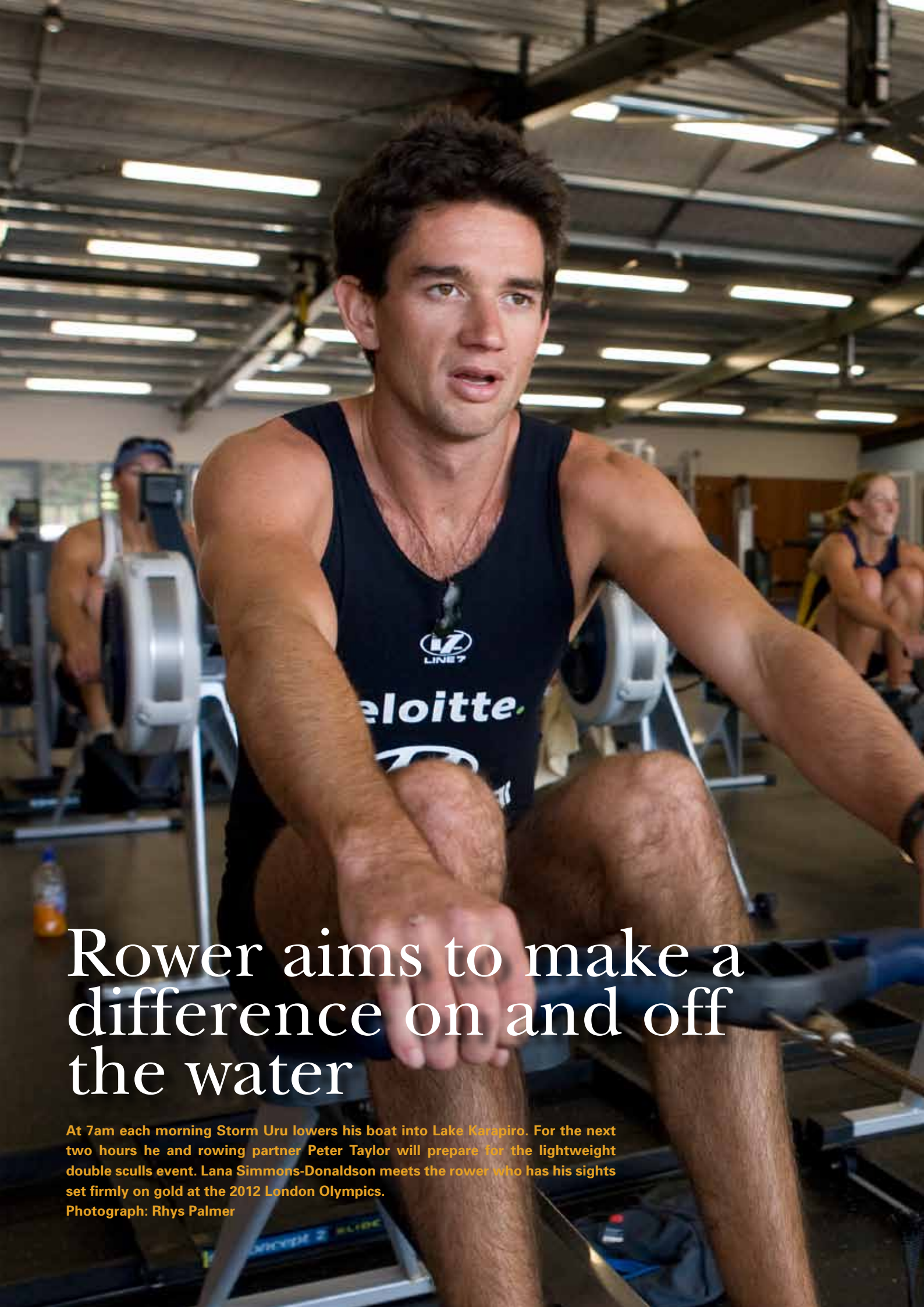
Photograph: Geoff Dale

Take gold. "Scientists could not explain its particular brilliance in terms of classical physics and chemistry. As my good friend Schwerdtfeger will tell you, the colour of gold is not a typical phenomena, like the colour of the sky, paint or hair and explained by classical theories of photons and electronic orbitals," says Martin. "The particular shine, along with other properties, is due to relativistic effects on orbiting electrons due to the heavy nucleus. We realise now that quantum effects are particularly important in the physics and chemistry of many everyday objects – such as lasers - and are going to be even more so in the future (computing and medicine are two obvious examples).

"Not too long ago quantum theory was regarded as an esoteric theory with no practical applications. Now our modern world would not function without it. This is partly why mathematicians follow their noses to develop seeming abstract theories – some day these ideas might underpin much modern technology. Our record is pretty good so far," he says, quoting German mathematician and scientist Carl Gauss - "theory attracts practise like a magnet attracts iron."

In this realm he also has research projects applying quantum theory and the mathematical theory of scattering to develop novel materials and electronic devices with Boris Pavlov – a mathematical physicist in the Institute.

He says that contrary to what many think, mathematicians are highly sought after across a range of careers and disciplines – medicine, technology, business, finance and elsewhere – because of their exceptional problem-solving ability. "The best people in virtually any discipline will have strong mathematical and analytical skills".



Rower aims to make a difference on and off the water

At 7am each morning Storm Uru lowers his boat into Lake Karapiro. For the next two hours he and rowing partner Peter Taylor will prepare for the lightweight double sculls event. Lana Simmons-Donaldson meets the rower who has his sights set firmly on gold at the 2012 London Olympics.
Photograph: Rhys Palmer

Storm Uru is just 24 and is 1.88m, taller than many rugby players, but weighs just 74kg. His physique is ideal for rowing, with his height and reach giving him an advantage over shorter rowers.

After breakfast at home, Uru will spend another 90 minutes with his books and papers out studying towards his other goal, a Postgraduate Diploma in Business Administration from Massey. Later, at about noon, he will return to New Zealand Rowing's new complex at the lake and work out at the gym. Then it is another 90 minutes' training on the water and home to more study in the evening.

Once a month, on average, the weather gets too rough at the lake and the only training option is the gym. The day I visit Uru is, unfortunately, one of those days and there is a palpable tension and twitchiness in the air of the gym, which is full of the elite of New Zealand rowing.

"We haven't been able to get out on the water for 24 hours," Uru explains, "so we're going to train on the Ergs [rowing machines]."

Uru lives by the philosophy of no boundaries – anything is possible if he puts his mind to it – an outlook he attributes to his parents, who "supported me 100 per cent in everything".

He may live and breathe rowing, but he is already looking beyond that. Last year he completed a Bachelor of Business Studies extramurally to add to the Bachelor of Science in chemistry he did at Canterbury University after leaving James Hargest College in Invercargill five years ago. He plans to enrol in a Master of Management degree next year.

When he left school he thought he would be a chemical engineer, like his father. Now he would like to be "a manager in a successful business and work in international money markets".

He is driven to complete what he starts. "Once I decide it's the right thing for me I have to complete it. Many times I wanted to pull out of study and questioned whether in the big scheme of things qualifications were important. When I do finish I feel proud and thankful that I did.

"It has been great studying extramurally. Massey provides a way I can continue to study wherever I am. I am only in Cambridge for five to six months of the year. During the term I could be anywhere in the world."

He completed two papers last year despite his busy schedule. "I had to complete work for one paper in three weeks after I got back from Beijing. It was really intense."

Last semester he took an international business paper. "I am interested in international financial systems, money markets and the financial environment.

"Lightweight double scullers have a very long shelf life; they peak in rowing between the age of 29 and 32 years. I've got a lot of time left in me. It's a sport that has become a career. Having my sponsors, Hyundai and Deloitte, on board has given me a shift in opinion. I am definitely going to stay in the sport for a number of years. When I first got interested I didn't think rowing was going to develop as a career or that I would get to develop the business side through study and exposure to different people and circumstances."

Since July Uru and the New Zealand rowing squad have spent three months competing overseas, in two world cups, the prestigious Henley Regatta and finishing with the world championships – his main rowing goal this year – in Poland.

Of Ngāi Tahu descent, he says he didn't have much connection with his Māori side growing up. He is proud to be Māori and has been back to his marae and local schools as a guest speaker. As a Sport and Recreation NZ lifestyle ambassador, he chooses to attend events with a Māori focus as a role model. "It has been a cool part of what I have done. Five years ago I never would have thought I'd be doing this. The students' response is overwhelming. Hopefully I can make a difference in other young people's lives."

Harnessing the Sun

Harnessing the Sun's energy to create electricity is not a new idea, but research being led by chemist Ashton Partridge could revolutionise the concept, as Bryan Gibson finds out. – *Photographs: David Wiltshire*

A team led by Associate Professor Partridge, from the Institute of Fundamental Sciences, has won $5.76 million to further its research into high efficiency photovoltaic solar panels.

"These are plastic panels," Partridge says. "At the moment you have silicon panels; now they're fine but they're also very expensive. The installation cost is expensive. They're very brittle. If hail hits them they will break."

The new panels would be far more sustainable. "They're recyclable too. After a 25-year lifetime, we can chip them down and just reuse them as a base material."

Partridge's team is made up of scientists from across the globe, each playing a vital part in the project. It includes members of Auckland University's engineering school, while scientists at Canterbury and Otago universities are also involved with various aspects of the research.

As an organic chemist, Partridge is focused on the dyes that convert the sun's energy into electricity.

"Photons from the sun are absorbed by the dye," he says. "Because the dye itself is coloured it will absorb in the visible spectrum. Most of the sun's energy is within that spectrum, and so you can see the light. The electron is excited and is removed from the dye molecule.

"The problem we've had to overcome with photovoltaics is how easily that electron is bumped out and how easily it is transmitted from one layer to the other. Eventually it has to end up in the copper wire, but there are a whole lot of interfaces there. The problem is minimising the impedance, or resistance. That's the art."

The work on dyes is continuing at the Massey-based MacDiarmid Institute for Advanced Materials and Nanotechnology, which Partridge heads. "But we have commercial partners we're working with, we have a proof of concept device and we have a route to market."

The final product is a plastic tile that could be used to cover an entire roof, which has obvious benefits.

"Let's say on average you get 650 watts per metre squared of roof space," Partridge says. "If we could harvest 10 per cent of that, based on average roof areas and average power consumption, we could generate enough energy for the total needs of a house plus two electric vehicles."

The beauty of the project is the large number of institutions involved, which Partridge says must be done more if New Zealand is to flourish as a scientific nation.

"This project spans a whole lot of research institutes and endeavours to get us all working together, so that we can actually produce something for New Zealand. New Zealanders and Australians are some of the best scientists in the world; we just have to be focused and we have to work together."

The aim is to keep the intellectual property in New Zealand as much as possible and for there to eventually be a photovoltaics industry here in New Zealand, he says.

The work is not new to Partridge, who has been working on conducting polymers for the best part of 20 years.

He collaborated with Alan MacDiarmid for eight years making an electronic nose: a computer that could smell.

Now there are a number of PhD students from around the world working with him on either this project or others related to conducting polymers.

"There are two working on dyes, and I have six working on different types of sensors for different applications."

It is this type of sustainable, environmentally focused research that Partridge sees as appealing to new scientists.

"We've got a whole stack of kids coming up through the university system and we need places for them to work. They need to be excited, they need to see a future in science, and hopefully this will help give them that."

Krishanthi Jayasundera (postdoctoral student), Adam Stephenson (PhD student), Nyree Parker (PhD student), Associate Professor Ashton Partridge, Emad Al-Imarah (PhD student), Helen Hsu (PhD student), Zoe Matthews (PhD student)

Massey has struck a collaborative partnership with the Centre for Nanotechnology and Molecular Materials at Wake Forest University in North Carolina to work on the development of next generation solar cells, new portable sensing technologies for medical and bio-defence applications, lighting systems and nanomaterials.

The partnership will establish a long-term exchange of scientists and engineering capabilities between the universities. It will also provide exchange student experiences for undergraduate and graduate students.

The effort, led by Associate Professor Ashton Partridge from the MacDiarmid Institute at Massey and Professor David Carroll from Wake Forest, will focus on the development of market ready technologies.

"The agreement will provide Massey University with strong scientific partners at the Nanotech Centre and can provide a convenient gateway to commercialise into the US market, Carroll says. "For Wake Forest University, Massey provides complementary engineering capabilities for continued development of our device programmes."

Bridie Virbickas is among 61 students taking the soil properties and processes paper taught on the Manawatu campus.
Photograph: David Wiltshire

Growing Smarter

Innovation remains key to agri-food growth

As global food shortages worsen and governments grapple with the problem of how to feed growing populations with shrinking resources, the agri-food backbone of New Zealand's exports will continue to increase in importance.

Massey has always played a pivotal role in developing the people and the skills that place New Zealand at the cutting edge of what needs to happen to create a sustainable future.

Innovation is vital to cope with the dangers posed by climate change, pollution, water shortages and loss of arable land – and the mantra of "working smarter not harder" is implicit when the world no longer has the ability to simply grow more crops and breed more livestock to feed itself.

The University is already a world leader in the agri-foods area, unrivalled in research, skills development and knowledge transfer.

In April it joined five other food research and development organisations in establishing Food Innovation New Zealand to market the nation's food research expertise to the world.

A memorandum of understanding was signed with AgResearch, Fonterra, Plant and Food Research, the Riddet Institute, and the

BioCommerce Centre. The brand launched in August.

University Vice-Chancellor Steve Maharey, who chairs the Food Innovation steering committee, says New Zealand and its leading food science organisations already have a global reputation for excellence.

"Collaboration between our organisations has helped grow the industry's reputation for providing New Zealand Government and worldwide private sector clients with world-class food research services and capability," Maharey says. This initiative is the first time the partners have formalised their collaborative efforts. The primary goal is to attract more global food giants to commission research in New Zealand and to establish research facilities here.

Recent farms systems projects include year-round lambing and identifying the most efficient beef cattle for particular farms – both projects have the capacity to feed more people from less land.

Scientific breakthroughs in Omega-3 fish oil and calcium fortified Anlene milk have led to global commercialisation of products with significant health benefits. The common thread from fish oil to better farm systems is innovation, Maharey says.

The decision to renew the focus on agri-foods last year saw the degree programmes revised and updated. In addition to the worldclass Bachelor of Food Technology degree – recently selected by the Singapore Government to be taught there alongside other world-leading technology degrees – this year's crop of students had the choice of degrees in AgriScience, AgriCommerce or Environmental Management in place of the Bachelor of Applied Science programme.

The programmes were developed over two years after extensive consultation with recent graduates, current students, academics and industry. With student enrolments heading for records levels the change appears to have won approval where it counts.

Massey Agriculture:

- Total students in agriculture and life sciences: 2500 EFTS (700 postgraduates)
- Current research contracts in agriculture and life sciences: 115 valued at $15.6m
- Farms: 2200ha (three dairy, three sheep and beef, one deer, plus fruit, pasture and crops research units)

Massey University is a world leader in the agri-foods area, unrivalled in research, skills development and knowledge transfer. In April it joined five other food research and development organisations in establishing Food Innovation New Zealand to market the nation's food research expertise to the world.

Bridie Virbickas, 18, is among 61 students taking the soil properties and processes paper taught on the Manawatu campus. With 71 extramural enrolments – and another 100 internal enrolments anticipated for semester two – the numbers are well ahead of any of the past three years.

Virbickas says Massey's reputation is what drew her from the family dairy farm near Whakatane to do a Bachelor of AgriScience. Massey's well-known for how good it is at agriculture and the new degrees seem to have got more attention and are more focused," she says.

The soil paper, along with a paper called Plants in Agriculture, are regarded as "indicator papers", says the Director of Massey Agriculture, Professor Jacqueline Rowarth. "When those class sizes are up – and they are this year – we know we're looking at some good numbers graduating in two or three years' time.

"They're keen and motivated students and taking full advantage of all the extracurricular professional development opportunities that Massey Agriculture offers," Rowarth says.

Last year the Pro Vice-Chancellor of the College of Sciences, Professor Robert Anderson, announced the new bachelors degrees saying they underline the University's commitment to building a sustainable nation. Anderson calls them "future-proofing" Massey's agriculture graduates by drawing on the strengths the University has in multiple disciplines and developing partnerships across developing disciplines to provide the skills needed by industry.

AgriScience is for students planning careers at the interface of science, technology and management in agriculture, horticulture or equine studies, such as technicians, farm or horticultural managers, fertiliser or seed company representatives.

Virbickas says she is enjoying the soils side of her degree and could be interested in a career in the fertiliser industry that might in turn lead to a farm advisory role.

Anderson says AgriCommerce, developed in partnership with the College of Business, is for students wanting to work in business related to primary production, such as rural banking, exporting, rural valuation, logistics and supply chain management.

"The Bachelor of Environmental Management will provide the career foundation for managers in resources, environments, catchments and parks, as well as for regional planners and policy analysts," he says.

Robert Southward, co-ordinator of the Plants in Agriculture paper, says the semester one class of 87 internal students is the biggest in at least six years, with the students an even split between AgriScience, AgriCommerce and Bachelor of Science, with some Veterinary Science and diploma students as well.

Alastair Neville, 20, started doing a Bachelor of Applied Science last year but switched to AgriScience after deciding "it was the way to go". He came to Massey from his family's dairy farm at Reporoa because of its reputation and variety of programmes.

A key advantage is the ability to study in diverse areas due to the comprehensive nature of the University. "At the moment I'm doing economics as an option and my intention are to do some business papers as well," Neville says.

When he completes the degree he plans to work as a farm adviser, rural banking or as a technical sales represenative. "Nowadays having a degree opens more doors. "Dad started farming after fifth form but he says because of the amount of paperwork you do you need business skills. It's also about the science. Agriculture is so much more in-depth."

Classroom politics

Rules and regulations in the classroom can both encourage and inhibit girls' achievement in mathematics. Associate Professor Margaret Walshaw talks to Kereama Beal and explains that these rules are not always set by the teacher, but by the pupils themselves.

– Photograph Graeme Brown

Associate Professor Margaret Walshaw says that being aware of the effects of social positioning in the classroom is an important tool for understanding achievement in mathematics, particularly for girls.

Walshaw is based within the School of Curriculum and Pedagogy in the College of Education and is co-director of the Centre of Excellence for Research in Mathematics Education.

She says that understanding the ways that girls do things is important, as is the way any single person views themselves in a social setting.

"My research has been built around ideas that try to unpack how people are positioned in society and my work is directly related to people in mathematics education. So I'm not as interested in the way people perform in mathematics, but I'm looking at a micro-level of what happens in classrooms to try and explain how they're positioned in a social setting and how it might affect them."

For a two-year Marsden study she looked closely at the inter-relationships in the classroom of different decile schools and found aspects of practice in the classroom that may not normally have been visible.

She used microphones attached to individual pupils at their desks to listen to their conversations, and then interviewed them following the lesson.

"Many people assume that a lot of the conversations carried out in the classroom by the pupils themselves are off-task conversations, but in fact the pupils would often relate what they were doing in their class work to their activities outside of the classroom in their own life.

"The pupils were also very focused on their academic work, and a lot of brainstorming would happen too, which was an interesting aspect."

Walshaw says that what was particularly interesting were the conversations that happened in a year-12 classroom between two girls who sat in front of two boys, all accelerated students studying mathematics at a higher level.

"It was a fascinating exchange that I didn't fully understand until I interviewed the girls afterwards. In the girls' view the boys were trying to distract them and get them into trouble, by kicking their chairs, and making them laugh – which was a no-no in this classroom.

"I saw a little of this happening, but the girls' perception of this may have been escalated. But what's important is the way they perceived what was going on and how it affected what they were doing."

Dr Walshaw says that one of the students in particular, who was prone to giggling, was significantly affected.

"The boys' behaviour did prompt her to giggle in the class which had the effect of creating a difficult relationship between her and the teacher.

"It was difficult for her to get beyond this, and as a result she didn't feel she could do anything good enough for the teacher. Over a period of time, in some way this incident contributed to her disengaging with the mathematics and deciding herself that she couldn't do it, when in fact she was a gifted student.

"These are the sort of things you are able to pick up when you look at the relationships within the classroom in a direct way."

In a group interview, the girls had criticised the boys' behaviour, but Walshaw found that they were even more critical of the other girls in the classroom, over seemingly minor things such as gestures or expressions that other girls may have made.

"I developed the idea that it isn't just the teacher who sets the rules and regulations for the classroom, but the pupils themselves.

"What emerged is a view of the very political and strategic nature of classroom life, which we often don't consider.

"Teachers are busy people and a lot of what goes on in classrooms is not apparent. It's only when you have the luxury of a fine-tuned research investigation that you're able to see what goes on.

"Teaching in any classroom is not an isolated event."

For whom the bell tolls

Just before lunch, I am saying to a master's student, "Making a serious piece of artwork for the first time is a bit like casting a bell. Take a look at Tarkovsky's film *Andrei Rublev* and you'll know what I mean. There's a character in that film, a boy, who pretends he knows how to cast a bell, that he has learnt the secret of the craft from his teacher, little knowing that one day he will be called upon to do it for real."

I turn to the student, "Look at the film and you will see what I mean, because now I'm asking you to do it for real". There is a knock on the office door. Daniel opens the door and walks in.

Professor Daniel Libens, from Gent in Belgium, has been here for the past week as a visiting guest professor, doing supervisions with the master's students in Fine Arts.

"Lunch?" he says. In the background the subliminal sound of bells chime out from the 50m tower of the National War Memorial.

We walk across campus heading for Cuba St, out past the old museum and down the steps of the memorial, turning left onto Buckle St at the Tomb of the Unknown Soldier.

Daniel speaks perfect English in a soft Belgium accent: "Flemish bells, so far from home – a Carillon."

"A what?" I ask.

"The bells, a Carillon. It's a Netherlands instrument. Don't you remember the one at Ypres, when you last visited Passendale?"

On the way to the café he explains. A Carillon is a large mechanised musical instrument consisting of a minimum of 23 bells, which had been developed throughout the Lowland countries of Flanders and Holland in the late 15th and early 16th centuries.

At the café table the Dominion Post tells of a skull found in the Ruamahanga River. An expert has dated it to the middle 17th century – an unknown Dutch woman in a Wairarapa riverbed, who appears to pre-date Captain Cook's arrival by 100 years or more.

In the afternoon I look up four words on Google: Carillon, Wellington, War Memorial.

Our war memorial tower, which stands at the entrance to Massey's Wellington campus, was opened on Anzac day in 1932. The tower originally had 49 bells, donated and inscribed to remember individuals who died in World War I. Since 1984, the Carillon has been renovated and enhanced by the addition of a further 25 bells, including 4 gifted by the nation in 1995 called Peace (Rangimarie), Hope (Tumanako), Grace (Aroha) and Remembrance (Whakamaharatanga). The later 4 bells are to commemorate the 50th anniversary of the end of World War II. In Peace (Rangimarie), the tower has the largest bell in the Southern hemisphere.

http://www.nationalwarmemorial.govt.nz/carillon-sounds.html

"Making a serious piece of artwork for the first time is a bit like casting a bell. Take a look at Tarkovsky's film *Andrei Rublev* and you'll know what I mean."
– Professor Jeremy Diggle

Professor Jeremy Diggle heads the School of Fine Arts. His work is represented in national and international collections and he has served as a board member of the European League of Institutes for the Arts and as the British national secretary for NAFAE (National Association for Fine Arts Education).

Food for the future – a weighty issue

Preventing obesity should be as straightforward as convincing people to cut back on junk food and to exercise more, right?

On one level it might be that simple. But on another, reversing the obesity trend requires a better understanding of how drastic lifestyle changes over the past few decades have contributed to fundamental changes in human metabolism that defy a simplistic 'eat-less, move-more' remedy, Massey's new Professor of Human Nutrition Bernhard Breier says.

One of the conundrums illustrating this altered and evolving state of human metabolism is the observation that the more 'low-fat', 'lite' or 'diet' products there are on the market, the more obesity rates appear to be increasing, Breier says.

It's not just the nutritional qualities and abundance of food that concerns him. Everything from food production and marketing, to town planning, public transport and our car-centred culture has influenced the dramatic shift in human metabolism over the past few decades, he says.

The result: unprecedented weight gain across the population, leading to a raft of health problems such as heart disease and diabetes, as well as social and economic issues including poor quality of life, reduced ability to learn and concentrate, and lower productivity.

The effects of obesity have a massive impact on the health system and economy, says Breier, who trained in physiology and endocrinology at the University of Gōttingen in Germany before gaining a PhD at the Auckland School of Medicine in 1988.

Internationally recognised for his work on the endocrine regulation of prenatal and postnatal development, metabolism and growth, his latest research published in *Endocrinology* (January 2009) reveals how low birth-weight babies born to mothers who were undernourished during pregnancy had an increased capacity for exercise in adult life, despite being more susceptible to obesity and metabolic disease. It is a prime example of the workings of metabolic flexibility, which he says is "a key concept for sport and exercise physiology as well as obesity prevention".

Professor Bernhard Breier

"When I sit here in my office, for example, I need different food in comparison to when I go tramping 25 kilometres a day. Different circumstances have distinct metabolic needs."

Breier believes the most effective way to address the "obesity epidemic" – as he unequivocally calls it – is to pool the knowledge of experts from human nutrition, exercise and health sciences, food technology, engineering, marketing, and psychology to achieve a more sophisticated, more holistic understanding of its causes and possible solutions.

He is currently harnessing wide-ranging expertise from these areas at Massey, and is inspired by the opportunities for multidisciplinary collaborative research projects both within the University as well as with external stake-holder groups through Massey's established links with district health boards, Crown Research Institutes, schools and the food industry.

"It's unique – nationally and internationally – to have all these areas working together under one roof," says Breier, who joined Massey's Institute of Food, Nutrition and Human Health late last year from Auckland University's Liggins Institute, which he helped to establish.

Curbing the current obesity trend sounds a tall order, and one that is likely to call for major societal changes.

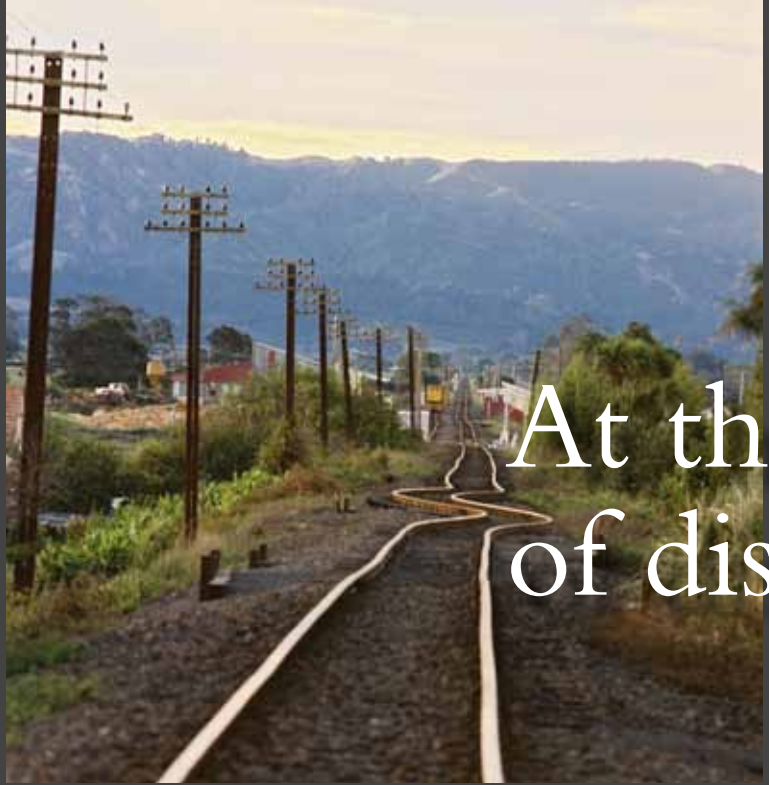
According to the Ministry of Health, a quarter of all adults in New Zealand are obese. The ministry estimated the direct cost of obesity to our health system at $460 million for 2004 – its latest figures.

Breier's armoury of obesity-reduction strategies include a school science curriculum to include good nutrition and how metabolism works, more psychologists trained to deal with the behavioural issues causing overeating, and town planners being made aware of the need for more walkways, cycle paths and parks so people can get the daily exercise they need.

In one recent development, he has been working with Counties Manukau District Health Board and its 'Let's Beat Diabetes programme' to establish ways to encourage more Māori to study nutrition and health, to counter high obesity and diabetes rates among Māori and Pacific Islanders. The Let's Beat Diabetes community partnership programme aims to increase knowledge of its Healthy Eating- Healthy Action strategy throughout the community,

Investigating the properties of foods such as blueberries, fish oil and walnuts – known to enhance learning and brainpower – to see if their health properties are mimicked by other foods is another of Breier's research interests.

Ultimately, he hopes future research will not only help inform consumers about the right nutrition for their lifestyle but will also generate demands for foods that nourish our brains and bodies without burdening our bellies. ❖



At the epicentre of disaster research

You are woken in the night by shuddering floors and walls, and terrifying rumbling as a massive earthquake hits. What you do next will depend on where you are, and what warning systems and disaster management procedures are in place – issues Associate Professor David Johnston has given much consideration.

As director of Massey's Joint Centre for Disaster Research, where planners, earth and social scientists collaborate at the Wellington campus' School of Psychology, he is at the forefront of research in New Zealand on the social dimensions of how people prepare for – and cope with – disasters.

Among numerous projects from the centre is the just-released report *Cellphones vs Sirens: Effective Public Notifications Systems for New Zealand*. Johnston collaborated with disaster experts to develop software to help local authorities devise the most suitable effective warning system for their region, whether emails or aircraft banners, radio messages or telephone trees.

"A fully effective warning for hazard emergencies is one which reaches people at risk no matter what they are doing, provides information on what the threat is, and on which actions to take," he says.

The software, developed for the Ministry of Civil Defence and Emergency Management and to be made available nationally and internationally, allows an agency to enter data about their population demographics (high transient/tourist population, large diffuse rural population), select hazards most relevant for their area and then determine the most effective and cost-effective method of communicating with people.

Johnston envisages research from the centre, including studies by nine doctoral and four masterate students from Massey and 11 students linked to the centre from other universities (Auckland, Victoria, Canterbury, Otago and Tasmania), will make a greater contribution to international disaster preparation in the future through his recent appointment to the Scientific Committee of the Integrated Research on Disaster Risk Programme.

The only New Zealander on the newly-created committee, he joins experts from Britain, Canada, the United States, France, Germany, Norway, Japan, Costa Rica and South Africa to form a globally integrated, multi-disciplinary research team focused on improving preparation and management of both human-induced and natural hazards and disasters. The programme is founded on the recognition that disaster prevention and mitigation are key factors in reducing global poverty and an integral part of development efforts, he says.

Research activity has flourished at the applied research centre – aptly located in the one of the country's most quake-prone cities – since its doors opened in December 2006 as a joint venture between Massey and GNS Science (Institute of Geological and Nuclear Sciences) – a government-owned research organization.

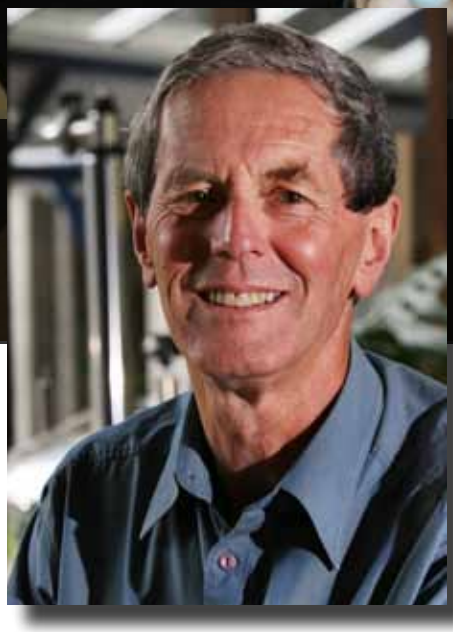
Expansion continues apace with Associate Professor Bruce Glavovic, from Massey's School of People, Environment and Planning in Palmerston North, appointed last month as Associate Director of the Centre.

Glavovic, who has an Earthquake Commission Fellowship in Natural Hazards Planning, wants to encourage more multidisciplinary postgraduate research to address pressing real-life issues of disaster planning.

His work focuses on how land use planning can be used to avoid putting people and property in harm's way, such as ensuring building does not occur on flood-prone land. He has a particular interest in coastal communities and has studied disaster recovery on the Gulf Coast in the United States following Hurricane Katrina and in Indonesia following the 2004 Boxing Day tsunami.

He has also been instrumental in forging a Memorandum of Understanding with the University of North Carolina at Chapel Hill signed in May, which he says will be "a catalyst for scholarship and international collaboration in the area of disaster risk reduction through land use planning, adapting to climate change and building sustainable, hazard-resilient communities."

– Jennifer Little,



Commitment to the long term

What is research and why do we do it? The simple answer, of course, is that research involves gaining new knowledge through experimentation and theoretical analyses, and we do it because it is the nature of the human race to desire a greater understanding of everything and everyone in the world in which we live.

As humans we have this urge to push the boundaries and gain greater insights into every aspect of our lives. This is often a challenging and demanding occupation and progress rarely comes easily, but when "the breakthrough" comes there are surely few moments more satisfying in an academic's career.

Why do we, in New Zealand's defining university, invest our limited resources in research? Again, the answers are straightforward. A university, as distinct from a polytechnic, is defined as an institution dedicated to creating new knowledge and acting as the conscience of society. If we don't contribute to research then we are not worthy to be considered university academics. Furthermore, without a research emphasis at our university we would fail to attract the very best staff to teach and inspire the next generation of researchers. We owe our students the best available. We can also achieve much by collaborating with researchers round the world and bringing into the team those with expertise that we lack. It's fun. It's rewarding and together so much more will be achieved than could otherwise be possible.

> "If we don't contribute to research then we are not worthy to be considered university academics. Furthermore, without a research emphasis at our university we would fail to attract the very best staff to teach and inspire the next generation of researchers. We owe our students the best available."
> – Distinguished Professor David Parry

Why don't we just use research work generated overseas? It would be cheaper. There are many reasons, of course, for rejecting such a concept outright. Firstly, economic progress means that we must have an edge over our competitors. Secondly, New Zealand's plants, animals and social environment area are unique. Research generated elsewhere will never be totally relevant here. Thirdly, if New Zealand is to be accepted as a partner in the international research community it must give as good as it gets. If we didn't contribute to the pool of knowledge we would have little access to that generated elsewhere and zero credibility.

Should all areas of research be encouraged, even those with no immediate economic benefit? Absolutely! Rarely can we predict with any certainty where research might lead us. Did those involved in the development of computers, lasers, antibiotics, microelectronics, the world-wide web, DNA fingerprinting, understanding of evolution at the molecular level, the use of number theory in cryptography and e-commerce, genetic engineering, semi-conductors, superconductivity, black holes, plate tectonics, space travel, organ transplantation and novel surgical techniques, conducting polymers and solar technology (to name but a few) have an end purpose in mind. Perhaps in some cases yes, but in most cases no. All scientific research ultimately leads via technology and engineering to commercial enterprises. It might take five years, it might take 50 years but it will happen, it does happen. We must commit ourselves to the long-term and not expect $10 of product to emerge from $1 of investment within a few years. History tells us that it takes considerable time between the generation of a good idea and a commercial product. We must be patient. This is not easy when political pressures demand a quick return.

To succeed at the highest international level in research those involved need to be dedicated, determined and excellent. Never settle for being second-best.

David Parry
Distinguished Professor of Biophysics