definingnz

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Massey University

Te Kunenga ki Pūrehuroa

Photo: World of WearableArt Ltd.

Welcome

"Massey doesn't conform to the standard pattern in many ways."

As the recently appointed Vice-Chancellor of Massey University, I want to take this opportunity to invite you to be a part of the exciting future we are building and to share some of our stories with you.

Among New Zealand universities, Massey is unique. Throughout its 80-year history Massey has played a defining role in the development of New Zealand through its contribution to land-based industries, distinctive mix of internal, extramural and international teaching, commitment to innovation, and close links with business and the community.

Massey has New Zealand's only faculty of veterinary science; pioneered and leads distance learning; appointed the first Professor in Biotechnology; led the way in areas as diverse as Finance, Food Technology, Social Work, Information Engineering, Aviation, Nanoscience and Genetics; is New Zealand's only multi-campus university; established the first Chair in Te Reo Maori; hosts the National Centre for Tertiary Teaching Excellence; won the only new Centre of Research Excellence in 2007; launched Pasifika@Massey, a strategy for Pacific peoples in 2006; has a strong presence in Asia; and in the last Performance Based Research Fund round Massey's Design and Fine Arts were ranked first.

In the face of new challenges our aim is continue to shape the future of our nation. Our bold, innovative, 'can-do' attitude is needed more than ever as New Zealand seeks to transform itself into a sustainable, prosperous, fair and vibrant nation able to thrive in a globalising world. But in the 21st century we will do more – we will work hard to make Massey an acknowledged world centre of tertiary learning, able to take the best of New Zealand research and teaching to the world. Achieving this will mean reinvigorating the spirit captured by the University's foundation Vice-Chancellor Sir Alan Stewart:

"Massey doesn't conform to the standard pattern in many ways. The University is young and so can more easily embrace change and retain a less conservative attitude. I hope this can continue forever."

Massey has always understood that it is people who matter. It is the capacity and capability of our staff and students that will determine what Massey is able to achieve. Our aim is to provide an environment that supports them to continue to take leadership roles throughout New Zealand so that they enhance Massey's reputation for being first to embrace changes.

This publication tells the story of just some of the outstanding work being undertaken by staff and students. If what you read captures your imagination, I invite you to find out more through news.massey.ac.nz where you will find more articles, including our Alumni and Research magazine. You might also like to subscribe to one of our regular e-mail newsletters.

Vice-Chancellor Steve Maharey

Massey University's Defining Qualities

Excellence
Excellence in research and learning is at the heart of everything we do.

First
Massey is driven by a tradition of leading and by an ambition for its staff and students to play leadership roles within New Zealand and beyond.

Innovative
Massey believes it has a responsibility to apply its knowledge to real world issues to bring about positive and innovative change.

Connected
Strong links with local, national and international stakeholders ensure Massey is relevant and responsive to the needs of those it serves.

New Zealand
Committed to the mutual rights and obligations contained in the Treaty of Waitangi, Massey is firmly embedded in the New Zealand landscape, and a champion of Kiwi traditions.

Opportunity
As New Zealand's only multi-campus and extramural university, Massey is committed to ensuring access to tertiary learning and research opportunities.

Collegial
Massey staff and students are part of a community committed to building a stimulating environment in which to research, teach and learn.

Autonomy
The University is an autonomous entity committed to academic freedom.

Massey University

Hulme super car comes out of the workshop

Get your motor running… the sleek two-seater high-performance Hulme Can Am is unveiled trackside at this weekend's A1 Grand Prix in Taupo. It's the first public viewing of the vehicle, designed by industrial designer Professor Tony Parker.

Dubbed Bear 1, the Hulme Can Am is an open version of the Hulme F1 Champion concept show car unveiled earlier in the decade. Both models were named in honour of New Zealand-born 1967 Formula One champion the late Denny Hulme and also celebrate Hulme's Can Am series victories in 1968 and 1970.

Just as its gruff no-nonsense namesake – known in grand prix circles as "The Bear" – clawed his way to the top of his sport, those who have devised the new car aspire to international market success for this venture.

Like its predecessor, it was designed and hand-built by the Hulme technology team in New Zealand. Although road legal, the car takes conceptual engineering and styling cues from current Formula One and sports racing car technology.

The car is the brainchild of entrepreneur and former Rolls Royce engineering apprentice Aucklander Jock Freemantle, who yearned to see a low-volume exotic road car designed and built in New Zealand and established a company, Supercars Ltd, to do it.

Jock Fremantle of Hulme Supercars Limited admires the earlier-version closed car seen here on display at Goodwood in the UK.

Professor Parker, based at Massey's Wellington campus, saw the project as a good research opportunity, also enabling students to gain hands-on experience of design, testing and production.

Professor Parker's design inspiration came from thinking about racing enthusiasts' aspirations to own and drive a Formula One racer – and be able to drive it safely on public roads or the track. "It's a recreational car for affluent connoisseurs and people who are collectors and motoring enthusiasts."

Massey University industrial design professor Tony Parker with a computer generated image of the Hulme Can Am open top road car he designed.

The car features an innovative, ultra-lightweight composite bodywork and race-orientated chassis, suspension and braking and is powered by a hand-built seven litre V8 Chevrolet provided by General Motors. To officially achieve super car status it will need to have a top speed of at least 320km/h.

"This first driving car is part testing mule-part demonstrator" Professor Parker says.

"Like most manufacturers based in New Zealand, the Hulme can't be mass market. We have to use design, engineering, technology and craft to make our way in the world."

Professor Parker has an industrial design diploma from the Design School and a master's degree from the Royal College of Art in London. He says he also drew on his more than 20 years in design education and practice to extensively research design options before he and Mr Freemantle settled on the supercar's design. A number of model variants are intended for international customers.

For further information email jock.f@supercarsnz.com

WOW winner still stunned

Nadine Jaggi

Three months after winning the Supreme Award at the 20th Montana World of Wearable Art Awards, Massey University design graduate Nadine Jaggi said the achievement is still sinking in.

Her intricate leather creation, Orintho-Maia – or "bird mother" – involved more than a year's work, and was created using hand-dyed, hand-sewn, embossed and carved leather to create a unique feathered look.

Jaggi, who also won the Air New Zealand South Pacific section, works as a costume designer for Weta Workshop in Wellington and took on the challenge of entering the awards in addition to her regular 50-hour week. "It was quite a triumph just to get that done."

After graduating from Massey's College of Creative Arts in 2004 with a Bachelor of Design with first-class honours majoring in fashion, she worked in Switzerland before returning to New Zealand two years later.

Other WoW place-getters with connections to the College of Creative Arts are Tanya Marriot, runner-up for the Shell Student Design Award with her garment Kanak, and Andrea Clinton, runner-up in the South Pacific section with her stylised moon garment 5 Maarama Crescent.

Fashion designer Kate Sylvester, a graduate of Wellington Polytechnic (which joined Massey in 1999) was one of three inductees into the College Hall of Fame last year.

Miss Sylvester was honoured along with Mark Pennington, from Formway Design in Petone and (posthumously) artist-printmaker Gordon Walters at the end of the *Blow08* festival, which showcased the college's work.

The Hall of Fame was established in 2007 to recognise past students and staff who have made an outstanding contribution to New Zealand's economy, reputation and national identity through art and design.

Breaking the cycle of violence

Dr Jackie Sanders

"We always seem to come back to this punitive approach, but there is no literature anywhere in the world that shock tactics do anything, except in the short term."

In mid 2008 – during an election year – Counties Manukau experienced a succession of horrific crimes. An elderly woman was murdered by an intruder in her home. A liquor store owner was shot dead during a robbery. A women died after being run down by the thieves who had stolen her purse. All of the perpetrators appear to have been young men.

The events brought a predictable public response: appeals for more police, longer sentences, getting tougher on crime, the creation of vigilante groups.

Social work researcher Dr Jackie Sander's response is at once to pause – as anyone would be, she is appalled – but also to put the question of how it is these young offenders came to be at this point in their lives.

Why, for example, do some young people associate in gangs? For reasons, she says, that have an internal logic for the person involved. "There's lots of really good stuff you get from being with your mates: they are really supportive of you; it's a really 'safe' environment for you – as safe as it possibly can be."

People, she says, do not function in isolation. They are deeply connected to social ecologies.

"There may be an internal logic to what they are doing. They are making the best adaptation they can make to their circumstances. They are doing [personally] healthful things. It is just that the consequences are appalling at times.

"We need to understand the resources available to them, why they make certain decisions, and think about how we redirect that – instead of saying 'everything you do is wrong'."

Dr Sanders also points out that events like these are the culmination of life experiences that began long before. She favours long-term responses. After all, at-risk 13-year-olds will realistically need strong support to get through the turmoil of adolescence and early adult life, and then, perhaps, further support up into their mid-twenties.

Short-term "shock" interventions, she says, are only ever likely to achieve short-term effects. Boot camps, for example, a constantly recurring suggestion for reforming the wayward, are of dubious value.

"We always seem to come back to this punitive approach, but there is no literature anywhere in the world that shock tactics do anything, except in the short term."

Perhaps the best time to begin intervening is during early childhood. Whatever their circumstances, Dr Sanders observes, most people want the best for their children.

One of the agencies she has worked with extensively is Te Aroha Noa Community Service in Palmerston North's decile-one suburb of Highbury. Te Aroha Noa, which began its life running playgroups for children and parents and providing counselling for families and whānau, now also offers such things as adult education, individual counselling and community-based social work.

But it is that kernel of early childhood education that has been crucial, says Dr Sanders. "A good way of bringing vulnerable people in – people who may not have had good experiences with education and may not trust agencies – is to say we can look after your children."

Hence the funding of 30 hours of early childhood education has been a boon, says Dr Sanders, though she expresses a concern that the current drive towards greater professionalism for childhood workers may have unintended consequences in stressed neighbourhoods.

"When you have a vulnerable population of parents and children, you don't necessarily want the parents to go away and leave their children in the care of other people; you want them to stay."

She applies the same argument to the 'Working for Families' package, which provides an in-work tax credit to families with dependent children.

In some instances, she says, it may be in society's best long-term interest to assist some full-time parents.

"It is better for us all, better for the parents and their children, if they are at home with their children being supported in caring for their children."

Dr Sanders worries that if something is not done, a strata of New Zealanders will end up locked in a multigenerational cycle of poverty. Anecdotally, the repercussions of the restructurings and redundancies of the late 1980s and the benefit cuts of 1991 continue into the present day. The adults whose material circumstances suffered so greatly had children who are now parents themselves. Social workers talk of having had dealings with each of the three generations.

What will happen to the young men who committed those terrible crimes in Manukau?

They will be punished with lengthy periods of imprisonment. And what then? asks Dr Sanders. "That's an issue we aren't brave enough to confront."

Fusion motion research may help skiers go faster

A revolutionary motion capture system that tells skiers how to race faster won Massey PhD researcher Matthew Brodie the Future Science and Technology honours at the MacDiarmid Young Scientists of the Year Awards.

A former speed skier, race coach and instructor as well as a graduate in engineering, Mr Brodie has pioneered a system which tracks the movements of a skier using a network of lightweight sensors strapped to the body. The fusion motion capture technology uses 15 motion sensors attached to the skier, producing data that can be used to adapt technique to enable the skier to go more quickly.

"I can now use the fusion motion capture I have developed to capture data on many sports."

"Before I started this I worked as a ski instructor and as a ski race coach and on ski patrol in Japan," Mr Brodie says. During that time I was exposed to different so-called ski methodologies – different views of how people should ski. But my previous training was as an engineer and when you look at the task of skiing down a slope it is governed by simple scientific equations, such as your change in height in relation to your final velocity. It seemed to me that these different ski methodologies were maybe more mythologies and didn't take into account the science behind the technique."

Measuring performance using traditional methods – multiple cameras placed around the ski run, around 40 cameras for just one kilometre – proved impractical due to the limited data capture and long set-up time. Massey University funded a new measurement system, but the software needed to process data was unable to cope with the rapid direction changes experienced while skiing.

"It was a big setback when I found that didn't work but every cloud now has a silver lining and I can now use the fusion motion capture I have developed to capture data on many sports – it's serendipity really."

The system uses inertia monitoring sensors attached to a skier's limbs, a GPS receiver in their helmet and pressure sensitive insoles in their ski boots. After data is transmitted to a central hub on the athlete's torso, data fusion algorithms are used to calculate their position on the slope and direction. A computer then converts the data into animations, allowing comparison between competitors and analysis of where speed gains were made. Although the system has been designed for skiing, it can be used in any sport, and with its flexibility will be suitable even for sports where longer distances or difficult terrain have made traditional camera-captured data impossible.

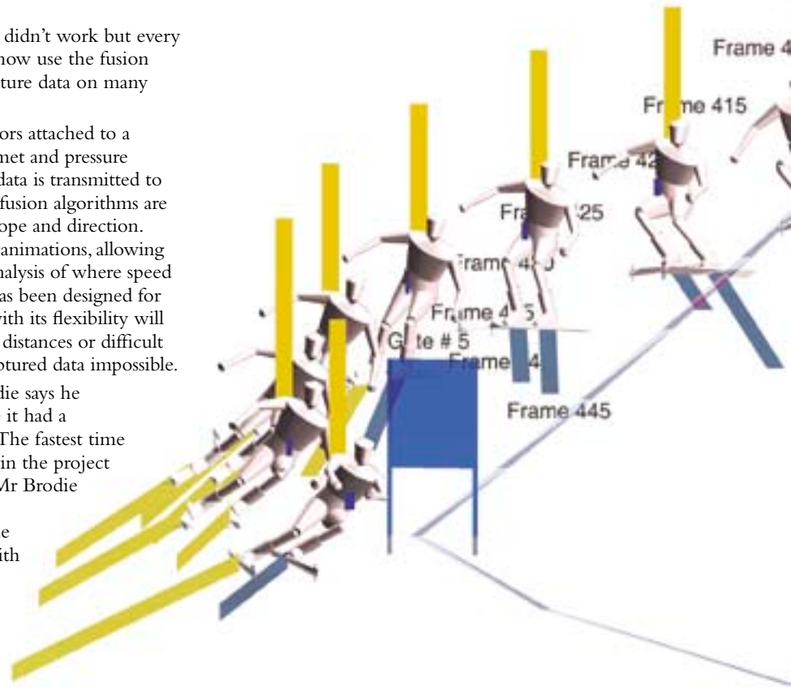
As well as his interest in skiing, Mr Brodie says he chose ski racing for his research because it had a straightforward performance measure. "The fastest time through the course is the best." Interest in the project is coming from around the world, and Mr Brodie has trialled his system on Mt Ruapehu with two members of the national alpine ski team and in Italy, in collaboration with Padova University and ski equipment manufacturer Nordica.

"Ultimately I can see many more applications," he says, " such as preventing falls in the elderly population, ergonomic equipment design, entertainment and even the design of transport systems to minimise energy consumption."

Mr Brodie, who is studying biomechanics based in Wellington, was also named runner-up for the overall MacDiarmid award.

Mr Brodie's work can be viewed at www.youtube.com/BrodieMAD

Matthew Brodie



Leader of the pick

Dr Rory Flemmer

Alistair Scarfe

A bulletin on Radio New Zealand's rural report made Garth Atkinson pause: The kiwifruit industry was going through one of its perennial crises of fruit ripening on the vines but growers unable to find pickers.

During the course of the 13-week season 100 million kiwifruit would be picked by hand.

In an age of automation the idea of picking by hand seemed an anachronism to Atkinson. Perhaps, he thought, Massey could do something about that. As a business development manager with the School of Engineering and Advanced Technology he had an idea about who to approach.

Dr Rory Flemmer, the expert in robotics to whom he took the problem, was more certain. With what he knew and the expertise available, an automated picker was definitely do-able.

In a industrial workshop on Massey's Manawatu campus the proof of Flemmer's assertion is taking shape. At a series of workstations postgraduate students have designing the specialised circuitry that will link the picker's servomotors to its central controller. In a forecourt, PhD student (and project managing director) Alistair Scarfe has fabricating the four articulated arms that will do the picking. Close by is the gleaming metal chassis with its oversize Tonka-toyish tyres on which the picker will manoeuvre.

In a matter of weeks the picker will despatch itself on its maiden voyage out into an orchard. Its instructions, says Flemmer, will be simple: go to a set of GPS coordinates; identify a row of vines; pick that row and successive rows; if your bin is full, go and change it; and when you have finished picking, come back and stop.

"The picker is completely autonomous," says Flemmer. "It will go out and follow thinking behaviour patterns."

The lineage of industrial robots goes back almost half a century to 1961 when Unimate, the first of its kind, unobtrusively entered service with General Motors. Unimate was first used as a pick-and-place robot to transfer hot metal parts from a die-casting machine. Six years later it was being used for spot welding, and in 1970 the carmaker opened an automated spot welding line of 28 robots.

In the early 1980s, when the Japanese became converts to the new technology, the field began to take off.

Since then the numbers of industrial robots has burgeoned. A survey published in 2004 estimated that at least 800,000 were in use within industry worldwide, 350,000 of them in Japan, close to 250,000 in Europe, and about 112,000 in North America.

In the automobile industries of Japan, Italy and Germany the ratio is one robot for every 10 production workers.

It is not unusual for an industrial robot to have a pay-back period of as little as one to two years.

"The modern economy is completely dependent on robotics," says Flemmer. Everything you purchase is made by robots. If it weren't made by a robot you couldn't own it – it would be too expensive. If you had a car that was made by hand it would cost you hundreds of thousands of dollars. And in fact it couldn't be made by hand. All of the electronic aspects are made by robots because the components are too small to see, never mind place and solder.

"We think [a product] is made in China by people; it's not, it's made in China by robots."

But those robots are largely in foreign factories. We don't see them.

But picture this then. You are driving through the green Bay of Plenty countryside when you see a far off movement among the vines.

Manoeuvring itself through the kiwifruit trellises at a measured walking pace, pausing when it needs to, is an extraordinary machine, its four grey powder-coated arms dancing from vine to bin and back. The only sound is the gentle pulse of a generator. Elsewhere another picker goes about its business.

Even from the distance of your car window, these machines seem to be behaving oddly. There is an apparent intelligence to their actions. Choices and decisions are being made.

The picker only pauses to return its bin to the orchard headland and collect another. The uncanniness of the sight becomes still stronger when, after a while, you may notice that the two pickers appear to be coordinating their picking paths.

And if you were to approach the machines, the detail of their actions would come in to focus. The pickers are choosing particular fruit: fruit that is neither over- nor under-ripe; fruit that falls in a given size range; fruit without blemish. Four kiwifruit a second are being placed in the bin. That's 14,000 kiwifruit-an-hour-per-machine, picked from the moment the dew dries on the vines until late into the night.

During spring these same machines carrying modified arms will be used to dispense puffs of pollen into the waiting flowers. And in the off season? The machines will be packed into containers and shipped to the kiwifruit orchards of Italy.

It is all a far cry from the traditional bucolic images of harvest time, of good-spirited communal labour. But then those times are long past anyway. Nowadays it is a struggle to find enough people to pick.

Then there is the problem of quality assurance: making sure the fruit is picked in optimum condition and carefully handled from then on. Like so much of the work for which robots are well suited (the word robot comes from the Czech word for drudgery), picking is highly repetitive, even tedious, work. Humans are notoriously intolerant of boredom; sometimes there are lapses of attention.

Why is a kiwifruit picker so late in arriving on the scene? Why, when there are tens of thousands of robots welding car components, are so few used in agriculture and horticulture?

Flemmer believes it has to do with one problem in particular – realising effective artificial vision.

Robots may have become smarter, faster, stronger, smaller, cheaper and more accurate, he says, "but you don't hire blind workers. Robots really need to see what they are doing." And artificial vision is complicated and demanding.

"The picker is completely autonomous," says Flemmer. "It will go out and follow thinking behaviour patterns."

Alistair Scarfe uses an arc welder on the forks that carry the picker's bin.

This is Massey's competitive advantage. Flemmer and his wife Claire understand artificial vision to a highly unusual degree, the result, he says, of a 20-year pedigree in building commercial industrial robots.

The kiwifruit picker employs a panoply of cameras: two are mounted looking forward and enable the picker to make its way around the orchard; two are mounted looking toward the rear "because sometimes it has to go find itself a kiwifruit bin, figure out its orientation and then drive in to pick it up with its forks", and there are "a number of cameras that look up at the canopy to see what is going on – and of course there has to be hand-eye coordination with the picking robots".

A particular technical problem is dealing with the extreme fish-eye effect of the very short focal length wide-angle lens the picker uses when identifying and picking fruit.

The short focal length allows the lens to take in a usefully wide span – around 120 degrees – but an uncorrected image looks like a reflection from a fun-house mirror. To locate objects such as fruit in three-dimensional space the picker must reconcile the information from two of these lenses and hence two of these highly distorted images in real time.

Solving this problem has been Claire Flemmer's particular interest. Flemmer says he and his wife have a balance of strengths: "She is more theoretical; I am more mechanical."

The kiwifruit picker has been carefully designed to avoid any risk to the people or animals that enter its operating space.

It can detect the movement of people or animals using infrared sensors and the picker will instantly stop if the soft bumper system running round the edge of the picker encounters an unexpected obstacle.

Then there is the conventional stop mechanism: the red button. The picker will have a number of strategically placed red buttons. You can even stop the picker by telling it to – the picker's control module allows for voice control.

Dr Rory Flemmer and Alistair Scarfe work on an early version of the robot. Flemmer says Scarfe's skill in mechanical design has raised the picker from utilitarian to a "work of art".

A packing robot developed using artificial vision was designed to sort and pack up to 400 trays of kiwifruit per hour, but the machine will first become operation in the apple industry this harvest.

Early recognition of top-performing business students leading to bigger successes

Fresh ideas including an innovative way to support high-flying business undergraduates have capped a ground-breaking year for Massey University's College of Business.

College Pro Vice-Chancellor Professor Lawrence Rose introduced the Dean's List to recognise the talent of top-performing undergraduates, raising their aspirations and helping recruiters target employees of the future.

Grant Dalton and Lawrence Rose

"It was fascinating to see many of these students appear later in the year as scholarship winners, leaders in business student groups and as high performing sportspeople," says Professor Rose.

Community engagement was a priority in 2008, with the college providing support to activities including the Young Enterprise Scheme, Global Enterprise Challenge, NZ Business Week and the National University Business Case Competition.

Other highlights of the year included:

- A scholarship launched in memory of the late Professor Brian Murphy, a widely respected educator in marketing, which is fundraising to support postgraduate research in the college.
- Grant Dalton, chief executive of Team New Zealand, who restored pride and passion into New Zealand sailing, was presented with the Massey University Services to New Zealand Sponsorship Award.
- Academic staff Dr Heather Kavan and Dr Hamish Anderson received Vice-Chancellor's Awards for teaching excellence, with Dr Anderson also receiving a national award for tertiary teaching.
- Professor Tony Vitalis received a Massey Research Medal for Supervision as well as being honoured by the New Zealand Ergonomics Society.
- Professor Anne de Bruin secured a Fulbright Scholarship to the United States.
- Researchers also secured significant external funding. Dr Ian Laird won funding for research into noise-induced hearing loss while Dr Steffen Lippert and Dr Simona Fabrizi secured support for work on venture capitalists and intellectual property. A team led by Associate Professors Frank Sligo and Margie Comrie won a Health Research Council of New Zealand (HRC) grant for research into health literacy and literacy training in apprenticeships.
- International appointments included Professor Claire Massey being re-elected to the board of the International Council for Small Business, Dr Craig Pritchard elected programme chair of the Critical Management Studies Interest Group of the Academy of Management and Professor Martin Young was appointed to the global curriculum advisory panel of the Financial Planning Standards Board, the first New Zealander to serve in this capacity.

Tony Vitalis

Claire Massey

"Given the efforts of all the people in the College of Business during 2008, I wholeheartedly believe 2009 will see even greater College success as we embark on the Road to 2020," Professor Rose says.

The Road to 2020 is Vice-Chancellor Steve Maharey's strategy to ensure Massey becomes New Zealand's defining university and a world centre of tertiary learning.

About the College of Business

- One of the largest business schools in New Zealand and a leading provider of training and research in business and management.
- Attracts students from throughout New Zealand and from 120 countries to the campuses at Albany, Manawatu and Wellington as well as distance learning.
- Academic staff recognised for their international qualifications and record of scholarship. And they are geared to help students take full advantage of the University's programmes, facilities and research capability.

Outstanding features include:

- Internationally-renowned research portfolios in areas such as work-related stress, small enterprise development, organisational safety and health; international trade and investment, technological change and technology transfer, tourism management, financial markets, market research, and business communications.
- Flexible and continuously expanding distance and block-course teaching programmes in a multi-campus environment, for working or location-bound students Professional and industry-oriented programmes in accounting; valuation and property studies; banking; aviation; and executive education (both MBA and postgraduate diploma courses).

Graduates of the College of Business at Massey University are known for their depth and breadth of knowledge, problem-solving skills and ability to think analytically and creatively. The College will strive to further increase its reputation for excellent and relevant research in business, management and related areas.

The vision of the College of Business is to continue to build on its proud foundation of over 25 years of academic and administrative excellence to propel Massey into the forefront of the leading business schools in the Asia-Pacific Region.

Massey University

Maori lullabies subject of PhD research

PhD student Amster Reedy recites a traditional oriori (lullaby) to his grandson Rikipapaki. The oriori is about the mythical origin of the kumara, composed in the 1600s by Enoka Te Pakaru of the Gisborne iwi, Te Aitanga a Mahaki, "Po! Po! E tangi ana Tama ki te kai mana" – "Po, Po (thought to be the shortened form of Potiki or last born). The boy, my son, he is crying for food."

Traditional Maori lullabies – oriori – are the subject of new PhD research to be written entirely in Maori by Wellington-based Amster Reedy.

Reedy says he aims to create a revival of Maori birth rites, rituals and practices. Oriori are recited at birth, during a child's upbringing or to observe the death of a child. "My goal is to reaffirm that Maori have comprehensive childrearing traditions, and that these practices are just as comprehensive and relevant as those of any other civilisation or society that exists or existed."

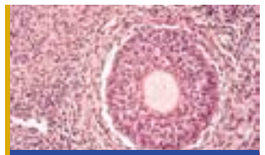
Reedy, 64, has worked as a consultant providing advice about Maori issues and leadership to a range of private and public sector organisations for almost 20 years.

Originally from Ruatoria, Reedy has a Bachelor of Arts (Hons), majoring in Maori from Victoria University. He returned to Ngata Memorial College to teach Maori and as principal.

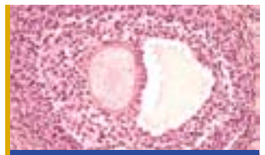
His research will focus mostly on oriori from his own iwi Ngati Porou.

Gelato the cream of the crop

Cappuchino stracchiatella gelato with ganache rib ripple scooped a gold at the New Zealand Ice-cream Awards, the true cappuchino style, authentic flavour and attractive appearance making it the top open creative entry. Creator Anthony Light produced the new gelato for his final-year Bachelor of Food Technology project.



The developing follicle as it begins to fill with fluid.



A follicle in the early stages of development, with the circular follicle and the egg, at the centre, surrounded by a thick red membrane.

As fluid builds up inside the follicle, the egg and the follicular cells can be seen to be pushed off to the left hand side.

Making babies

Gabe Redding

John Bronlund

Bioprocess engineer Gabe Redding has found an unexpected career in IVF research.

An honours degree in bioprocess engineering has taken Dr Gabe Redding in an unusual direction: fertility research.

As a PhD student, he mathematically modelled the human oocyte – aka the ova or egg – and its immediate environment. Now a postdoctoral fellow, he has spent time in France to digitise the world's largest collection of cross-sectioned slides of ovarian follicles.

His work at the interface between engineering and medical science may crucially affect decisions about how oocytes are cared for in the laboratory and about how embryos are selected for transfer – decisions with huge implications for the would-be parents who turn to IVF as their treatment of last resort.

"The health and reproductive success of the woman can in no way be threatened."

Do you know someone who is undergoing fertility treatment? If you do, you are not unusual. Infertility is a product of the times, as women have increasingly chosen to delay child bearing. In the early 1970s the most common age for child bearing was 20-24; today it is 30-34, and many women are bearing children – or trying to – in their late 30s and early 40s.

But biology conspires against the older intending mother. All else being normal, on average it takes three to four months for a 25-year-old woman to conceive, double that for a thirty-five-year old, and four times that – the average time to conception rising to 15 months – for a 39-year old.

As many as one in 15 couples have a fertility problem at some point in their reproductive life. But medical science has advanced apace, and there is now a range of medical interventions, from changes in life style and diet through to the procedure known as in vitro fertilisation – in vitro, literally 'in glass', being the counterpart of in vivo, 'in life'.

Typically in the course of in vitro fertilisation a regime of injections will be used to first stimulate the development of multiple follicles of the ovaries and then trigger ovulation. Harvested using a thin needle, the eggs are fertilised in the laboratory and one or more embryos are transferred back to the – with good fortune – mother-to-be.

Louise Brown, the first 'test tube' baby was born in Britain 1978. Five years later New Zealand had its own first IVF birth. In the succeeding decades the techniques have become more and more sophisticated. Every year hundreds of New Zealand babies are conceived and delivered as a result of IVF.

Massey's involvement with IVF research began with an approach to Associate Professor John Bronlund of the University's School of Engineering and Advanced Technology by Alan Hart of AgResearch, which had been funded by the New Zealand Foundation for Research, Science and Technology to develop sensors to measure the oxygen levels in the fluid of human ovarian follicles.

AgResearch had been chosen because of its long experience in IVF with farm animals, and Hart knew Bronlund as someone who could simplify any problem down to its basic engineering components.

Shortly afterwards Redding visited Bronlund's office enquiring about possible PhD projects. Bronlund said he might have just the project for him to consider.

That this was not a standard engineering project was something Redding soon came to understand. Bronlund and Hart suggested that the new boy should see something of the practical reality of IVF, which is how Redding, who is needle phobic ("I cringe when I see a needle on TV"), came to find himself an awkward spectator in the corner of a surgery in the presence of very long needle which was being used to take the eggs from a female patient.

Aspiration, as it is known, is an uncomfortable, sometimes painful procedure. "I was quite glad to get out of there and back to the laboratory," says Redding.

But the experience underlined the human reality of IVF. The commitment of couples to having children no matter what. The cycle after cycle of treatment many couples undertake, often at their own expense. The roller coaster of emotions: hope, despair and elation.

The ovarian follicle is the base unit of female reproduction: this is the structure that contains and nourishes the single egg or ovum. The follicular fluid, contained within the follicle, surrounds the ovum. This is the soup of sex steroids, glycoprotein hormones, plasma proteins, mucopolysacharides, enzymes and dissolved gases that provides the ovum with nourishment and guides its growth.

Understand the composition of the fluid and you should be able to better mimic conditions within the follicle inside the laboratory and, by measuring the composition of the fluid drawn from a follicle, make predictions about the health and viability of the egg.

But using physical methods is awkward. The health and reproductive success of the woman can in no way be threatened. Quite properly, there are rigorous ethical protocols that must be met.

However there is another approach – mathematical modelling – and this is what Redding, supervised by Bronlund and Hart (the ideal combination of creativity and rigour, Redding says) went on to do.

The egg and its follicle have a particular problem, says Redding. Unlike most body structures, they lack a network of capillaries to pump oxygen-bearing blood through their cells. Instead they must rely on passive diffusion of oxygen from the follicular fluid, and this imposes certain limitations, one of them being the size a follicle can reach.

In fact, says Redding, there is a stratagem that part-way allows the follicle to grow larger. "Think of a potato. Here is this big lump of cells without any capillaries for circulation, and because of this a potato can grow only so big and no bigger. Now think of a pumpkin. It too lacks capillaries, but it can get much bigger. Why? Because it has this big airspace in the middle."

In the same way, the follicle becomes a sac of cells, filling with fluid at its centre until the pressure ejects the egg into the fallopian tube in ovulation, an event so physically dramatic that many women actually feel it take place. The build up of fluid has always been seen as part of the mechanism of ovulation; Redding's mathematical modelling for his PhD has shown that physics holds sway as well: without the build up of liquid at the follicle's core the egg would be starved of oxygen.

Redding's work attracted wide interest and he won a postdoctoral fellowship worth $261,000 over three years from the Foundation for Research Science and Technology. He will develop models of the transport of glucose and the products of its breakdown, carbon dioxide and lactate, and of the key hormones in follicle development.

But this time he intends to include the detailed structure of the follicle within his modelling.

The virtual follicle – the first ever – will be constructed from data gathered during the visit to France, where Redding digitised one of the world's few collections of slides of cross-sectioned follicles, applying the same work ethic that sustained him through his PhD: often rising at 5am and working until exhaustion sets in. Once the model is complete, Redding intends to put it at the disposal of other researchers.

"If I am going to put in the effort, no one should have to repeat it."

Massey University

Commitment to athletes pays off

The support and flexibility offered to athletes at Massey University has seen it become the most successful sporting university in the country and last year its students made up more than 10 per cent of the New Zealand Olympic team in Beijing.

The team included the country's 1000th Olympian, rower Hamish Bond, who is completing a Bachelor of Business Studies extramurally at Massey from his Cambridge base.

Mr Bond was named the 2008 Manawatu campus sportsman of the year and was one of the 23 Massey students who represented New Zealand at the Beijing Olympics.

Fellow Olympian, cyclist Catherine Cheatley, was named Palmerston North sportswoman of the year, while in Auckland the supreme awards went to yachtsman Michael Bullot and Olympic rower Juliet Haigh.

Deputy Vice-Chancellor Professor Ian Warrington says the University is proud to support its sportspeople.

"2008 was an incredible year for Massey sport, with 23 of the 185 athletes representing the country at the Olympics this year having ties to the University," he says. "It's an achievement which could not be matched by other universities around the world."

Massey athletes also won 15 of the 50 New Zealand University Blues awards last year, a feat that Professor Warrington says is another indication that the University's commitment to sport is paying dividends.

"We have made a considerable commitment to sport, both at the Manawatu campus and in Albany and Wellington, enabling our students to compete at the top level and gain a tertiary qualification. It's particularly pleasing too that many of these students have been assisted by the Academy of Sport."

The University offers a large number of sports related study programmes in science, management and coaching but high performance co-ordinator Kelly Rofe says it supports athletes in whatever field they wish to study.

2008 Albany sportswoman of the year rower Juliet Haigh, Vice-Chancellor Steve Maharey and sportsman of the year yachstman Michael Bullot at last year's Massey Blues dinner.

"Being able to study extramurally is obviously a big plus for athletes whose training base may not be near a university campus," she says. "But the support we offer in terms of scholarships, the academy and mentoring is also invaluable, meaning athletes can succeed both in their sporting arena and the classroom."

This support allows each athlete to balance the commitments of their sport with their academic goals, she says.

Athletes from a wide variety of sporting codes are accepted into the academy each year.

The 2008 intake included Olympic shooter Rob Eastham, racing driver Ant Pedersen, barefoot waterskiers Ryan Goen and Kelly O'Donnell and world under-19 duathlon champion Struan Webb.

Last year the University also presented six of its athletes with inaugural Elite World Travel Awards.

The award provides assistance of up to $3000 to elite athletes representing New Zealand at international sporting events.

The awards went to Mike Dawson and Mark Yungnickel to attend the World University Canoe Slalom Championships, shooter Rob Eastham who attended the Beijing World Cup, Sam Gregory for the World Clay Target Shooting Championships, Khord Kopu for the World Inline Hockey Championships and triathlete Struan Webb.

Triathlete and Academy of Sport member Struan Webb.

Barefoot Waterskier and 2008 Academy of Sport members Ryan Groen.

Barefoot Waterskier and 2008 Academy of Sport member Kelly O'Donnell.

Contact Massey University Tel: 0800 MASSEY Fax: +64 6 350 5618
Web: www.massey.ac.nz Email: contact@massey.ac.nz TXT: 5222