

**EVOLUTION WHILE YOU WAIT**

What bacteria can teach us

**THE NEW BLACK**

The promise of biochar, part II

Massey

# defining *nz*

News from Massey University | Issue 16 | November 2010



## Unmasked

Design graduate Annabel Goslin

## All the food that's fit to print

Nutrition goes high-tech

# BLOW

[www.blowfestival.co.nz](http://www.blowfestival.co.nz)

Massey's festival of creative arts  
returns to the Capital  
*programme inside*



MASSEY UNIVERSITY  
TE KUNenga KI PŪREHUROA

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A meal that combines fresh produce with pre-packaged ease won the Massey University Supreme Award at this year's New Zealand Food Awards. The award was presented at a gala dinner at Auckland's Langham Hotel. The quinoa, mushroom and roast vegetable ready meal made by the Tasty Pot Company was chosen over more than 90 entries. The awards, in association with Massey University, identify the best food products, with categories from dairy products and convenience to food business.

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# FROM THE VICE-CHANCELLOR



“It’s not fair!” As any father or mother will tell you, this is one of the most irritating battle cries a child can adopt. Irritating partly because the come-back, “Life’s not fair”, doesn’t really work. At base, just like our children, we believe life should be fair. Similarly, we like to think that our society is fair in the sense of rewarding ability and endeavour, no matter where they may spring from.

So how fair is our society? Or put another way, how equal is New Zealand society? The answer, which may surprise you, is not very. In a recent book, *The Spirit Level: Why Equality is Better for Everyone*, authors Richard Wilkinson and Kate Pickett look at the ratio between the income received by the top 20 percent and the bottom 20 percent of 23 industrialised nations. New Zealand came in at number six – only Australia, the United Kingdom, Portugal, the United States and, at the top, Singapore, are more unequal. The top 20 percent of Kiwis earn around 6.5 times more than the bottom 20 percent. In Japan, Finland, Norway and Sweden, which top the equality league, the ratio is less than four times.

But why should relative incomes matter? It is when the authors start correlating their measure of inequality to other indices that things get interesting.

More unequal societies, they find, tend to have higher levels of drug use, mental illness, and health and social problems. Their inhabitants tend to live shorter lives. They tend to be more obese. Societal inequality, it turns out, can make you fat.

All of which may sound as if I am summoning you, torch in hand, to the barricades, but I am not. What I want to do is to make the case for open access to education, specifically tertiary education, as one of the key ways of ensuring that people experience their society as fair.

My generation, the baby boomers, lived through a time when education was being expanded. Huge numbers took advantage of this and rose to positions of wealth, prominence and power from relatively straitened circumstances via a tertiary education system that was relatively open and more or less free. The sons and daughters of farm and factory workers, of clerks and shop assistants, gained their degrees and joined the moneyed white collar classes.

When I went to university in 1972, having left school after gaining my School Certificate then returning to night school

some years later to get my University Entrance, I knew that I was enjoying a privilege that had been beyond the means of most of my parents’ generation.

Since then, of course, participation in tertiary education has grown enormously, although the ‘largely free’ aspect has passed into history.

But is it fair? Can an individual get a fair go despite coming from a disadvantaged background? The question has become more pressing as New Zealand has become more stratified and unequal. We know, for example, that Maori and Pasifika students and those from mid- and lower-decile schools are underrepresented in our tertiary education system. I am certain they are no less able than their peers.

The ever-increasing costs of education no doubt represent a barrier to many of these students. But access to loans helps keep the door open even though this means taking on debt. But now we see other barriers emerging.

It is current policy to strictly limit the places available at universities. Emphasis is being placed on under-25-year-olds (school leavers in practice) studying full-time and completing their first degrees. This seems reasonable until it is realised that more mature students who might want to take a different route toward gaining their qualifications are not the priority.

Mature students more often than not want to study part-time, take breaks from their studies, may never complete a qualification and may take a long time if they do. This pattern does not reflect a lack of ability. Rather it reflects the fact that mature students are juggling work and family responsibilities while they study. They are usually highly motivated and intelligent people – it is just that they have other things to do.

Since 1964 many of these part-time mature students have accessed tertiary education at a distance through Massey University.

Right now there are 17,000 of them. But one estimate suggests that in a 50-year period 250,000 New Zealanders have studied through Massey at a distance. The impact of this has been nothing less than a transformation. People who would have otherwise been denied tertiary education have got it. And it has been a quality

education because every effort has been made to ensure their experience has been no less than that of the students studying on campus. It has given people, regardless of their circumstances, a fair go at gaining a tertiary education.

This century there will be a higher proportion of the population wanting to study at a distance. We have an aging population that will need to gain and improve qualifications. But policies that limit places while focusing on school leavers studying full-time on a campus threaten the future of a vital part of the tertiary education system. Life-long learning will not be possible. A sense of belonging to an open and fair society that makes it possible for its citizens to improve themselves through education will be undermined.

Our society will be less fair and less equal. And that will be better for no one.

Steve Maharey,  
**Vice-Chancellor**



## Talking Points



“Some of the bright kids think, ‘Shall I stick with the hard stuff and have a grotty life or shall I go and explore my creative side?’, and remember, their parents have been encouraging them, saying, ‘You’re so creative darling’.

“Then they have the quarter-life crisis. ‘The education conveyor belt has dumped me,’ they say. They find there are no silverscreen jobs.”

[Professor Jacqueline Rowarth](#) talks to Jon Morgan about the underplayed merits of studying science and maths. *The Dominion Post*, September 2010



“We have really good weather here and really flat roads, so we have a lot of people wanting to cycle and they are put off by glass on the roads.”

[Hastings Mayor Lawrence Yule](#) explains the city’s adoption of a Glass Vac. The modified 110cc Honda was designed by fourth-year mechatronics student Kent Gearry (pictured here). *Manawatu Evening Standard*, September 2010



Work is to begin in early 2011 on a student amenities centre for the Albany campus. The \$15 million two-storey centre includes an enclosed plaza, a food hall, social and dining spaces, retail outlets, a health and counselling centre, and space for the students’ association and clubs. It is expected to be completed in February 2012.



Massey PhD student Emmanuelle Martinez, Anton van Helden, PhD student Sarah Gardner and Dr Karen Stockin prepare to post-mortem an hourglass dolphin in Massey’s new Albany-based Coastal-Marine Pathology Unit. The 1.7-metre, 78-kilogram male was found dead at Flea Bay near Akaroa. Dr Stockin knows of only one other case of an hourglass dolphin, a polar species, stranding in New Zealand in the past 150 years. She conjectures that the dolphin’s sense of direction may have been upset by Canterbury’s 7.1 magnitude earthquake.



## Cup half full

Economics lecturer Sam Richardson talks to Kathryn Farrow about the economics of the Rugby World Cup.

### Will the cup really generate \$507 million for the economy?

If you are trying to raise money, particularly public money, for a big event it helps to say that it will bring in ‘\$X’ million to the local economy. But these bandied-about figures rarely materialise, and even if the organisers sell all of the tickets to the matches, the cup is projected to run at a loss.

When I considered the effect on employment and GDP in local host economies of 11 major sporting events in New Zealand for my PhD, I found that only the 1997 Netball World Championship had had a significant positive impact during the event itself. In fact, big events with lots of visitors can crowd out regular tourism.

### What is the true figure likely to be?

Some United States economists have suggested that generally the real figures can be gained by moving the decimal point one place to the left. In which case, instead of \$507 million we would be talking \$50.7 million. I do believe that \$507 million is much too high.

### But I guess this isn't a purely economic decision, is it?

In New Zealand, sport is ingrained into the culture, and that matters. If New Zealanders and the rest of the world see the event as successful, the cup will be good for our long-term reputation in ways that are difficult to put a dollar value to. If the criteria for the Rugby World Cup were purely economic, the IRB wouldn't choose New Zealand; they would choose somewhere like Japan. This isn't a straight dollars-and-cents decision.

### Could this be the last time we host a Rugby World Cup?

It might be. The costs just keep growing. Joint hosting with Australia would be a possibility or hosting events such as the world championships. I don't think we are going to be able to host big events. Hand-on-heart, I do hope that the cup succeeds, but I also believe that increasingly scarce taxpayer funds should be allocated to events where the benefits clearly exceed their costs.

Māori Communications Manager Lana Simmons-Donaldson with trophies from the national Māori Language Awards. Massey was the joint winner of both the Māori Language Week category (with Inland Revenue) and the supreme award (with Raukawa Charitable Trust of Tokoroa). The awards recognised the success of the 2010 Ngā Kupu Ora Māori Book Awards and a Māori Language Week initiative encouraging café users to place their orders using te reo.



## Taking stock

The rollercoaster highs and lows of real-life stock market trading are all in a day's study for Massey postgraduate students Annie Zhang, Katie Brown, Rick Du, Jeremy Jukes and Iris Li. The five are the fund managers of the College of Business Student Investment Fund, with \$23,000 invested in the NZX50 and the ASX200 stock exchanges, across all sectors of the market. It is the only fund of its kind in New Zealand and one of only two in the Southern Hemisphere.

“It is fun and it gives you valuable experience of how to make money and awareness of the risks associated with it,” says Annie Zhang. “We are quite proud that lately we have outperformed the NZX50 benchmark.”

Before recommending a buy or sell, the team conducts an analysis and prepares a stock report, with former New York pension fund manager Associate Professor Russell Gregory-Allen giving the final yea or nay.

“It is one thing to teach in the classroom, but until people have to make decisions with real money they don't really learn,” says Pro Vice-Chancellor Professor Lawrence Rose, who seeded the fund 15 years ago.





Twenty-seven of the 37 Massey students who took part in the Commonwealth Games will return with medals from 14 events – a better haul than most participating countries. Pictured is Kayla Sharland of the silver-medal-winning Black Sticks.

Shadowlands, a garment created to evoke the world of fungi, has won College of Creative Arts (CoCA) student Luka Mues the Shell-sponsored student design category of the 2010 Montana World of Wearable Art Awards. Mues, alas, could not be there. He was in San Francisco attending the Academy of Art University on a \$2500 exchange scholarship funded by global telecommunications company AT&T. Another CoCA student, Loren Shields, was the category runner-up with Smouldering Energy, an entry taking its inspiration from a burning West-Coast underground coalmine. A third CoCA student, Renee Ingram, was a finalist.



Mark Sainsbury's own car, a 1963 Lincoln Continental, dates back to before talk of peak oil or anthropogenic climate change, so it was anyone's guess what the front person for TV1's Close Up would think of the latest addition to Massey's vehicle fleet: a very special Toyota Prius, one of a run of just 600. What makes this Prius different? It can be charged using normal household 240-volt power, and it can then travel up to 30 kilometres at 100 kilometres per hour on the stored charge alone, after which it will revert to the normal thrifty petrol-assisted mode of any other hybrid. Massey has leased two of the Priuses from Toyota as part of a three-year global field trial. A third is based at Toyota's National Customer Centre in Palmerston North. Sainsbury's thoughts? He was not at all forthcoming, but the segment closed with Sainsbury at the petrol pump, watching dials spinning towards the \$100-plus it takes to fill the Continental's tank.

### Cheating your gut instincts

An extract of a New Zealand tree fern could be the equivalent of 'stomach stapling in a can'. Professor Roger Lentle has been investigating the qualities of a highly branched polysaccharide gum derived from the trunk and fronds of the mamaku or black tree fern. It is strange stuff: try to stir it, and the harder you stir, the more it will resist; when it flows, it does so as a stretchy, dough-like mass. These two qualities – known as sheer thickening and extensional flow – baffle the digestive system.

"We know that contractions in the gut are caused by it feeling there is something in there and needing to push it on," says Lentle. "This extract seems to dupe the sensory nerves in the stomach so they signal that the stuff is flowing when it isn't and vice versa."

The result: when the gum reaches the lower part of the stomach it leads to feelings of satiety. It is a natural appetite suppressant. And while it isn't very digestible, once the stomach acids have had their way it passes harmlessly on through the gut.

A nourishing sweet carbohydrate porridge made from the pith of the mamaku is known to have been an occasional food for pre-European Māori.

Lentle is intrigued by the gum's possibilities, and would like to talk to anyone, particularly iwi, who may be interested in working with him or can tell him more about the traditional uses of mamaku and its products.



## Build a better enzyme...

Reduced to a computer file, the blueprints for a human being are surprisingly small. You can fit a human genome – the entirety of an individual's hereditary information – on to one-and-a-bit computer CDs.

And while filling those CDs has been expensive, the price is falling fast. For the original human genome, completed in 2003, the sequencing enterprise took 13 years and US\$2.7 billion. For the genome of James Watson (one of the co-discoverers of DNA), completed in 2007, the cost was US\$2 million, and today, for US\$45,000, you too can join the queue.

Gene sequencing is undergoing an industrial revolution. Gone are the labour-intensive days in the lab. The chore of reading the more than three billion base pairs that make up a genome has been delegated to banks of automated machinery.

How do you read DNA? One fundamental requirement is the ability to copy and paste strands of DNA, operations that are carried out by molecules called enzymes.

When Dr Wayne Patrick began work on Massey's Albany campus in 2007, the polymerase enzyme used to copy DNA had already been manipulated to improve its efficiency. Could he do something similar with the ligases, the enzymes that are used to stick chains of DNA together? Patrick decided to pursue the commercial opportunity, as much as anything to see what would happen.

In the past three years, Patrick and his team have succeeded in grafting an assortment of DNA-binding proteins to a promising ligase, and they now have several candidate molecules that should make DNA sequencing faster and cheaper.

His success has brought plaudits. This year Patrick, who has achieved the grand old age of 33, became the NZBio Young Biotechnologist of the Year, and was a finalist in the Science and Health category of the 2010 Bayer Innovators Awards. (Massey's Palmerston North-based Professor Simon Hall won the Research and Development category for his work on battery technologies.)

And his personal "experiment" – seeing if he could achieve a commercial winner – has succeeded too: the US-based company Enzymatics Inc, which specialises in the production of inexpensive, high purity enzymes, has signed a commercial agreement.

Part of Patrick's success can be laid at the feet of the Manawatu Bio Commerce Centre (BCC) – one of Massey's commercialisation partners. It was the BCC that insistently called major enzyme manufacturers in the US and elsewhere and brokered the eventual deal.

What now for Patrick? First he wants to publish his work, something he has deferred until now. Then he is interested in doing something with enzymes and bioremediation – using them to clean up polluted water or soil.

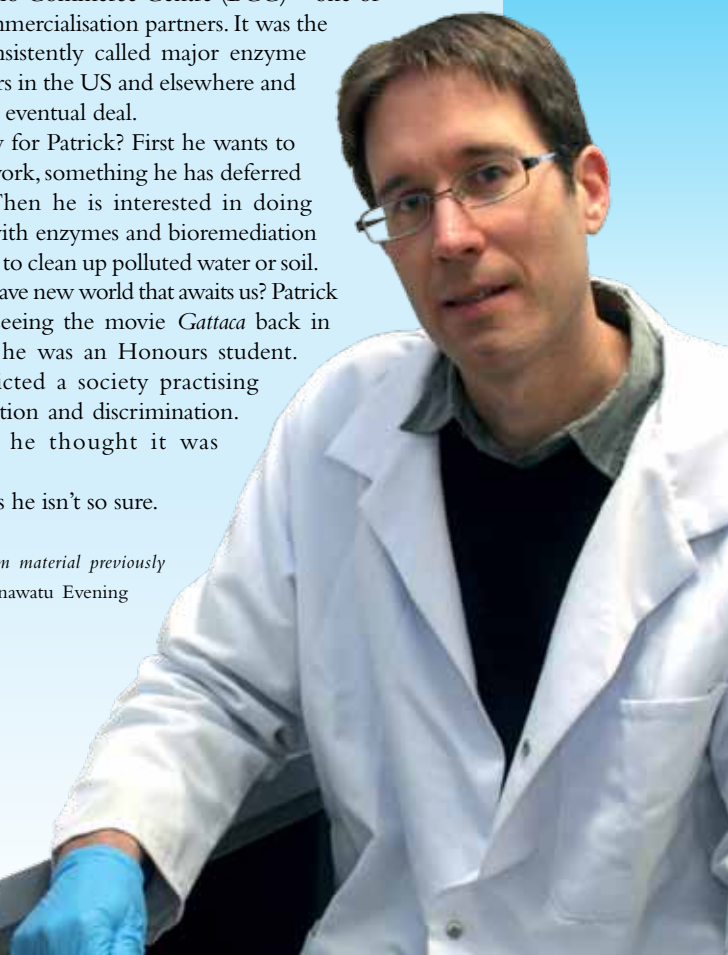
And the brave new world that awaits us? Patrick remembers seeing the movie *Gattaca* back in 1998 when he was an Honours student.

*Gattaca* depicted a society practising genetic selection and discrimination.

Back then, he thought it was ludicrous.

These days he isn't so sure.

*Abridged from material previously  
run in The Manawatu Evening  
Standard.*



## Charged up +



When Italian chemist Alessandro Volta built his first battery back in 1800, it was by stacking zinc and silver plates separated by layers of cloth soaked in brine. When he made his second, he used zinc again, replacing the silver with copper. Zinc seemed destined to be a mainstay of battery technology.

So why nickel-cadmium batteries, when zinc is cheaper and far less toxic than cadmium, or lead-acid batteries, when zinc offers far higher energy- and power-to-mass ratios?

The problem with zinc is that, as the battery discharges and recharges, long,

branching, destructive structures called dendrites form on the electrode.

Or that is how things used to be, until Massey's Professor Simon Hall and PhD student Michael Liu succeeded in finding a way to create a stable, long-lasting zinc electrode. Their work became the basis of the start-up company Anzode, of which Hall is Director.

Hall's work recently won him the 2010 Bayer Innovators Award for research and development. Hall also holds the 2008 Fonterra Prize for Industrial and Applied Chemistry and a 2005 Distinguished Patent Award from the US Energy Department.





Burial pole (kelideng) at Pelajau, about 64 kilometres upriver from the mouth of the Oya River and only accessible by boat. This burial pole, about 300 years old, marks the site of a once-significant but now abandoned Melanau settlement and longhouse. Pelajau is a place of importance in Melanau history on the Oya River and considered a sacred spot.

### Ann Appleton, anthropologist, Sarawak

I am one of three anthropologists working at Universiti Malaysia Sarawak's Institute of East Asian Studies in Sarawak in Borneo. I have been here since I graduated with my PhD in 2006.

The institute is a stopping-off point for many overseas academics engaged in Borneo-related research, from PhD students through to old hands who have been coming to Sarawak for decades. It is a fascinating working environment.

Mukah, where I began my Massey doctoral research back in 2000, is barely recognisable these days. The old river ferry has been replaced by a four-lane bridge; the jungle has given way to highways and housing estates, a new secondary school and a polytechnic, shops, restaurants and department stores. A ten-storey administration building dominates the skyline.

In the Melanau villages on the outskirts, change has been slower. Even so, much of the old culture, especially the rituals associated with the old animistic religion, is fast disappearing. Three of the *a-bayohs* (shamans) with whom I worked closely in

2000–2001 have since passed away and I only know of one still working actively in the Mukah area.

What is it like getting around in Sarawak? Getting to some places by road can still be hazardous. These days to get to Mukah I either try for a seat on a little Twin Otter plane or take the overnight bus, borrowing a car once there. Then there are the joys of river travel: sitting at the bottom of an open boat travelling downriver in torrential rain, trying to keep your camera, voice recorder and GPS dry, and knowing there will be no shelter until you get to your destination.

Recently I've been exploring the early history of Melanau settlements on the Oya and Balingian Rivers and how this has contributed to the identity of the various Melanau settlements in the present day. I've also just completed some in-depth research on former secondary burial practices and published a Melanau Mukah–English word list and phrase book – the sort of thing I longed for when I first arrived.

It's going to be hard to leave here, as I will one day, but Sarawak will always be a second home.





## Who was that masked woman?

*Paul Mulrooney talks to industrial designer Annabel Goslin.*

Weighing around 150 grams and travelling at speeds of up to 120 kilometres per hour, a field hockey ball is a fearsome projectile.

"I was in a tournament and I was participating in a penalty corner when the girl taking the shot undercut it right into my face," Annabel Goslin remembers.

The impact broke the seventh former's nose, fractured an eye socket, and temporarily blinded her.

Little wonder then that in 2009, when Goslin came to her final year as a design student at Massey's College of Creative Arts, her chosen project was a hockey face protector, appropriately named 'The Guardian'.

The Guardian – featuring a detachable sweat-lining and eyeholes positioned to allow greater peripheral vision – became iconic for that year's BLOW creative arts festival. Its super-heroish look was deliberate, according to Goslin. "I was just trying to push the

features of the human face, and I didn't want the mask to be too intimidating, so I looked at accentuating features like the hard jaw, the 'Superman jaw'."

Goslin's student work went on to win her two international Red Dot awards – one for The Guardian, the other for an all-purpose sports rain jacket – and a Zonta award sponsored by the eponymous global women's organisation.

These days Goslin, now 23 and a working industrial designer, is part of the team at Palmerston North-based Unlimited Realities, designing the software and user experience for touchscreen computers and tablets.

But she hasn't gone entirely virtual: she has a sideline doing contract work for hockey goalie equipment manufacturer OBO, which commands a remarkable 60 percent of its market worldwide.

One project is the design of a goalie's equipment bag: something large enough to

hold a helmet, leg guards and chest armour, able to be stood on one end, robust, and easy to manoeuvre. To go into production the bag needs to match OBO's tagline – be 'Good shit that really works'.

A prototype made to her specifications recently arrived from China. New Zealand Black Sticks goalie Kyle Pontifex put it through its paces, walking it up and down stairs, testing the durability and strength of the straps, and trying it out for size in the boot of his car.

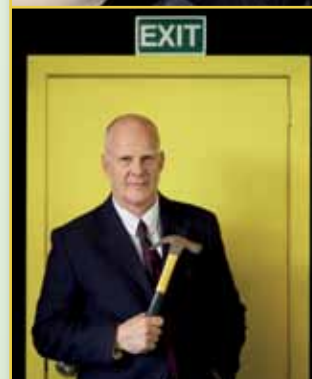
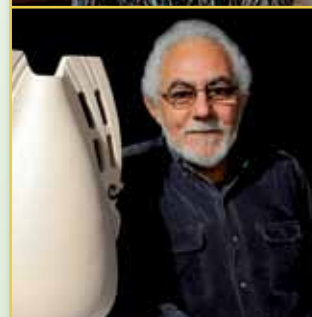
Pontifex's verdict on the bag: somewhat awkward, more work needed.

Goslin will now start the final round of design refinement.

"I think if you do get stuck, the best method around that is going out and talking to people who use it.

"My job is to listen to and observe the users' needs and wants, and to then create desirable and functional products for them – because [in reality] you don't design by yourself." ■

### Hallmarked



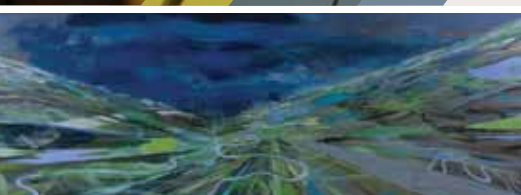
The newest members of the College of Creative Arts Hall of Fame are (from top) textile designer and artist Avis Higgs, Māori clayworker and artist Manos Nathan, and Fane Flaws, who has variously been a graphic designer, painter, songwriter, director of music videos, short films and commercials, and writer, illustrator and publisher of children's literature.



### EXPOSURE

An exhibition of  
graduating students' work

**Date:** 6-20 Nov  
**Times:** M-F, 9am-7pm, S/S, 10am-4pm  
**Location:** Massey University,  
Museum Building, Block 1  
and Block 2 (Entrances C and D)  
**Bookings:** School groups contact:  
StudentLiaisonWN@massey.ac.nz  
**Enquiries:** creativearts.events@massey.ac.nz



### Simmer Dim and Cut Copy

The Engine Room showcases two parallel exhibitions by US artist Shona Macdonald: *Simmer Dim*, and the second, featuring works on paper curated by the artist, *Cut Copy*.

**Date:** 10-20 Nov **Time:** Opening 5.30pm  
on 9 Nov, then Tue-Sat 12pm-4pm  
**Location:** Massey University, The Engine  
Room, Block 1

✈ International Guest



### An Engineer goes to the movies

Chris Chitty offers insights into the suspension of disbelief in movies, aided by a video of the construction and testing of CGI robots. Chris reflects on what we are really looking at on screen, and why we are so convinced by these illusions.

**Date:** 17 Nov **Time:** 6pm-8pm  
**Location:** Massey University, Museum Building,  
Theatrette 10A02



### Iwi Creativity

*Iwi Creativity* profiles and celebrates the work of Māori art and design students: a great opportunity for Whanau and the wider community to share in the achievements of Māori at Massey University.

**Dates:** 6-20 Nov  
**Times:** M-F, 8.30am-8pm, S/S 10am-8pm  
**Location:** Massey University, Pyramid  
**Enquiries:** j.r.hemera@massey.ac.nz



### Surplus and Creativity: Kinder, softer, sweeter

The *Surplus and Creativity Exhibition* reintroduces objects that are surplus or discarded and which have been reformed and recontextualised into objects of new value.

**Dates:** 15-26 Nov  
**Times:** M-F, 9am-4pm  
**Location:** DOC Conservation House,  
18-32 Manners St, Wellington



### Musicircus Music of the Future

Created by John Cage, the anarchic proposal of *Musicircus* means no centre, no hierarchy, no paying. More than 100 musicians playing together but separately – can sense be made from this chaos?

**Date:** 20 Nov **Time:** 6pm-8pm  
**Location:** Massey University, Museum Building,  
Great Hall



# WELLINGTON CAMPUS

PERFORMANCES · EXHIBITIONS · PUBLIC TALKS · FORUMS

## Unzipped

Massey Fashion  
Show 2010

**Dates:** 12 Nov 8pm, 13 Nov 3pm & 8pm  
**Location:** Great Hall, Massey University,  
Buckle St (Entrance D), Wellington  
**Cost:** Evening \$40, matinee  
\$21 waged, \$11 unwaged  
**Bookings:** [www.dashtickets.co.nz](http://www.dashtickets.co.nz)  
**Note:** Booking fee applies  
**Enquiries:** [creativearts.events@massey.ac.nz](mailto:creativearts.events@massey.ac.nz)

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## Blast:

Dissolving Design Disciplines

John Walters from UK's Eye magazine joins a selection of New Zealand design's 'unusual suspects' to explore the contemporary merging of design disciplines. *Blast* will appeal to designers and commentators looking for fresh perspectives on cross-disciplinary collaboration.

✈ International Guest

### Blast Off

*Blast* speakers give a retrospective of their design journeys – 20 slides x 20 seconds – followed by an interactive discussion led by chair John Walters.

**Date:** 11 Nov **Time:** 6pm  
**Location:** Massey University, Museum  
Building Theatre, 10A02  
**Bookings:** [g.vanmelle@massey.ac.nz](mailto:g.vanmelle@massey.ac.nz)

### Blast Talks

Designers share approaches to cross-disciplinary practice through a series of short presentations and audience involvement, culminating with a panel discussion chaired by John Walters.

**Date:** 12 Nov **Time:** 9am-5pm  
**Location:** Massey University,  
Museum Building, Theatre, 10A02  
**Cost:** \$80, concession \$20 (includes Breakfast)  
**Bookings:** [g.vanmelle@massey.ac.nz](mailto:g.vanmelle@massey.ac.nz)

### Blast Breakfast

Share breakfast with *Blast* guests at an iconic Wellington location and catch an interactive wrap-up of themes and angles raised over the past 48 hours.

**Date:** 13 Nov **Time:** 10am  
**Location:** TBA

## NZPQ10: Performance Design Laboratory and Workshop for PQ11

A series of open design laboratories, performative events and workshops presented by artists, designers and students representing NZ in the 2011 Prague Quadrennial of Performance Design and Space (PQ11). *NZPQ10* explores the active intersection between visual arts, theatre, architecture, film, and design practice, to expand our conception and scope of performance design. *NZPQ10* is staged within Massey's design studios and Wellington city itself.

**Dates:** 12-20 Nov

**Times:** 9am-7pm M-F, 10am-4pm S/S

**Location:** Massey University, Museum  
Building, Spatial Design Studio, 10B12

✈ International Guests

### Performative Practices

Leading New Zealand scholars, artists and designers explore performative practices that erode boundaries between performance, environment and event. Performances will be presented around Wellington, encouraging public participation.

### Ecology in Fifths: Development Season

Sam Trubridge

Unravelling the NZ myth of a clean green and natural landscape.

**Dates:** 10-21 Nov **Time:** 8pm  
**Cost:** \$35 / \$16 concession

### Hidden City Maps

Sarah Burrell, Jon Coddington  
and Andrew Simpson

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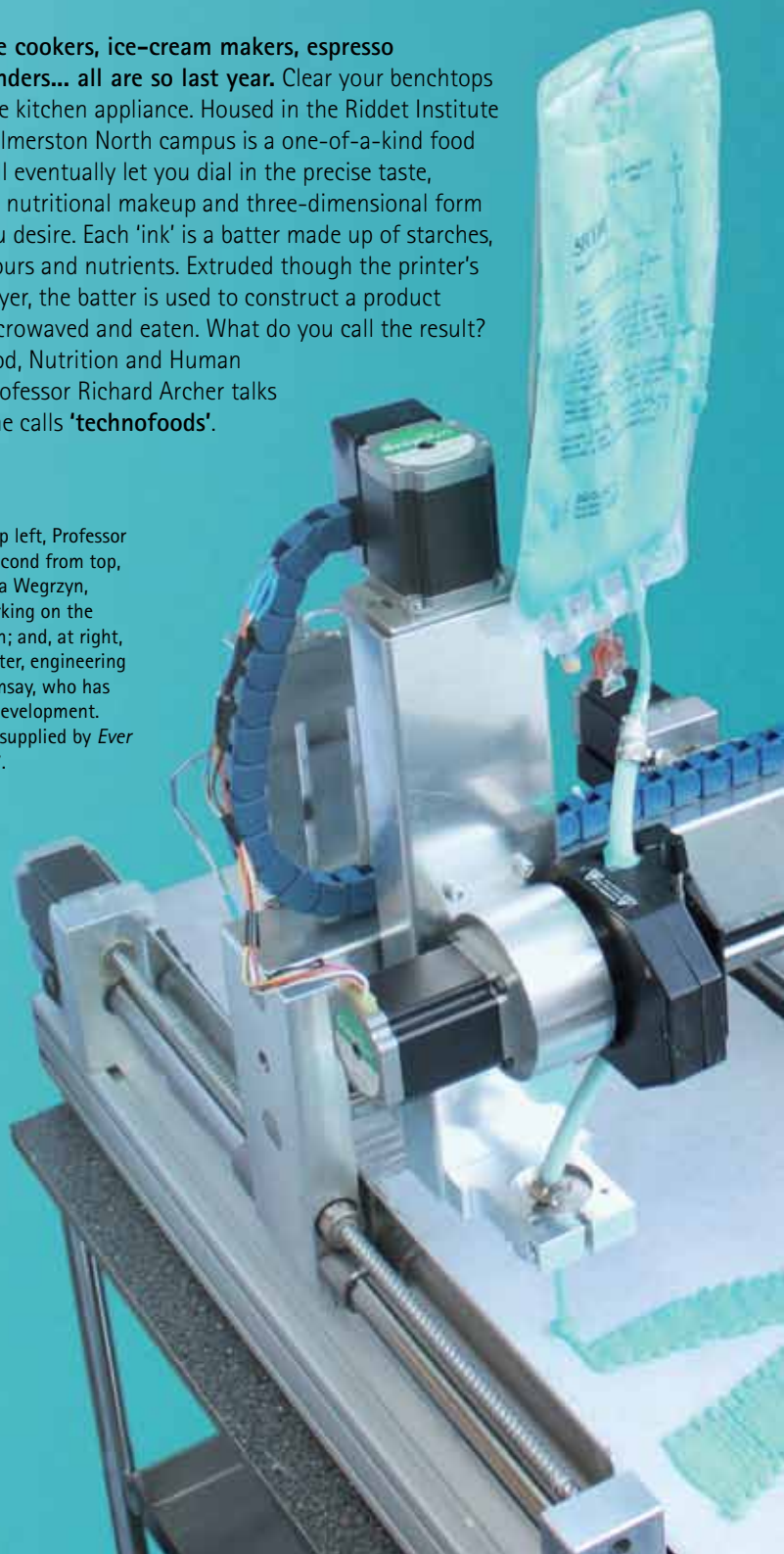
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## all the food

Crockpots, rice cookers, ice-cream makers, espresso machines, blenders... all are so last year. Clear your benchtops for the ultimate kitchen appliance. Housed in the Riddet Institute on Massey's Palmerston North campus is a one-of-a-kind food printer that will eventually let you dial in the precise taste, colour, texture, nutritional makeup and three-dimensional form of the food you desire. Each 'ink' is a batter made up of starches, colorants, flavours and nutrients. Extruded through the printer's jets, layer by layer, the batter is used to construct a product ready to be microwaved and eaten. What do you call the result? Institute of Food, Nutrition and Human Health head Professor Richard Archer talks of a category he calls **'technofoods'**.

Pictured are, at top left, Professor Richard Archer; second from top, PhD student Teresa Wegrzyn, who has been working on the batter composition; and, at right, alongside the printer, engineering student Grant Ramsay, who has led the software development. Video stills kindly supplied by *Ever Wondered? TVNZ7*.





# that's fit to print





## Enter the dragon

The resilience of China's economy may have been the one bright spot in the global financial crisis. But Professor of International Business **Usha Haley** counsels caution: not everything that is good for China is good for its trading partners. She talks to Malcolm Wood.

**F**or China, Marxism may have been just one of those phases you go through. Certainly it isn't the word Professor Usha Haley uses to describe it today.

"There is a continuity in the way the Chinese embrace technology, in the way they organise, and in the way they deal with people from outside China, from outside the middle kingdom. Their communist ideology is more akin to imperial Chinese than Marxist ideologies."

Haley, Massey's newest School of Business professor, is a long-time China watcher and analyst: her interest in emerging market economies, of which China is one, stretches back to 1992. China has made for good watching. From 1978, when Deng Xiaoping took power and the 'bird cage' economy was created – the bird being the free market, the cage being the central plan – it has been an economic phenomenon.

For three decades China's GDP has grown at the rate of around 10 percent year on year. In 2009 the value of China's exports overtook that of Germany, making it the world's largest exporter; in the second quarter of 2010 it overhauled Japan, becoming the world's second largest economy.

China has had advantages: cheap and compliant labour, state-supplied credit at low rates, inexpensive land.

Even so, within this pattern there are oddities. Consider the abrupt rise of China's steel industry, as Haley did when commissioned by the Alliance for American Manufacturing. In 2005 China was the fifth largest exporter of steel in the world; in 2006 it became the largest.

What had happened? It wasn't cheap labour or centralised and highly efficient industry. Haley looked closely at the Chinese steel industry and found it to be highly fragmented – and, if anything, becoming more so.

Instead, what stood out was the scale of Chinese subsidies. In 2007 these amounted to \$15.7 billion – money that went to support coal, coke, gas and electricity to keep the furnaces running. Indeed, according to her research, China's steel exports almost perfectly correlate with the level of the subsidies.

Similarly, in studies conducted for the Economic Policy Institute of the Chinese glass and glass products industry and the Chinese paper industry, she again found huge levels of subsidy: for the glass and glass products industry the 2004 to 2008 subsidies came to more than \$30.3 billion; for the paper industry from 2002 to 2009 the subsidies came to \$33.1 billion.

These subsidies are in addition to another subsidy-in-effect: the Chinese have held the value of their currency, the renminbi, at an

artificially low level. It should, critics say, be worth 25 to 40 percent more.

Who gains from this? The Chinese exporters and, for now at least, the world's consumers. Who loses? The industries and labour forces that are put at an unfair disadvantage – many of them US based.

No wonder then that in the US, where the current unemployment rate stands at 9.7 percent, the US-China trade deficit stood at US\$46.3 billion for August 2010 alone, and the talk is of a double-dip recession, that trade sanctions are being actively contemplated.

However, despite the cause being taken up by President Obama with China's Premier Wen Jiabao, Haley doubts the Chinese will allow the renminbi to appreciate markedly.

"It's not in the Chinese government's interests as it views it – although it increases the Chinese people's purchasing power. So the government will not devalue the yuan voluntarily. The Chinese make noises once in a while but do little, and I think the rest of the world has realised we have very little influence on China; we can only influence our own actions, and we don't have many options."

That the Chinese and US economies exist in a delicate balance restricts what either can do. The US is massively in debt to China. China cannot sell off its reserves of US currency without devaluing the currency and its reserves in the process.

But Europe has imposed protectionist measures, says Haley, and the US is likely to follow suit.

"This is not a free market we are operating in, so we shouldn't operate on free market assumptions."

Haley has testified several times before the US Congress about her research findings. In July 2010, 104 US senators and representatives wrote a bipartisan letter to President Obama recommending action on China trade. It drew on Haley's research into the paper industry.

So what of New Zealand? In 2008 New Zealand entered a free trade agreement with China and in 2010, as exports to the US declined, China became New Zealand's second largest trading partner after Australia, whose own economy was being fuelled by China's appetite for minerals.

Thus far, New Zealand's exports to China have been dominated by natural resources – products like milk powder, wool and logs.

Haley worries that New Zealand could prove naive in its dealings with its vastly larger and more powerful partner.

"How do I put this delicately? New Zealand should take a more strategic view."



China is in the business of picking winners and trying to own areas of endeavour that will move it up the value chain. Sometimes the tactics it has employed have included an element of bait-and-switch: a foreign business with valuable intellectual property is lured to China on the promise of cheap manufacturing only to find that the 'property' part of the formula is less fastidiously observed than in the West.

"The Chinese government is not interested in foreign investments in general manufacturing the way it was in the 1980s and 1990s. That is no longer a draw for China. The government would like foreign investments in clean tech, green tech, biotechnology, aviation – industries that it has anointed as strategically important."

Most of these are not areas of natural strength for New Zealand, but dairying, where New Zealand does have substantial intellectual property, is one area of national strategic interest where care needs to be taken.

"How do I put this delicately?  
New Zealand should take a  
more strategic view."

New Zealand should also be careful when it comes to the issue of land ownership. There should be national debate over the Chinese-backed bid for the Crafar farms.

"The Chinese are acting rationally by taking an opportunity that, I suspect, is being bankrolled by the China Construction Bank."

We need to remember, says Haley, that New Zealand's area of arable land is trifling compared with the acreages available in China – or the US for that matter – and that the New Zealand land and landscape embody other spiritual, emotional and national values too precious to alienate.

New Zealanders should also be aware that some of its areas of natural strength can be contested. "Take wood, for example. China subsidises its plantations so there will come a time, probably within the next five to seven years, when it doesn't need imported wood from New Zealand or the US.

"New Zealand should not be relegated to becoming an exporter of natural resources and agriculture when there is a chance to move up the value chain and export more sophisticated manufactured products."

In the longer term, Haley does not see China's growth continuing unchecked for many more years. China, she says, faces some fundamental problems, two of them rooted in the age profile of its population, which is becoming older – "China is going to be in the unenviable position of becoming an old country before it becomes a rich country" – and which, because of prejudice against female children, will have large numbers of unpartnered men.

Her faith in the resilience of the US is undimmed – "I think it will come back. The US is going through a period of readjustment and recovering from bad policies and intense global competition" – and she sings the virtues of a free society – a free press, free internet, free universities and free speech – as an engine of innovation.

"Currently, the Chinese are not the leaders in first-order cutting-edge technology, but rather in second-order applications. Money can buy innovation only to a point."

Interesting times lie ahead. "This is an extremely complex world. I tell my students, you have to be able to chew gum, whistle and walk at the same time." ■



Indian-born US citizen Professor Usha Haley's academic qualifications include a Master's degree from the University of Illinois at Urbana-Champaign in political science, and Master's and PhD degrees in international business and management from NYU's Stern School of Business.

Her research interests have included boycotts, divestitures and regulations, and the economics of developing markets.

*The Chinese Tao of Business: The Logic of Successful Business Strategy*, the 2004 book she co-authored with husband George T Haley (an industrial and international marketing professor) and Chin Tiong Tan, was a well reviewed best seller and remains an essential guide for anyone aspiring to do business there.

She has written for *The Christian Science Monitor* and *Newsweek* and been cited in *The New York Times*, *The Economist*, *CNN* and *The Wall Street Journal*.

Currently Professor Haley is working on research into the Chinese auto parts and green tech industries and is completing her seventh book, *Subsidies to Chinese Industry: State Capitalism, Business Strategy and Trade Policy*. The book, again to be co-authored with George T Haley, will appear under the imprint of Oxford University Press in February 2011.

Besides the US and India, she has lived and worked in Mexico, Singapore, Finland, Thailand, Vietnam, Italy and Australia.

# the play's the thing

What can society's future leaders and communities learn from theatre? Passionate about inspiring people through teaching and drama, and the recent recipient of the annual National Tertiary Teaching Award for 'sustained excellence', senior lecturer **Angie Farrow** at Massey's Palmerston North campus is an award-winning playwright who teaches creative processes, theatre, public speaking and leadership skills. She talks to **Mark Amery**.

**Given the array of means of socialising and being entertained online and on screen, why should theatre still matter?**

Jean Louis Barrault once described theatre as a "present art". He reckoned it was one of the few arenas that required both actor and audience to be in the moment. It is also about telling stories that can help us see ourselves more clearly. These stories can have a poetic value that often touches us spiritually. I think we live in a time of great distraction and this is not just to do with the way that technologies beguile us away from the moment of experience, but because many of us are caught up in the desire to achieve and consume. I strongly believe that theatre can bring us back to a sense of community.

Right now, I am working on the Manawatu Festival of New Arts. It involves around 60 people and it is sometimes exhilarating to be in the same place with all these people, all working for the same end, all feeling the excitement of anticipating the first night. I am sure there must be some kind of scientific reason why this kind of community experience is so arresting. Does a large group give off a particular chemistry when it is of one accord? I am not religious, but group singing can have the effect of making me want to sign up for a baptism! Like religion, theatre is about taking people into altered states. It is also about bringing them back to a place where they can meet and learn and grow.

I like to think of theatre as a place where people can experience a kind of collective dream. And because the experience of watching the play is always collective, it is somehow more intensive. Sometimes, it is as if the audience is saying, "Yes, we have all done this, we all know how this feels. We have more in common than we thought". I think theatre is one of the few areas left to us where we can have this shared and intense experience of congregation.

**In a time of increasing online learning tools, is this sense of congregation and community something you also see as important about universities having physical campuses?**

We have a terrific campus at Palmerston North. It is spacious, beautiful and, I think, very conducive to learning. One of the joys for me has been developing the on-campus summer school paper, Creative Processes. Students come in January when the weather is often balmy and there is often time to wander around the grounds or talk to fellow students. People often describe their experience of doing the course as life changing and I think that this is due, at least in part, to the electric atmosphere that is often generated when a lot of people with a similar purpose gather into one space. Extramural students often experience loneliness when studying at home and the campus course is a great way to offset the isolation of distance learning.

I am not against online learning. Indeed, I think it's a useful tool and especially helpful for the extramural student. However, I don't think we have to fall in love with it. I see many people in thrall of the computer because it is so tricky and clever and attractive and because it usually does what we tell it – and perhaps because it is another kind of consumption. In Britain, I know of some institutions that are buying into online learning wholesale because it is cheap to run and because it allows lecturers to focus on the more lucrative pursuits of research. All their lectures and learning materials have gone online and their campuses have largely been vacated by students. I am horrified by this idea. For me, nothing beats a face-to-face learning environment, where students are getting inspiration from each other and engaging in a living and breathing exchange of ideas.

Everything I teach relies on working relationships between participants in three-dimensional space. Theatre and public speaking are collective activities and everyone needs to be there in the flesh to make them work. Theatre online would be like reading the recipe book without ever sampling the food.

**How much have you learnt about teaching from theatre and playwriting?**

Theatre is an all-encompassing, whole-body thing and it has taught me a lot about the nature of teaching. When students have to learn through their bodies and hearts as well as their heads (as performers





In the moment when you become attached to the work, you have to be willing to let it go.

do), I find that the learning is richer and becomes more embedded somehow. I know from years of experience that some students can only learn fully when their bodies are engaged. Look for the fidgeters in any classroom and they will usually be your kinaesthetic learners. Many of us think that university teaching should be about paying attention primarily through cognition or mental reasoning, but I think there is a place for multiple pedagogies and theatre is a great place to learn about what these might be.

Knowing a bit about the craft of acting has also been helpful because I can apply it to my performance as a teacher. Like an actor, you have to be totally immersed in what you are doing, to know how to tell good stories, and to be tuned in to some kind of higher purpose. At the same time, teaching isn't 'acting' because to be any good, you have to be authentic and true to your spirit. You don't have the actor's mask that can often hide your true feelings.

My colleague, Thom Conroy, uses a phrase 'getting yourself out of the way' when he talks about the art of writing. I think it's true for teaching also. Somehow you have to get your ego and all distracting thoughts well away from you and let the work – the art – come through you. When I am teaching really well, I can lose myself. It is a kind of immersion that can lead to moments of inspiration and genuine flair.

#### **Does strong leadership also involve similar creative skills to those of the theatre director or artist?**

In the '80s I did a Master's in creative arts in education at Exeter University. The research seeded a deep fascination in me for the

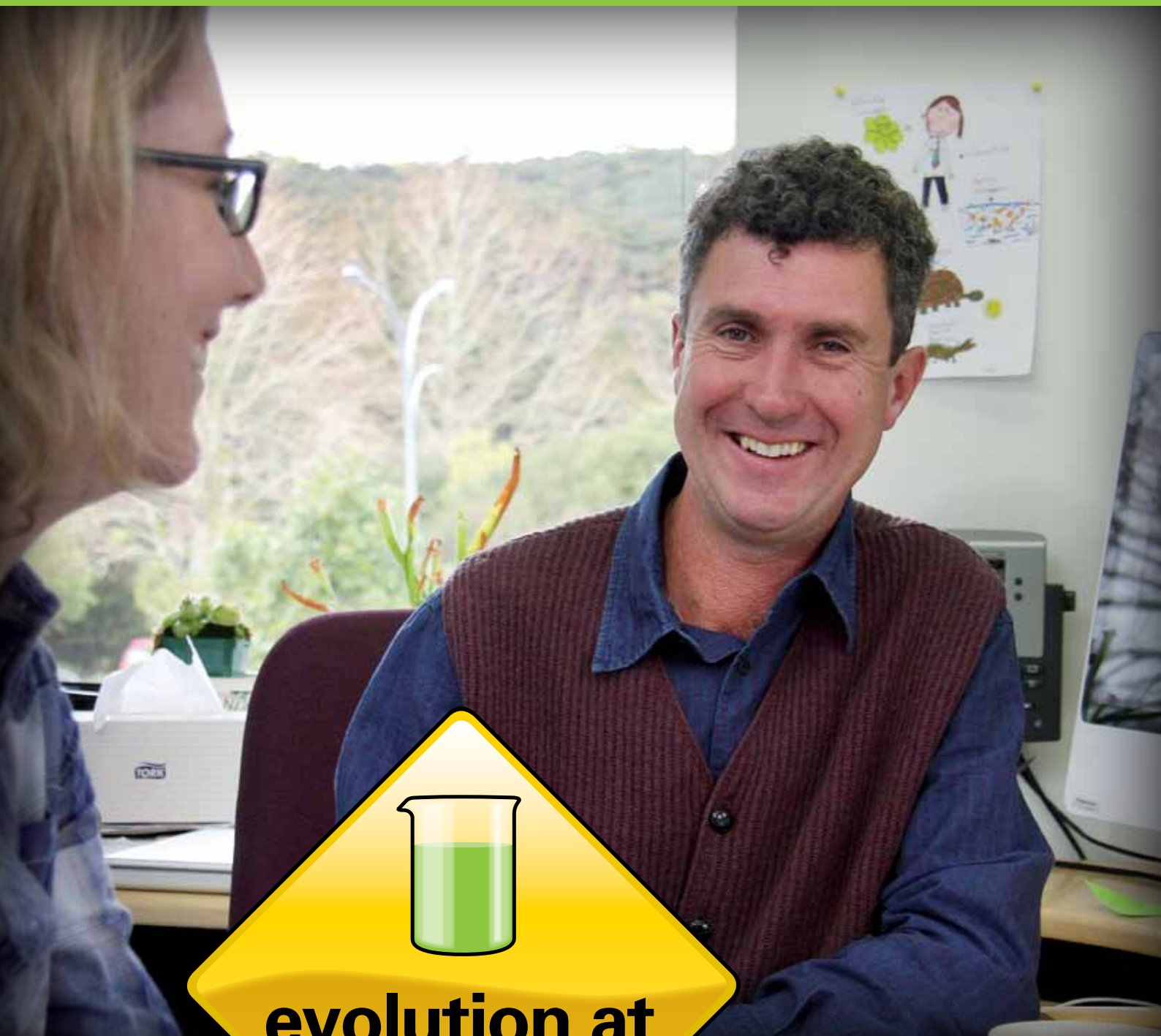
creative process. The principles of creative process can be applied to most human activities and not just the arts. I used to teach a course in creative leadership in which I employed a lot of the techniques that I would use as a theatre director. In order to get actors ready for a show, you often need to take them through a range of exercises that would enable them to be emotionally, spiritually and physically ready for the creative act. I have come to understand that those exercises can apply to just about all aspects of human endeavour, not just theatre.

Creative practice is often very paradoxical. You have to be prepared in order to be spontaneous. In the moment when you become attached to the work, you have to be willing to let it go. You cannot create with just your heart; the mind must be engaged also. You cannot achieve a sense of order in the work unless you have experienced chaos. In creative leadership, you need to let go of your power in order to be powerful. It is possible to teach these things and to give the students an understanding of how they can work with their own resistances and strengths in order to find a creative edge.

#### **How easy meanwhile is it to teach playwriting?**

There are a lot of skills involved, and most of these, such as building a character or shaping a narrative, are reasonably straightforward to teach. What is much more difficult I think is helping students to come up with original ideas. I often talk about 'inside out' writing. By this I mean writing that comes from some kind of inner impulse or unconscious voice. I encourage students to write 'automatically' without premeditation or conscious manipulation of the words. It is often by this means that writers find a unique take on a subject or character. I guess it is because their 'censoring' voice is suspended.

I also encourage writers to get some experience of acting and directing in order to learn the language of the stage. People who write a lot of short stories or novels often find the shift to playwriting quite difficult because they are used to their words being received by a single reader, often in a very private setting. But theatre is a public and collective activity and the theatre play is a blueprint for three-dimensional action. The playwright therefore needs to write with a strong sense of how the play will look, sound, feel and move in theatrical space. ■



### evolution at work

A few millilitres of nutrient broth, a bacterium and a few days: these are all the ingredients you need to watch evolution happening before your eyes.

Professor **Paul Rainey** talks to **Malcolm Wood** about experimental evolution, Oxford, and his hopes for the New Zealand Institute for Advanced Study.



If Professor Paul Rainey can't quite understand why some people would deny the simple and powerful truth of evolution, he has good reason. The reality of evolution is such that it is all he can do to hold it in check.

At the New Zealand Institute for Advanced Study, this means that reference cultures of the model bacterium *Pseudomonas fluorescens* SBW25 have to be held in a glycol antifreeze solution at minus 80 degrees Celsius.

Released from suspended animation into the warm, hospitable world, they begin to feed and multiply, their numbers doubling once every 45 minutes or so, and as they do, evolution takes hold.

To a bacterium, a splash of fresh nutrient broth at the bottom of a vial is an unsettled vastness; every millilitre can be home to 1000 million cells. It is also a surprisingly varied place. There is the substrate of the glass; the oxygen-rich realm where the liquid meets the air; the liquid between with its gradients of light, nutrient and suspended gas. In each niche some bacteria will do better than others, leaving more descendants.

Heritability, variation, selection pressure: the necessary conditions for evolution have been met.

After a few days the bacteria that have been taken from the test tube will be very different from those that went in.

Is evolution a reality? Just try to stop it.

Not that Rainey wants to. The frenetic pace of bacterial evolution allows him to develop and test theoretical models for scenarios that might take millennia to play out at the more leisurely rates of reproduction seen in higher organisms. Here he can observe the processes that have given rise to life as we know it, in all of its glorious strangeness and diversity.

Rainey did not set out to become this – a geneticist exploring the workings of evolution using microbial populations. He began his undergraduate studies in science aspiring to a degree in forestry, thinking this would embrace his interests in science, research, biology and plants. But forestry, he soon enough discovered, was more about production and forest management. He switched to a BSc in botany, finishing his degree in the regulation three years without being particularly stirred by the experience.

But then he had other interests. As an undergraduate, Rainey had supported himself as a semi-professional jazz saxophonist. Two days after sitting his final exams, Rainey (an aficionado of such greats as Sonny Rollins and John Coltrane) was in London, giving himself over to the London jazz scene.

What brought him back to New Zealand after a year was his girlfriend, and what led him to abandon his bohemian existence, he says, was placating the fears of her parents.

Eventually he took a temporary job with a wholesale outlet for a dairy company; it morphed into a permanent position. “And I remember it dawning on me that this was quite a respectable job that I could stay in for the rest of my life, and I thought, ‘Oh my God...I had better get out of here.’”

So he did, completing first a Master's and then a PhD with the Department of Plant and Microbial Sciences at the University of Canterbury.

This time he was there because he wanted to be and he “enjoyed it tremendously”.

For his PhD, he chose to look at the role of the bacterium *Pseudomonas putida* – *putida* deriving from the Latin for rot – in providing the stimulus that persuades the fungi *Agaricus bisporus* to produce its fruiting body, the common mushroom.

In turn, this led him to Cambridge University to take up an appointment as a postdoctoral research scientist in the then School of Botany, where this time he took *Pseudomonas tolaasii*, a bacterium that is no friend to the mushroom industry.

In fact, this is a bug many of us have unwittingly met. When the mushrooms at the back of the fridge become slimy and blotched, this is *P. tolaasii* at work; to commercial mushroom farming the condition is known as brown spot disease.

Rainey addressed the biochemistry and molecular genetics of the toxin tolaasin, a detergent-like molecule that enables the microbe to establish colonies on the mushroom's otherwise water-repellent surface.

His next appointment also dealt with a member of the *Pseudomonas* genus. The Institute of Virology and Environmental Microbiology in Oxford wanted someone to map the genome of *P. fluorescens*, a plant-growth-promoting bacterium.

“Those were the days when people were releasing recombinant organisms into the environment. The idea was that if we had a map of the genome the bacteria could be released and if the genome was changing through time we would see that.”

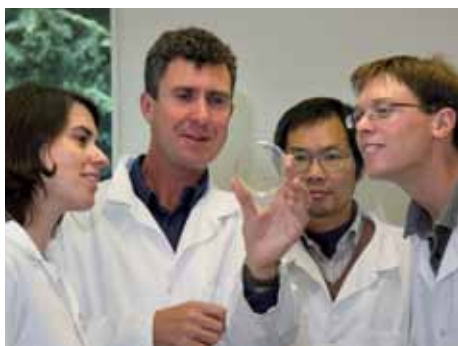
*Pseudomonas putida* at Canterbury; *Pseudomonas tolaasii* at Cambridge; *Pseudomonas fluorescens* at Oxford.

What is it about *Pseudomonas*? “*Pseudomonas* is an interesting genera of bugs. They are brilliant opportunists, extraordinarily versatile, exploiting every available niche in the terrestrial environment. In the marine environment the equivalent are the vibrios, the choleras.”

After a few days the bacteria that have been taken from the test tube will be very different from those that went in. Is evolution a reality? Just try to stop it.



Rainey's work until this point may sound quite narrowly focused, but in fact from the days of his Canterbury PhD, he was fascinated by bacterial ecology and evolution, an interest initially encouraged by evolutionary biologist Professor David Lloyd and members of Canterbury's postgraduate community.



From left: Sylke Nestmann, Professor Rainey, Dr Xue-Xian and Dr Jonathan Gauntlett.

It had not been just the association of *P. putida* with mushroom production that interested Rainey. "I saw these bacteria do very interesting things. If you left them in tubes without shaking, what would come out after a few days or so would no longer resemble what went in in the first place. It seemed quite magical at the time."

This other strand of research became explicit at Oxford's Institute of Virology and Environmental Microbiology, where Rainey had the mandate to explore *P. fluorescens*' population ecology and ecological divergence.

As a model organism for research, *P. fluorescens* has much to recommend it. It poses no risk to researchers and it is easy to identify. "The

wonderful thing about *P. fluorescens* is that it produces a fluorescent pigment, and it is very pretty, very easy to see."

The particular strain of *P. fluorescens* he used had been taken from a sugar beet, hence the first two letters of its acronym, SBW25.

At Oxford Rainey began the painstaking labour of mapping the *P. fluorescens* genome, slicing it into fragments – perhaps 130 in all – separating the fragments using electrophoresis, and then aligning overlapping sequences to arrive at the right order.

In 1994, as his work wound to a close, and backed by Professors Richard Moxon at the University of Oxford and Rich Lenski of Michigan State University, he applied to the Biotechnology and Biological Sciences Research Council (BBSRC) for an Advanced Research Fellowship to pursue research into bacterial ecology and evolution.

His success brought him five years of funding. He had no teaching obligations. He could go anywhere he liked in the UK to set up a research group.

But he and his wife liked Oxford. "I moved across the road to the Department of Plant Sciences."

For an academic, Oxford is an easy place to like, and for Rainey it would be the setting for a happy

## Fast forward

In the bacterial world, evolution works swiftly. For the work published in their influential 1998 paper in *Nature*, Rainey and Michael Travisano observed that in their cultures of *Pseudomonas fluorescens* raised in the undisturbed nutrient broth at the base of a glass vial, "extensive morphological diversification" was apparent after just three days.

These morphologies – the physical forms – appeared to fall into three main groups, to which Rainey and Travisano gave shorthand names on the basis of the appearance of the colonies formed on an agar culture.

From the surface of the broth came the 'wrinkly spreader' morph, matted together through the overproduction of a cellulose-based

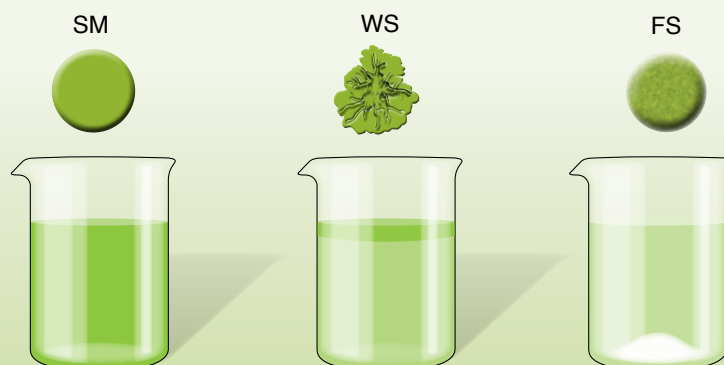
polymer; on the glass surface, the 'fuzzy spreader'; and in the liquid environment between the two, the 'smooth morph', which is closest to the ancestral form.

Rainey's work using *P. fluorescens* SBW25 has been used and elaborated on by researchers many times since. The three niche-specific genotypes – wrinkly spreaders, fuzzy spreaders and smooth morphs – are now part of the lexicon of the trade.

Yet, while the pattern is consistent, the genetic pathway, it seems, is not. Each time, the die is cast afresh.

This can be seen if samples of the same variant – perhaps wrinkly spreader – are taken from different cultures and subjected to the same selection pressures. Some will do well, some won't. Although they

Introduced into a beaker of sterile medium, *P. fluorescens* SBW25 swiftly diversifies to fit the niche environments available. After a few days in the undisturbed medium, a range of forms, or 'morphs', can be seen. These can be assigned to one of three principal morph classes – smooth morph (SM), wrinkly spreader (WS) and fuzzy spreader (FS). Each has a marked niche preference. The differences in form are clearly seen when colonies of the bacterium are grown on agar plates.





## Lessons from the laboratory

As the evolutionary scientist Stephen J Gould once wrote, “On any possible, reasonable or fair criterion, bacteria are – and always have been – the dominant forms of life on earth”. But because we are large, multicellular organisms ourselves, we are “accustomed to viewing phenomena of our scale – sizes measured in feet and ages in decades – as typical of nature”.

The disciplines of ecology and evolution began with multicellular organisms and that legacy is still with us, says Rainey.

“Someone wanting to do ecology and evolution would probably do zoology and plant science; they probably wouldn’t do microbiology. And someone doing microbiology is unlikely to do any ecology or evolution.”

This is unfortunate. Particularly so because microbes and viruses reproduce at such speed and so prolifically that they can out-evolve our measures against them.

In the past half century humankind has in effect been conducting a large-scale, uncontrolled experiment in drug resistance.

A legion of bacteria, including strains of *Mycobacterium tuberculosis*, *staphylococci* and *salmonella*, now exhibit multiple drug resistance.

How does this come about? In part because those administering the drugs – who are choosing the treatment intervals, dosages and drug combinations – are failing to take evolution into account.

*Pseudomonas aeruginosa*, an opportunistic pathogen in cystic fibrosis sufferers, is treated using antibiotics. Yet at one gathering of physicians Rainey was dismayed to discover that every physician had their rule-of-thumb, no two the same – surely a disaster in the making.

Similarly, in the treatment of tumours – the body’s own cells gone rogue – the principles of evolution also apply. Every time an antitumour drug is given, a selection pressure is brought to bear and a de facto experiment in ecology and evolution is carried out.

“One of the worst things that can happen is an adaptive radiation within a tumour,” says Rainey.

In ecological terms, the administration of an antitumour drug can be seen as a disturbance event: it disrupts ecosystem productivity and influences diversity.

One inference to be made from theory is that in the case of an antitumour drug regime the drug should be administered either very frequently or very infrequently; it is in the middle ground that the greatest risks of drug resistance lie.

look the same, they have followed different genetic routes, conferring different levels of fitness.

The changes can also now be tabulated by comparing the new genotype with the ancestral form.

Rainey is now using *P. fluorescens* to address two of the last great problems in evolution: the origins of multicellularity, and the extent to which evolution is predictable.

In the course of life’s four-billion-year history on this planet there have been a number of events known as the major evolutionary transitions. The leap from single cells to multicellularity is one of these – and the evidence is that this particular transition has happened not once, but a number of times.

But how so? Multicellularity, when seen from the standpoint of the individual single cell, is an odd deal to make.

Take Rainey’s raft-like mats of wrinkly spreader cells. By overproducing cellulose at the cost of a small metabolic penalty, they are able to stake out that enviable oxygen-rich territory at the water surface.

But better still from the evolutionary standpoint of the individual cell would be to freeloader – hang out with the wrinkly spreaders, reaping the benefits of their oxygen-rich environment, without paying the price.

In the event, this is exactly what happens. The freeloaders proliferate, out-competing their apparently more public-spirited neighbours, and sooner or later the mat sinks beneath their weight.

In a true multicellular organism the individual cells have made the supreme sacrifice, giving up capacity for autonomous replication. But how does one get there?

As Rainey has put it, “Mats must evolve to leave mat offspring, but mats cannot evolve to do this because they lack Darwinian individuality – the element essential for the evolution of group-level traits, such as mat offspring. They lack the thing they need to evolve the thing they lack. Of course this is a nonsense.”

His solution lies partly in a reconceptualisation of what is going on. Think of the mat as the multicellular vegetative stage and the cheat as the single-cell reproductive stage and you are partway towards a multicellular organism.

The remaining requirements? One would be that the switch between two forms is genetically programmed rather than reliant on one or other mutation.

Can such a shift occur naturally within the laboratory environment? Rainey thinks so. “It sounds fanciful, but it’s not impossible.”

The extent to which evolution is predictable is his other major interest. By predictable, he does not mean deterministic: the definition of evolution he is fondest of quoting – Richard Dawkins’ “the non random survival of randomly selected mutations” – precludes this.

However, it may be that at the molecular level evolution is being played with weighted dice.

“It is possible that natural selection has favoured certain – I will use the jargon term – ‘genetic architectures’, architectures that have evolved by natural selection, because let’s say they facilitate subsequent evolutionary change. Evolution may have favoured organisms that are evolvable.”



## The secret life of sea slugs

In mid 2009, dogs began falling sick after visits to Auckland's beaches. They vomited and lost all co-ordination. Six died. At first the thought was that a dog poisoner was at large; then, as dead penguins and other wildlife began washing up, algae was fingered as a likely culprit.

Only after Nelson's Cawthron Institute sent a staff member to Auckland to collect samples was the mystery solved. Washed up on shore were numbers of dead sea slugs – grey side-gilled sea slugs, *Pleurobranchaea maculata* – and, though tiny, these were soon shown to be highly toxic, containing concentrations of tetrodotoxin, a poison more normally associated with puffer fish and the blue-ringed octopus.

Knowing the culprit raised more questions: why had no-one ever noticed that the sea slugs were toxic? Were the sea slugs producing the toxin themselves or accumulating it in their diet, perhaps from a micro-organism? Had their toxicity been changing? Were there more of them?

Intriguingly, while some museum specimens dating back 30 years have been found to carry tetrodotoxin, some present-day slugs are tetrodotoxin free.

One part of this puzzle has become Professor Rainey's territory. Working with the Auckland Regional Council and the Cawthron Institute in Nelson in a three-year \$250,000 research project, he and his colleagues will establish genetic similarities between the various sea slug populations in the Hauraki Gulf and other New Zealand coastal waters and compare their toxicity.

His interest is the population ecology, in migrations and mutations.

and highly productive decade. It was while here that he and Michael Travisano published the 1998 paper in *Nature* that established *P. fluorescens* and their typology of evolutionary variant as a way of exploring evolution in the laboratory.

In 1997, while still holding his BBSRC fellowship, Rainey was appointed a stipendiary lecturer at Wadham College, founded in 1610, and a fellow of the all-graduate St Cross College, founded in the 1960s.

The appointments gave him entry to another world. With the Wadham College appointment in particular, Rainey could avail himself of all of the privileges afforded an Oxford don, many centred on the pleasures of the table.

"There would be sherry in the common room, several courses at the high table, then a move to the dessert room." Rainey took on the onerous duties of running the college's wine cellar.

From a certain standpoint, it all sounds very antique, very mockably *Brideshead Revisited*. Yet Oxford's institutions make it what it is. Rainey remembers guest nights during which he might meet anyone "from the rear admiral to politicians to scholars from all over the world". The colleges were like extended families, and extraordinarily hospitable to their own. It attracts and holds extraordinary people: Rainey remembers the likes of Richard Dawkins (whom he remembers as quite shy), Bill Hamilton, "the greatest evolutionary theorist since Darwin", and Bob May, Chief Scientific Adviser to Tony Blair and past President of the Royal Society.

And in a world of corporatism, where administrators and politicians increasingly held sway over tertiary education, Oxford (along with Cambridge) remained an independent redoubt,

run by the Congregation, Oxford's parliament of professors, tutors, fellows and administrators.

It is a formula that is envied and resented. Oxford and its institutions are at one and the same time seen as bastions of entrenched privilege and as, in many ways, an embodiment of academic excellence and societal engagement. Rainey's memory is of a "wonderfully privileged, highly stimulating, difficult-to-defend way of life. Anyone who has ever experienced it would hate to see it go".

So why return to New Zealand? When Rainey first moved to Britain it was with the intention of returning after a few years to take up a lecturer's position. But in the early 1990s the competition for positions in New Zealand was surprisingly fierce, and after a time Rainey came to be increasingly reconciled to being where he was. His career advanced at a satisfying pace; he and his wife had a daughter; they bought their second house; Oxford and the British system offered him a degree of support that would be difficult to match.

But family connections – his own and his wife's – prevailed. When the Chair of Ecology and Evolution fell vacant at the University of Auckland Rainey was equivocal. "Oxford was a hard place to leave." But his wife's reaction was definite. "I mentioned it to Katrina and her eyes lit up."

Rainey took up the chair in 2003 (Oxford also appointed him International Professor of Biology and Visiting Professor, Wadham College, in that same year), but he was never truly comfortable with the culture of his new employer, and when Professor Gaven Martin approached him about the possibility of a chair in the New Zealand Institute for Advanced Study, he was receptive.

He took up the position in 2007.

## The New Zealand Institute for Advanced Study



**Distinguished Professor Gaven Martin**  
FRSNZ  
Research Interest: Mathematics



**Professor Paul Rainey** FRSNZ  
Research Interests:  
Ecology and Evolution



**Professor Peter Schwerdtfeger** FRSNZ  
Research Interests:  
Theoretical Chemistry and Physics

The New Zealand Institute for Advanced Study aspires to be one of the world's leading centres for theoretical research and intellectual inquiry in the sciences. It exists to encourage and support fundamental scholarship – the original, often speculative thinking that produces advances in knowledge – and is characterised by interdisciplinary clusters of elite scholars with the ambition and capability to lead New Zealand's cultivation and generation of knowledge.



What has it won him? Rainey sips a cup of espresso-strength plunger coffee; blackbirds are singing outside the window.

Through the door of his office I can see two postgraduate students in the alcove-like room across the hall, leaning in towards their computer monitors, conversing intently.

That is one of the prices of success. The New Zealand Institute for Advanced Study, launched in 2007, is outgrowing its premises. "We are chock-a-block."

He seems generally happy. He is building a yacht at home. His saxophone has fallen by the way – "which is a bit of a shame" – and he has returned to the piano; he favours Bach's partitas, preludes and fugues, "and I go through stages of getting quite good on some," he says wistfully.

He talks about the trip he is about to make to Monterey – Steinbeck country – to teach at a summer microbiology school (a boot camp for postgraduates) at Stanford, where he is Visiting Professor. He talks about a trip to Norway, where he delivered a lecture as part of the Darwin year celebrations and met Elizabeth Hambro, Charles Darwin's great granddaughter; a professor he met while there is keen to spend a sabbatical year with the institute. He has no shortage of talented postgraduates wanting to work with him – one of the two postdoctoral researchers I can see in the room opposite is a mathematician newly arrived from the States.

Massey, says Rainey, "has a nice touch". "The research team here is fantastic. It's a great culture, a great environment. I just hope we can grow it."

Up until quite recent times it was regarded as *de rigueur* that any bright postgraduate would want to head off to the big-name universities in Britain or the US – the OxforDs, Cambridges, Stanfords and Harvards – where the serious thinking took place.

The best New Zealand-based researchers could hope for was to ride along on the coat-tails of others. "[We think] we're a small country, we don't have a lot of money, we'll just pick the cherries of the things that are done 'out there'."

It's a mentality that the normally temperate Rainey strenuously contests. The New Zealand Institute for Advanced Study is an initiative that shows that extraordinary work can happen where there is the will.

"We don't think we can do it here? That's bullshit!" ■

*Postscript: In October 2010, Professor Paul Rainey was awarded a two-year James Cook Research Fellowship, worth \$126,000 a year.*

This article first appeared in the magazine *Massey Research*.

## MARSDEN FUNDING 2010

- Eleven Massey University research projects, one of them led by Professor Paul Rainey, have received Marsden funding totalling \$7.8 million in the 2010 funding round. The Marsden Fund supports projects in sciences, technology, engineering, mathematics, social sciences and humanities. It is administered by the Royal Society of New Zealand on behalf of the government.
- Two awards are for fast-start projects and nine are for standard projects over the next three years. A project led by Distinguished Professor Gaven Martin has been extended for another two years, with new funding of \$600,000.

Dr Andrew Sutherland-Smith, *Stretching protein springs: How do cells respond to force?*, \$870,000

Professor Barry Scott, *Symbiotic synchrony: metabolic co-regulation in a plant-fungal symbiosis*, \$900,000

Dr Austen Ganley, *A spanner in the works: role of the ribosomal DNA repeats in chromosome missegregation*, \$860,000

Dr Justin O'Sullivan, *Moving genes in genome structure and memory*, \$845,000

Professor Marti Anderson, *New robust solutions to the multivariate Behrens-Fisher problem*, \$530,341

Professor Paul Rainey, *Unravelling the principles of genetic evolution*, \$870,000

Professor David Penny, *From genomics to properties of the last Eukaryote common ancestor*, \$785,728

Dr Steven Matthews, *Oxides on the inside: A step change in high temperature oxidation resistant materials technology*, \$300,000

Dr Shane Telfer, *Creating nothing out of something: A route to ultraporous metal-organic frameworks*, \$780,000

Dr Nigel Parsons – *Race, place and biopolitics: Zionism, Palestine and population management in the 21st century*, \$256,000

Associate Professor Karen Witten (pictured below), *Multi storey living with kids in mind: Constraints and opportunities for children's mobility and development in the context of competing discourses of safety and independence*, \$805,000



# the new black

Malcolm Wood talks to Professor Jim Jones

*In the first instalment of 'the new black' we met Associate Professor Marta Camps and found out about biochar as a means of storing carbon in the soil and tackling climate change. In this second instalment we meet Professor Jim Jones and the fledgling science of biochar production.*

What you notice first is the smell: the penetrating, all-pervading aroma of smoke, not pungent, but a sweet high note. In the engineering block on the Wellington campus, Professor Jim Jones and Mickey Burlace are making charcoal, dancing attendance on a

contraption that looks like an elongated hot water cylinder. Inside the cylinder pine chips have been heated to high temperatures by a mix of self-combustion and the heat from a gas burner at the cylinder's base. But there is not much to see – just the lines representing temperatures spidering up a graph on a laptop computer and the gauzy-white smoke issuing from a chimney tube and disappearing into an industrial fume hood. The well insulated double-walled cylinder is no more than uncomfortably warm to the touch.

Jones and Burlace have been running the pyrolyser since 9.30 in the morning; it is now 4.30 in the afternoon. It is the first time they have run the pyrolyser, and it has been one of those learning experiences. The fan pumping in air has burned out. The seal where the temperature sensors enter

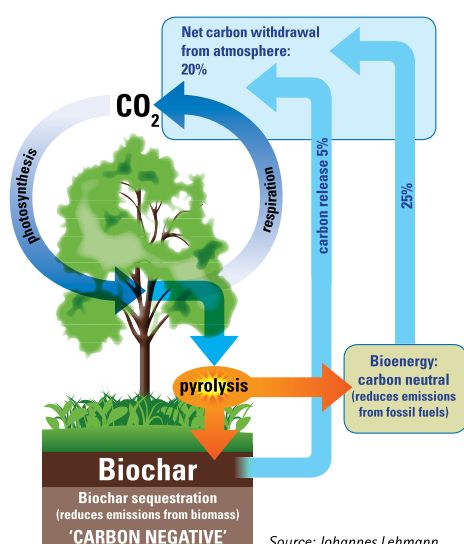
the cylinder needs to be better caulked. The initial temperatures have been lower than predicted. Flushing air in from the top of the cylinder should, according to Jones' thinking, have led to a combustion front working its way down through the pine chips. It hasn't.

You can't help thinking that if what they wanted was barbecue-quality charcoal, they could have popped down to the local service station.

Humankind's association with charcoal is ages old. Charcoal supplied the black in palettes for the Cro-Magnon artists whose work is visible 38,000 years later on the walls of the French Grotte Chauvet. It was used to smelt the tin for bronze that gave us the bronze age, and later it fuelled the furnaces of the early industrial revolution. Milled to precise tolerances, it was a key ingredient in gunpowder. But times moved on. The furnaces became coal-fired; gunpowder was supplanted by other more potent explosives; what interest there was in charcoal lapsed. In the developing nations people continued to use charcoal as the principal fuel for cooking; in the developed world, charcoal was used as a high-quality reductant in steelmaking – and it was there, until global warming became an accepted phenomenon, that things stood.

That the first run of the pyrolyser would not go entirely to plan was always on the cards, and Professor Jones is more intrigued than anything else. In his early 40s, Jones has a shock of black hair, a nationally competitive runner's physique, and a wolfish grin.

As an engineer, his background is in particle technology – the study of particles dispersed





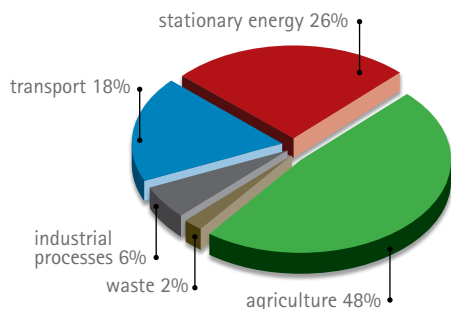


## Growing pains

For a developed nation, New Zealand emits an unusual mix of greenhouse gases from an unusual range of sources. The reason, in a word, is agriculture. About half of New Zealand's greenhouse gas emissions – particularly more potent, but shorter-lived, greenhouse gases methane

Projected emissions by sector 2010. Owing to earlier plantings, forestry is projected to capture the net equivalent of 16.3 million tonnes of CO<sub>2</sub> this year. This is likely to turn to deficit when extensive harvesting takes place in the 2020s.

See [www.mfe.govt.nz](http://www.mfe.govt.nz) for more information.



and nitrous oxide – come from agriculture, a sector slated to join the New Zealand Emissions Trading Scheme (ETS) in 2015.

This means that quite small changes to New Zealand's land use can dramatically affect its

greenhouse gas emissions. The drought of 2007–2008 was, for example, bad for farmers but good for New Zealand's greenhouse gas bookkeeping.

In April 2009, New Zealand had 9.6 million emission units to spare – emissions that have been permitted but not used – under the Kyoto protocol. In April 2010, largely due to the drought and farmers choosing to destock, this had risen to 11.4 million units, an increase of 1.8 million units.

As you would expect, forestry, is, over time, a net consumer of greenhouse gases, but in the short term there are ups and downs. Under the international rules, the growth in forests planted after 1990 is a source of carbon credits, but equally when the trees are harvested there are debits, just as there are debits when pre-1990 forests are cleared and not replanted.

In the 2020s the balance is likely to turn to deficit as the 600,000 hectares of forest planted in the 1990s begin to be harvested. This is when processing forestry wastes for biochar will, if the right economic mechanisms are in place, become important to New Zealand's carbon balance.

## The black market

In Rotorua a pilot pyrolyser plant looks like a sure-fire way of saving its users money. Lakeland Steel, a supplier of engineering services, has built a sawmill-based pilot pyrolyser that uses sawdust to produce syn-gas (a mix of carbon monoxide, carbon dioxide and hydrogen), which is fed to a generator to produce power.

The balance sheet should be compelling: the sawdust feedstock is effectively free; the resulting electricity has a market value. And the biochar? So far this is a near-worthless byproduct.

It is odd that while the world is pricing carbon dioxide emissions, no market – other than the voluntary market – places a value on carbon sequestration technologies such as biochar.

At Massey's Wellington campus, doctoral student Ruy Anaya de la Rosa is looking at what will need to happen before biochar can be integrated into the officially mandated carbon markets.

Originally from Mexico, Ruy did his masterate in environmental science in the Netherlands before spending several years in places such as Cambodia, Mexico and Morocco working for the charity GoodPlanet.org introducing more efficient, less polluting charcoal cookstoves.

But while the work, which both lowered carbon emissions and improved people's health, was satisfying, he found himself increasingly interested in the workings of the carbon marketplace. In theory the marketplace should have been reducing

pollution and promoting sustainable development. In fact, neither seemed to be happening. "So far people have preferred to purchase carbon offsets rather than reduce their own emissions."

Now, as a PhD student, he has set himself the task of understanding a potential subset of that market: the environmental calculus of biochar. It is, he says, more complicated than it looks. There are some interesting tradeoffs. Biochar could be used to sequester carbon in soils, or it might equally be used as a fuel to offset the consumption of fossil fuels. There is the matter of additionality: should carbon credits go to enterprises, such as biochar for improving soil and increasing productivity, that might have made economic sense anyway? How do you calculate the carbon cost – the 'leakage' – of actually producing biochar? How do you guarantee that in particular soils a particular biochar will last for the necessary 100 years or more?

Under the current rules, he says, there is no way biochar can be included in an ETS.

He first intends to conduct a number of life cycle assessment case studies. "I am starting with kiwifruit prunings. They can be turned into biochar, which is then applied to the same orchard. It means looking at the costs of harvesting, transport, drying and pyrolysis of prunings and of mixing the biochar into the soil; looking at the whole chain of a biochar system. And, yes, the ultimate aim is to see how biochar can be integrated into the ETS."



Ruy Anaya de la Rosa





Engineering student Mickey Burlace discussing the finer points of pyrolyser construction.



Early prototype pyrolyser.

within a continuous fluid. He has been more used to working with the granulation of fertiliser or food ingredients.

He is in a hurry; in three years' time, the startup funding from the Ministry of Agriculture and Forestry will be at an end. The quarter-scale pyrolyser has been built by Burlace – a second-year engineering student taking a year out to earn some money and travel to a wedding overseas – in the span of three months.

This is not New Zealand's only working pyrolyser. At the Wood Technology Research Centre of the University of Canterbury, work is underway on using pyrolysis as a means of breaking down and concentrating biomass so that it can be affordably transported to a central plant where it will be used to generate syn-gas and bio-oil; in Palmerston North the Australian firm Pacific Pyrolysis has been working with the city council to use pyrolysis to manage organic waste; in Marlborough, the firm Carbonscape is using microwave technology to produce biochar (think of the potato left too long in the microwave oven); in Kapiti, SpecioNZ is piloting another novel microwave set-up intended to reduce the volumes of sewage sludge sent to landfill; and in Rotorua, Lakeland Steel is using the pyrolysis of sawdust to produce syn-gas, intending that it be used for inhouse electricity generation for sawmills.

But for all of the efforts going into biochar, both here and internationally, the physics and chemistry of processes used to produce biochar – let alone biochar with particular desirable qualities – are not well understood.

Until the oil crisis of 1972, there was little interest in the pyrolysis of biomass, and for the

next 20 years the emphasis fell on producing a biocrude oil; gases and biochar were seen as unwanted byproducts. Now the measure of success has become the conversion of biomass to carbon.

Professor Jones wants to work out precisely what is going on. What happens as he varies the moisture content of the biomass, the supply of oxygen, and the temperature, and the processing time?

In early 2011 he and his colleagues will have a full-scale continuous-flow pyrolyser, something small enough to take out to farm or forestry properties where the biomass is sourced, yet large enough to be viable, and – unlike the prototype – fuelled by a continuous flow of biomass, perhaps in the form of chipped and dried wood wastes.

The pyrolyser will generate gas for burning or power generation and biochar for soil amendment or fuel.

He will also have a batch pyrolyser capable of producing a bespoke biochar tailored for field trials conducted by his colleague Associate Professor Marta Camps.

Already Professor Jones is fielding proposals. A forestry-based community in the north is interested in using pyrolysis to produce electricity and heating. Industries that have used coke to take as a reductant when smelting metals or turning limestone into cement are now thinking seriously about the possibility of using biochar.

After a century of neglect, charcoal is on the come-back. Biochar is the new black. ■

*The prototype pyrolyser has since had a number of highly successful runs.*

Now the measure of success has become the conversion of biomass to carbon.



**Brass datum point, foyer, old museum building, Wellington campus**

*Pro Vice-Chancellor Sally Morgan writes*

The plot of land that is home to the College of Creative Arts, Massey's creative heart, is much storied.

In its history, it has been part of a Māori pa, of a military stockade, of an astronomical observatory, of a prison and, from 1936 until 1996, of New Zealand's national museum – the legacy of which is the now refurbished building jointly owned by Massey and the Wellington Tenth Trust.

The very contours of the land have changed. Before the arrival of the Europeans, Mount Cook had the same cone-like profile as the nearby Mount Victoria. Indeed, Puke-ahu, the original name, means a hill heaped up in an even symmetrical shape. Convict labour reduced the height by 25 metres and the clay spoil from here and elsewhere on the ridge became the substance of the distinctive 'king's arrow' stamped bricks you can still see in the Wallace Street embankments.

My favourite thing is something most people probably pass unwittingly, a tile-sized brass plaque engraved with a compass rose and inset into the linoleum of the museum building foyer.

The significance? To own land, you must first survey it, and every survey has to start from somewhere. At some time in 1870, chief surveyor Henry Jackson stood here and used a theodolite to take star sightings; it became the zero point or datum for the national system of land surveys, a status it retained until 1949.

For me it is a metaphor for new beginnings: it says 'start here'.





Petina Winiata, Vice-Chancellor Steve Maharey, Patricia Grace, Kelvin Day, Robyn Bargh (Huia Publishers), Julie Paama-Pengelly, Assistant Vice-Chancellor (Māori and Pasifika) Professor Sir Mason Durie, Spencer Lilley, Christine Thomson (New Holland Publishers) and Brian Bargh (Huia Publishers) at the second annual Ngā Kupu Ora Māori Book Awards.

## 2010 Ngā Kupu Ora Māori Book Awards

How do you become an author? According to artist and writer Julie Paama-Pengelly, whose book *Māori Art and Design* won the won the Art, Architecture and Design category of the second annual Ngā Kupu Ora Māori Book Awards, sometimes the book chooses you.

When she was approached with the proposal that she author the book, she was torn. It would mean setting aside December and January. "What sane person wants to sit inside and write for two months of the summer?" she asked her awards audience, especially if, as she does, you live by a beach. On the other hand, if someone else had written it, she feels certain she would not have been satisfied with the result.

Few other authors, for one thing, would have had her academic credentials. Over the years,

Paama-Pengelly, who is currently working towards her PhD, has clocked up a BA, an MPhil and Bachelor's and Master's degrees in Māori visual arts, all with Massey.

Another motivation was her belief that the subject demanded a Māori author. "The written word is written by our coloniser; everything we read has come through a sieve. It's not our world as we see it." The very conventions of 'art' and 'design' are European imports.

She advises aspiring authors not to think too much about the scale of the enterprise, but to focus on achieving a set daily word count.

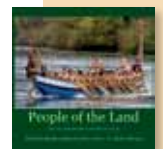
*Māori Art and Design* was one of four category winners in the 2010 Ngā Kupu Ora Māori Book Awards.

**Art, Architecture and Design:** *Māori Art and Design: Weaving, painting, carving and architecture* by Julie Paama-Pengelly (New Holland Publishers).

**Biography:** *Ned & Katina: A true love story* by Patricia Grace (Penguin).

**History:** *Contested Ground: Tē Whenua i Tohea. The Taranaki Wars, 1860-1881* edited by Kelvin Day (Puke Ariki New Plymouth District Council/TSB Community Trust/Huia Publishers).

**Te Reo Māori:** *People of the Land: Images and Māori proverbs of Aotearoa New Zealand* by Sir Hirini Moko Mead and June Mead (Huia Publishers).



Now in their second year, the Ngā Kupu Ora Māori Book Awards take their name from a library collection of Māori resources established at Massey in 2005 to support the research, learning and teaching needs of staff and students. Ngā Kupu Ora can be translated as 'the living words'.





## Fair's fair

**The Aid Triangle: Recognising the human dynamics of dominance, justice and identity**  
MacLachlan, M., Carr, S. C., & McAuliffe, E. (2010). London: Zed Books.

Jennifer Little talks to Professor Stuart Carr.

At one desk sits an expat worker from a 'developed' country, at the next his local 'developing country' counterpart. Both are doing the same job, but the expat is being paid many times more. What effect does this have? Organisational psychologist Professor Stuart Carr describes discrepancies like these as "the elephant in the room, part of the hierarchy in the world we are not supposed to talk about".

Carr first witnessed the 'dual salary discrepancy' during a stint teaching at the University of Malawi in the early '90s. He had arrived from Scotland's Stirling University with a PhD in social psychology and the terms of his contract mirrored local rates, but as an indignant and poorly paid local staff member pointed out, this wasn't the rule. Most of the overseas academics earned good money; most locals a pittance.

The experience – and his realisation of the effect the injustice was having – triggered a series of research projects and, most recently, a book, *The Aid Triangle: Recognising the human dynamics of dominance, justice and identity*, which he has co-authored with Professors Malcolm MacLachlan and Eilish McAuliffe.

Carr, who is based at the School of Psychology in Albany, describes the disparity in expat and local pay rates as "a debilitating form of economic apartheid harking back to colonial days".

"Salaries are symbolic of a whole range of things, like inequality and status," says Carr.

The business of aid, it turns out, is dense with damaging assumptions to which it is easy for people to subscribe unwittingly. Even the language – terms like 'developing', 'Third World' and 'lower-income economies' – is full of pitfalls.

Then there are the aid community's prevalent, sometimes contradictory, myths: 'paternalistic myths' – *we serve society, look after incapable minorities, are changing the world*; 'reciprocal myths' – *everyone has equal opportunity*; 'meritocracy myths' – *anyone can make it if they try hard enough*; and 'sacred myths' – *some institutions, groups and individuals have a legitimate right to run the show*.

For aid workers, there is a particular allure to viewing themselves as 'hero-innovators', but the flipside, says Carr, may be that 'under-developed' groups "internalise" an inferior position on the development ladder".

Insensitively delivered aid can have other repercussions. Carr lays at least part of the blame for the endemic corruption often found within the public institutions of aid-recipient countries on the experience of injustice. If, as a member of a public service, you are subject to irrational demands and

inhumane working conditions, then perhaps absenteeism and under-the-counter payments are best seen as no more than reasonable coping strategies.

Aid can even, he says, threaten the very identity of the people it is intended to help, the experience of the Aboriginal people in Australia being a case in point.

Nor is the system good for the mental wellbeing of aid workers, who must somehow manage the disjunction between at one moment dealing with need, suffering and perhaps even starvation, and at the next, by accident of nationality, operating inside a cocoon of affluence and a culture of hedonism.

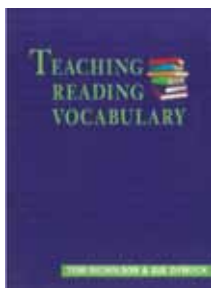
So what needs to happen? "I actually think the solutions aren't complicated – you raise local salaries, you lower expat salaries, or you meet in the middle. The bit that needs work is figuring out which one works."

Papua New Guinea, one of the nations with which he has been closely involved, is now debating whether to scrap dual salaries at its national university, and he and his co-authors recently won a grant from UK Aid to evaluate the effectiveness of raising civil service salaries in 'lower'-income economies.

"Ultimately, we can't continue with a system designed for colonial days: 'We've got the know-how and you guys haven't so we have to pay market rates for our people'. That whole system doesn't stack up any more because you have poorer nations with well educated, trained people now. We've got to take on board basic values of justice, equality and identity."



Salaries are symbolic of a whole range of things, like inequality and status.



## Words fail

**Teaching Reading Vocabulary**  
Tom Nicholson and Sue Dymock,  
NZCER

*Reviewed by Jennifer Little*

“Yes, but, like, yes, like, but, like, yes, no, like, no, yes...” The vocabulary-deprived character Vicki Pollard in the television show *Little Britain* represents something more to Professor Tom Nicholson than a figure of fun. She is a cautionary figure: he worries that a generation of New Zealand teenagers are becoming like her.

“Young people are reading less and failing to build vocabulary amid a sea of text messaging and cyber chat,” says Nicholson, and this, he says, will have repercussions for them later in life. Their command of language affects their ability to learn, their confidence, job prospects and relationships, and even their ability to share a joke.

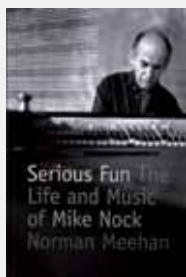
In *Teaching Reading Vocabulary* Nicholson urges teachers and parents to encourage children to read more and to take up those old-fangled tools: a dictionary – the ‘holy grail’

for word acquisition and knowledge of multiple meanings – and thesaurus. Modern English – the combination of British, American and Commonwealth English – is estimated to possess a phenomenal 750,000 words. Be greedy, he says.

Can a vocabulary be enlarged without books? “Obviously, yes. Just watching television or movies can sometimes have you reaching for the dictionary; for example, when the weather forecaster says that the next few days will be salubrious (that is, favourable), or when a character in a movie says she feels discombobulated (that is, confused).”

His tips for teachers? Survey the children’s interests and stock the class and school library with books that reflect these; select 30 suitable ‘good books’ and keep them in an easy-access box; encourage children to see book-based movies then read the books themselves. (JK Rowling’s *Harry Potter* series, Roald Dahl’s *Charlie and the Chocolate Factory*, EB White’s *Charlotte’s Web*, CS Lewis’s *The Lion, the Witch and the Wardrobe* and Kate Dicamillo’s *Tales of Despereaux* make his list).

*Teaching Reading Vocabulary* also covers scheduling regular reading time at school and at home, reading aloud to children, reading with children, talking to them about what they are reading, the use of word maps, webs and quizzes and advice on how to choose a good dictionary.



## From Ngaruawahia to New York

**Serious Fun: The Life and Music of Mike Nock**  
Norman Meehan, Victoria University Press

*Reviewed by Malcolm Wood*

The first piano Mike Nock played belonged to his aunt, who had lent it to his family, and his first teacher was his father. The era was 1950s, the place was small-town, dirt-road Ngaruawahia, and Nock was 11 years old. The boy’s first experience of modern jazz was hearing the bebop musicians Charlie Parker and Dizzy Gillespie on the family wireless. It was a revelation. As Nock tells his biographer Norman Meehan: “I said ‘Jesus, here is some truth! Here is something that is definitely happening’.”

His path was set. When his father died a short while later, Nock took piano lessons from Bert McNamara, the local pharmacist. When the Nock family piano was reclaimed, Nock, as McNamara remembers it, practised on a keyboard he had drawn on a piece of cardboard.

At age 15, with school already well behind him, Nock became the pianist for the Flaming Flamingos, a band based in the Palmerston North motor camp. They pawned his saxophone to buy food. At age 19 he had himself smuggled across to Sydney in a friend’s passenger cabin. Two years later he arrived in New York via Britain for a short-lived stint as a jazz student, before fortune of a sort smiled and the “little sandy-haired dude” was invited to play with the renowned saxophonist Yusuf Lateef, working the chitlin’ circuit of black clubs.

He was indefatigable, surviving drugs, episodic poverty, crime (a neighbour in the tenement building Nock occupied remembers him being used for “mugging practice”), racial tensions, a chain of relationships, marriages, the ructions of the ’60s, and changing musical fashions.

Nock’s dedication to jazz, his “serious fun”, was unswerving, and while he never became rich and his fame was limited he was able to do what he loved and get by – not a claim many jazz musicians can make.

In the mid-1980s Nock returned to Australasia, eventually settling in Sydney, where he teaches at the Conservatorium. Here, ironically, for someone self-taught and on occasion disdainful of whether jazz in its essentials *can* be taught, he has become a torch carrier, hugely influential in creating the succeeding generations of jazz musicians.

Nock has been lucky in his biographer. Meehan’s own jazz chops are considerable – his recent output includes jazz settings of the work of ee cummings and of local poet Bill Manhire – and his dedication to setting out Nock’s story is impressive. Between 2004 and 2007 Meehan recorded 30-plus interviews and he brings an educated ear to Nock’s output, with which he is thoroughly familiar. No-one can accuse the book of lacking detail. The book even comes with an accompanying DVD of *Mike Nock: A Film* from 1993.

Nock, who turned 70 this year and is still performing, was present in Wellington for the book launch.

## Just William

Paul Mulrooney talks to senior lecturer in history Dr James Watson about Prime Minister WF Massey. Dr Watson is the author of a biography of WF Massey written as one of the Makers of the Modern World series of books, covering the world leaders who signed the Treaty of Versailles at the 1919 Paris Peace Conference.

### What did Massey hope to achieve at the conference?

Massey approached the Paris Peace Conference with a set of aims that encapsulated what he saw as New Zealand's interests. Some of these were focused on concerns that related directly to New Zealand itself; notably the control of Western Samoa, securing a supply of cheap phosphate from Nauru, receiving a share of any reparations to be extracted from Germany and protecting the graves of its soldiers on Gallipoli. He also wanted to make sure any future German aggression was stopped and, via the Royal Navy, ensure that the British Empire, which was New Zealand's main safeguard, retained its power.

### It didn't all go his way then.

The remark "all political careers end in failure" is attributed to the British right-wing politician Enoch Powell, but would appear to be particularly applicable to the last years of Massey's life. Domestically he struggled to hold on to power with a small, uncertain majority after 1922. Internationally there were strong signs that his dream of an eternally powerful and united British Empire was fading. In 1923 the British electorate rejected giving tariff preference to imports from dominions like New Zealand, an issue on which Massey actually campaigned in Britain, flouting the constitutional convention of non-interference in the elections of another country, and Germany showed little inclination to accept the provisions of the Treaty of Versailles, which he thought already contained too few real safeguards against possible future German aggression.

### What were Massey's views on some of the major world figures at the conference? US President Woodrow Wilson, British Prime Minister David Lloyd George and French President Georges Clemenceau?

He considered Wilson to be hopelessly idealistic and as having come into the war [April 1917] rather late in the piece. He got on well with Lloyd George and shared a mutual scepticism of President Wilson with Clemenceau.

### At the outbreak of World War I in 1914 what kind of man was Massey?

He was very conscientious and well informed in political debate. He was a man of fairly decided views but by the same token when it came to politics was prepared to compromise and take the middle road.

He didn't exactly do that when Massey's Cossacks (special constables on horseback recruited from rural areas to keep order) were sent into the streets of Wellington in 1913.

I take the view that it was the Red Federation's leaders who were looking for confrontation and some believed a revolution could be brought about through a general strike. It's the job of the state to enforce the law and that is what the so-called Massey's Cossacks were doing: protecting the strike-breakers and defending the wharves. The police force was

small and military forces in New Zealand minute, hence the need for special constables.

### Was there much truth to his nickname 'Farmer Bill'?

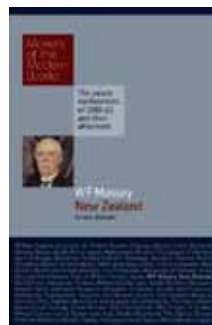
Yes, farming was the profession he chose and it was always close to his heart. However, his whole view was that it was the job of the government to assist the people onto farms, or as homeowners, or give them their chance to make good and make themselves independent of their work.

### So where would you rank him among past New Zealand Prime Ministers?

Fairly highly. He kept his party in power for a long period of 13 years. He always did his homework on people and issues and was well briefed and prepared to make compromises – like his lengthy coalition agreement with Liberal leader Sir Joseph Ward – to see something through to the end.

### So that's Massey politically, what about as a person?

He was a warm character and no cold fish, but like a lot of warm characters he could get hot under the collar at times!



WF Massey: New Zealand Makers of the Modern World: The peace conferences of 1919-23 and their aftermath  
James Watson, Haus Publishing, 2010



# Cherished illusions

*In the second of a series of articles, Associate Professor Wyatt Page looks at why you shouldn't always believe your eyes.*

All of the visual illusions in the previous instalment were stationary illusions and required only a single eye to perceive. With 3-D currently the rage in the cinema, computer games and even on television, this instalment will focus on visual illusions that involve motion, depth and the use of both eyes.

The image cast on the retina in our eyes is fundamentally two-dimensional, but we look out on a three-dimensional world. So at best we have 2.5-D vision and probably more like 2.1-D, we can't see around the backs of objects without changing our location.

When we look at a moving scene or move through a stationary scene, the human visual system (HVS) acquires a sequence of 2-D images, from which it derives information about the motion. This is done by estimating how patterns move between successive images in two dimensions. This process corresponds to velocity measurements of local image patterns and is called optical flow. These flow measurements represent an approximation of the projection of the actual 3-D motion and can only be computed where there is detail, or edges, in the scene. Imagine you are in the passenger seat of a car and you open the door slightly and look down at the road markings as the car is moving (don't try this for real or you'll get in trouble). Because you can only see a small section of the white road marks, and the markings have little structure along them, motion can only be sensed accurately in the direction at right angles to the edges of the markings. Estimating motion parallel to the edges is difficult and likely to be inaccurate as there is little structure in that direction to compare. This velocity measurement difficulty is called the aperture problem and can result in bias in motion illusions.

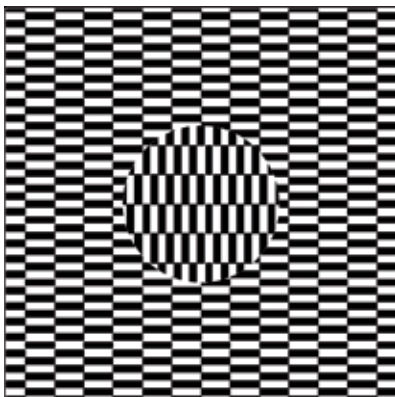


Figure 1

The Ouchi illusion, figure 1, is one of the best examples of a bias in motion illusion. If you move

your head about, the round section in the middle appears to move independently of the outer section. This is because, by rotating the middle section 90 degrees, the direction in which we can estimate motion accurately is reversed between the middle and outer regions and they no longer appear to move together. By carefully constructing an image, the bias in motion can be used to create the anomalous rotation illusion of Pinna and Brelstaff. If you move your head in and out while looking at figure 2, the stationary rings appear to rotate, with the outer ring rotating in the opposite direction to the inner ring.

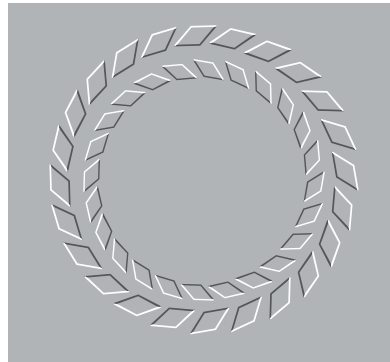


Figure 2

One of the things that I covered in the previous instalment is that our eyes are never still; they dart about in defined patterns, ensuring that the small high-resolution spot (only 5 degrees wide) in the middle of our visual field scans the scene and acquires salient information. As the eyes move, the scene painted in our brain tries to incorporate the



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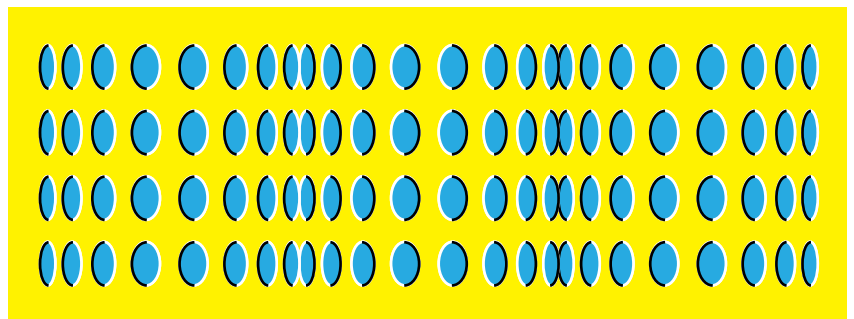


Figure 3

new information from both eyes and fuse it with the information it has already acquired. Because the information varies in spatial resolution, time and location, anomalous motion can occur when the fusion process has difficulties. Look at the image in figure 3 with just one eye and you will get a sense of depth and a 3-D effect; open the other eye and

the image will appear to roll. You can fix your gaze and lock one location but then another will roll. A section from a recent motion fusion illusion by Professor Akiyoshi Kitaoka is shown in figure 4. Look at it with both eyes and some of the discs appear to rotate as you scan the image. This may even occur using just one, but will not be as pronounced.

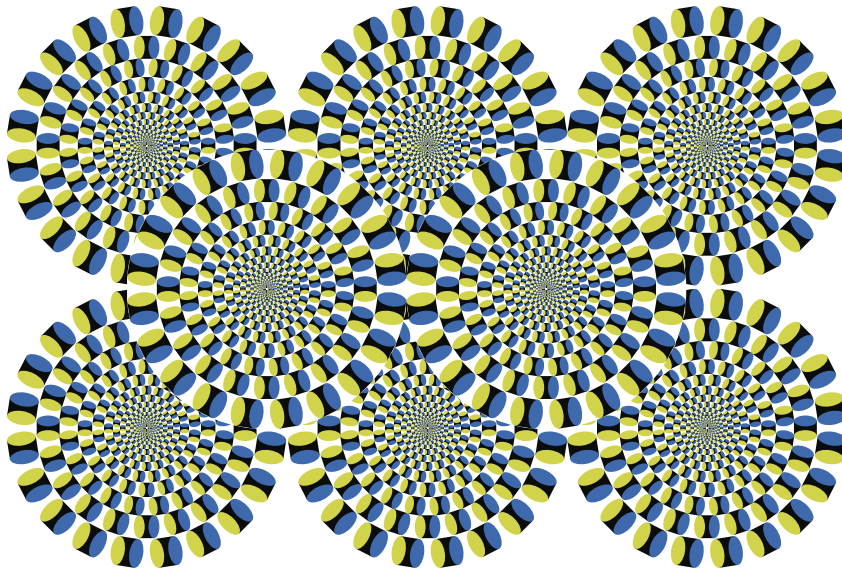
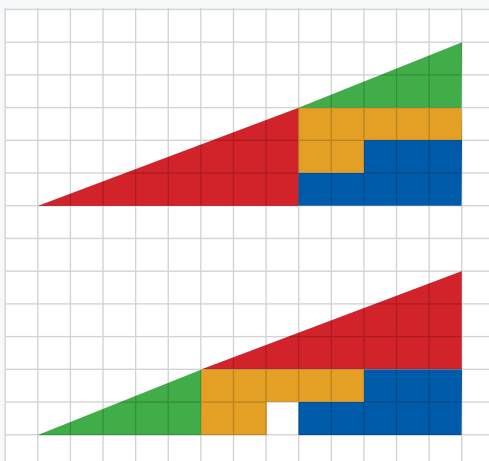


Figure 4

If we look along a section of railway track, the rails appear to converge off into the distance and the spacing of the sleepers appears to get smaller the further away they are. We know from experience that the tracks are parallel and the sleepers equi-spaced, but nevertheless this illusion persists. This is an example of linear perspective in action and the HVS has evolved to incorporate this knowledge when it interprets a scene.



In my last article, I concluded with this odd visual illusion. The coloured blocks that make up the top triangle have been shuffled into a slightly different configuration in the lower triangle. But where did the extra square come from? The answer: run a ruler along the diagonal of the triangle – you will find it's not straight.

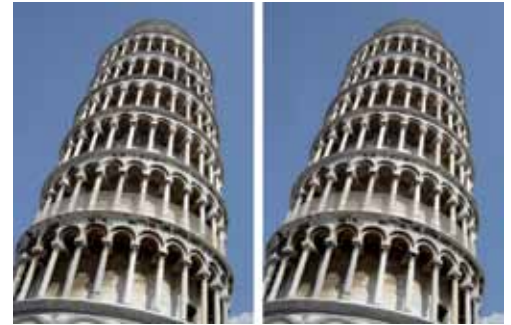


Figure 5

In figure 5 the second leaning tower of Pisa appears to lean a little more than the first one, whereas they are in fact identical images. Our visual system has pre-compensated for the expected linear perspective, thus creating the illusion. The strange thing is that it even works for train tracks as can be seen in figure 6 where the two images are identical.



Figure 6

It is important that we are able to tell how far away things are, so we have evolved a range of methods to assist with depth perception, and only some of these require two eyes. There is some evidence that our perception of depth is more fundamental than our perception of form, as depth processing appears to occur before form processing in our brain. In analysing and interpreting a scene we use several methods, including experience, expectation, local clue consistency, monocular clues and binocular clues. The use of linear perspective above in interpreting the images is an example of experience, expectation and monocular (single eye) clues in action.

I'll finish this instalment with a tactile or touch illusion. A simple example of a tactile illusion is when you wear a baseball cap for a long period of time then take it off; the cap can still be felt for some time afterwards. This type of illusion is interesting because the areas of the brain that activate during the illusory tactile perception are similar to those activated during actual tactile stimulation. We normally underestimate the importance of touch, yet it is the first sense to develop in the womb and is a key element in the emerging field of emotional immersion. Try the following (do it with your eyes closed for best effect) – cross your index and middle fingers and run them along the bridge of the nose with one finger on each side... weird? Uncross the fingers and try again. ■





The Massey Agriculture XV and Lincoln University contest possession at the LA Brooks rugby match in September. Lincoln was the eventual winner, the score being 19-6. The Lincoln team took home the LA Brooks Trophy and MOG Shield, which they have not held since 2008. The LA Brooks Trophy was first contested in 1952, then reinstated six years ago after a 39-year hiatus.



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