

MASSEY RESEARCH

The disease detective
The fight against *Campylobacter*
Young people these days
Overcoming disadvantage

Access all areas
Underground photography

Research, Scholarship
and Creativity

October
2008

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Dream run
The science of motion analysis



Massey University



Points of difference

As many people know, it can be an enlightening experience to return to a once familiar place after a long absence. Certainly this has proven so for me. I left Massey as a lecturer in 1990 for a career in national politics; now I have returned in 2008 as the University's Vice-Chancellor.

True, I never really lost touch in the intervening years. Palmerston North, where the university is headquartered and has its largest physical presence, was my electorate; many of the university's staff remained close personal friends; and, yes, I had some part in shaping the tertiary education system the University functions within. Still, I left and I returned, and there is nothing like absence and return to give you a certain clarity of vision.

So when people ask me what it is I think makes Massey different from this country's seven other universities, I know what I will say: Massey is "New Zealand's defining university".

It is a phrase that resonates in a number of ways; the ambiguity is deliberate. I mean that if you were looking at a university that defines and embodies the central traits of what we would like to think of as the New Zealand character – innovation, honesty of purpose, and a certain egalitarian idealism – then Massey is a good contender. If you were looking how representative Massey is – at the span of the disciplines it teaches, or its geographic spread across three physical campuses and the extended virtual campus occupied by its extramural student body, or the degree to which its student make-up reflects that of the wider population – the University's claim is undeniable. And there is, of course, a third sense: that in which Massey is defining and shaping New Zealand through the creation and dissemination of knowledge.

We live, so the pundits tell us, in the age of the knowledge economy. As we move further into post-industrial times, among the factors of production that are the determinants of prosperity, one of the least tangible – knowledge – has become ever more important.

Hence the increasing emphasis on education, not just in New Zealand but in every developed economy. You can see this in such things as the rising spending levels devoted to education – across OECD the total amount of public spending on educational institutions rose on average by 19 per cent between 2000 and 2005 alone – and in the numbers of people choosing to study towards tertiary qualifications.

In my age cohort, New Zealanders between the ages of 55 and 59, 37 per cent hold a tertiary qualification; for the cohort age 25 to 29 that percentage has climbed to 48.7 per cent.

Universities are recognised as creating the educated workforce and fostering the kinds of research that are key to their nations' economic prosperity, social wellbeing and cultural life.

All of these types of research can be seen in this publication. In the realm of science that stands to produce a commercial benefit is Professor Rory Flemmer, who is developing a robotic kiwifruit picker, which will address that industry's perennial labour problem. He stands at the end of a long line of Massey researchers who have helped make New Zealand's farming and horticultural practices a byword for efficient and profitable land use.

In the realm of building New Zealand's social capital is Dr Jackie Sanders, who, together with Professor Robyn Munford (profiled in this publication in 2007), is leading a substantial multi-year project to identify why it is that some individuals raised in adverse life circumstances go on to make good lives and contribute to society while others of their peers do not. Her optimism is heartening; although there are no quick fixes, lives can be changed.

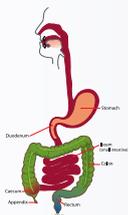
For a representative of the realm of culture there is the celebrated photographer Wayne Barrar, whose works, later in this publication, I will let speak for themselves.

Finally I am conscious of the many fine researchers who are not represented here – this is the fifth annual issue of *MASSEY RESEARCH* and I am told that the list of outstanding researchers still to be profiled is as long as ever – and of the fact that research takes place at many levels within a university. In fact, in Britain Warwick University has taken the step of establishing a journal for undergraduate research.

Warwick's example is salutary: as society changes, so too should its institutions. Here again, I believe Massey can lead the way, holding fast to what it does well yet, as it has throughout its history, perpetually reinventing itself to do things better.

Expressing itself, in short, as New Zealand's defining university.

Steve Maharey
Vice-Chancellor





The growth of postgraduate study

One measure of the health of any university is the number of its students who are undertaking postgraduate study. Their choice of university is a validation of its reputation. Their work forms a part of its intellectual capital. Some will go on to become part of that pool of talent from which the university draws its own staff.

By this measure, Massey is thriving. In 2006 more than 16.9 per cent of its student population were postgraduates, a proportion higher than that of any other New Zealand university. In 2007 that percentage climbed to 19.4 percent, once again the highest percentage of any New Zealand university, and the percentage of research postgraduate students likewise climbed, from 5.2 per cent to 7.2 per cent, giving Massey the joint highest share of research postgraduate students.

In 2007 there were a record 111 doctoral completions, a number likely to be soon surpassed again. Massey now has more than 900 students enrolled in doctoral degrees.

Some of them you will meet in these pages. Take Matthew Brodie, who was the runner up in the MacDiarmid Young Scientist of the Year Awards for his work with fusion motion capture and downhill skiing, Sophie Blomfield, who is addressing the engineering problems associated with IVF, or Alistair Scarfe, who is part of the animating genius behind the robotic kiwifruit picker now taking shape in a campus workshop.

All are full time students who are closely associated with particular campuses.

What you won't find here, but certainly are deserving of mention, are the sizeable contingent of Massey's postgraduate students who study part time, often via distance learning. Among PhD candidates the figure is over 37 per cent.

Frequently these are mature-age students who are using their research projects to untangle and address real-world problems they have first-hand experience of in their working environments. In turn, they are able to use their findings to inform their actions. These students include teachers, business people, social workers, midwives, technologists and scientists.

They have chosen Massey because of its undisputed pedigree as New Zealand's most experienced and able provider of distance education.

They too are a part of Massey's research community.

Nigel Long
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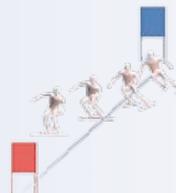
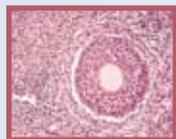
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MASSEY RESEARCH

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Matthew Brodie has devised fusion motion software that will allow a skier's movements to be precisely analysed over the course of a run. His work has won the doctoral student the Future Science and Technologies category in the MacDiarmid Young Scientists of the Year awards as well as the awards overall runner up placing.
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The Tasman Glacier is being consumed by its terminal lake. Soon this iconic feature will be little more than a remnant of what was. Dr Martin Brook has been investigating what is happening and why.



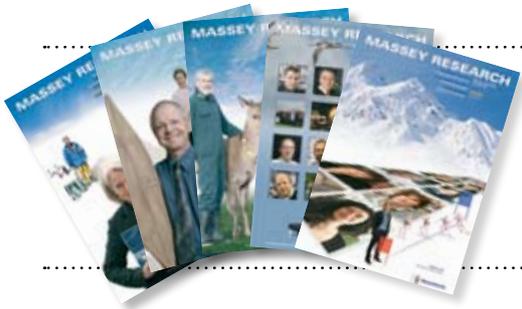
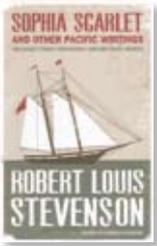
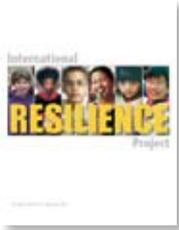
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In 2006 there were 15,873 medical notifications in New Zealand for *Campylobacter*, an unpleasant gastrointestinal disease that can, in rare cases, be fatal. *Campylobacter* is carried by a number of host animals including, most notoriously, chickens. Professor Nigel French is working to source *Campylobacter* outbreaks and control its spread.
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Associate Professor Roger Lentle understands the muscular workings of the digestive system in a way few others do. His work is full of surprises, and it could have many practical applications.



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When California’s eucalypts started to fall victim to a newly arrived beetle, Professor Qiao Wang found the parasitoid wasp to control it.

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To understand how best to help troubled young people and their families you have to understand how they see themselves and the world. Jackie Sanders is a lead researcher in the New Zealand’s Pathways to Resilience project, which is looking for the reasons why some young people do well despite adverse life circumstances while others do not.

64 ACCESS ALL AREAS

Wayne Barrar is literally an underground photographer: one segment of his recent work has been devoted to commercially mined underground spaces and the uses they are put to when the mining stops.

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Professor Cluny Macpherson has had a lifelong personal and academic engagement with Samoa and its people.

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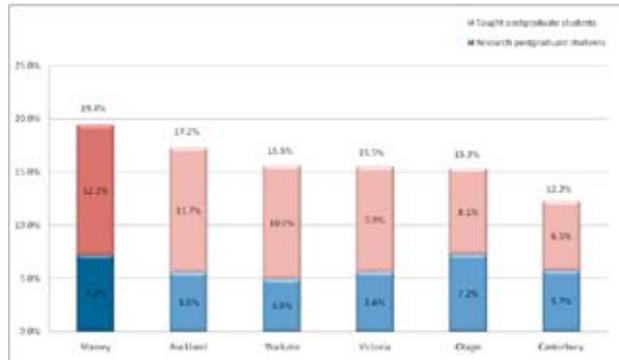
Professor Richard Dean Batt

To learn more about Massey research and to view earlier issues of this publication visit <http://masseynews.massey.ac.nz>



An exceptional postgraduate research experience

Postgraduate student numbers are burgeoning at Massey. In 2006 more than 16.9 per cent of Massey's student population were postgraduates, a proportion higher than that of any other New Zealand university. Now that percentage has risen to 19.4 per cent, again the highest percentage of any New Zealand university, and the percentage of research postgraduate students has climbed from 5.2 per cent to 7.2 per cent, giving Massey the joint highest share of research postgraduate students.



Postgraduate students as a percentage of total students (EFTS) for 2007

A research powerhouse

Massey's lineage as an agricultural college can still be seen in the University's eminence in biosciences, but Massey has become much more.

Currently the University has more than 700 research-active staff. They include acknowledged world experts in fields as disparate as sleep/wake research, the 'handedness' of molecules, and the Bartók Viola Concerto.

The Performance-Based Research Funding exercise has identified Massey as having strengths in a number of domains:

- applied biological sciences
- veterinary and large-animal science
- accounting and finance
- communications, and journalism and media studies
- design
- management, human resources and industrial relations
- Māori knowledge and development
- social sciences, social policy and social work
- visual arts and crafts.

The University also hosts a span of human health research expertise, including nursing, rehabilitation therapies, public health, and burgeoning new areas such as sport and exercise science.

Massey is one of three New Zealand universities to make the Shanghai Jiao Tong University ranking of the top 500 universities worldwide and the top 100 in the Asia-Pacific region.

The Graduate Research School

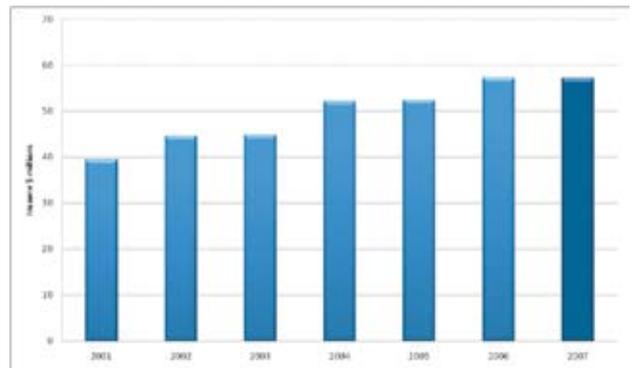
The Graduate Research School is responsible for doctoral degrees (in philosophy, business and administration, clinical psychology, and education), and scholarships, both undergraduate and postgraduate. It is also to assume responsibility for research masters degrees. The School provides information and administrative services for

Building a research infrastructure

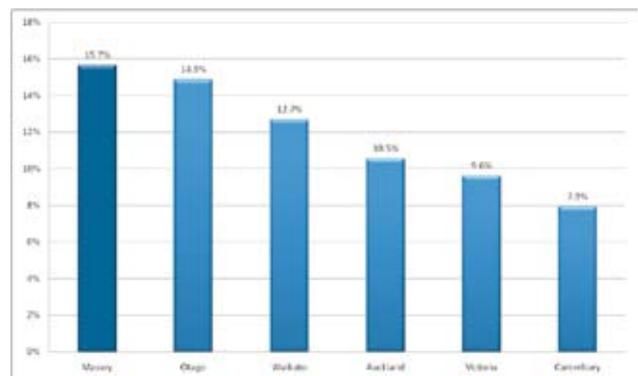
The University is committed to providing its researchers with an environment in which scholarship and creativity can flourish. This includes professional development programmes, generous leave provisions, a system of rewards and recognition, opportunities for promotion and, at the postgraduate level, a range of scholarships. It also includes investing in the equipment and infrastructure that make advanced scientific research possible. 2007 was marked by the opening of the Hopkirk Institute and of the Manawatu Microscopy and Imaging Centre, and 2008 by the opening of a \$25 million state-of-the-art food pilot plant.

A magnet for research investment

The research funding attracted by medical research – an expensive and well-funded activity – skews the totals for research funding across the universities. If this funding is excluded, however, Massey can be seen to attract more research and contract income from external sources than any other New Zealand university. External sponsors invested more than \$57 million in Massey's researchers in 2007.



Total research and contract income awarded for 2007



External research income as percentage of total turnover for 2007

doctoral degrees and scholarships.

The Dean of Graduate Research, Professor Margaret Tennant, is the chair of both the Doctoral Research Committee and the Scholarships Committee. The dean also has an advocacy role for graduate research within the University.



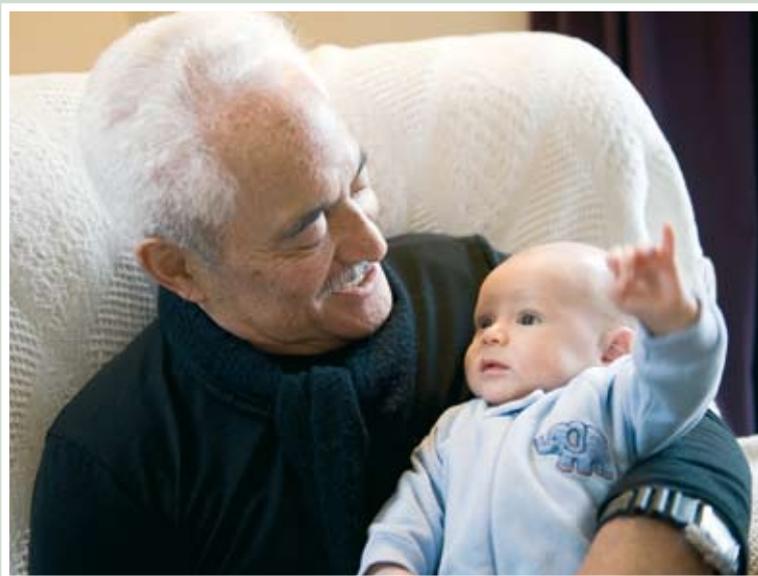
Peach-flavoured omega-3-enhanced ice-cream was one of the treats on the menu for the opening of Massey's \$25 million state-of-the-art food pilot plant on the Palmerston North campus. The most advanced facility of its kind in Australasia, the plant is part of a complex that will be used for research and teaching. The plant will also be used by companies to draw on the expertise of Massey's staff and postgraduates to develop commercial products. The plant was officially opened by Agriculture Minister Jim Anderton. Each serving of the ice cream contains 60 milligrams of omega-3, or about 10 per cent of the recommended daily amount. From left: the Hon Jim Anderton Minister of Agriculture; Professor Richard Archer, Head of the Institute of Food, Nutrition and Human Health; Professor Ian Warrington, Acting Vice-Chancellor.



A new cell culture lab is the first of a series of initiatives undertaken by Massey to boost veterinary and animal science research. The \$250,000 Cell Culture Central (CCC), which was opened by Professor Hugh Blair in June, is part of the multimillion dollar Building Research Capability in Strategically Relevant Areas initiative, supported by the Tertiary Education Commission. It targets subjects where the Performance-Based Research Fund (PBRF) results revealed gaps in areas of strategic relevance to New Zealand's development. CCC director Associate Professor Christine Thomson says cell culture is one of the fundamental techniques underpinning biological sciences. Cell culture techniques are used to grow and differentiate cells in vitro, that is in a Petri dish, or a culture flask in an incubator. "These cultures can then be used to study basic cellular appearance, the cell's physiology and function, the effects of drugs and mechanisms of disease. The CCC lab is a clean facility and does not study infectious organisms. Pictured are Associate Professor Christine Thomson and Professor Hugh Blair, both of the Institute of Veterinary and Animal Biomedical Sciences, and Gareth Pryme of equipment supplier Bio-Strategy.



Master's student Amy Jerram with some experienced farm workers. Jerram is conducting research into the life of farm dogs, collecting information from more than 100 farms in Manawatu, Wanganui, Hawke's Bay and Wairarapa. "We want to find out about the farming operation, the experiences of the people with working dogs, the health of dogs currently in work on the farm and dogs retired from the farm in the previous 12 months," Jerram says. The work may directly benefit farmers, Associate Professor Mark Stevenson, who together with Dr Naomi Cogger is supporting Jerram's work, explains. "When good dogs are found we want to know how long they last and why they are being retired – is it due to old age or injury? If arthritic conditions are identified as an important reason for loss, for example, then a useful outcome of this study will be to provide owners with some early intervention strategies: maybe a reduction in the intensity and length of work periods and providing a few home comforts."



Amster Reedy recites a traditional oriori (lullaby) to his grandson Rikipapaki. The oriori is about the mythical origin of the kumara, composed in the 1600s by Enoka Te Pakaru of the Gisborne iwi, Te Aitanga a Mahaki, "Pō! Pō! E tangi ana Tama ki te kai māna – Pō, Pō (thought to be the shortened form of Pōtiki or last born). The boy, my son, he is crying for food." Traditional Māori lullabies – oriori – are the subject of Reedy's PhD research. His thesis is to be submitted in Māori.

Burying the black stuff

The Government has announced funding for two new Massey-based professorships in biochar – a form of carbon sequestration that may prove a useful tool in addressing climate change. These are intended to be a first step towards building a world-class centre of excellence in biochar research and use.

Biochars, such as charcoal, are very stable forms of carbon and can be produced from a range of tree and arable crops, agricultural and urban wastes. Incorporated in the soil, biochar has the potential to act as a permanent carbon store. Indeed, if you grow trees or crops which draw on carbon dioxide, then use pyrolysis – combustion in the absence of oxygen – to produce biochemicals or biofuels, and finally take whatever charcoal remains and use it as a soil amendment, then you have an actively carbon-negative technology that reduces atmospheric concentrations of carbon dioxide.

One of the professorial positions will focus on biochar and its behaviour in New Zealand soils; the other on using pyrolysis to process a biomass feedstock into biochar. The two new professors will lead research into biochar as a means of mitigating global climate change and into how best to enable its uptake in New Zealand – particularly by the agricultural and forestry sectors.

Professor Mike Hedley, who with Dr Attilio Pigneri led the scientists, engineers, life cycle economists and research consultants who developed the proposal, says the team is thrilled with the outcome.

The initiative is funded by the Government's investment initiatives under the Sustainable Land Management and Climate Change Plan of Action, and will be administered by the Ministry of Agriculture and Forestry (MAF).



Dr Attilio Pigneri (left) and Professor Mike Hedley with a sample of biochar, the substance that may help mitigate climate change.

FRST Postdoctoral Fellows

Two Massey scientists working on new ways to control infectious diseases have been awarded scholarships worth more than \$500,000.

Dr Gayle Ferguson (at left) and Dr Monica Gerth (at right), both researchers at the University's new Institute for Advanced Study in Auckland, have been named as recipients of Foundation for Research, Science and Technology Postdoctoral Fellowships. These bring with them an annual stipend of up to \$58,000 a year for three years, plus an allowance for research costs and ongoing skills development, to a total of \$264,000 over three years.

Dr Ferguson's fellowship will support research into the fundamentals of bacterial evolution, a study with potential to deliver new knowledge about infectious diseases together with novel treatment strategies. She will investigate the way organisms mutate and evolve to better understand pathogenicity in bacteria.

As well as improved infectious disease control, Dr Ferguson's research into how controlled molecular switches are constructed has potential to produce knowledge of interest to mathematicians and nanotechnologists. Possible applications



in these areas are biosensors, artificial cells for enhanced pharmaceutical biosynthesis and light detectors for advanced image processing. Dr Ferguson has recently returned from the United Kingdom.

Dr Gerth's fellowship will support research into new treatments to control infectious diseases, significant in New Zealand because around 7 per cent of deaths result from bacterial infection and antibiotic resistance is a growing problem. Her novel strategy is to use the cell's own metabolism to poison itself. The research will initially seek to understand how a common bacterial protein called HutD works, and then to develop drug-like inhibitors of it. The work will result in new scientific knowledge useful to the



drug development and infectious disease control industries. Dr Gerth also aims to develop patentable intellectual property for developing new drugs based on HutD. She will be working with staff at the New Zealand Institute for Advanced Study and the Institute of Molecular Biosciences at the University's Auckland campus.

Chairman of the NZIAS board Professor Grant Guilford is pleased to see the two young scientists acknowledged.

"A key focus in developing our Institute for Advanced Study was to provide an environment where fundamental scholarship can thrive, enabling the kind of original thinking that produces major advances in knowledge."

Health Research Council Funding

Six projects are to receive funding totalling \$7.2 million from the Health Research Council's annual funding round.

The University's Centre for Public Health Research has been awarded \$2.5 million for a three-year study of occupational health in New Zealand.

Professor Neil Pearce said the funding represented the first large grant for a full programme of research into occupational health.

"It is an area that has been neglected in the past in New Zealand. These grants give a boost to us and our capacity to do world class occupational health research."

Dr Lis Ellison-Loschmann, one of Professor Pearce's team, has also been awarded \$2 million for two other projects focused on Māori health.

Dr Ellison-Loschmann has worked with the centre since 2000. She recently returned to New Zealand after spending two years with a world-class cancer research group in Barcelona, Spain as part of her post-doctoral study.

The grant, \$1 million over three years, for research into breast cancer in Māori and Pacific Island women will allow an in-depth look into why these groups have lower survival rates than European women. A five-year grant of \$1 million will allow Dr Ellison-Loschmann to look at stomach cancer in Māori, with the aim of finding out why Māori are five times more likely to get stomach cancer than non-Māori.

Louise Ihimaera (Ngāti Porou, Ngāti Kahungunu, Whakatōhea), who is based at the University's Research Centre for Māori Health and Development, has received a grant of \$114,497 to look at Māori whānau participation in mental health service delivery.

Ms Ihimaera says whānau have an important role to play in improving mental health service delivery, development and evaluation. She hopes that this PhD study will contribute significantly to recognition of the value of whānau participation in compulsory treatment and care situations that can lead to positive health outcomes.

She says the funding will provide an opportunity for whānau to share their stories and reinforce the importance of whānau or others closest to them as part of an individual's recovery journey. "Although some whānau lifestyles may have negative influence or impact on a whānau member experiencing serious mental health issues, many whānau are a positive influence and are often the unsung heroes of voluntary care."

Other projects to receive funding are:

- The Centre for Social Health Outcomes Research and Evaluation receives \$853,355 to study the range and magnitude of alcohol's harm to others.
- The Department of Psychology receives \$1,107,000 for work on popular understandings of medications and their use in everyday life.

Deputy Vice-Chancellor (Academic and Research) Professor Nigel Long describes the funding as an exceptional show of confidence in the ability of the University's public health researchers.



A volunteer takes part in SPIRIT – South Pacific Islanders Resist Diabetes with Intense Training. SPIRIT is a randomised, controlled trial being undertaken by PhD candidate William Sukala and a team of health researchers. Forty volunteers with type-2 diabetes, most from the Porirua area, are being tested and assessed. Twenty will then take part in supervised weightlifting for 16 weeks while the rest will have their usual care. Pacific Islanders are disproportionately affected by type-2 diabetes and obesity compared with Europeans. “International studies conducted in high-risk groups have indicated that weightlifting is both safe and effective in improving blood sugar control and other factors in type-2 diabetes management,” says Mr Sukala. The study is made possible by the cooperation of church groups and health professionals.



Professor Tony Signal chairs the New Zealand group collaborating with CERN’s Large Hadron Collider project. The New Zealand group contributed to the design of the central detector and to ensuring the beams, which are less than the width of a hair, enter the experimental apparatus correctly. Like other physicists, Professor Signal is hoping that the 26 kilometre in diameter circular collider will find evidence for the existence of the Higgs boson, a particle predicted by the Standard Model of particle physics, and perhaps lead to an understanding of the enigma of dark matter.



Associate Professor Regina Scheyvens and Associate Professor Glenn Banks, both of whom are recipients of \$34,000 grants from the inaugural funding round of the international development research fund of NZAID. Dr Regina Scheyvens will work with Associate Professor Azmat Gani of the University of the South Pacific and two Pacific Island graduate students on how tourism can better contribute to poverty reduction in Fiji and Vanuatu. Dr Banks will work with Dr Bill Sagir of the University of Papua New Guinea on mining and community development in Papua New Guinea.

Quiet time

A study into the prevention of noise-induced hearing loss is to be undertaken by a multidisciplinary team led by the University’s Centre for Ergonomics, Occupational Safety and Health at the College of Business.

A \$500,000 contract has been awarded under the Occupational Health and Safety Research Portfolio, an initiative funded by the Accident Compensation Corporation, the Department of Labour and the Health Research Council. The study is part of a programme of work focused on noise-induced hearing loss.

The study is timely. Noise-induced hearing loss is rising, with New Zealanders making claims for compensation at the rate of 11 cases a day, at a cost to the Accident Compensation Corporation of more than \$43 million annually.

Dr Ian Laird at the University’s Centre for Ergonomics, Occupational Safety and Health is leading the project. Others on the team include Massey researchers on all three campuses and researchers from Otago University, Canterbury University and the University of South Australia.

Top Achievers Doctoral Scholarships

Three Massey research projects are to receive nearly \$280,000 in Top Achievers Doctoral Scholarships.

Auckland campus postgraduate student Kimberly Good has been awarded \$99,682 for her study *Is the Black Dog Really a Dalmatian? – an investigation into whether different types of depression lead to different outcomes through cognitive behaviour therapy.*

Ms Good was also recently awarded a \$30,000 William Georgetti scholarship to help her complete her Doctor of Clinical Psychology over three years.

Ms Wang, from the College of Sciences’ Information Systems Department, receives \$90,034 for *Modelling Data-Intensive Scientific Workflows for Lab Automation in Analytical Research.*

Mr Davies, from the College’s Institute of Fundamental Sciences, receives \$86,750 for *Semiparametric Methods for Spatio-Temporal Modelling in Epidemiology.*

Going places



Dr Cheyne’s project steering group: Malcolm Thomas (Thomas Consulting), Associate Professor Christine Cheyne (Massey), Anne Redgrave (Horizons Regional Council), Dr Imran Muhammad, Dr Jonathan Godfrey, Liezel Bobadilla (Massey), Roger Boulter (Boulter Consulting), Phil Hendon, Dave Gennard, Emma Hardgrave (NZ Transport Agency).

Two significant research contracts funded by the New Zealand Transport Agency’s 2008-09 research programme have been awarded to staff in Massey’s School for People, Environment and Planning. Associate Professor Christine Cheyne and Dr Imran Muhammad, of the school’s resource and environmental planning programme, are each leading a project.

Dr Cheyne will gather data on transport implications of population shifts in non-metropolitan regions, including a survey and interviews with residents in those regions about their use or non-use of public transport.

“This research seeks to fill a gap in research about public transport attitudes and behaviour,” she says. “Existing research has been conducted mainly in metropolitan areas or large urban centres.”

With environmental and economic factors now influencing a shift away from private transport, there are some challenges

for parts of New Zealand that have smaller populations, Dr Cheyne says.

“They cannot support conventional mass volume public transport. But there is a lot of scope for shared transport or what is known as demand responsive transport. Our research will focus on the potential for expansion of such options.”

The second project, led by Dr Muhammed, will prepare a best-practice guide for public transport planning in Auckland, Wellington and Christchurch.

“The strength of this project lies in its international research team and this project will draw directly on expertise from Australian and northern European universities,” Dr Muhammad says.

“This research project will investigate ways to maximise public transport performance – through improved network planning with limited resources – in the specific conditions found in Auckland, Wellington and Christchurch.”



Wide awake

Sleep researcher Dr Sarah-Jane Paine has been awarded the Health Research Council Eru Pomare Research Fellowship in Māori Health, worth \$463,000 over three years.

Dr Paine, from the Sleep/Wake Research Centre in Wellington, will continue her research into the circadian body clock and how it regulates sleep timing. She will also compare the prevalence of circadian rhythm sleep disorders in Māori and non-Māori, and examine relationships with age, sex, night work and socio-economic deprivation. Dr Paine also plans to develop best-practice guidelines to improve health service delivery for Māori, using sleep disorders as a case study.

The fellowship, honouring the legacy of Professor Pomare, funds emerging leaders in Māori health research with a PhD or equivalent, for clinical or medical research.

Medication and meaning



Massey psychologists Helen Madden and Professor Kerry Chamberlain.

A study on medication use is to explore the symbolic significance, rather than the pharmacological function, of drugs and health remedies in the daily lives of New Zealanders.

Psychologists Professor Kerry Chamberlain and Helen Madden, from the School of Psychology in Auckland, will manage the project, heading up a team of researchers from Waikato, Otago and Victoria universities to investigate popular understandings of medications and their use.

The Health Research Council-funded study will consider all forms of medications, medical drugs, alternative medicines and dietary supplements in an attempt to determine whether some medication consumption is “life-saving or life-styling”, Professor Chamberlain says.

“It aims to develop new knowledge about

the meanings of medications, their safety and risk, and the influence of media and social processes in their use and misuse.”

The idea for the study arose from Professor Chamberlain’s observations that the role of medication in people’s lives in the 21st century has become increasingly complex with the advent of direct advertising of pharmacological drugs, the influx of over-the-counter medications, internet-based medical information as well as the profusion of alternative medicines, natural remedies and dietary supplements.

“We know little about what happens with medications when taken home, why people do what they do with medications, or how they are understood by people.”

Pharmac’s community drug bill stood at \$563 million for the year to June 2006.

2008 Marsden grants

The Marsden fund is supporting seven new research projects led by Massey staff who are established researchers, and four new research projects led by Massey staff who are seen as emerging researchers have received Fast Start funding for their projects. The new funding will total \$5.4m over the next three years. Many Massey staff are also acknowledged as associate investigators in projects led by other institutions.

Administered by the Royal Society of New Zealand and funded by Government, the Marsden fund supports excellence in leading-edge research in New Zealand. This year the fund awarded grants totalling \$54 million.

Professor Nigel French, Institute of Veterinary, Animal and Biomedical Sciences, receives \$740,000 for a project entitled *Cows, Starlings and Campylobacter in New Zealand: unifying phylogeny and epidemiology to gain insight into pathogen evolution*. The introduction of European wildlife and livestock into New Zealand has provided us with a unique opportunity to study the evolution of a globally important human pathogen: *Campylobacter jejuni*. Using analytical tools developed by our research team and detailed laboratory studies including whole genome sequencing, we aim to exploit the newly-discovered host specificity of *C. jejuni* strains and the historical separation of both host and bacterial populations, to improve our understanding of *C. jejuni* evolution. Ultimately we can learn why *C. jejuni* emerged to become such a prominent pathogen, anticipate further evolution and restrict emergence and spread of new strains. See page 24 for more about Professor French.

Professor Paul Rainey, Institute of Molecular Biosciences, receives \$880,000 for *The evolution of multicellularity*. The origin of multicellularity is one of the most perplexing and exciting problems in biology. Recent empirical work has led to recognition of shortcomings with existing theory. Together the applicants have formulated a radically new theory which shows that tension among levels of selection can fuel (rather than impede) transitions in individuality. A key realisation is that the fitness of higher and lower levels is intimately linked so that cells at each level can be considered different stages of a life cycle. This proposal seeks to extend recent theory, test key predictions and experimentally recreate an evolutionary transition.

Professor Peter Schwerdtfeger, Institute of Fundamental Sciences, receive \$740,000 for the project *The variation of fundamental constants in space-time*. Fundamental constants like the speed of light, Planck constant or gravitational constant play defining roles in physics and chemistry. Modern theories attempting to unify all four fundamental forces of nature suggest that all fundamental constants may vary in space and time. The search for such small variations currently constitutes one of the most exciting areas of physics. For further progress in this area it is important to find enhanced effects of the variation of fundamental constants. We therefore want to find suitable molecules, perform calculations and stimulate new searches of the variation effects both in cosmic and laboratory molecular spectra.

Professor Martin Hazelton, Institute of Fundamental Sciences, receives \$310,000 for his project *New tools for statistical inference for network-based transportation models*. Network-based models of road traffic systems underpin a vast array of transport management and planning activities. In practice they must be calibrated for the traffic

system under consideration, giving rise to a wide range of statistical inference problems. The most readily available type of data for fitting transport models comprises traffic counts on a set of network links. However, these do not uniquely determine the route flows, leading to a statistical linear inverse problem structure. By focusing on this common structure, our aim is to develop improved tools for inference with wide applicability in transportation science.

Dr Carlo Laing, Institute of Information and Mathematical Sciences, receives \$454,000 for his study into *Complexity reduction in neural models*. Recent advances have led to increasingly detailed models of neuronal networks. These models are time-consuming to simulate, and understanding their "essence" is difficult. Recently-developed "equation-free" (EF) methods enable one to analyse and efficiently simulate complex, multi-scale systems. We aim to use EF methods to analyse several neural models, including the complex respiratory neural network. The techniques involved include identification of low-dimensional variable(s) which describe the macroscopic dynamics of the network, and bifurcation analysis in terms of these variables. Our goal is to provide an understanding of such networks that cannot be found in any other way.

Professor Mick Roberts, Institute of Information and Mathematical Sciences, receives \$462,000 for his project entitled *Modelling a virus*. Viruses multiply and evolve within their hosts. A virus is in conflict with its host's immune system. Transmission of a virus to a new host, even one of the same species, introduces it to a different environment and different selection pressures. Transmission of a virus between hosts of different species may result in unexpected consequences for host or virus. Mathematical models will describe the within-host evolution and between-host transmission of a virus. Thought experiments carried out on the models will reveal how the virus's characteristics and environment determine how it spreads. The results will be related to HIV and influenza.

Professor Kerry Chamberlain, School of Psychology, receives \$645,000 for *Social meanings of medication*. Medications abound in contemporary society, and many people believe there is 'a pill for every ill'. This project explores the social meanings of medications and their use within everyday life in domestic settings. Specifically, we will sample three types of households, those containing: younger children; people with chronic illness; and users of alternative medications. Information will be sought through interviews, discussions, observations, diaries and photographic tasks, and from the contents of first aid kits and medicine cabinets. Our aims are to discern what medications are present, their pathways through such households, their symbolic meanings, and social practices involving their use.

From top: Professor Nigel French, Professor Paul Rainey, Professor Peter Schwerdtfeger, Dr Carlo Laing, Professor Mick Roberts, Professor Kerry Chamberlain Absent: Professor Martin Hazelton

2008 Fast Start grants



Dr Wayne Patrick, Institute of Molecular Biosciences, receives **\$300,000** for his study *Where do new enzymes come from*: All species must adapt to survive in changing environments; however, the molecular mechanisms that underlie adaptation are poorly understood. My goal is to understand a key aspect of adaptation: the origins and evolution of new enzymes. Here, I propose to use the high-throughput tools of functional genomics and in vitro evolution to observe the emergence of hundreds of new enzymes in the model organism, *Escherichia coli*. This work will provide unique genome- and proteome-wide insights into the fundamental biological processes of adaptive molecular evolution, as well as into applied problems such as the evolution of antibiotic resistance.

Dr Steffen Lippert, Department of Commerce, receives **\$300,000** for *Venture capitalists and intellectual property*: Venture capitalists (VCs) often finance early stage innovations that are too preliminary for patent protection, and are kept secret instead. This secrecy provides VCs with an information advantage, inducing stronger incentives for them to invest into innovations than for traditional players. Therefore, the common wisdom suggesting that better intellectual property (IP) protection fosters innovation may be wrong, implying that policy-making could benefit from economic research on the link between IP protection and VC financing. Hence, we propose to use economic modelling to investigate this link and to test our predictions empirically, aiming at sound theory-based policy recommendations for fostering innovation.

Dr Leigh Signal, Sleep/Wake Research Centre, receives **\$300,000** for *Waking up can be hard to do: unravelling the dynamics of sleep inertia*. How the brain transitions in and out of sleep remains a fundamental unsolved mystery of neurobiology. On awakening, consciousness returns before full waking function. The poor performance and grogginess experienced in this transitional period is known as sleep inertia. Two studies will be conducted that systematically manipulate the factors affecting the magnitude and time course of sleep inertia after short periods of sleep at different times of the day and night. The proposed research will significantly advance basic scientific understanding of dynamics of sleep inertia and is directly relevant to the issue of workplace napping in safety critical settings.

Dr Ingrid Horrocks, Department of English and Media Studies, receives **\$220,000** for her study *Reluctant wanderers: women re-imagine the margins, 1775–1800*: This project will explore how and why the figure of the female wanderer became important in late 18th-century British literary culture. There is a significant understudied corpus of literary texts from the last three decades of the 18th-century that foreground this figure. *Reluctant Wanderers* will analyse the uses to which the figure of the wanderer is put in texts by Mary Wollstonecraft, Charlotte Smith, Frances Burney, Ann Radcliffe and other women writers, critically examining their content, context and formal attributes to reveal a uniquely female contribution to wide-ranging debates about the nature of sympathy, community and social exclusion.

From left: Dr Leigh Signal, Dr Ingrid Horrocks



St Francis Xavier's School Year 5 and 6 pupils in all parts of the classroom can hear principal and teacher Bernadette Murfitt with the help of a sound field system. A study by Dr Stuart McLaren from the Institute of Food, Nutrition and Human Health and Dr Steve Humphries from the School of Psychology has clearly established the value of such systems, particularly where extraneous background noise is a problem. However, even in quiet conditions, with pupils listening attentively, a significant improvement was noted with the number of correct scores in the listening test obtained with the system turned on.

Success and succession – small business owners move on



Thirty four per cent of the country's small business owners indicate they intend to exit their businesses within the next five years and 64 per cent want to exit within the next decade, according to a report by Professor Claire Massey (at left) and researcher Dr Martina Battisti (at right) of the New Zealand Centre for Small and Medium Enterprise Research.

The report examined the succession plans of New Zealand's small and medium-sized business owners, many of whom are now nearing retirement age. In New Zealand 350,000 small and medium sized enterprises make up more than 99 per cent of all business and account for about 50 per cent of employment.

The Centre has recently completed a report on the succession perspectives from small enterprises for the Ministry of Economic Development. This was based on a survey which had more than 1300 respondents.

Small and medium enterprises are defined as: micro enterprise – fewer than five staff,

small enterprise – between six and 49 staff, medium enterprise – between 50 and 99 staff.

Of the 1330 respondents, the majority (67 per cent) were aged between 41 and 60. Twenty-two per cent were more than 60 years old. Average turnover in the businesses surveyed was slightly in excess \$3 million with the top earner at \$80 million.

Asked about plans for exiting their firms, 58 per cent of the owners indicated they were thinking of selling, 36 wanted to pass the business on and 7 per cent said they were intending to sell or wind the business down. Forty seven per cent had an exit plan but mostly these plans were unwritten or informal.

The greatest barrier to exiting a business, owners reported, was the dependence of the firm on the owner's involvement. This was the case for 62 per cent of those surveyed. Fifty-six per cent envisaged problems finding a suitable successor or buyer and 42 per cent said they found the thought of leaving the firm unpleasant.

Of those who had no plans to exit their business, 75 per cent said that it was too soon to make a plan and 38 per cent said they didn't have time to deal with the issue.

Compared to the micro firms with fewer than five staff, the small firms were more likely to have an exit plan. They believed that an exit plan provides financial stability to the firm, maintains harmony with employees, increases the value of the firm and improves the financial standing of the firm.



P update

Methamphetamine use appears to have stabilised over the past three years, but frequent users are experiencing more health and legal problems. These are two of the findings from the latest iteration of the Illicit Drug Monitoring System (IDMS), a snapshot of trends in drug use and drug related harm in New Zealand.

Lead researcher Dr Chris Wilkins of the Centre for Social and Health Outcomes Research and Evaluation (SHORE) says frequent users of methamphetamine were more likely to have needed an ambulance, accident and emergency department, drug and alcohol worker, counsellor or GP in relation to their drug use in 2007 compared to the previous two years.

“Overall levels of methamphetamine use appear to be fairly stable but this research indicates there is a growing population of heavy users experiencing health and legal problems,” Dr Wilkins says.

Frequent methamphetamine users were also more likely to have committed violent or property crime last year compared to the 2005 findings.

“Users are under increasing financial pressure, however only minorities of frequent users reported paying for their drug use with money from property crime and even smaller minorities committed violent crime.”

There has been some decline in the availability of crystal methamphetamine (ice), the research shows.

“This is likely to reflect the impact of some very large seizures of crystal methamphetamine made by police and customs in 2006 and 2007,” Dr Wilkins says.

Frequent drug users, interviewed as part of the ongoing research, stated that more people they knew were using ecstasy last year compared to 2006.

“The situation with ecstasy is somewhat confused by the previous ready availability of BZP party pills [now outlawed], which are sometimes fraudulently sold by drug dealers as ecstasy. Increasing use of ecstasy may also reflect the declining reputation of methamphetamine, which is increasingly associated with serious psychological problems and addiction.”

Designing the food of love

A mathematical model developed by Professor David Raubenheimer could lead to an increase in breeding success for New Zealand's rarest bird, the kakapo.

The model compares the balance of nutrients needed by animals and the balance of nutrients in foods. It has been used to analyse dietary components and their consequences for other birds as well as humans, spiders, insects and fish.

Until now, protein-enriched food supplements have been favoured for kakapo; protein is an important nutrient for breeding in many species. However, Dr Raubenheimer's analyses suggest that calcium rather than protein is the limiting nutrient for kakapo breeding.

"Calcium is needed in high levels during breeding, for the development of egg shells and for bone growth," Dr Raubenheimer says. "It is also significant that kakapo have an unusually large skeleton and hence a high demand for calcium."



Farm kids breathe easier

Prenatal exposure to farm animals and plants helps protect children from asthma, allergies and eczema.

Researchers from the Centre for Public Health Research found that farmers' children had a lower incidence of allergic diseases than children not exposed to animals, grain and hay products.

The research team surveyed 1333 farmers' children and a reference group of 566 children aged from five to 17 years. Children with both prenatal and current exposure to farm animals were found to be 50 per cent less likely to have asthma than the reference group, and similar results were found for other allergic diseases such as eczema and hay fever.

The findings have been published in the *European Respiratory Journal*.

Associate Professor Jeroen Douwes says it is the first study to show a direct link between exposures in utero and a significant reduction in asthma symptoms, hay fever and eczema.



Un sugared truths

Blood sugar levels might be just as important a measure of health as blood pressure or cholesterol according to Naomi Brewer. Brewer, a research fellow at Massey's Centre for Public Health Research, is the lead author of a study published in *Diabetes Care*, published by the American Diabetes Association.

The study followed 47,904 people who had undergone haemoglobin A1C testing – a standard way to measure blood sugar – as part of a screening program for hepatitis B from 1999 to 2001. They were followed until the end of 2004, by which time 815 had died.

Ms Brewer and her team discovered that the likelihood of death rose in parallel with blood sugar levels, even when the analysis was restricted to people without diabetes. Those in the highest category of blood sugar levels had more than twice the death rate of those with low levels.

"In future, people will need to know their haemoglobin A1C level, just as they may currently know their blood pressure or their cholesterol levels," she says.

As well as the association with the overall risk of death, strong associations were seen for some specific causes of death, including endocrine, nutritional, metabolic and immunity disorders (which can include diabetes and cystic fibrosis), and diseases of the circulatory system (which can include heart disease). Weaker associations were noted between elevated blood sugar levels and deaths from cancer. The associations were equally strong in men and women.

Although the association is known and has been observed in several overseas studies, this new study is the largest international study to date, and the first such study in New Zealand.

Sheep a significant source of leptospirosis infection

The changing profile of victims of leptospirosis and the high number of cases among Hawke's Bay meat workers have prompted a co-operative study into the disease between Massey University's EpiCentre and meat company PPCS. The research was carried out in February and March at the PPCS Takapau plant.

Thirteen of 15 patients admitted to the ICU at Hawke's Bay Hospital suffering from leptospirosis from 1999–2005 were employed as meat workers or inspectors.

Blood samples and interviews were conducted with 242 volunteers. Twenty-three, (9.5 percent), tested positive to antibodies for *Leptospira* serovars *pomona* (13) or *hardjo-ovis* (9) and one tested positive to both.

Dr Jackie Benschop says these workers had occupational exposure to sheep only. "This, in combination with our results, adds weight to the hypothesis that sheep are an important source of leptospiral infections for humans."

The results are preliminary and the EpiCentre leptospirosis team, led by Associate Professor Cord Heuer, still has more work to do on the data collected.

"These results are not adjusted for the fact that these workers may have had exposure to leptospirosis outside of the workplace," says Dr Benschop. "We'll be concentrating on potential lifestyle exposure to leptospirosis in the data over the next few months."

Further data analysis will also help determine the effect of the worker position in the meat plant on exposure to *Leptospira* species, giving clues to transmission pathways.

Dr Benschop says workers reported – and researchers saw – good use of protective gear at the PPCS plant, with staff wearing gloves, glasses and face masks when working in potentially exposed areas, limiting exposure to *Leptospira* bacteria that are shed in the urine of infected animals.



Timber workers study links cancer, respiratory disease to occupational PCP exposure

Researchers at Massey's Centre for Public Health Research investigating the health of former timber workers have found levels of dioxin more than twice that of long-term Paritutu residents and significant prevalence of health effects related to PCP exposure.

The Health Research Council-funded study, resulting in the report *Health Outcomes in Former New Zealand Timber Workers Exposed to Pentachlorophenol (PCP)*, was prompted by continuing concerns that timber workers exposed to PCP were suffering long-term health problems.

Lead investigator Dr Dave McLean, a research fellow of the centre, says the study was comprehensive. The first phase comprised tracking and analysis of health information and the work practices of almost 4000 randomly-selected timber workers

"The group worked in the industry before the late 1980s, when PCP was used. They were selected using industry records and followed to the present day to assess how many had died and how many had developed cancer," Dr McLean says.

The PCP used at the time was contaminated by some types of dioxin during manufacture, with the study confirming that the types of dioxin found in the workers fit the profile of

the dioxin found in PCP at that time. Dioxin is known to increase the risk of cancer.

The second phase of the research comprised a survey including interviews and clinical examinations of 293 surviving workers.

"We went out and held clinics around the country, inviting people to turn up for a blood test, questionnaire-based interview, a physical and a neurological exam.

"Looking at their lifetime work history, and in particular their history of work in the timber industry, we established that about 10 per cent of the former timber workers had heavy exposure to PCP.

"People with heavy exposure to PCP were three times more likely to have respiratory disease. People with more PCP exposure also had increased prevalence of a number of other health conditions, including eczema, thyroid disorders, unexplained persistent fevers, recurrent nausea and diarrhoea, heart palpitations and low libido. Not all of these increased risks were statistically significant, because the number of workers with heavy exposure was quite small."

Dr McLean says that as cumulative exposure increased there was also increased prevalence of neuro-psychological symptoms, including memory loss, depression and tiredness.

"This is an indicator that there may be some

damage to the central nervous system, in this case at a level similar to that of people heavily exposed to solvents. The concern is that we're measuring sub-clinical changes but that in people of this age there may be repercussions because they will have reduced capacity to compensate for the effects of ageing."

The third phase of the study included blood testing for dioxin levels in 71 of the exposed workers and 23 non-exposed workers. These, when combined with the results of blood tests undertaken on 23 members of the Sawmill Workers Against Poisons (SWAP) group showed that the exposed workers had much higher dioxin levels than those not exposed.

"Comparisons of the intensity and years of exposure also saw a very clear dose-rate relationship – people who mixed the solutions, handled the timber and cleaned the sludge in the dip tank with the highest levels."

The tests showed that the exposed workers had dioxin levels about the same as those observed in former long-term Paritutu residents while SWAP members had levels around twice that.

The report can be found at: <http://www.dol.govt.nz/publication-view.asp?ID=249>



Body of evidence

Men and women have quite different ideas about what is the ideal female form. In a survey conducted by Massey's Department of Communication, Journalism and Marketing, when confronted by an array of female body shapes and asked to choose the one that came closest to the ideal, women tended to choose a slimmer figure than the men. Another similar discrepancy: while the men were generally happy with their own figures, the women – particularly those who were middle aged – often wanted to lose weight.

The finding is a sidelight of a wider survey of sport and leisure in New Zealand led by Marketing Professor Phil Gendall and carried as part of the annual International Social Survey Programme (ISSP). Between

October and December last year, 2250 people over the age of 18 were surveyed by mail about their self assessment of their health and happiness and their participation in sport and leisure activities.

Generally New Zealanders were found to be happy and healthy, says Professor Gendall. The survey shows the happiest and healthiest are married men and women; the least happy and healthy are divorced, widowed and separated men.

The survey found 85 per cent of New Zealanders are involved in some sort of sport or physical activity. Walking came out top as the most frequent sporting or physical activity, favoured by 35 per cent, but getting fit, going to the gym, cycling, jogging and playing golf or rugby are popular.

Keep working

A health, work and retirement longitudinal study, carried out by researchers at Massey University's School of Psychology, shows that people over 65 and still working feel better than those who have retired. The study has collated information gathered from 6662 people aged between 55 and 70 about their transition from work to retirement and how their health has been affected.

Researcher Dr Fiona Alpass says data collected from the first questionnaire indicates those employed past the age of 65 rate their own mental health higher than those who have stopped working.

"But we don't know yet whether retirement leads to poor mental health or whether poor mental health leads to early retirement. I suspect it is a combination of both, but the data from upcoming questionnaires is needed to confirm that."

Unease about their financial situation once retired was also a concern.

"Almost half of our working respondents thought their living standards would decline in retirement. However, it must be noted that a large percentage thought they would stay the same."

The snail's tale

On a small, barren, mist-enshrouded plateau edge on the South Island's West Coast there once lived a small population of large carnivorous snail.

Beneath them lay a rich seam of coal worth many millions of dollars to the local economy. What would you have done? Left the habitat untouched and forgone the income? Mined the coal and accepted the loss of the snails? Tried for a compromise and transferred the snails to some habitat not threatened by economic development?

This is no class exercise – these events have taken place. The snails are members of the endemic New Zealand genus *Powelliphanta*, the place is Mount Augustus on the South Island's West Coast, the mining company is Solid Energy and the compromise solution was chosen: about 60 percent of the population were captured, with a third transferred to land beneath the existing colony (marginal land occupied naturally by few snails), a



third translocated to another plateau (where they will be in competition with another snail species), and a third remain in storage.

How do you assign a value to a population of native snails? Partly it depends on your philosophical standpoint, partly on what you know about those snails. In a paper in *Conservation Genetics*, Steve Trewick of Massey and the Allan Wilson Centre for Molecular Ecology and Evolution, Kath Walker of the Department of Conservation, and postgraduate student Corina Jordan describe work to determine whether the Mt Augustus *Powelliphanta* is “a distinct evolutionary

lineage and therefore a unique part of New Zealand's biodiversity or a genetically undifferentiated but isolated population of a more widespread taxon”. Just 1.5 kilometres away from Mt Augustus beneath the forest line is a population of another snail, *Powelliphanta patrickensis*, and, in the lowland forest, *Powelliphanta lignaria* looks very similar. Was the Mount Augustus snail a near relative of either of these or something more interesting?

Trewick and his colleagues compared the ecology, form, habits and mitochondrial DNA of a number of *Powelliphanta* species before concluding that “the combined weight of evidence indicates that it [the Mt Augustus snail] should be treated as a separate species”.

So what happens now? As the paper's authors note, by the time the species is formally recognised “the land where it lived will have ceased to exist”; the habitats the snail has been transplanted to are characterised as “at best suboptimal”.

Not entirely drowned



Has New Zealand always been above water – as the more traditional scientific viewpoint holds – or, as some now argue, was there once a time when it was entirely submerged? Both sides agree on the existence of the so-called Oligocene drowning period, some 26–38 million years ago when the New Zealand landmasses were greatly reduced in size. But were there still fragments of land where plants and animals held out?

Now a new witness has been called to the stand: the New Zealand kauri, *Agathis australis*. A DNA analysis conducted by the Massey-hosted Allan Wilson Centre has shown that *A. australis* diverged from its Australian near relative in the ancient

past rather than during the comparatively recent Oligocene.

“The simplest explanation for the molecular clock findings is that New Zealand has existed ever since it rafted away from Gondwana, more than 80 million years ago,” says Professor Peter Lockhart (pictured above).

“If this is so, New Zealand kauri may well have a whakapapa that traces back to 95 million-year-old South Island fossils.”

The study, part of a PhD dissertation by Dr Michael Knapp in Massey's Institute of Molecular BioSciences, was published recently in the journal *Systematic Biology*.

An odd thing about tuatara...

A study of tuatara has revealed that at the DNA level New Zealand's “living fossil” has the highest evolutionary rate ever measured.

Evolutionary biologist Professor David Lambert and a team from the Allan Wilson Centre for Molecular Ecology and Evolution recovered DNA sequences from the bones of ancient tuatara up to 8000 years old and compared them with present-day tuatara.

The significant changes in the DNA (molecular evolution) over time have not, however, equated to significant changes in physical form (morphological evolution). In fact, to look at, the tuatara has hardly changed at all over long periods of evolution.

“We would have expected that the tuatara, which does everything slowly – they grow slowly, reproduce slowly and have a very slow metabolism – would have evolved slowly,” says Professor Lambert. “In fact, at the DNA level, they evolve extremely quickly, which supports a hypothesis proposed by the evolutionary biologist Allan Wilson, who suggested that the rate of molecular evolution was uncoupled from the rate of morphological evolution.”

The research appears in the international journal *Trends in Genetics*.



Professor Mason Durie has been doubly honoured. In June the University's Deputy Vice-Chancellor (Māori) was awarded the **Mark Sheldon Prize** and in August he returned to his alma mata Otago University to accept an honorary **Doctor of Laws** degree and deliver the graduation ceremony address. Awarded by the Royal Australian and New Zealand College of Psychiatrists, the Mark Sheldon Prize honours meritorious work in service provision and research to advance knowledge and understanding of indigenous mental health.



Professor Roger Openshaw is the recipient of an inaugural **Distinguished Fellow Award** from the School of Critical Studies in Education from the University of Auckland.



Director of Massey Agriculture **Professor Jacqueline Rowarth** has been appointed a **Companion of the New Zealand Order of Merit**, lecturer in the School of Health and Social Services **Dr Martin Sullivan** (not shown) has been appointed to the **Queen's Service Order**, and **Associate Professor Tony Whincup** (not shown) has been awarded the **Kiribati Order of Merit**.



Vāka Moana: Voyages of the Ancestors, edited by and with major contributions from **Distinguished Professor Kerry Howe** has won the **non-fiction writing and text and reference book sections of the Hawaii Book Publishers' awards**. In 2007 *Vāka Moana* won the history category of the Montana New Zealand Book Awards.



Dr Lisa Emerson from the School of English and Media Studies has won the **Prime Minister's Supreme Award for Tertiary Teaching** excellence and **Dr Hamish Anderson** (not shown) from the Department of Economics and Finance a **national award for sustained teaching excellence**.



Professor Steve Morris is this year's recipient of the **Sir Arthur Ward award for application of research to animal production**. Professor Morris received the award at the recent joint conference of the New Zealand and Australian Societies of Animal Production in Brisbane.



Socio-economist **Professor Anne de Bruin** has received a **Fulbright New Zealand Senior Scholar Award** for four months' research in the United States. Known for her long-running research interest in entrepreneurship, Professor De Bruin will spend time at Babson College in Boston and interact with researchers at neighbouring Harvard University and the Massachusetts Institute of Technology.



Distinguished Professor Gaven Martin is this year's recipient of the **New Zealand Royal Society's Hector Medal in Mathematical and Information Sciences**. The award recognises his "deep and wide-ranging contributions to the theory of Kleinian groups, geometric function theory and other fundamental parts of modern mathematics, including the solution of a number of difficult and long-standing problems".



Emeritus Professor Bill Oliver, a formative figure in Massey's history department, has been honoured with a **2008 Prime Minister's Award for Literary Achievement**.



Professor of Fine Arts Anne Noble has been granted a **United States National Science Foundation artists and writers award**. The award will enable her to return to Antarctica in late 2008 to complete her major photographic project, *WHITE LANTERN*, which has already attracted international critical acclaim and is to be published in book form as well as exhibited widely around the world. Of 90 applicants, seven were successful in gaining awards; Professor Noble was the only successful applicant from outside the United States. She has visited Antarctica twice before, in 2002 as a New Zealand Antarctic Arts Fellow and in 2005 with the assistance of Creative New Zealand.



Individual



Professor Harjinder Singh

The University's Fonterra Chair in Dairy Science and Co-Director of Riddet Institute Professor Harjinder Singh has established a world-class capability in dairy food research at Massey University and leads a large research programme directed at understanding structure-function relationships of milk proteins in food colloids. His research programme focuses on physical and chemical characteristics of food components, interactions/modifications during processing, and functionality in food systems, such as texture, flavour, appearance, shelf-life and nutrition. Professor Singh has been a leading figure in the development of dairy science in New Zealand and has contributed to the growth of the New Zealand dairy industry by facilitating development of new processes and products. He is the principal inventor of four patents, including the Omega-3 technology which is used in the joint venture company Speirs Nutritionals.

Professor Singh has published more than 225 research papers and book chapters. Most of these papers have been published in high-ranking food and dairy journals as well as fundamental physical sciences journals, and a large number of papers have attracted high citation ratings. He has supervised 60 postgraduate students.

The international standing of Professor Singh's contributions has been recognised by the receipt of two prestigious international awards: the William Haines Dairy Science Award (2008) from the California Dairy Research Foundation and the Marschall Rhodia International Dairy Science Award (2001) from the American Dairy Science Association. His outstanding contributions to the wider food science discipline are recognised by his election to the Fellowship of the Royal Society of New Zealand (2002) and Fellowship of the International Academy of Food Science and Technology (2006). He serves as a member of several editorial boards and has given numerous invited keynote addresses at international conferences.

Professor Singh was nominated by his co-director at the Riddet Institute, Distinguished Professor Paul Moughan, who says that Professor Singh has demonstrated distinguished scholarship and intellectual leadership of the highest order.

"His work has been characterised by innovation, novelty and creativity as well as the ability to translate laboratory-based findings to the food industry. It is rare to encounter such excellence in both fundamental research and industrial application."

Professor Singh arrived at Massey University in 1989 as a lecturer, after working as a research officer at the New Zealand Dairy Research Institute. He completed a BSc (Hons) and an MSc (Hons) in Biochemistry at Punjab Agricultural University, and a PhD in Food Science and Technology at the National University of Ireland, University College Cork.

Supervisor



Professor Tony Vitalis

In his 25 years at the College of Business Professor Tony Vitalis has supervised 24 PhDs, 16 as main supervisor. Many of his students have gone on to become heads of department or hold leadership positions at Massey and other universities. He has also supervised more than 80 master's projects and several master's theses. Several papers coauthored with students have received accolades including two best papers at the New Zealand Ergonomics Conference.

In addition to his formal supervision, Professor Vitalis has taken a leading role in promoting and developing a research culture within the College. He has served as the College's representative on the Doctoral Research Committee for several years. As well as examining Massey DBA, PhD and MSc students, Professor Vitalis is an appointed examiner to Canterbury, Victoria and Waikato universities, as well as Australia's Curtin University and the University of East Asia in Macau.

Among those who supported the application of Professor Vitalis are former Dean of the Graduate Research School Professor Ken Milne, former acting ProVice-Chancellor of the College of Business Professor Barrie Macdonald, Pro-Vice-Chancellor of the College of Business Professor Larry Rose, Dean of the Graduate Research School Professor Margaret Tennant and Professor of Management Ralph Stablein.

Professor Claire Massey says the contribution of Professor Vitalis as a supervisor is "incalculable".

"Tony takes the task of supervision to heart: I know of no other supervisor who so generously opens his home to students – they are not only mentored and advised but fed and entertained. This is an extraordinary commitment and one that is well beyond most of us but which for Tony is as natural a part of supervision as teaching a student how to manage statistics. He is a role model for us all – and one I often think of when I am working with my own students."

Professor Vitalis joined the University in 1980, after completing an MSc and a PhD in ergonomics at the University of London. His external service includes time as president of the New Zealand Ergonomics Society, various roles for the New Zealand Institute of Management and as a referee for research applications to the Foundation for Research, Science and Technology.

Team



Early Career



Dr Bryan Walpert

College of Humanities and Social Sciences

A senior lecturer in creative writing in the School of English and Media Studies, Dr Bryan Walpert has 57 poems published or forthcoming in journals and anthologies in New Zealand, the US, Canada and the UK.

Cinnamon Press is publishing his first full collection of poetry, *Etymology*, in February.

Dr Walpert's poetry has won numerous prizes, including first and third prizes in the 2007 New Zealand Poetry Society International Poetry Competition.

He also won last year's James Wright Poetry Prize sponsored by the prestigious US literary journal *Mid-American Review*.

Critical academic writing also plays a significant role in Dr Walpert's work, and he has had a number of essays on American poetry and poetics published in scholarly journals, literary encyclopaedias and professional publications.

Dr Walpert has two critical book projects currently under way. One, under consideration by a publisher, explores the use of science in American poetry. The second is a series of essays on poetics.

"This award is recognition of the value of creative writing," Dr Walpert says. "But for me, creative writing goes hand-in-hand with critical work. It's hard to read and write poems without thinking about the literary and philosophical questions that underlie the poetry."



Dr William Fish

College of Humanities and Social Sciences

Since completing his PhD in 2001, Dr William Fish has completed the book *Perception, Hallucination and Illusion*, which Oxford University Press will publish next year.

Dr Fish has been a lecturer in the University's philosophy programme since 2004 and has had five articles either published or accepted in the past year.

Two of those have been accepted by the journal *Analysis*, which consistently ranks among the top ten philosophy journals worldwide.

His work has also been critically discussed by leading philosophers around the world, showing the impact his research is having in the field.

Dr Fish says his work centres on the nature of the visual experience one has when seeing the world, which, unprejudiced by theory, seems clear: experience embodies an openness to reality.

"Philosophically and scientifically, however, things are not this easy," he says. "Typically, philosophers and scientists have accepted that our pre-theoretical view is mistaken and have tried to construct theories of experience against this background."

"The central plank of my recent research has been that the pre-theoretical view is not mistaken after all. Instead, the apparent difficulties with the view spring from certain deep-seated assumptions that can, once uncovered, be undermined."

The Centre for Social and Health Outcomes Research and Evaluation and Te Ropu Whariki

The Centre for Social and Health Outcomes Research and Evaluation (SHORE) and Te Rōpū Whāriki undertake policy and community research and evaluation on a variety of health and social topics.

Both focus on policy-relevant research in public health areas including alcohol and other drug epidemiology and policy, gambling, neighbourhood and health, environmental issues, Māori health and well-being, the evaluation of health promotion programmes and community action research.

SHORE is a World Health Organisation Collaborating Centre in the field of alcohol and other drugs.

Its principal function is to conduct social and public health research that is of scientific and policy importance with the aim of contributing to the improvement and protection of health and well-being both in New Zealand and overseas.

Te Ropu Whariki is involved in a wide range of research projects with a Māori development focus. It is at the forefront of research that supports Māori community development providing a mix of strategic and applied research from a kaupapa Māori base.

Centre director Professor Sally Casswell says SHORE and Te Rōpū Whāriki gain success through the collaborative approach they take to research.

“The relationship is really important as a lot of the work we do in public health research involves Māori, so the fact we can do joint projects is crucial,” Professor Casswell says. “Everything we do is a team effort, so researchers get to learn from one another.”

She says the centre develops respectful relationships with participants that are pivotal to good research.

“We’ve also struck a good balance in terms of taking on projects from both funding agencies such as the Health Research Council and the Marsden Fund, as well as taking on work commissioned by government agencies.”

left to right: Taisia Huckle, Brionhy Hooper, Dr Tim McCreanor, Dr Jennie Connor, Dr Richard Griffiths, Dr Lanuola Asiasiga, Belinda Borell, Jeffery Adams, Associate Professor Karen Witten, Dr Suzanne Mavoa, Michael Blewden, Professor Sally Casswell, Lisa Morice, Dr Sarah Greenaway, Paul Sweetsur, Jan Sheeran, Ryan You, Dr Chris Wilkins, Gerda Langst



Dr Vyacheslav Filichev

Institute of Fundamental Sciences, College of Science

Dr Vyacheslav Filichev’s research is based around nucleic acids, particularly deoxyribonucleic acids (DNA). The work is interdisciplinary, embracing chemistry and biology.

Professor Peter Derrick, head of the Institute of Fundamental Sciences, praises Dr Filichev’s work.

“He has published at least 11 papers during his time at Massey

since 2006, which represents outstanding productivity starting from scratch in a new institution. His papers are of a uniformly high quality, and are being noticed internationally.”

Dr Filichev had also shown himself to be a very strong research supervisor, and is “a magnet” for research students.

“Because of his enthusiasm, dedication and passion for his science and probably also because of his intellectual nimbleness.”

Dr Filichev was a key player in setting up a DNA research laboratory, Professor Derrick says, and had, with developing initiatives in DNA synthesis, engineered a significant research development for Massey.

A lecturer in chemistry, Dr Filichev graduated with an Honours Diploma of Higher Education (equivalent of an MSc) and a PhD in Organic Chemistry from St Petersburg State Technological Institute in Russia.

“It’s nice that people recognise my work,” he says. “When I

came here, staff at the Institute of Fundamental Sciences helped a lot – without their support it would have been very difficult to establish a research lab in my area, DNA synthesis.”

Dr Filichev’s work sees DNA modified chemically with direct attachment of organic reporter molecules. By chemically modifying DNA, fundamental processes such as the regulation of gene expression can be studied and modern diagnostic methods developed. As a result of this research a novel type of bionanosensors and molecular devices can be obtained with implications for fields including health care.

In 2007 Dr Filichev received a Marsden Fast Start grant for his project *Synthetic probes yielding stable and selective DNA triplexes for gene visualisation*.

Dr Filichev and Dr Gareth Rowlands have been granted a postdoctoral fellowship, see page 87.





Dream **run**

Matthew Brodie, the runner up in the MacDiarmid Young Scientists of the Year Award, talks to Malcolm Wood.

Brodie's breakthrough is the development of fusion motion analysis software that will allow a skier's run to be analysed and understood in all of its detail.

It is a first.

Motion analysis has a long history. In the 1870s Eadweard Muybridge photographed a horse in fast motion using a number of cameras arranged parallel to the track and triggered by a succession of trip wires. It is believed his stills settled a bet about whether a galloping horse's hooves are ever simultaneously clear the ground – they are – and showed that the illustrators of the time had things hopelessly wrong.

Until very recent times most motion analysis has been carried out in a way Muybridge would recognise, using cameras in the controlled environment of the laboratory, athletics track or film studio (for 3D animation-based and special effects).

In some situations, however, optically-based motion analysis is not practicable. Downhill skiing is one. Steep and irregular terrain, extreme speeds (speed skiers routinely exceed 200 kilometres per hour), the dramatically changing scale and orientation of the skier in the camera frame, the need to tilt and pan multiple cameras each with an operator, and the visual problems of snow and natural light all mean that optical analysis will never be a practical or efficient solution, says Brodie.

Fortunately in the past decade a wave of affordable, tiny microelectromechanical sensor (MEMS) technologies for measuring movement have come to market. Is this a solution? Maybe. The problem, it turns out, is making sense of the data they produce.

Matthew Brodie was raised in Palmerston North. He did a degree in chemical engineering

at Canterbury University and took up a job as a process engineer at Carter Holt Harvey, but after a while boredom took hold.

So he quit, took three months out for an invigorating tramp of the length of the South Island, and went in a different direction. In his early teens Brodie had been introduced to skiing during family holidays at Mt Ruapehu. Now, over a number of years, he embarked on a series of ski-related jobs: ski-patrolling at Mt Olympus and Temple Basin, working as an instructor and coach in Japan in the off-season, and eventually establishing a small business bringing Japanese skiers to New Zealand. For a while, before the dollar inflated against the yen, he did well. But it was a precarious lifestyle, and he had other interests. Postgraduate study beckoned.

Brodie had his research topic in mind, exploring the dynamics of skiing, and a preferred city, Wellington, where his girlfriend had just taken up a job. That being so, Massey, which taught exercise science and engineering and had a Wellington campus, was the logical choice. Biomechanist Dr Alan Walmsley, of the Institute of Food, Nutrition, and Human Health and multimedia systems engineer Dr Wyatt Page of the School of Engineering and Advanced Technology agreed to be his supervisors. He was awarded a scholarship to help with his costs, and a capital case was put forward for the sensor system he would need.

What kinds of movement are there? In the case of single sensor, there are three perpendicular axes in which it can move in three dimensional space (forward or backward, up or down, left or right) and three perpendicular axes around which it can also rotate independently (forms of rotation known as yaw, pitch and roll).

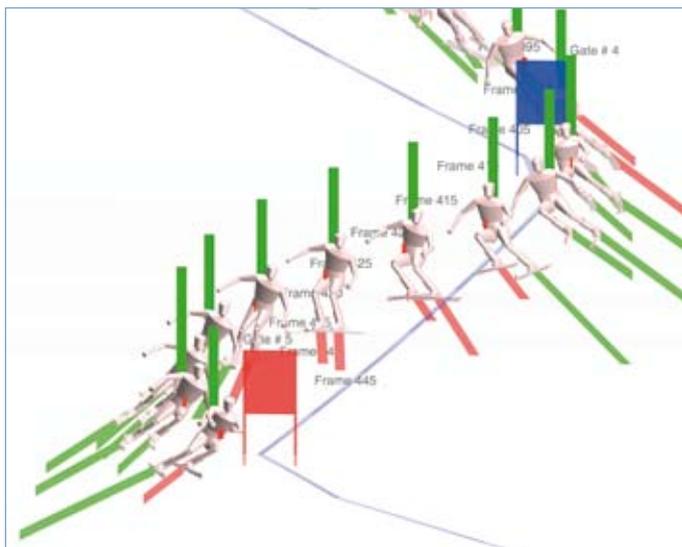
The sensors purchased by Massey would measure each of these kinds of movement. Although weighing just 30 grams, each contains

Achieving top one hundred status for YouTube views nationally, being interviewed by *New Scientist* for its web site, featuring in the national papers and on national television...

Matthew Brodie, the category winner of Future Science and Technologies and overall runner up in the MacDiarmid Young Scientists of the Year awards, is taking his 15 minutes of fame all in his stride, with a kind of self-possessed bemusement.

The truth is that, for the time being, his life is not as glamorous as all that. In a secluded office on Massey's Wellington campus, Brodie's days are devoted to compressing four years of research into the under-100,000 words requirement for a PhD thesis.

And although his thesis is about the science of skiing, the doctoral student – and newish father – will not see much snow this year.



To view skier animations visit www.youtube.com/BrodieMAD

three gyroscopes (to measure orientation), three accelerometers (to measure acceleration), three magnetometers (to measure the strength and direction of the magnetic field in the immediate vicinity) and a thermometer (for sensor calibration).

All up, the system purchased for Brodie's work consisted of 15 sensors wired to a central bus, which could connect to a laptop computer or modified logic board. What is more, the system even came with 'Nancy', a software body model, based on the scanned dimensions of a real person, to which the data from the sensors could be mapped.

But Nancy, as Brodie was to discover, had her limitations. For one thing, she had a problem with her lower back: the software assumed this was rigid. For another, as supplied, Nancy also lacked legs. Hers was a torso-and-arms model only.

A third problem was that the software model worked on the assumption that the sensors would be attached to the subject at set body points in impossible-to-maintain orientations.

These were matters Brodie remedied. He built Nancy her lower limbs, freed up her lower torso, and devised a way of placing the sensors where he wanted and subsequently performing a calibration.

Then came the crunch. He put a subject wearing his sensors on an office chair and spun the chair to see what Nancy, the computer double, would do. As the chair rotated, its occupant and Nancy parted ways. The subject kept her arms to her sides; Nancy raised hers into the air.

"After I spun the person on the chair and discovered that the model didn't work, that's really where my novel contribution to this begins," says Brodie.

Brodie knew he would have to re-engineer the modelling software and he knew too that he would have to take steps to improve the accuracy of the raw data. He embarked on a series of experiments.

He could see that he would need another external source of data. "The IMUs [Inertial Measurement Units] just give you local movements. I needed to know where a person was and how fast they were moving through global space." He attached a GPS to the helmet of his subjects, but, again, an off-the-shelf GPS was not going to work.

"But if you can get the raw data out of it and combine it with the inertial measurement data, you can get a more accurate position and orientation.

"One step up from the raw data, GPS gives you time-of-flight and carrier frequency, which is like the Doppler effect you hear when an ambulance goes past. When you are going towards a satellite the frequency gets higher; if you are going away from a satellite the frequency drops. You can tell the relative velocity. Then if you take the accelerometer data and integrate it you have another measure of velocity. So now we have overlap: information on velocity from two different sources."

Brodie's third source of data was a multiple-sensor pressure-sensitive insole, again off-the-shelf, and again needing to be tweaked to provide the data he needed.

Brodie and his subjects became a regular feature on the slopes, Brodie, the boffin with his laptop and Ben Griffin, his test pilot, with a tangle of wires sprouting from his daypack and a GPS taped to his helmet.

Brodie's first animations looked somewhat awkward. "I had to assume some part of the person was fixed. So I assumed the cervical

spine was fixed. My first animations look as if they are hanging on a coat hanger."

Gradually the software model was refined to the point where Brodie and Griffin could sit down after a run – perhaps back in the "blue monster", Brodie's VW van-turned-laboratory – and watch exactly what had happened. How Griffin had angled his body. Where his line had been. The pressure he had exerted on the snow. How efficiently, in Brodie's terms, height and gravity had been used to generate velocity.

Overseas, Brodie's work was also becoming noticed. At a science and skiing congress in Austria, Brodie was given a coveted spot as one of the early speakers and awarded a *Fédération Internationale de Ski* sponsored prize for innovation.

It was this, together with the fact that he was not part of a large, well-established research group, that Brodie believes clinched the award from the MacDiarmid award committee.

A second wave of publicity for his work – this time international – came when Brodie was invited to write the lead article for the first issue of the *Journal of Sports Technology* and the publishers put out an international press release.

Brodie's work could have multiple applications. The obvious one is in enabling competitive skiers to improve their times, but the animations it produces could also be used as an add-on for televised ski races (in the same way that animations are used to enliven the America's Cup races) or to identify and address the causes of sports injuries.

Nor is there any reason why the technology should not be applied to any other sport or form of movement.

Already inertial sensors and other forms of movement detectors are being used in such consumer appliances as the Nintendo Wii game controller and the Nike sensor for running shoes.

Prices too are coming down. Brodie calculates that the cost of the basic components in the sensors he made use of has come down by two thirds in the last four years.

It is a reasonable prediction that in future we will not lack for technology or data when it comes to motion analysis. The trick will be to make sense of it. ■



Advance and retreat

For somewhere to contemplate climate change and its consequences, I can recommend nowhere better than floating on an inflatable boat on the ever-extending lake that now lies at the terminal face of the Tasman glacier.

Thirty years ago there was no lake: the Tasman river issued forth from the glacier's face.

By the early 1980s there were a few surface ponds – the technical term is 'supraglacial' – toward the end of the glacier.

By the late 1980s, when Martin Kirkbride, (who would supervise my PhD in the late 1990s), undertook his first survey of what was happening, the ponds had begun to coalesce, and by 1990, the Tasman Glacier's had its own 'proglacial' lake.

When I first visited the Tasman Glacier in January 2000, as part of my PhD fieldwork, the lake was two-to-three kilometres long, and today the lake is an inescapably significant geographic feature: six-to-seven kilometres long, a couple of kilometres wide and – as we discovered in a detailed survey in April 2008 – at least 245 metres deep.

No, this is not man-made global warming at work, but something much older. The Tasman Glacier is belatedly responding to the post-1850 century of climate warming that began with close of the 'Little Ice Age', a 400-year event which included three cool periods.

That climate warming may not have amounted to much – perhaps a 1 degree Celsius rise in average temperature – but it was enough. Worldwide, as numerous studies have shown, glaciers in general went into retreat.

In general, but not universally. For when you look at an individual glacier, matters become more complicated.

The mass balance (or 'health') of a glacier is a delicate budgetary exercise. There are inputs, (collectively known as accumulation) in the form of snowfall and avalanching onto the

surface. And there are outputs (collectively known as ablation), including surface melting, meltwater runoff and evaporation, and the direct evaporation of ice.

New Zealand's mid-latitude situation and its particular geography mean that the effect of climate change – either current or historic – can lead to quite different glacial responses according to the glacier you choose.

Indeed, because the prevailing weather patterns have led to higher snowfalls in upper

basins or nevés, the Fox and Franz Josef glaciers have advanced over a kilometre from their 1950s and 1960s positions, even as glaciers on the east coast of the divide have continued to retreat.

Because of this, they respond quickly to changing climatic conditions. A recent study published by our group¹ found evidence that the terminus of the very steep Fox Glacier responds to changes in accumulation of snow in its névé in less than a decade.

In contrast, low-angle debris-covered glaciers like the Tasman Glacier respond an order of magnitude more slowly to climate change, and when it is climate warming the change often takes the form of a gradual surface lowering.

Until the arrival of the lake, this is exactly what happened to the Tasman, the downwasting evident to anyone who, over the years, had to climb ever further down steep moraine walls to reach the glacier surface.

With the formation of the lake, the equation changed. The downwasting continues, but it is the lake that is exerting the greater influence: every day and all day, its waters eat away at the glacier.

The lake allows the terminus of the glacier to calve blocks of ice off the snout. This happens in a number of ways. At the water line, a thermo-erosional notch forms, melting a large, flat cavern into the ice cliff. This destabilises the ice above, causing subaerial calving; sometimes there are spectacular collapses of ice into the water, sending waves across the lake – to the consternation of anyone in a small survey boat!

Another type of calving happens beneath the water's surface, chunks of ice breaking away from the submerged portion of the glacier and rising to the surface as icebergs. During our April fieldwork, icebergs would occasionally emerge from the water at quite large distances from glacial terminus.

The distance of the icebergs from the terminus taken together with the evidence of our sonar work suggests that a large 'foot' of ice extends for maybe 200 metres under



The Tasman Glacier and its surroundings as seen by Landsat in 2001. 1. Mount Cook Village; 2. The Tasman Glacier's proglacial lake; 3. The main body of the rock-and-scrub covered Tasman Glacier; 4. The high peak of Aoraki Mt Cook; 5. The Hochstetter Glacier, where the lake is likely to eventually terminate. Image: NASA <http://visibleearth.nasa.gov/>

basins or nevés, the Fox and Franz Josef glaciers have advanced over a kilometre from their 1950s and 1960s positions, even as glaciers on the east coast of the divide have continued to retreat.

The Fox and Franz are 'clean ice' glaciers: they lack the insulating rock, gravel and dirt cover you see on glaciers such as the Tasman.

One of our iconic landscapes is changing rapidly, writes **Dr Martin Brook**.
And there is nothing much we can do about it.

the water away from the ice cliff into the proglacial lake.

The work that has been done on similar calving glaciers in South America and Alaska suggests that there is a direct relationship between the calving rate of the ice cliff and the water depth. As lake depth at the snout increases, more glacier ice comes into contact with the lake water, more melting occurs, and the calving rate increases.

The Tasman Glacier – and the lake at its tip – occupy a deep rock basin carved during the last major Ice Age around 20,000 years ago. As the Tasman Glacier retreats further up the Tasman valley, the rock basin is deeper and so the lake becomes deeper too, in turn putting



Two boats were used in the survey of the Tasman's lake, one (upper photo) carrying an echo-sounder to measure lake depth, the other (lower photo) pulling a towfish sonar, imaging the sub-bottom materials beneath the lake floor. The towfish sonar, a shallow seismic technique, is used to identify subsurface ice and the sub-bottom sedimentary stratigraphy.

In the summer of 2008/9 Brook and his team will return to Aoraki/Mt Cook National Park to continue sonar work at the Tasman and other proglacial lakes. They will be using ground-penetrating radar to study glacier structure; crevasse geometry, continuity and orientation are key determinants in glacier calving rates.

The data gathered will form part of an honour's project by Rob Dykes and a PhD thesis by Clare Robertson.

more and more of the front of the glacier in contact with lake water.

And whereas many glacial lakes are dammed by narrow moraine walls, which may eventually breach, the dam wall of the Tasman's glacial lake lies below the level of glacial outwash plains that stretch tens of kilometres to the south towards Lake Pukaki and the Mackenzie basin.

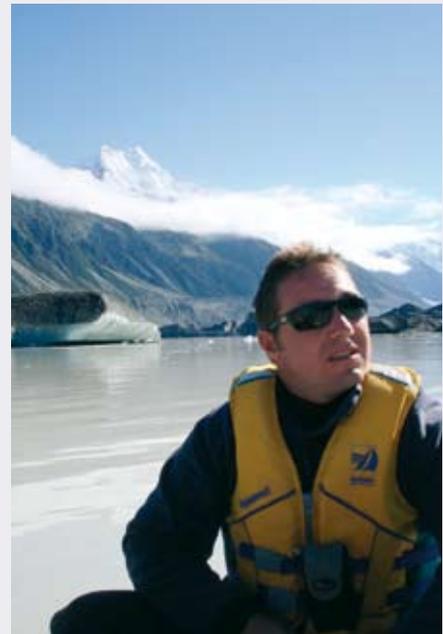
So what is going to happen to the Tasman Glacier and the lake with which it is now twinned? Or, more particularly: How far will the glacier recede? How large will the lake grow? And how quickly are things going to happen?

In the 1990s, when the lake was starting to grow significantly, Dr Martin Kirkbride put forward two scenarios, one moderate, one more extreme. In his moderate scenario, the glacier would retreat up the valley and the lake, growing at a moderate rate, would reach seven kilometres long by the year 2200. In the more extreme scenario the glacier would retreat rapidly reaching 10 kilometres up-valley by 2008 from status quo in 1986. With the lake now at seven kilometres and growing, this is much closer to the reality. To date, it looks like the ice cliff has retreated at the rate of roughly 180 metres a year, but the rate is likely to increase as the lake deepens.

The relationship between the lake and the speed of glacial retreat is fascinating. Within the glaciological community there is intense debate about the relationship between calving and glacier dynamics. A central issue is whether calving losses are the cause of ice flow acceleration or the consequence².

One view is that calving is the 'master' process, with calving losses triggering a cascade of dynamic changes up-glacier, including flow acceleration. A contrasting view portrays calving as the 'slave' of glacier dynamics, responding more or less passively to changes in other parts of the system. In this view, coupled dynamical and geometric changes to the glacier system drive increased calving rates, by causing the calving front to retreat and increasing the rate at which ice is delivered to that point.

Conceivably the glacier will continue to retreat rapidly until bedrock in the valley profile is exposed at water level (730 metres above sea level) between the glacier and the



British-born Dr Martin Brook completed his PhD at Dundee University in 2001, having conducted fieldwork in New Zealand's Southern Alps, northwest Iceland, and the Scottish Highlands. As well as his work on the Tasman glacier, Brook is working on an understanding of the dynamics of the Fox Glacier and of the rates of landscape evolution in the North Island, particularly in the Tararua ranges.

lake. Geophysical work carried out in the early 1970s in the valley suggests that this point will be reached after another eight or nine kilometres of recession, where the Hochstetter Glacier now joins the Tasman. This will be a vastly different landscape from that which we know today.

Are there then wider lessons to be drawn from all of this? I do not know. Certainly, as I have said, the Tasman Glacier is reacting to climatic changes that occurred well before any concerns about global warming.

Perhaps what it illustrates is that small climatic changes can have complex and sometimes disproportionate effects. ■

1. Purdie et al. (2008). Seasonal variation in ablation and surface velocity on a temperate maritime glacier: Fox Glacier, New Zealand. *Arctic, Antarctic & Alpine Research* 40: 140-147.
2. Benn et al. 2007. Calving processes and the dynamics of calving glaciers. *Earth Science Reviews* 82(3-4): 143-179.



the disease detect

tive

Nigel French, Professor of Food Safety and Veterinary Public Health, is a past master at tracking the origins of disease outbreaks.

He speaks to Malcolm Wood.

Looking back now, senior human resources advisor Dave Ingram blames it on a careless gesture made while holding court over a summer barbecue. He remembers touching his lip with his hand, taking a sip of wine, and watching organic slick from the raw chicken he had just handled coalescing on the wine's surface.

Two days later came the first of many bouts of diarrhoea. He was, he decided, quite sick – but just how bad things were only truly dawned when he went out to the veranda to turn off the gas to the barbecue, lay down to reach the tap and found himself unable to rise.

The ambulance staff who were called saw that he was severely dehydrated and attached a drip. At Wellington Hospital he was hurried into intensive care. Ingram saw in the New Year from a hospital bed. It was a week before he was able to leave.

Though his experience was an extreme one, Ingram is not alone. Catching *Campylobacter* is not uncommon: many thousands of New Zealanders are diagnosed with the gastrointestinal disease every year. The usual prognosis is unpleasant but rarely life threatening: a miserable seven-to-10 days of diarrhoea (sometimes bloody), often accompanied by fever, abdominal pain, nausea, headaches and muscle pain.

Nonetheless, it can have serious consequences and, on occasion, it is fatal. It kills around one New Zealander every year directly; and then there are the delayed deaths, the sequels, like that of Green Party leader Rod Donald.

A cyclist and a conspicuous advocate of healthy lifestyles, the lanky bearded Donald seemed a good candidate for a robust age. His death at age 48 from myocarditis following a *Campylobacter* infection came as a shock to many New Zealanders.

Studies have found that *Campylobacter* triples the risk of death within the first month following infection.

Professor Nigel French is on familiar terms with *Campylobacter*, shortening the unwieldy Latin tag to 'Campy' as he takes me through a presentation he recently delivered to the incoming Vice-Chancellor. This is one of number of presentations he has at the ready. Campy is evidently a subject of wide interest.

We are sitting in Professor French's office in the Hopkirk Institute, a joint venture between Massey University and AgResearch. Opened in March 2007, the Centre is a place of spare, self-contained, elegance, all floor-to-ceiling glass

and polished concrete floors. One wall of his office, its glass expanse only interrupted by two Mondrian-ish squares of blue, overlooks an area of lawn; opposite, through more glass, the view is into a corridor and the adjoining laboratories. He reflexively apologises for his clutter – what there is of it – but it is hardly his fault; anything out of place here would look wrong.

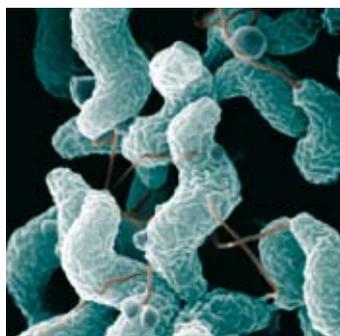
Professor French began his career as a vet, and the Hopkirk Centre specialises in animal health: it contains the largest concentration of animal health specialists in the southern hemisphere.

But that is animal health. So why, then, the interest in *Campylobacter*, which on the surface seems to be a public health issue?

In fact, the borders between veterinary public health and human public health are very poorly defined. We catch diseases, animals catch diseases, and often they pass between us. Infections that can pass from animals to man are known as zoonoses.

In the past decade or so a number of relatively novel zoonoses have hit the headlines. BSE, Hanta virus and West Nile virus – to name a few – are diseases that have, with varying degrees of success, made the leap from animal to man. But if you think about it there are many other lower profile run-of-the-mill zoonoses: listeriosis, brucellosis, leptospirosis... the list goes on and on. Of the more than 1400 pathogens that cause human disease, around 800 are estimated to have crossed over from animals.

We may think we hold a privileged place in the animal kingdom, but our pathogens know different. >>>



This scanning electron microscope image shows the characteristic spiral, or corkscrew, shape of *Campylobacter jejuni* cells. The brown filaments are flagella, the cell's outboard motor. Photo by De Wood; digital colourisation by Chris Pooley.



When bacteria go bad

Genetic engineering is not a technique confined to the laboratory; sometimes nature does it itself. Consider *E. coli* O157, also known as VTEC (verocytotoxic *E. coli*), which first emerged during the 1980s.

Generally speaking, *E. coli* is a widespread and generally benign gut inhabitant. VTEC, however, is not, causing stomach cramps, diarrhoea, vomiting, and sometimes, particularly among children, kidney damage.

What turned *E. coli* to the dark side? The agent seems likely to have been a virus which cut a portion of DNA from the bacteria *Shigella*, which is a cause of dysentery, and pasted it into the genome of the formerly blameless *E. coli*.

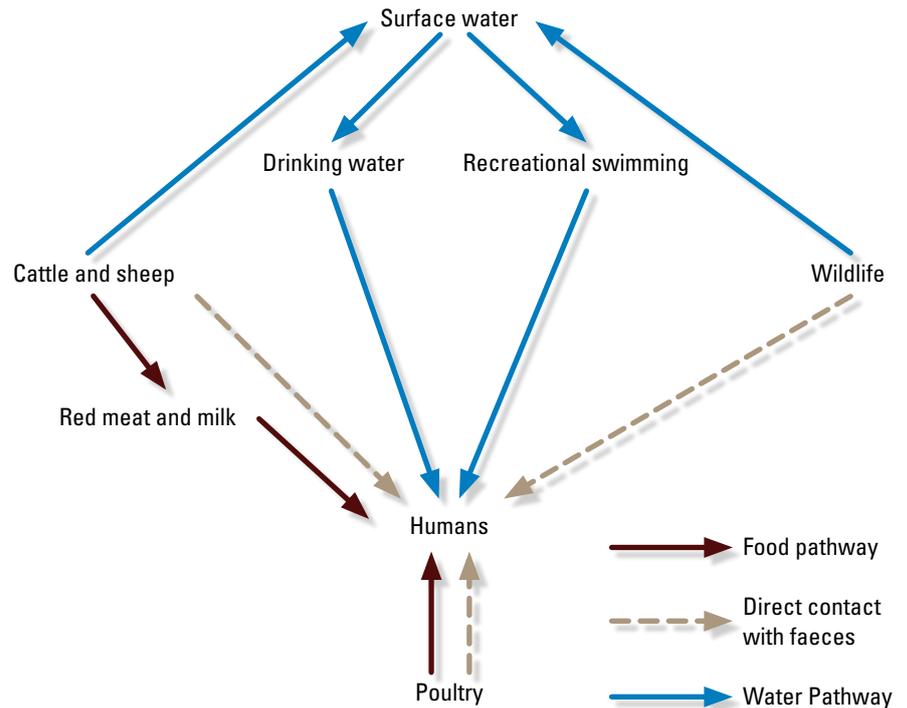
In New Zealand VTEC is the least reported of the notifiable forms of gastrointestinal illness and, although it has been shown to be present in livestock, it seems to be less prevalent than in other countries that have carried out surveys.

Nonetheless, the control of VTEC is a major consideration for New Zealand's \$5.4 billion meat export industry and a concern for the Food Safety Authority, which as well as being concerned with domestic public health is charged with facilitating access to markets for food and food-related exports.

Among Professor French's published papers are a number looking at how VTEC perpetuates itself within cattle herds – using UK dairy herds as the model – and how to disrupt the cycle.

Work is also proceeding on the epidemiology and control of the notifiable diseases caused by *Cryptosporidium* and *Leptospira*.

E. coli photo by Eric Erbe.



So intertwined are animal and human medicine that increasingly the talk is of a 'One Medicine' philosophy, which would see veterinary and medical science in much closer alliance.

Campylobacter, no respecter of boundaries, is a good example of a subject suited to a One Medicine approach. The work being done by the Hopkirk Centre and Massey's Institute of Veterinary, Animal and Biomedical Sciences (IVABS) complements that of Otago University's School of Public Health and ESR.

And just as *Campylobacter* cannot be said to be the exclusive domain of animal or human health, nor does understanding the disease belong to a single discipline. Working alongside Professor French are a variety of specialists: epidemiologists, mathematicians, microbiologists and molecular biologists.

Since 1980, when *Campylobacter* was first made a notifiable disease, our rate has climbed upward, with a surge of infections in 2006 lifting the figures to 15,873 notifications and 969 hospitalisations in that year.



Left to right: Vathsala Mohan, Kenneth Teh, Esther Kimaro, Julie Collins-Emerson, Vanh Keovilay, Simon Spencer, Lynn Rogers, Professor Nigel French, Hamid Irshad, Sarah Vaughan, Professor Tom Besser (Washington State University), Anne Midwinter, Errol Kwan, Tui Shadbolt, Isabel Li, Eve Pleydell. Absent: Rebecca Pattison, Rukhshana Akhter, Petra Mullner.

Professor Nigel French

Apply a multiplier of between seven and eight to arrive at the total of reported and unreported infections and you have a figure of more than 100,000 *Campylobacter* infections nationwide.

To put that in international perspective, our rate in recent years has been three times that of Australia and 30 times that of the US. The likely cost to the New Zealand economy has been put at around \$75 million.

The source? Although *Campylobacter* is ubiquitous – found in cattle, sheep, wild birds and in ponds and waterways – the major contributor to human infection is chicken.

Many baby boomers will look back to the days when a roast chicken was a rare treat. In the 1960s on average we consumed a kilo of chicken a piece annually. Today that figure is more than 34 kilograms.

And chickens and *Campylobacter* get along just fine; the bacterium is a commensal species in chickens, causing no harm to its host.

How important is chicken as a source of *Campylobacter* infection? When, following a dioxin scare, fresh chicken was withdrawn from sale in Belgium during a four week period in 1999, the national *Campylobacter* infection rate fell 40 percent.

In New Zealand a survey conducted by the Consumers' Institute in 2003 found that of 40 whole fresh chickens 85 percent tested positive for *Campylobacter* and a national retail survey of *Campylobacter* in minced and diced chicken and red meat conducted by ESR (Environmental Science and Research) from July 2003 to June 2004 found that 89.1 percent of the 230 chicken samples tested positive.

In February 2005, not long after his arrival, Professor French assigned a PhD student to the problem of sourcing the *Campylobacter* strains. Petra Mullner used the techniques Professor French had developed at Liverpool University, and as she progressed her findings were regularly sent to the guardian of food-related public health, the New Zealand Food Safety Authority. Her work also fingered the poultry industry as the principal culprit in what was now acknowledged as a New Zealand *Campylobacter* epidemic. In 2006 as the epidemic hit new peaks, Dr Michael Baker of Otago University's School of Public Health began publicly urging that either the poultry industry institute a regime of freezing all poultry products (a measure that can reduce *Campylobacter* counts from three-fold to upward of 300-fold) or that the public should vote with its shopping trolleys and avoid chicken – “the cheap and dirty food of New Zealand” – altogether.

In 2007, in large part informed by Mullner's preliminary findings, the NZFSA

Professor French, who grew up in rural England and worked on farms during his adolescence, always wanted to be a farm vet, and that, after taking his BVSc in 1987 was what he became. But, although he enjoyed being in practice, it wasn't enough, so after three years he returned to study with a vengeance, signing up for an MSc in Epidemiology at London University and a PhD at his alma mater, Bristol University, degrees he would complete within a single three-year period funded by the Wellcome Trust Fellowship (for his masterate) and DEFRA (for his PhD).

While working as a vet his interest had turned to herd health and, by extension, to population medicine. His PhD addressed blowfly strike, an affliction that leads to the death of around 12,000 sheep in Britain annually, and its relationship to disease. Out on Exmoor – a region of woods, moorland and rolling countryside – he visited numerous farms over a period of months, taking blood samples from thousands of lambs.

Blowflies overwinter as larvae in soil, maturing and breeding when temperatures warm. During the summer, when the conditions are good, the entire blowfly life cycle from egg to adult can occur in less than 10 days. Professor French and his collaborators were the first to describe the underlying conditions that create fly ‘waves’ and to explicate the relationship to seasonal disease. It was a neat project, says Professor French, and led to 30-or-so papers.

Professor French's PhD had been supervised by then reader (the British Associate Professor equivalent) Kenton Morgan, and when Morgan was appointed Professor of Epidemiology at Liverpool University, the two moved as a team to continue the working relationship. At Liverpool Professor French worked on the epidemiology of colic in horses, an often fatal condition, and found evidence associating colic with tapeworm infestations, *Clostridium botulinum* and the behaviours known as stereotypies.

But in the public mind he is more associated with another animal welfare topic. He nods toward a tongue-in-cheek leaving gift from Liverpool: a mounted photograph of three horses and riders taking a jump. Professor French was one of the coauthors of *Equine welfare: Risk of horses falling in the Grand National*, a paper published in the journal *Nature*.

Published shortly before the race was to be held, the paper caused a stir in the media. They phoned one of the coauthors, explains Professor French.

“They asked him which horse do you think is going to win and he said, well, that's really not the purpose of the research. But when



they pressed him, he reluctantly said *this is the horse that is most likely to complete the race and therefore win, and this horse is the second most likely*. Then the media asked a bookie, who said “These boffins don't know anything. The odds say this horse will come first; this horse will come second.”

To Professor French's satisfaction, the bookie's horses fell at the first jump and the ‘boffin's’ picks took first place and runner up just as predicted. Unfortunately the system has failed to deliver accurate predictions in subsequent Grand Nationals.

Professor French was with Liverpool University for seven or eight years (during which time he also worked in Tanzania), but he was paying a steep personal price for his career success; ever ambitious to make changes, he was becoming stressed and seeing little of his wife or children, then age nine and six. New Zealand looked like a better place to achieve a work-life balance and to continue working on the subjects that interested him.

Four years on, he does not regret his decision to move to Massey and Palmerston North. His family is thriving; a passionate fly fisherman, he spends, as he puts it, a lot of time standing in local rivers; he is studying blues guitar with a local teacher, “and that's a lot of fun”. And work is going well. “I like working on big issues.”

Professor French divides his working life between Massey's EpiCentre, where he is Co-Director, the Hopkirk Institute, where he is a team leader (and a representative of Massey's Institute of Veterinary and Animal Biomedical Sciences), and occasional visits to Britain, where he holds the status of visiting professor at the universities of Liverpool and Glasgow.

held a series of consultative meetings before publishing *Campylobacter in Poultry – Risk Management Strategy 2007–2010*. The actions contained within the strategy address the issue of *Campylobacter* at every point between the farm and the fork, the idea being that changes made all along the chain – on the farm, during processing, on the shelf, and in the hands of the consumer – will aggregate into a substantial benefit for public health.

Under an electron microscope *Campylobacter* is revealed to be a blunt curved tube sporting a slender filament – the flagellum that it uses as propeller. This is the bacterium's phenotype: the physical expression of its DNA. Many diagnostic tests rely on the characteristics of the phenotype. For example, the organic compounds produced by the pathogen may be used to type it using antibodies.

But methods like these have their limitations. The essence of what an organism is – its own unique bar code – is defined by its genotype, in the case of *Campylobacter*, a single circular chromosome of around 1.6 million base pairs. But there is no need to read an entire genome to conduct an epidemiological study. Rather, what is needed is a precise method that lends itself to high throughput.

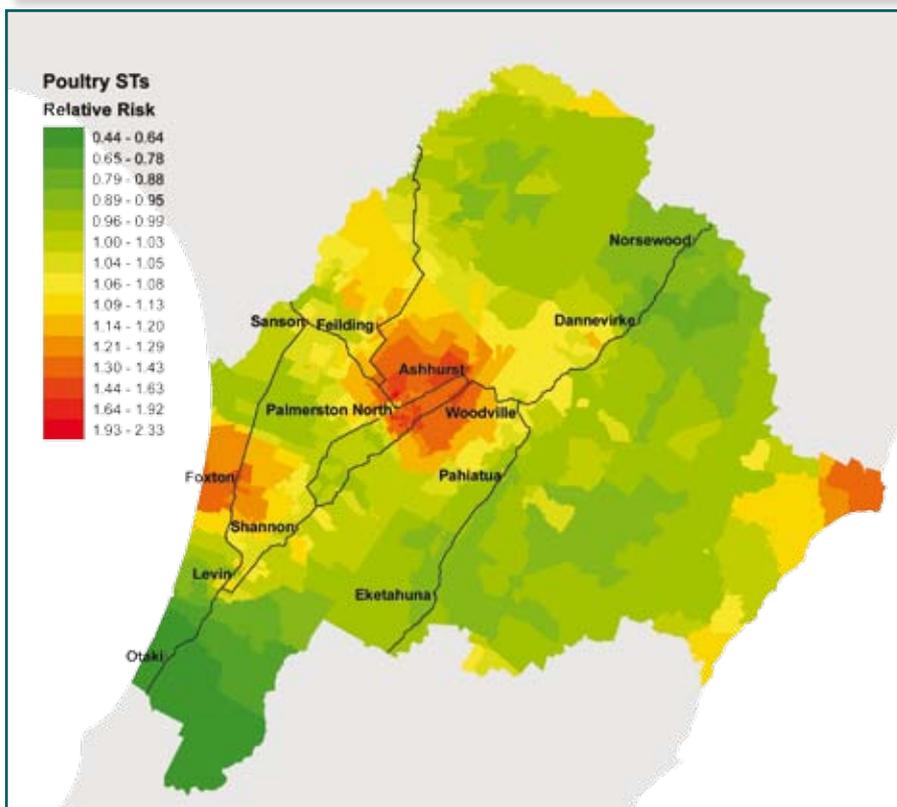
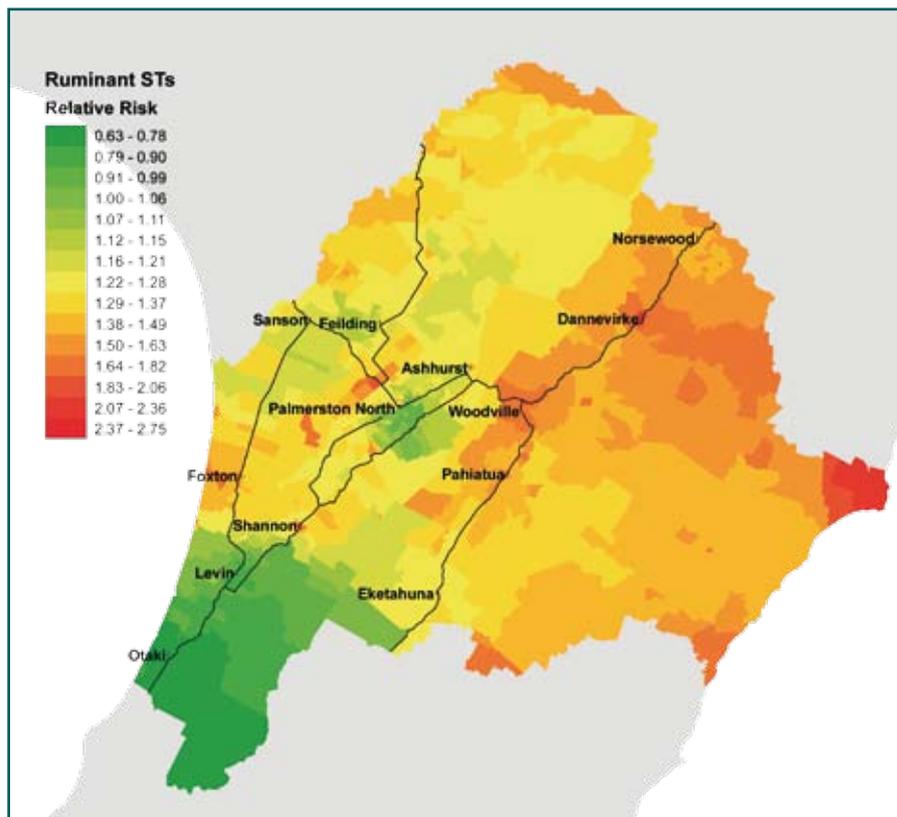
So Professor French and his collaborators are using methods that sequence strategically chosen shorter lengths of DNA, with the mainstay being a method called multilocus sequence typing (MLST)

For MLST, lengths of between 450-500 base pairs are taken from each of seven genes. These are 'house-keeping' genes: genes that are essential to the cell metabolism and so less likely to be under positive evolutionary selection.

For each house-keeping gene, the different sequences present within a bacterial species are assigned numeric identities. Hence a bacterium can be categorised using a seven integer series. These series are then compared with an international web-based database and divided into sequence types.

It has been shown that the prevalence of bacterial sequence types in *Campylobacter* varies widely according to host species. This is a potent means of tracing back to the source of human infections.

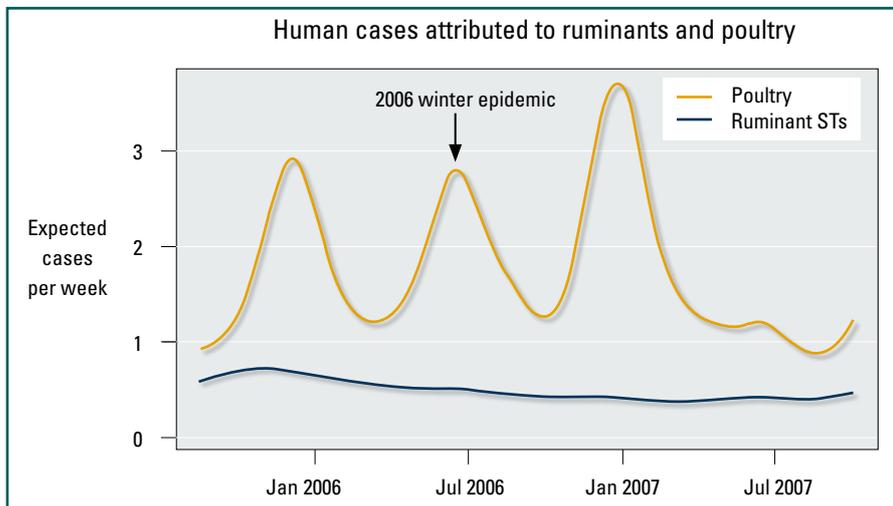
For example, according to internationally gathered data, Sequence Type 45 (ST-45), is strongly associated with chicken offal or meat (24.3 percent) and with human cases (44.3 percent of human stool). ST-61, which is strongly associated with cattle (30.1 percent), is slightly less common than



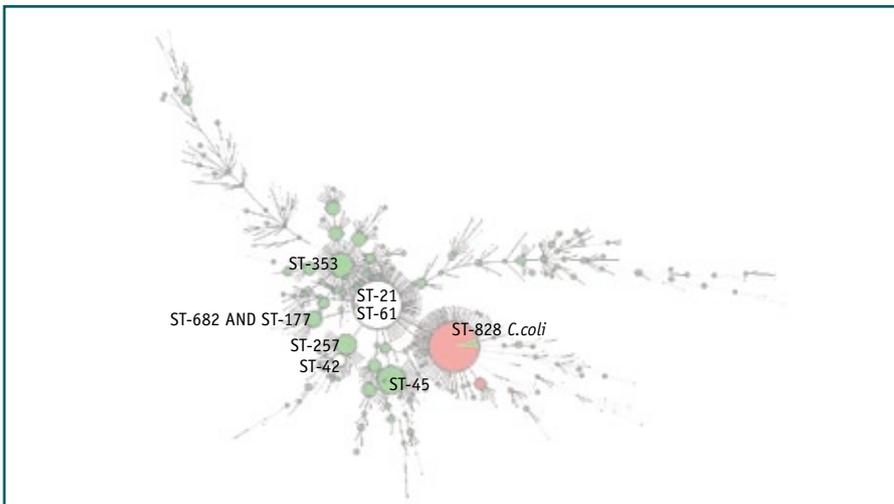
Statistically-speaking, what is the likelihood of you or your neighbour catching *Campylobacter*? The New Zealand census divides New Zealand into so-called meshblocks: small areas that are either empty or contain between one and 200 people. The greater the concentration of people, the smaller the meshblock. Knowing the number of notified cases of *Campylobacter* per meshblock, it then becomes possible to quantify risk. These two maps show the risk arising from those Sequence Types (STs) associated with ruminants such as cattle and sheep and those Sequence Types more associated with chicken. The maps, which incorporate a range of spatial and temporal variables, were developed by Professor French and Dr Simon Spencer. Maps like these can be useful in spotting anomalous events such as outbreaks.



Professor French and Dr Simon Spencer



The number of cases of campylobacteriosis attributable to poultry and ruminant sources in the Manawatu. Human cases are assigned based on their sequence type and a Bayesian smoothing model is applied to give the expected number of cases in each week.



Multilocus sequence typing has revealed the population structure of *Campylobacter jejuni* and *Campylobacter coli*. Sequence types are organised into clonal complexes containing closely related strains that differ as a result of sequence changes in one or two alleles. Most human cases result from these two species and many of the clonal complexes are associated with particular hosts – features that enable human cases to be attributed to particular animal reservoirs.

ST-45 in human cases (35.2 percent). ST-177 is heavily associated with wild birds (18.4 percent), particularly starlings (44.7 percent) but does not figure greatly in human infections (7.9 percent).

For the past three years Professor French has been working with ESR, AgResearch and MidCentral Health on the identification, surveillance and epidemiology of *Campylobacter* in the Manawatu using MLST as their workhorse analytical technique.

Around 3500 samples have been analysed. The sources include stool samples from notified cases (one of his masterate students is working for the Palmerston North Hospital public health unit) and the samples taken from the many sources of *Campylobacter* within the wider environment: poultry, red meat, recreational waters, sheep and cattle faeces, and wild birds.

Like the international data, Professor French’s work shows the strong associations between particular sequence types and sample sources. But the New Zealand data also contains some distinct oddities. The most prevalent sequence type found in human cases, ST-474 (27 percent of Manawatu cases), is internationally rare. The ST-474 genome, taken from both a human and a poultry isolate, is being sequenced by the Massey-hosted Allan Wilson Centre.

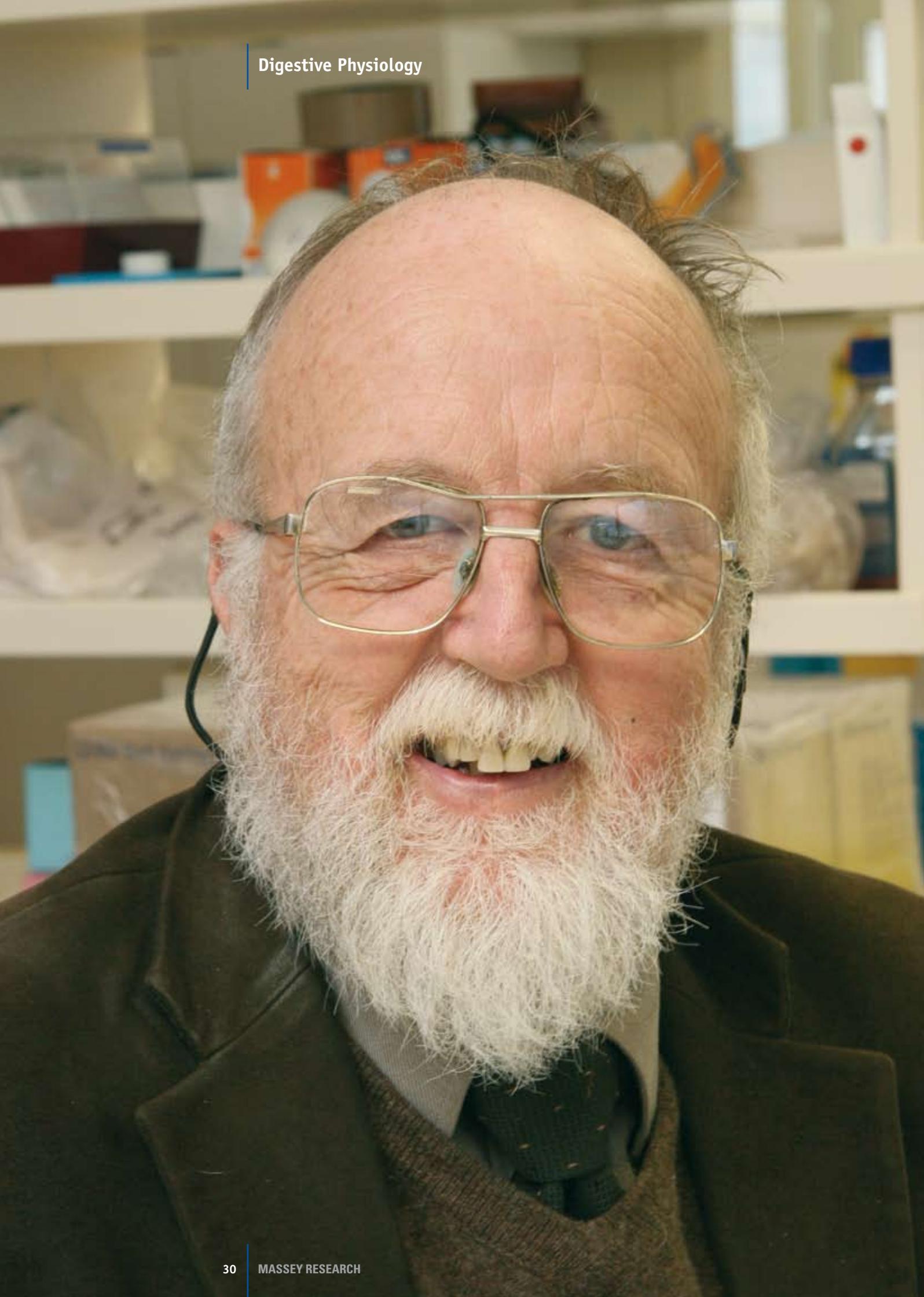
The patterns found in the Manawatu have also been found in subsequent studies in Auckland and Christchurch.

MLST has allowed him to do more than show the links between *Campylobacter* outbreaks and the chicken industry; he can even quantify the likelihood of an infection originating with a particular company – the New Zealand market was dominated by just three.

What has happened to New Zealand’s *Campylobacter* infection rate? As the NZFSA’s strategy has been adopted, the trend has been in the right direction: during the first quarter of 2008 there were 1762 notified cases – the lowest first quarter total in the past 12 years. The drop is dramatic, and Professor French expects further falls; eventually New Zealand’s rate of *Campylobacter* infection should fall to that of Australia – and very likely below.

Now the research he and his colleagues are conducting into those other sources of *Campylobacter* – sheep, cattle, wild birds, water – will increasingly come into its own.

The clinician’s reward may be the people cured. Here is the epidemiologist’s: fewer people are getting sick, more of us are healthy. The trends are heading in the right direction. Professor French is pleased. ■



Reading the entrails

Malcolm Wood talks to Associate Professor Roger Lentle

Associate Professor Roger Lentle has been described to me as Massey's David Bellamy, and it is true, there are similarities. The accent for one thing – though Bellamy's tendency to swallow his 'r's is absent in Dr Lentle. And the two share the same enthusiasm and evident grasp of subject; both are born communicators. The key difference is that Dr Lentle's passion is not for green and growing things, but for the physical processes of digestion and the physical qualities of what passes through the digestive tract. He is an expert in what is delicately termed 'digesta'.

If you think about your digestion in terms of the science you learned in school, it is probably in biochemical terms: the enzymes in saliva that break down starches, the mix of hydrochloric acid and the enzyme pepsin in the stomach, the bile and pancreatic juices in the small intestine. The chemistry that transforms the toast and jam you had for breakfast into the stuff of energy and body maintenance is wondrous, but there are other ways of framing the process.

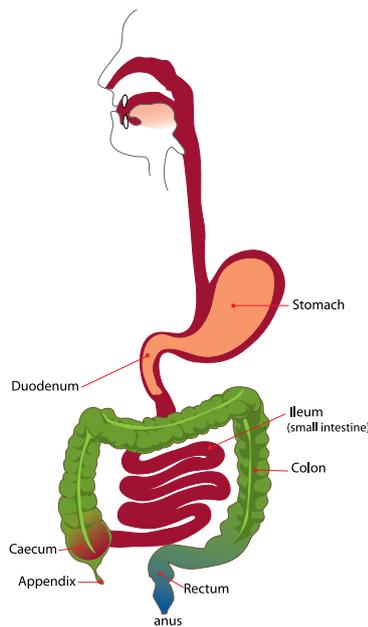
Consider the mechanical and physical problems. Somehow your well-chewed toast and cup-of-tea chaser must be shifted from mouth to oesophagus to stomach and then through the ten metres of convoluted tubing that is first the small and then the large intestine until you feel the call of nature and flush away something that is neither tea- nor toast-like in nature.

And that is not all, for along the course of this transmutation the digesta has to have been mixed in such a way that nutrients are transferred to the wall of intestine and into your being at the least energetic cost.

Why Dr Lentle's interest in digesta? It is not something that might have been easily

predicted. In a way, it could have been almost anything. The former senior lecturer in general practice at Otago University is something of a polymath. He likes diversions and digressions.

"I've got all sorts of backgrounds," he says, chuckling. "I have degrees in medicine – in fact I have been a practising clinician for 20-odd years. I have a degree in biochemistry. I have a masterate in ecology and a PhD in digestive physiology – or ecophysiology if you want to be precise."



As it happens, what caught Dr Lentle's interest was a 1986 paper by Deborah Penry and Peter Jumars. Penry and Jumars proposed modelling digestion processes by looking at the types of industrial reactors designed by chemical engineers.

These can be broken up into various theoretical models: batch reactors, where the ingredients are added to the reactor and completely removed when the reaction is complete (think home brewing) and

continuous flow reactors, which can either be plug-flow reactors or continuous-flow stirred tank reactors.

Penry and Jumars suggested, for example, that the ruminant gut was best thought of as a continuously stirred reactor – in the form of the stomach – followed by a plug flow reactor, conceptualised as the flow down a sequence of pipes.

Dr Lentle was intrigued. He wanted to explore the model. Where should he begin? He decided to turn to the kangaroo as a model system. This was because unlike placental ruminants, such as cattle or deer, which have a four-chambered stomach and chew their cud (regurgitate and re-chew their food), the kangaroo has a relatively simple digestive system: it chews its food well and only once, giving it a relatively homogenous consistency, and it has but a single stomach.

It was the consistency and characteristics of the mix of fluid and vegetation clippings in that stomach that interested Dr Lentle.

He sampled the mix, took measurements, and published. "That was really the first paper to properly evaluate the physical properties of digesta and how they would mix in terms of the theories of chemical engineering."

Could the stomach be acting as a stirred reactor? Not, he found, if it relied, as does an industrial stirred reactor, on producing turbulent flow.

"In order to induce turbulence in the stomach of the kangaroo [I found that] the muscle would have to contract at the speed of light."

Dr Lentle now began measuring the qualities of the digesta as it travelled through the gut.

Dr Lentle's particular interest is in the changing rheology of the digesta – its characteristics of deformation and flow. >>>

For most of its life, your digesta is a non-Newtonian fluid. This means that unlike water, which is its major constituent, its viscosity does not remain constant.

“From a physics point of view you are dealing with a suspension of particles,” explains Dr Lentle, “and that brings problems with pumping, as any chemical engineer will tell you.

“Some suspensions of particles will lock up when you pump them – they shear thicken. The more you apply shear to them, the thicker they get and *bang*, they block up solid.”

‘Shear’ is the sideways force you apply when you, say, run two surfaces across one another.

In fact, he says, fortunately for our digestive health, our digesta are pseudoplastic: instead of thickening they shear thin; alongside the gut wall the particles seem to line up under shear stress and they slip more easily.

But there is another problem: once the digesta starts to thicken – to become more of a particulate aggregate, as Dr Lentle puts it – how does the gut circulate it in a fashion that allows it to add enzymes and fluids and take up the remaining nutrients?

“You look at the digesta in the terminal ileum of most animals and it is the consistency of treacle.”

The answer, Dr Lentle has found, is that it does not. Instead, the gut compresses the springy mat of the digesta, forcing the nutrient-rich liquid to the sides of the gut, and then, as the gut relaxes and expands, the nutrient-depleted but now secretion-rich liquid is taken back in; the process rather like that of squeezing and releasing a kitchen sponge. “From the literature I have a fair idea of the pressures that are developed inside the bowel, so you can work out whether there would be significant extrusion of the liquid during compression.”

The extruded liquid in turn lubricates the movement of the digesta.

Dr Lentle goes hunting through his computer files and brings up a video file of a long windsock of gossamer-like tissue against a jet black background. This is a part of a possum’s small intestine, the ileum. Suspended in a mix of nutrients, it is still living and – as a waft of motion along its length shows – still functioning, pumping through the guar gum mix it has been fed.

This was the next stage in Dr Lentle’s journey. Having established the properties of digesta, and in the process having shown that the mechanisms put forward by others could not work, he would try to find out what was happening.

Normally the processes of digestion are investigated by introducing a dye tracer into the digestive system, either with food or, using various processes, into various parts of the gut. But these methods have limitations: you cannot see what is going on or where.

The method he has chosen has been to analyse the workings of actual organs held *ex vivo*, maintained living within the laboratory. All at once the hidden is made visible, and there is another advantage: removing an organ from the body also removes the noise that comes from sympathetic and parasympathetic nervous systems. No longer is the organ responding to diurnal or nocturnal rhythms. No longer is it reacting to stress. And because the guar gum mixes that are ‘fed’ to it are devoid of nutrient, another feedback mechanism is eliminated. In Dr Lentle’s words, this is the engine running smoothly at idle.

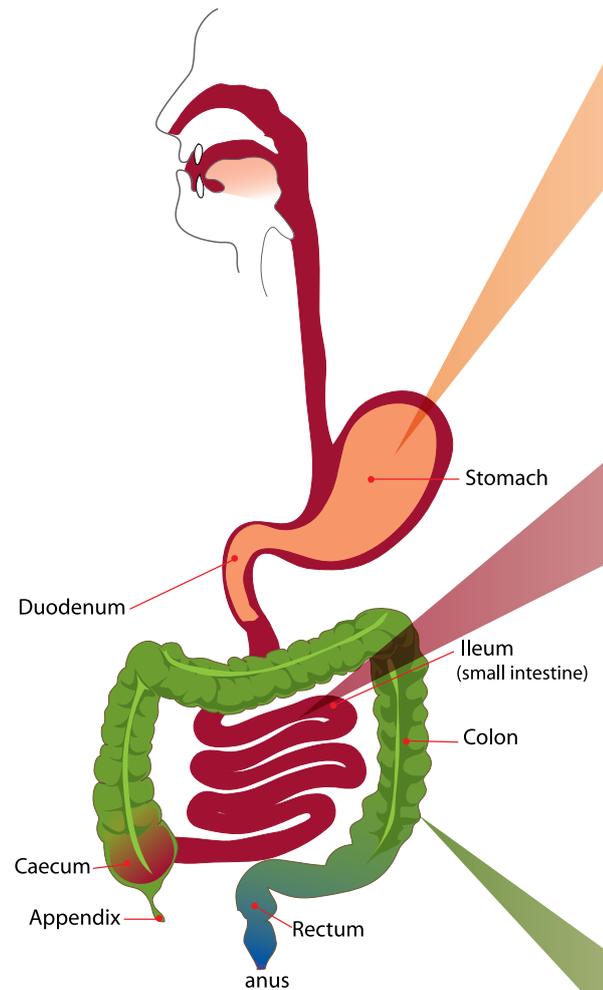
Because no one animal has a digestive system equivalent to our own, Dr Lentle has picked and mixed. The possum ileum is the nearest practicable analogue he could find to the human equivalent in the small intestine. In place of a human stomach, he has chosen that of the rat, and, in place of the human colon or large intestine, that of the rabbit. “You get as near as you can.”

How does the digestive system move its digesta? Although it may look inert – an inelegant assemblage of bags and tubes – the digestive system is highly muscular. The stomach, for example, far from being a hold-all is better, in functional terms, viewed as three organs, each of which exerts a particular physical effect, breaking up solids, pumping digesta, and constricting flow.

The more pipe-like lengths of the short and long intestines are also muscular. Here the muscle comes in two layers, radial muscles running around the diameter of the intestinal wall and longitudinal muscles running along its length. The two layers work in rippling concert, the circular muscle opening and

closing the diameter of the intestine and the longitudinal muscles shortening and then relaxing to propel their contents onwards. This rhythmically choreographed flow of extension and contraction is called peristalsis.

Dr Lentle is not the first researcher to have observed digestive organs at work outside the body. But he is among the few to have monitored what happens when these organs are fed solutions that approximate real digesta in their viscosity.

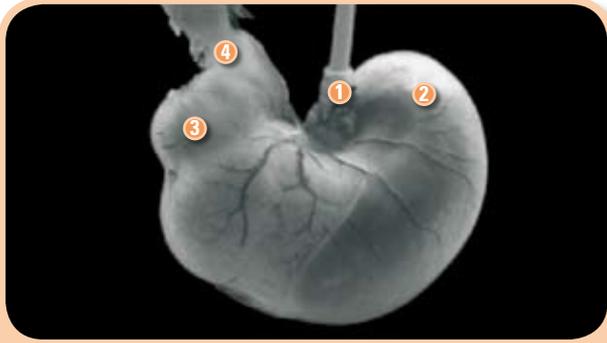


Many physiologists, have, for example, used a solution of salts and glucose when investigating the workings of the stomach. “That’s fluid water; not at all like what you see on the pavement on a Saturday night,” he says.

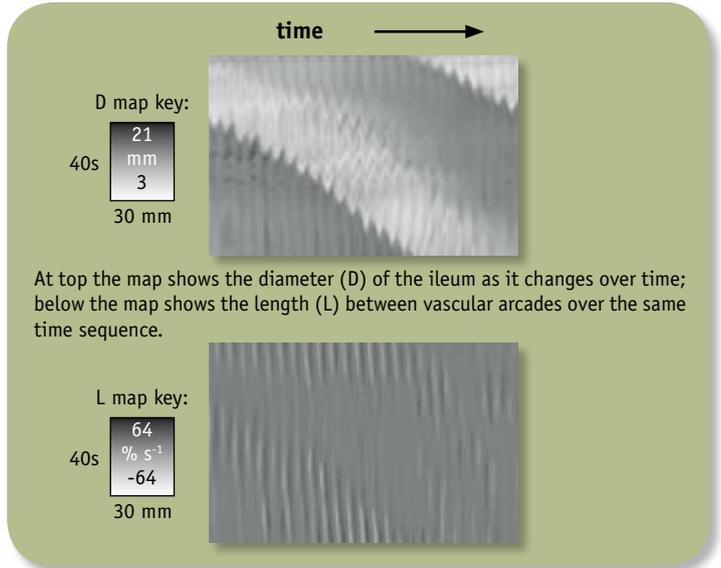
His approach to analysing what he sees is also novel. “The *way* we do the looking is frontier stuff.”

High definition video is taken of the organs in action and the individual video frames are computer analysed and the results compiled into a time sequence.

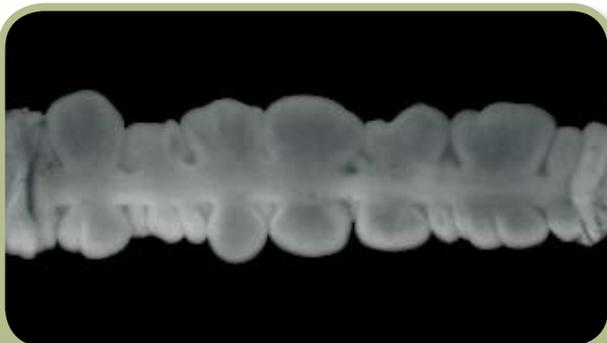
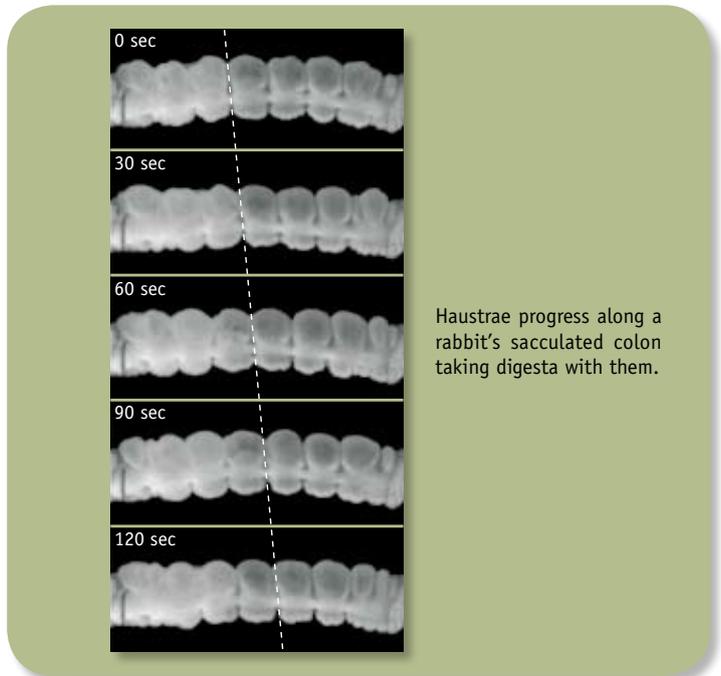
When analysing the action of the possum ileum, for example, one analysis measures the



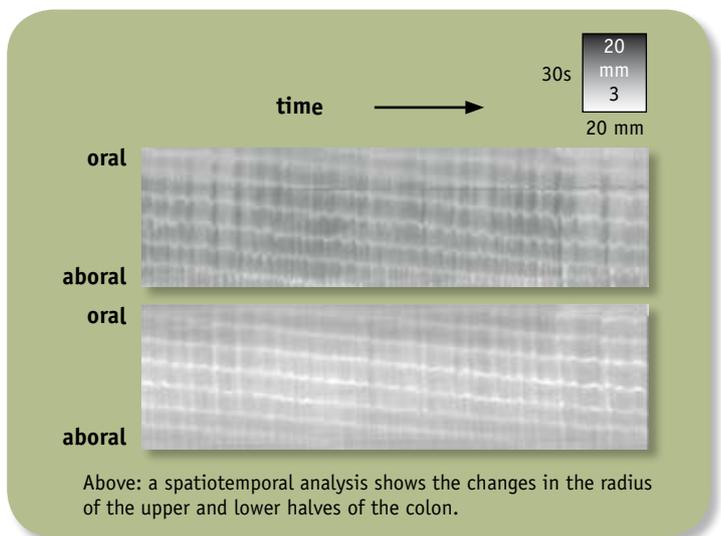
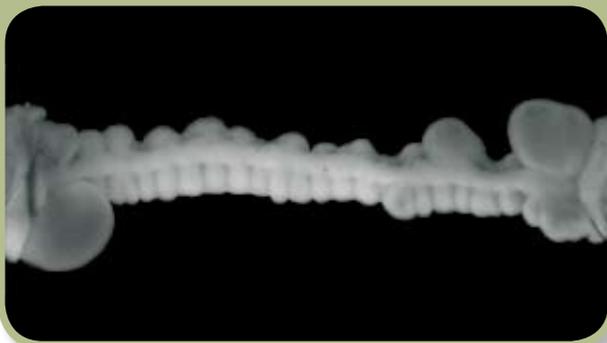
A rat's stomach in action. 1. The entry of the oesophagus 2. The fundus 3. The antrum 4. The pylorus, the point of entry to the small intestine. During digestion the antrum pumps coarse digesta towards the closed pylorus causing it to fragment during backflow.



A possum's ileum *ex vivo*. At left a contraction is beginning to make its way along the ileum's length.



A rabbit's sacculated colon radially distended (at top) and contracted (below). The sacs, or external pouches, are known as haustrae.



pixel distance between walls of the ileum, while another measures the pixel distance between the vertical lines of feeder blood vessels – the vascular arcades – that intersperse the ileum. These two sets of measurements taken along the length and breadth of a section of ileum are then visually represented by shaded pixels: white for the maximum extension, black for the minimum, and intermediate shades for the measurements in between. Chemical engineer Dr Pat Janssen wrote the computer algorithms used for the spatiotemporal mapping system.

Dr Lentle's work – the spatiotemporal mapping – shows that even in the absence of peristalsis, the muscles of the intestinal wall are in constant movement, see-sawing between the action of the radial and longitudinal muscle, exerting shear stress to liquefy the sides of the digesta where it meets the mucus boundary of the gut.

This 'fast phasic activity' has never been observed before.

Of what practical use is all of this? How can the rheometric qualities of what we eat be used to our advantage? Dr Lentle gives the example of guar gum, the same soluble fibre he uses to feed his *ex vivo* organs. Guar gum has almost eight-times the water-thickening potency of corn starch and is poorly digestible.

"A guar gum tablet has no nutrient content and yet it can be used to quite profoundly affect the glycaemic index of food. If you take a guar gum tablet after having consumed a sugary drink, your body's sugar uptake will be slowed," explains Dr Lentle.

"So the USDA (United States Drug Administration) allows the prescribing of guar gum for the treatment of diabetes.

"If you tinker with the physics, you can manipulate how much sugar, how much fat, or how much cholesterol you soak up. Our understanding allows you to tinker intelligently."

How so? Say you want to thicken the digesta in the small intestine. Normally the stomach – the guardian of rheology as he terms it – will hold back thick material until it has been heavily diluted. But by understanding the way the system functions, you can set about fooling it.

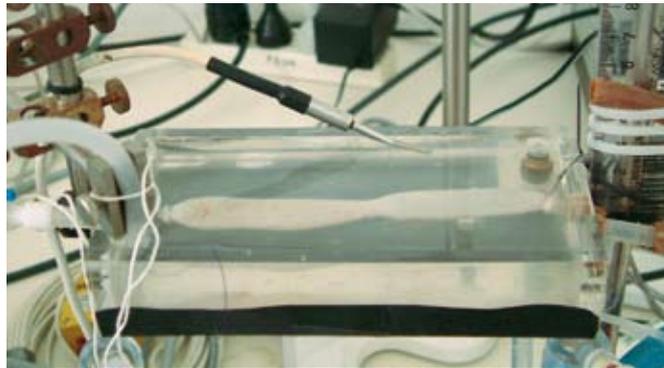
"You can take something like guar gum and add another polymer to it – perhaps maltodextrin. When the viscous solution of guar gum mixes with the maltodextrin the

two polymer strands interact and the solution becomes a watery drink.

"The stomach interprets this as a liquid and pumps it through into your small intestine, where an enzyme, pancreatic amylase, chops up the maltodextrin molecule leaving a thick treacly undiluted solution of guar gum."

A number of diseases can afflict the small and large intestines. Ulcerative colitis, for example, is a chronic digestive disease characterised by inflammation of the colon.

One ulcerative colitis treatment is the drug Pentasa (mesalamine), but in order for Pentasa to make it to the colon it must first avoid being absorbed in the small intestine.



A section of living possum intestine is being directly observed in a tank simulating normal conditions in the body

Dr Lentle's understanding of the physics of digestion may allow more of the drug to reach its target.

Another disease that may lend itself to treatments that employ the physical properties of digesta is diverticulitis, a common disease often found in the large intestine.

Here the digesta has become much thicker, and, unlike the small intestine, where

Dr Lentle's work is, quite literally, a revelation, a revealing. He is seeing things no one has ever seen before. These are firsts.

peristalsis is more continuous, periodic mass movements help propel the contents from the large intestine through the colon to the rectum.

"Diverticulitis is generally seen as a problem where the pressure inside the cavity of the colon gets so high that it causes these little blowouts, rather like the blowouts through the wall of a tyre," explains Dr Lentle.

"We know that in some way this is related to the character of the material. If you add

inert fibre you can introduce changes to consistency. We know people with more fibre in their diet are less prone to diverticulitis."

The fibre causes 'intestinal hurry'. "When you get intestinal hurry the colon doesn't have as much time to absorb the water so the stool becomes more liquid."

The equation seems to be more liquid stool means less pressure means less risk of diverticulitis, says Dr Lentle.

And it is the physical form of the fibre that seems to matter. Dr Lentle cites a study in which volunteers were fed quantities of inert plastic, either in the form of tiny spheres or as milled flakes. The milled flakes reduced the transit time of digesta; the spheres made no difference.

Back in the hard times of evolutionary history, humanity acquired certain tastes. Though they may not be good for us in our now more sedentary existence, rich, sweet, fatty, processed foods are what we like. Little wonder that many of our modern-day afflictions have a dietary connection: obesity, diabetes, heart disease.

Dr Lentle's proposition is that once you understand the physiological processes of digestion and intestinal function, you should be able to use nutritionally inert ingredients to engineer so-called functional foods that produce desirable effects.

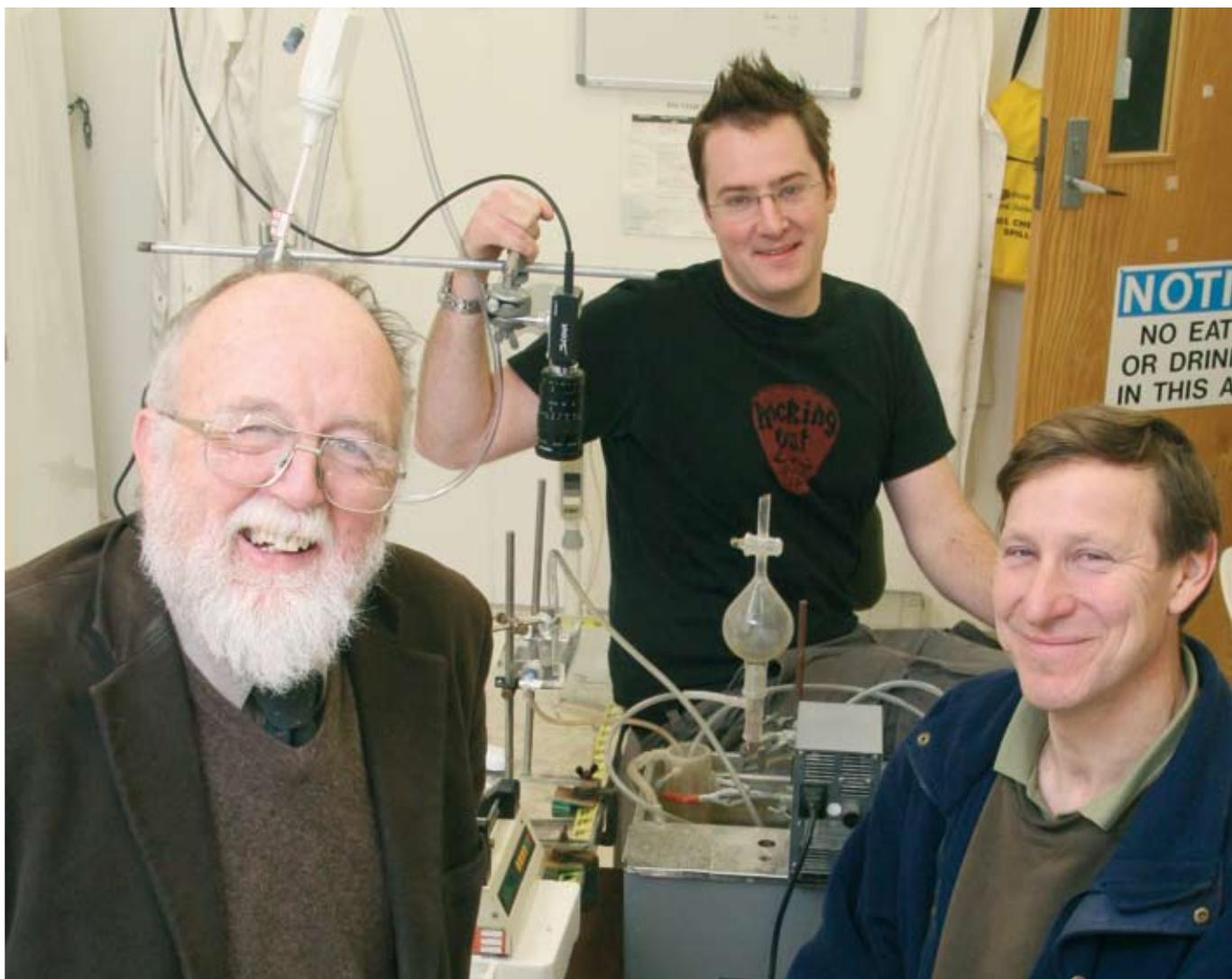
These include everyday foods that manage the difficult trick of both pleasing the palate and being good for us and specialist products that address particular medical conditions or cater to the needs of particular populations, such as sports people, infants or the elderly.

Science writers are fond of rhapsodising about the miraculous workings of many other organs of the body: the 100 billion neurons in the

brain, 2.5 billion times the heart beats in an average lifetime, the immense biochemical complexity of the work of the liver. The stomach and intestines are supporting cast. Until, that is, you look closely at them.

Once again I think of David Bellamy, of the delight taken in the wonder of things in themselves. Dr Lentle's work is, quite literally, a revelation, a revealing. He is seeing things no one has ever seen before. These are firsts.

How could he not be excited? ■



The members of the digesta team. Left to right: Professor Roger Lentle, technician Corrin Hulls and senior lecturer Dr Pat Janssen. Absent is anaesthetist Dr Paul Chambers of the Institute of Veterinary and Animal Biomedical Sciences.

Further reading

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Questions of life and death

Lis Ellison-Loschmann has dedicated her career – first in nursing and midwifery and now in academic research – to Māori health. Shortly after returning from two years in Spain and following the announcement of substantial Health Research Council funding for three major Māori health research projects she talks to Keri Welham.

Lis Ellison-Loschmann may work from a former industrial building with a view of commuter traffic on Wellington’s busy Adelaide Road, but she can still picture Barcelona.

Ellison-Loschmann and her family have just returned from two years in the Spanish city, where the Massey University researcher studied with world class cancer and environmental epidemiology research groups.

They lived in an attic apartment in a working-class Catalan neighbourhood and Ellison-Loschmann was based in one of the largest biomedical research centres in Europe, the Barcelona Biomedical Research Park alongside the Mediterranean. When her children were homesick, she would take them to a beach café called Santa Marta, where the tables featured mosaics of unmistakably Māori design.

For the 44-year-old, Barcelona was a welcome removal from her usual focus on Māori health.

“There’s just an expectation that you’re Māori and you will work in Māori health,” she says, sitting in her busy corner office hung with pictures of her children and a green woven mat which keeps falling off the wall.

Ellison-Loschmann describes her dedication to Māori health research as a “willing responsibility” but she relished Barcelona and the break it offered her from that focus for the first time in her career.

“I still miss the vibrancy of that city, knowing there was always something going on and feeling like you were in the middle of the world for a change.”

Not that this is any sort of backwater. Her diary is packed full, and already a student waits patiently at the door. This is the first floor of what used to be a recycling operation in the Wellington suburb of Newtown; now a health research outpost of Massey. Ultimately, researchers hope the work carried out in this building, at the university’s Centre for Public Health Research, will lead to improvements in the health of New Zealanders.

By the end of this year, Ellison-Loschmann will have launched three significant research projects with collective funding of \$2.5m.

The woman who left school at 16 to pick kiwifruit will lead the research teams on each project for the next three to five years. The first project will gather information about the disproportionately high rate of stomach cancer in Māori, the second will look at possible inequalities in breast cancer survival rates for Māori and Pacific women, and the third will look at the occupational health problems of Māori workers.

What is already known is that, for many cancers, Māori have much worse survival rates than non-Māori. If a Māori woman gets breast cancer or cervical cancer, she is more likely to die sooner than a non-Māori woman with the same condition. Researchers are attempting to determine what factors may contribute to those poor survival rates. They will consider access to healthcare, uptake of health screening programmes, and general health and lifestyle prior to the cancer. In the case of gastric cancer, the role of genetic factors also needs to be considered.

This is pivotal research in the fight to determine how best to improve Māori health and save lives.

Ellison-Loschmann uses general and Māori electoral rolls to find Māori for control groups. Those included in studies are those who identify themselves as Māori, and have said they have Māori ancestry. Ellison-Loschmann says the electoral rolls provide a practical base for accessing Māori subjects.

“The question of who is Māori has been raised often and redefined by many in the past. Our primary concern is to obtain the best possible data to understand Māori health. However, defining who Māori are is an area of health research in New Zealand which requires careful examination.”

Her own identity is interesting. Her appearance – that distinctive head of dark curly hair, her arresting features – must make many people wonder about her lineage.

Raised in Tauranga as one of nine siblings, Ellison-Loschmann is Māori on her father’s side – the line of descent including Te Atiawa, Ngāi Tahu, Ngāti Toa Rangatira and Ngāti Raukawa – and Tahitian on her mother’s. The tale of how the two met is one she treasures. “Occasionally I think that their destinies were to be with each other – if you believe in that sort of thing.”

Her mother, who came to New Zealand in 1949, was born on the island of Raiatea, while her father, a fitter and turner (and a dab hand at building swings, go-karts and scooters for his kids) was born in its near namesake Rangiatea in Otaki. They met at Hongoeke Marae north of Wellington.

Back in Tahiti her mother had taught primary school and worked in an accountant’s office. In her new home she worked on a tobacco plantation in Nelson, and at the ‘Wills’

As a population group, Māori have on average the poorest health status of any ethnic group in New Zealand.

As New Zealand entered the new millennium, Māori females had a breast cancer registration rate 1.3 times that of non-Māori females, but a breast cancer mortality rate twice that of non-Māori females.

Rates of stomach cancer registration and mortality were almost three times higher for Māori males than for non-Māori males.

For many cancers the rate ratio for Māori compared with non-Māori is higher for mortality rates than for registration rates. This suggests that Māori with cancer may be more likely to die from their cancer than non-Māori.

Source: www.maorihealth.govt.nz

cigarette factory in Lower Hutt, picking up the nickname “Frenchie”. (Although fluent in Tahitian, French, and Spanish, she spoke no English when she arrived in New Zealand.) For Ellison-Loschmann, her mother’s influence was formative.

A year picking kiwifruit paid for Ellison-Loschmann’s entrance into nursing training at Wellington Polytechnic from 1982.

After graduation, she worked in family planning, delivery of babies, cervical screening education, psychiatric care and sexual abuse counselling. A lot of her nursing and midwifery work was with Māori.

And then, when working as an assistant on one of New Zealand’s most famous health research projects, she was nudged in a slightly new direction.

“Well, you know how some people just get lucky? Well, I’m one of those people.”

Ellison-Loschmann worked with the late Dr Irihapeti Ramsden on her cultural safety research. Ramsden’s PhD explored the history and development of cultural safety education within nursing and midwifery education programmes in New Zealand. The work was recognised internationally as a significant development in health education, particularly in nursing education.

During the years they worked together, Ramsden began to realise Ellison-Loschmann’s interest was in health research in general, not just research about nursing. Ramsden referred her assistant to Neil Pearce, who was looking into Māori and asthma.

Ellison-Loschmann studied for her PhD, looking at asthma severity in Māori, alongside Pearce and Ramsden, who herself was a severe sufferer of asthma.

Pearce says: “Lis’s PhD showed the major problems of asthma in Māori, and particularly that these problems are not due to any innate tendency for Māori to get asthma, but rather they mainly stem from problems of access to health care for Māori who have asthma.”



Distinctive tables in a Barcelona café.

Ellison-Loschmann still works under the guidance of Professor Pearce, who heads the Centre for Public Health Research. She is now working on a Postdoctoral Fellowship with Pearce and Professor Chris Cunningham from the Research Centre for Māori Health and Development on the epidemiology of cancer in Māori.

Professor Pearce says each of Ellison-Loschmann’s current studies can only be addressed with epidemiological research: the

study of incidence and distribution of a disease in a population.

“It is therefore extremely important that researchers like Lis are leading the way. Although the basic epidemiological methods are the same for any epidemiological study, there are a number of specific characteristics of such research in Māori, including the types of questions that get asked, the process of community consultation, the urgent need and responsibility to translate study findings into policy.”

Ellison-Loschmann does not regard conducting research with Māori as more difficult than with other ethnic groups. But, as Pearce says, consultancy is a large part of preparing for research and Ellison-Loschmann believes a lack of specifically Māori representative groups makes it more difficult to access the Māori expertise that is available but scattered.

For example, although cancer is one of the biggest killers of Māori, there is no Māori equivalent of the Cancer Society that researchers can refer to when planning studies. Ellison-Loschmann believes there should be.

“It’s true that we don’t have recognised ‘Māori’ bodies for a whole lot of areas and I am not suggesting that we need to set up separate groups for everything but cancer has probably now taken over from CHD (chronic heart disease) as the number one cause of mortality in Māori and we are still way behind in addressing the health inequalities in this area right now, let alone the potential health consequences that will result from it over the next 50 years.” ■

Breast Cancer in Māori and Pacific women.

Ellison-Loschmann will lead a \$1 million study into possible inequalities in survival of breast cancer. Previous studies have shown all women in New Zealand have an equal chance of developing breast cancer, but Māori, Pacific and poorer women seem to have lower survival rates.

Based on recent research, 107 breast cancer deaths could be avoided each year if Māori and Pacific women, and women with low socio-economic status, all had the same breast cancer survival as non-Māori /non-Pacific women.

Ellison-Loschmann will lead a team of 10 researchers from New Zealand universities hoping to identify why those differences in survival rates exist.

Over three years, they will focus on the role of access to primary care and pathways through care from diagnosis to treatment. The team will also take into account international studies which suggest some population groups may be predisposed to getting more aggressive forms of cancer with a different tumour biology.

Occupational health of Māori workers

The study is set down for three years, at a cost of \$560,000. Ellison-Loschmann will lead a team of seven researchers looking at the occupational health of Māori workers. Ellison-Loschmann's team will build on the work of a telephone survey three years ago.

This survey involved 3000 employees who were asked about muscular-skeletal conditions, the impacts of shift work on sleeping patterns, and other issues such as respiratory illness. Within that group, there were 300 Māori, but that wasn't enough for a separate analysis of Māori health in this area. Researchers will find and survey another 2200 Māori workers using the electoral roll and telephone interviewing. The study will consider the overall contribution of work-related disease to Māori mortality and morbidity. The findings will then be used to monitor trends over time.

Conditions common in workers include occupational asthmas, asbestos poisoning, exposure to carcinogens such as pesticide sprays and stress.

The study is one of four funded by a \$2.5m programme grant for occupational health research at Massey. The other three projects are investigating dermatitis in cleaners (headed by Jeroen Douwes), asthma in saw mill workers (headed by Dave Maclean), and modifiable risk factors for congenital malformations (headed by Andrea t'Mannetje). The four studies are expected add to the global understanding of occupational health, which has been an under-researched field in New Zealand.

Stomach Cancer in Māori

This is a five-year study, funded through a \$950,000 grant, involving eight researchers from New Zealand and one, Mona Jeffreys, from the University of Bristol. Stomach cancer is a relatively uncommon form of cancer, but has a high fatality rate. Of the 350 or so New Zealanders diagnosed with it every year, an average 50 to 60 are Māori. Recent studies have shown Māori are three times more likely to get stomach cancer than non-Māori, and three times more likely to die from it.

Researchers are hoping 75 per cent of New Zealanders diagnosed over the next five years will participate in the study. The mortality rate is high and stomach cancer is a swift killer; a fact which will make this study particularly difficult for the interviewers who meet the subjects and hear their stories.

"I think it's a really important study but it's not going to be an easy study because most of the people die," Ellison-Loschmann says. A pilot study had shown people with stomach cancer were overwhelmingly keen to participate in research that might help others.

Risk factors for stomach cancer include a diet high in salted meats, alcohol consumption, and *Helicobacter pylori*. (*H. pylori*, which in some people appears to lead to stomach cancer, is found in the stomach lining of about 30 per cent of the New Zealand population and is treatable with antibiotics.) There are also genetic factors which will be explored.

About 90 per cent of stomach cancers can be divided into two categories: intestinal and diffuse.

Intestinal stomach cancer is usually found in older people, often males, and is more common in those with a history of ulcers or *Helicobacter pylori* infection. Diffuse stomach cancer most often affects women, hits earlier in life, is more aggressive and appears to be more common in Māori. Dr Parry Guilford of Otago University, a member of the research team, has done previous research on families who are disproportionately affected by the diffuse type of stomach cancer. These familial clusters appear spontaneously worldwide.

Ellison-Loschmann's team will conduct interviews and collect bloods from Māori with stomach cancer, together with equivalent data from a control group of Māori without stomach cancer.

Ellison-Loschmann
will lead three national health
research studies, collectively attracting
\$2.5 million in Health Research Council
funding. All will be under way by the
end of the year.

Grounded

For artist **Simon Morris**, the world is his gallery.

Alexander Bisley and Malcolm Wood write.

From the passenger-side window of Simon Morris's well-used family station wagon, Wellington hospital presents a bleak prospect: a collection of hulking grey, multistorey concrete buildings.

What were the architects of the '70s and early '80s thinking? This is technically brutalist architecture – brutalist deriving not, as you might think, from 'brute' or 'brutish' but from the French *concret brut*, "raw concrete".

We are here to visit the Otago School of Medicine and Health Science's award-winning extension, a construction that somehow manages the miraculous feat of seeming an organic part of the established schema while being anything but oppressive. Its centrepiece is one of Morris's works, a set of laser-cut, gloss-clear-coated steel screens.

As we walk through the car park, Morris points out how the Athfield-designed extension integrates architecturally: the facing, though largely of glass, still employs rough cast concrete in a traditional fan structure that references the period-appropriate work of the American architect Louis Kahn.

Then we enter the building and the true scope of the Athfield team's achievement is revealed. Two incisions have been made

into the first floor of the original building to integrate the old with the new. Light pours in from windows and skylights into a series of clean, new, open spaces – a library, a reception area, a café, lecture theatres and a foyer – and, amidst it all, saving this from being merely generically good modernist design, is a glittering cascade of light: the screens.

This is one representative of a corpus of work to which Professor of Fine Arts Anne Noble, the Director of Research for Massey's College of Creative Arts, applies the adjectives "astonishing", "moving", "innovative" and "groundbreaking".

If Morris seems very alive to architecture and its idioms there is a reason: it is in the family. His father was a well established architect whose work meant not only reams of discarded plans for a boy to draw on, but site visits, which were an occasion for explanation and discussion. His mother also had a strong interest in design. This was an art-aware, gallery-going family, and Morris knew early on that he wanted to go to art school.

He chose the Ilam School of Fine Arts at Canterbury University. There he took painting as his discipline, working under the guidance of Don Peebles. Peebles was an abstractionist known for his rucked and folded canvases

and Morris too pursued abstraction from the beginning, developing interests you can still see in his works today: in geometry, in colour and in materiality – the nature of paint.

After Ilam he travelled and then, in the mid-90s, enrolled in a masterate at Melbourne's RMIT. At a time when internationally painters were trying to find new forms, Morris began his own explorations as he and his supervisor, David Thomas, discussed how Morris might examine the relationships between painting and architecture. Morris became interested in expanding the scope of painting to encompass both gallery and non-gallery sites.

One way, Morris soon found, was to abandon canvas altogether and to paint directly on to walls; wall paintings became one of his signature forms.

"They allow you to see work from an architectural perspective, in terms of light and movement in space," he says.

One of Morris's 2005 wall paintings is in the National Collection at Te Papa Tongarewa. The concept for the work, which is in the museum's keeping, allows it to be remade, either by Morris or by someone following Morris's written instructions.

These set out the general rules to be followed in the work's recreation – such as

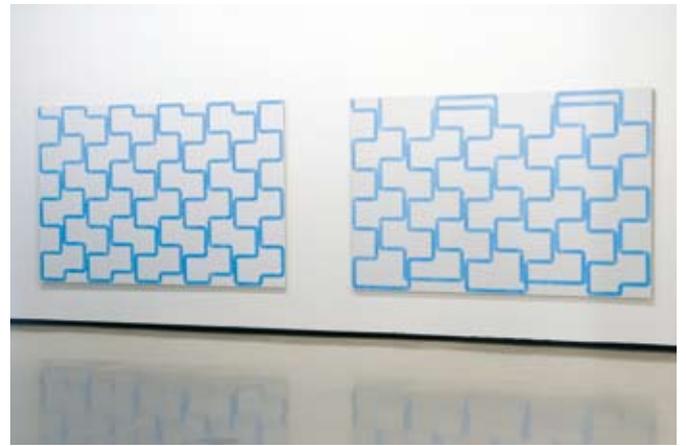




Previous page and left: *Space in Light* (2007) screen, University of Otago School of Medicine and Health Science, Wellington.

Below left: *Wall of Edges* (2002) wall drawing, Museum of New Zealand Te Papa Tongarewa, Wellington.

Below, from left. *Blue line, here to there, 2 hours 30 minutes* (2007), acrylic on linen; *Blue line there and back, 2 hours 24 minutes* (2007), acrylic on linen. *Telecom Prospect 2007*, City Gallery Wellington.



the time to be taken, the media to be used, and the rules to be followed as the artwork is formed – rather than specifying something that is in any way a facsimile of the original realisation.

“I conceived the work in 2005; but how it will be displayed in 2055 is something we can only guess at. There are endless permutations.”

In the years since graduating from RMIT, Morris has amassed a considerable body of work and has featured in a number of major exhibitions.

In Wellington City Gallery’s 2007 flagship *Prospect* exhibition, Morris was described as “exploring the relationship between abstraction and the everyday” and “examining visual systems and how they can reveal and extend our experience of space”. He elaborates: “An ongoing theme in my research is how formal abstraction can unfold into real space and time. How it reveals itself in the everyday – the spaces we occupy, the things we look at, and so on. I’m not talking about pure form in a sense of the artwork referring to itself, but a context where form is used in-site or on canvas to point outwards.

“For example the ‘Coloured Water’ paintings I showed in *Prospect* use a repetitive abstract

structure with reference to the real period of time in which the line was painted. The painting can be read as both a contemplative and literal reference to time, both the time taken to create the work and the in-the-moment time when the work is viewed and absorbed.”

Prominent art critic John Hurrell, who hailed Morris’s work as a highlight of *Prospect*, described it as having “sinuous muscularity”.

This is a description Morris likes. “He has picked up on the material economy and the physical act of making these works. The paint is thin like a watercolour and stretched out, allowing the field colour and texture of the ground to influence the image and enhance the linear activity of painting in time. Painting the line requires a commitment over a particular period of time. It is physically demanding but also a quiet and solitary act.”

For her part, Wellington City Art Gallery senior curator Heather Galbraith has described Morris’s paintings this way:

Simon Morris’s paintings take time. What may appear as an arbitrary journeying line is the outcome of a directed sequence. Morris sets up a framework intentionally restricting the scale, proportion and colour palette

within which different formula direct the pattern making process. This can include the length of the passage of paint in any one direction, when to pause and change the form through alternating thickness or direction and when to stop.

The artist explores how a pre-determined action, once initiated, can determine the making of a painting distinct from aesthetics. The dominant connection in Morris’s painting is with the real – specifically with time and space. All of his work is made in relationship to the spatial qualities of the ground (or surface) they are painted on.

Among Morris’s works, a number follow a certain pattern: a ribbon of paint, for the most part following a horizontal grid, but that at set intervals sinuously turns and occasionally runs over itself, following an apparently arcane and embedded quasi-mathematical logic of its own.

These paintings evoke the patterns you might create by carefully laying out a line of rope – or mowing a lawn in a carefully aligned and choreographed sequence.

So when Morris was invited to create work for *SCAPE*, the 2002 Biennale Art and Industry

This page: Image and detail of *Rainscreen* (2007) facade, a collaboration with Athfield Architects and Fraser Engineering. The New Dowse, Lower Hutt.





exhibition in Christchurch, he knew what he wanted to do. He entered into a collaboration with grounds staff at Jade Stadium to produce a mown image on the playing field. A cricket game between New Zealand and India provided a dramatic context. Morris thought about the sporting arena as a site for his artistic interests. “The important thing here was that the work was to be developed specifically for a sporting match with an audience, people involved in the entire spectacle of the event. The rules of the game became analogous to the rules for making this artwork, the nature of the pattern and how it intervened in the field of play.” A continuous line, the width of the cricket wicket, was mown into the turf, starting and finishing at the point where the lawnmower entered and exited the pitch. The mower turned at the “boundary” in a given order, creating a play of light off the grass; illuminating the pattern that varied as the spectator moved about watching the cricket.

“The work was contingent on a range of things such as the quality of light, the grass growth and skill of the ground preparation crew,” says Morris.

Professor Noble describes *Stadia* as a giant painting situated in a public space: “an abstract

tracery of green, revealed through light reflecting on grass”.

“Simon created a new context and new audiences world wide – millions of people saw it via satellite television – for a contemporary artwork.”

His second work, a companion piece, also involved enlisting an established institution in the cause of fine art. This time his partner was Christchurch Botanic Gardens and his ‘canvas’ for *Tilt and Grow* was a slightly inclined herbaceous border adjacent to a path.

The normal gardening practice is to plant cohorts of species that will flower simultaneously, and once the flowering is done with, to till and replant. Morris instead took the annual species available in the nursery – lobelias, tulips, pansies – and planted them in a long, looping continuous line, letting nature take its course over a three-month period as the plants flowered and died. “I realised that time could be used as an active element in an artwork.”

Professor Noble says *SCAPE* gave Morris the opportunity to undertake some bold experiments with contexts, media, and collaborative strategies. “Simon tested innovative collaborative strategies by

involving grounds staff at Jade Stadium and the horticultural team at Christchurch Botanic Gardens in the creation of temporal public art works.

“*Stadia* and *Tilt and Grow* are extraordinary works.”

If *Stadia* and *Tilt and Grow* come close to being performance pieces in their ephemerality, then their complement is to be found in the inescapably crafted, corporeal and permanent works Morris has created for the Dowse Art Gallery in Lower Hutt and, of course, the Otago School of Medicine at Wellington Hospital.

Both of these were created over the course of one frenetic summer in 2007–2008 and both – like *Stadia* and *Tilt and Grow* – have been collaborations.

At the Dowse, Morris worked with Athfield architects and Fraser Engineering Group to create *Rainscreen*, a facade designed to capture and control sun strike, channelling it through thousands of diamond-shaped perforations to create a constantly shifting shadow play inside and outside the building.

It is, as the gallery describes it, “a happy hybrid of artistic expression and eco-friendly design”, and the collaboration went smoothly.

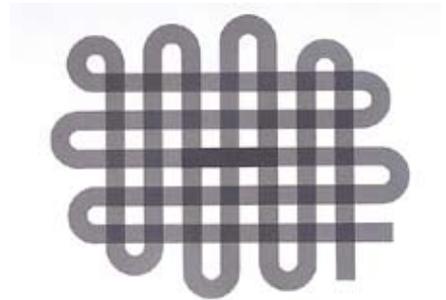


Left: *Light in Space* (2007), wall drawing, University of Otago School of Medicine and Health Science, Wellington.

Top: *Stadia* (2002), Jade Stadium, a collaboration with the ground management team. *Scape: 2002 Art and Industry Biennale*, Christchurch.

Right: drawing for *Stadia* (2002).

Bottom right: *Tilt and Grow* (2002), a collaboration with the curator of collections Christchurch Botanic Gardens created in the Christchurch Botanic Gardens. *Scape: 2002 Art and Industry Biennale*, Christchurch.



“It is interesting to see how people with different skills and interests can come together for a project,” says Morris.

Perhaps one reason why the collaborations worked lies in Morris’s willingness to listen and find accommodations. “There are more interests at stake than my own.”

Morris fondly remembers spending time at Fraser Engineering, where the screens were produced on a turret press.

For their part, the firm is also intensely proud of the work

“We are still in touch when there is the possibility of doing things.”

At the Otago School of Medicine and Health Science extension, Athfield Architects were again the instigators. This time the screen was laser cut with a repeated motif. Morris looked to the work of architect Louis Kahn and the abstract artist Joseph Albers. “Brutalist architecture often integrated abstract art into its design. I wanted to reinsert abstraction into the reinterpretation of a brutalist building.”

Will people be aware of these formal influences? Probably not. What they will see is the gleam of the steel, the light coming through the incised motifs and their intersections, and the multiple reflections

cast on the glass of the building’s internal windowing. The screens are much admired – as a black-suited and yellow-silk-tied executive will come up to Morris to tell him during our visit.

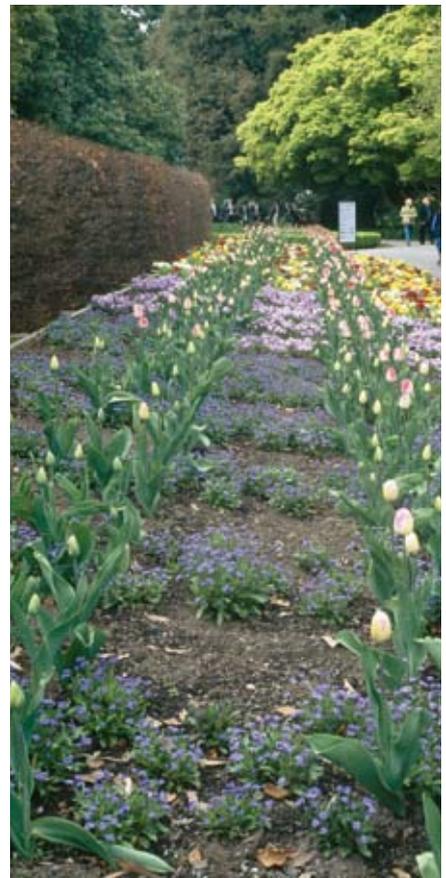
Professor Noble is another admirer: “Through his collaborations with architects and engineers, Simon inserts his conceptual abstract works within the materials and form of the building, impacting on interior and exterior experience of light, form and space. The resulting artworks are a clever marriage of art and design and offer new ways for art to operate within the urban and built environment.”

And now? When Morris came to Massey it was with the intention of helping to guide the inception of Massey’s Bachelor of Fine Arts. He has done that: the degree is now in its eighth year and well respected.

For the past three years, he has been the subject director of studio arts. Now he has stepped away from the role to focus on teaching and research.

He is shifting his emphasis back towards studio works; throughout his career he has continued to paint. He will bring with him what he has learned.

“The canvas is also a site.” ■





crisis management

As current-day policy makers address issues in education, they need to understand what has informed the decisions of the policy makers who came before them. For that, you need one of New Zealand's few experts in education history.

Professor **Roger Openshaw** talks to Kereama Beal.

“Education is in crisis” – the New Zealand public is no stranger to the phrase. Professor Roger Openshaw has seen it used countless times over the decades, by governments, opposition parties, and special interest groups of every stripe. Surely, he observes, if education has been in crisis for so long, you would think we would have fixed it by now.

Professor Openshaw's personal chair is in education history; his interest is the historical context that shapes and surrounds our perceptions of education and how we consequently set about making policy.

Consider that perennial educational crisis: literacy. As part of his research for *Literacy Crises and Reading Policy: Children still can't read!* (co-edited with Britain-based New Zealand academic Janet Soler and published in 2006), Professor Openshaw took a hard look at the state of reading standards in England in the decades following WWII.

“It's hard to explain why people in England were so concerned about reading standards and whether that had any connection with whether children could read or not,” Professor Openshaw says.

“We started out actually, by asking ‘Can you tell [whether there was cause for concern]?’ In England it was particularly difficult because the post-World War II period was actually quite decentralised in education, so tests were not standardised across all regions.

“The only people who did research in this area concluded that in England, reading standards had actually declined during

World War II because of the bombing and dislocation of children.”

Professor Openshaw says that standards rose rapidly, however, from 1945 to around 1960. “Children were back in school, teachers were being trained – roofs were back on school buildings... there was a big building programme and a rise in prosperity which in turn led to a rise in reading standards.”

According to Professor Openshaw, the rapid rise largely levelled out from 1960 and

“Successive governments used Reading Recovery to say ‘hey, look what we're doing for education!’ As to whether it actually improved kids' literacy, of course, is another matter – although there's evidence which suggests it's not as good as it sounds.”

has remained more or less consistent to the present day, with the exception of a slight dip when the National Curriculum was introduced.

“So if that line's flat, from 1960, then why do you get peaks of concern? They turn out to be very episodic, sometimes built around newspaper feature articles for example, which tend to focus on areas of crisis.

“One of the reasons we found people in England were so concerned was an enormous growth in the size and influence of the middle classes in the post-war period.

“People were suddenly really interested in their kids doing well. In a way the traditional barrier between social classes was beginning to disintegrate – it's still evident today, but not

nearly so much as it was – and because of that, suddenly all things were possible, or seemed possible, so you have more anxiety.

“Suddenly a child isn't confined to a trajectory that's already been pre-set. Suddenly there's a chance, and that chance sees people put pressure on the government. In turn, governments and oppositions – especially oppositions – see political mileage in it. Literacy standards have particular mileage. If you'd asked the government in 1945 about

literacy standards, they would have told you it wasn't their concern,” he says. “They would have said, ‘Go and ask your local authority, they know what they're doing.’

“If they'd said that in 1975, however, the government would have been pilloried, because suddenly it is a matter of concern for nearly everyone, and politicians must respond. So they created

national literacy strategies. In England these were focused on whole-class sessions to improve literacy, and they appeared to do much the same with numeracy.”

Professor Openshaw says that the book included a major section on New Zealand. He was particularly interested in Reading Recovery – an early literacy intervention developed in New Zealand and designed to significantly reduce the number of children with literacy difficulties in schools.

The programme rapidly became a way of gaining political mileage with the electorate. “Successive governments used Reading Recovery to say ‘hey, look what we're doing for education!’ As to whether it actually improved kids' literacy, of course, is another

matter – although there's evidence which suggests it's not as good as it sounds."

Professor Openshaw says that as a historian he was most interested in how systems like Reading Recovery were established, the hype behind it, and the vested interests of successive governments in maintaining the programme and stifling criticism of it.

He is currently working on a book which critically examines the 1988 Picot Report and the subsequent Labour Government policy document, *Tomorrow's Schools*.

The Picot Report, or *Administering for Excellence*, recommended that the funding of institutions' activities be calculated on the basis of new nationally determined formulae, and be sent directly to institutions as a bulk grant. The bulk grant was to have two distinct components: one based on salaries and one based on all other expenditure.

Boards of trustees, which under reforms ushered in by the *Tomorrow's Schools* initiative were largely elected by the parent community, had some discretion in the use of the funds, including leeway in the numbers of teachers they hired where they placed them on the salary scale.

"This drastically changed the administration of New Zealand education," Professor Openshaw says.

"The thing about it is that there are two almost diametrically opposing views on the report. One says that Picot was a great thing, democracy from below with the notion of 'parent power' coming into play. Another group of people, however, said it was one of the worst things we ever did because it was a cynical attempt by Treasury and the State Services Commission to privatise education, and introduce the notion of competition. So who's right?"

Professor Openshaw says that based on current evidence, both the Picot Report and *Tomorrow's Schools* can be seen as the product of mixed ideological forces, and combine both left-wing and right-wing political ideas.

"In a sense, secondary schools became the focus for discontent. In 1945 they were seen as the answer to a lot of problems, but by the 1980s they were seen as part of the problem," he says. "Both the left and right rejected the notion of gradual change. It had to be immediate and complete."

"His phrase that stands out – 'orchestrated litany of lies' – is a very famous one. Suddenly you can apply this to all professions – a sense of cover-up – and it came from the left, and it came from the right."

According to Professor Openshaw, people also felt that a sense of community had broken down. "There had been a huge awareness of mounting economic and social crises in New Zealand, and a Māori radical movement from the 1970s which was very strong in the early 1980s added to the pressure.

"An NZCER [New Zealand Council for Education Research] submission to the Royal Commission on Social Policy that was meeting at the same time as the Picot taskforce claimed two-thirds of New Zealand children were disadvantaged by the present system: Māori, Pacific Island, the disabled, women and immigrants.

"Obviously when you add all of those categories together, it looks terribly frightening and so you want to change the system, but I don't think we'd want to make such a bald statement today.

"However, it captures the flavour of the times: 'crisis, everything's in crisis, we've got to do something'. Teachers were suddenly seen as controlling things – 'provider capture' was the new policy rhetoric."

The Picot Report, he says, needs to be seen in the context of other contemporaneous official reports issuing forth. He says there was a succession of reports dating from the 1970s through to the mid-1980s accusing professionals of being self-serving, and even dishonest.

One example, he says, is the Cartwright Inquiry held in 1987–1988, which was commissioned by the Minister of Health to investigate alleged malpractice at Auckland Women's Hospital. The inquiry revealed that the hospital and hospital board hierarchy had declined to take action. "In turn this led to a full-scale inquiry into the health system. The result was the Gibbs report, which recommended the health system we have now: area health boards, the notion of competition between hospitals to avoid provider capture, and ensuring that the system is more friendly to groups thought to be disadvantaged. Thus we had the notion of clients – not patients,"

Professor Openshaw says.

"Things like the Erebus Inquiry further fueled the climate of public distrust."

In November 1979 a scheduled Antarctic sightseeing flight from Auckland crashed into Mount Erebus, killing all 257 passengers and crew members on board.

In response to public demand, a further Royal Commission of Inquiry performed by highly respected judge Justice Peter Mahon was announced by the Government.

Justice Mahon claimed airline executives and senior pilots had engaged in a conspiracy to whitewash the inquiry, accusing them of covering up evidence and lying to investigators.

"His phrase that stands out – 'orchestrated litany of lies' – is a very famous one," Professor Openshaw says. "Suddenly you can apply this to all professions – a sense of cover-up – and it came from both the left and the right.

"There was the Scott Report into teaching in 1986–1987, which was very influential, and accused the teaching profession of being immune to criticism and protecting incompetent teachers at the expense of children and communities."

The Picot Report likewise argued for de-centralisation of educational decision making and focused on management of schools by parent representatives.

Professor Openshaw says there was a diverse set of influences on Picot, much like any public policy, and that the outcome has been an untidy compromise.

“Nobody wins, that’s the thing. Most would expect that if Treasury really had won, the right would have rubbed their hands together and said ‘we won! That’s a famous victory!’ But they’re not saying that at all.

“In fact they’re saying the opposite and claiming that educators and bureaucrats subverted the reforms still keeping power to themselves.”

The left, he says, have said much the same thing and nobody seems to believe that they’ve won anything.

There is a wealth of material held by Archives New Zealand in Wellington and Auckland, Professor Openshaw says. This includes personal papers from former Prime Minister David Lange.

“It’s a fascinating story. For instance I have learned about the work that public relations firm Logos did in selling the Picot Report to the public.”

He says it wasn’t the first time a public relations firm had been used in education, but it was probably the most concentrated and extensive use of such a firm – to the tune of about \$300,000.

“The notion was about managing the process – for instance, the term ‘fireside chats’ was at one stage used when outlining how Picot was to be explained to the public. Fireside chats, of course, relates to the fireside chats used by President Roosevelt on radio in World War II in the United States.”

The Treasury files in Archives are also fascinating,” he says. “In late 1984 both Treasury and the newly elected Labour Government became particularly interested in an initiative called the Community Education Initiative Scheme begun under the previous National Government. The notion was that in Mangere, Otara and Porirua, all areas with a high Māori population, they would evolve power to the local community,” he says. “Among Māori activists and Treasury officials alike,

was this idea that you could improve Māori children’s attainment through giving money for education to the local community and getting them to help spend it. Take it away from the middle-class bureaucrats, and give it to the people who are going to be at the sharp-end.”

Professor Openshaw says the decade prior to the Picot Report illustrates clearly that the left and the right were largely in accord in their philosophy of shifting power from the central bureaucracy and giving it to the people.

“There were some weaknesses in their theories, and some differences in their arguments, but it seemed at the time that they were saying the same thing.”

Professor Openshaw has also explored taskforce chairman Brian Picot’s writings, available in the National Library and the Alexander Turnbull Library. “You can see the development of Picot’s own ideas and theories on revitalising communities and on conflict resolution in several of his often privately published papers.”

Professor Openshaw says from the 1970s on, the pervading message from all sides was for education to undergo ‘radical change’. “The notion of rebuilding community through active participation came through constantly,” he says.

“Once the Picot Report entered the public arena, of course, it was rapidly denounced by

“From Treasury and the State Services Commission’s point of view, it didn’t go far enough, and it was claimed that the Government didn’t take community power to its logical conclusion for fear of backlash from their electorates.”

Professor Openshaw says that with so many sides dissatisfied, little changed – particularly in terms of equity.

He says research by Cathy Wylie (of the New Zealand Council for Educational Research) shows that boards of trustees have not become the battlegrounds that it was feared, and that teachers and communities in most cases are working well together.

Professor Openshaw comes back to the assertion that education is in crisis.

“Despite Picot, education is still always in crisis,” he says, “I doubt, however, that we will see radical change on the scale of the Picot era again for some time.

“Educational problems are often quite complex and therefore elude quick fixes. However, being historically informed enables us to at least advocate some intelligent policymaking, and look at things from all-sides,” he says.

“There are rarely any instant answers to problems and challenges, yet solutions have abounded from all sides. With so many solutions, it’s a wonder at times there are any problems left at all!” he laughs.

As he continues his work on the Picot Report, Professor Openshaw aims to further interrogate the rival points of view on the reforms, and his research is different in that it is heavily based on primary sources and manuscripts, which, he says, people have in the main not yet used.

“I’m able to review files and material, often as it’s being released to researchers like me,” he says. “This is exciting because, as a historian, I do like to stand back and take another look at received wisdom, no matter where it emanates from. This stance, however, does not always make us terribly popular with those who cherished received wisdom in education.” ■

“There are rarely any instant answers to problems and challenges, yet solutions have abounded from all sides. With so many solutions, it’s a wonder at times there are any problems left at all!”

virtually all the active players in the process for one reason or another. On the left, it was claimed that the process was driven by Treasury and the State Services Commission, with the intention of privatising education and introducing competition while keeping power in the centre through the Ministry of Education.



The Halloween paper was eventually published in the *American Economic Review*.

Another paper came about when two students, Gerben Driesprong and Benjamin Maat, wanted to test a hypothesis that oil price changes predict stockmarket movements a month or so ahead.

“I said if there is one bit of information everybody watches, it is the oil price, so it is very unlikely it would predict stockmarket prices, because if there is one piece of information which will be incorporated in a

“I realised the Apple was simply a superior product, so once the iPod users realised that, that’s when Apple would make money.”

Indeed, Apple’s share of the home PC market has grown over the past three years, and its share price has spiked up.

Professor Jacobsen’s shift to New Zealand was motivated by lifestyle.

As well as his teaching and research workload in Holland, he was running a small company and writing a regular newspaper column.

“My partner was working as a lawyer doing

That said, the New Zealand investor does face certain disadvantages.

“There is no discount [share] broker here so that you can [invest in shares] in an affordable way.”

Another drawback is the local lack of mutual funds, which allow investors to get exposure to a basket of shares, rather than bet everything on the rise of a specific stock.

What are the prospects for the New Zealand finance industry? Professor Jacobsen is optimistic. The inflow of investment funds into the market

“The financial sector in New Zealand is remarkably underdeveloped. The stock market pretty thin, a lot of stuff goes on. Only if New Zealand really well would I dare to invest it’s still the wild west here.”

stockmarket price, it is the oil price change. But I also invited them to have a go and prove me wrong.

“They found there is strong predictability. In almost all markets in the world, when the oil price goes up, the stockmarket goes down; you can trade on this.

“In the academic literature we found no one had seriously considered the issue.”

It’s in the literature now, in a forthcoming issue of the *Journal of Financial Economics*.

“Publishing in the top academic journals, that’s what it’s all about for us. It’s like a gold medal in the Olympic games for academics. It’s a sign of quality and that people like what you are doing.”

While Professor Jacobsen argues that finance and stockmarkets are more predictable than was once thought, he’s not keen on pricing individual shares.

He sees too much herding behaviour, particularly on the part of the financial analysts in the system, who tend to repeat what others have already said.

“I’ve only ever advised [purchasing] one stock in my life, and that was Apple in 2005.

“People said ‘Are you crazy?’ The reason I did it was ‘herding behaviour’. The iPod had just come out and the analysts were being very conservative.

“After years of suffering Microsoft PCs, because every company or university I worked for required me to use Microsoft software, I had started re-using Apple computers. Now it was possible to run exotic Windows software on Apple, so I could use what I wanted.

public offerings at a bank, so she worked even more than I did. At that stage we said we wanted to work to live, not live to work.”

The pair had almost become dive instructors in the Maldives, when the opportunity to come to New Zealand came up.

“I love this country,” he says. “I think it is a privilege to live here. The only negative is that it’s so far away from the rest of the world, especially Europe.”

However, that doesn’t mean the financial markets are distant – those are only a click of a mouse away.

Professor Jacobsen says there are huge opportunities for New Zealand in addressing holes in the market, although he has reservations about the local finance sector.

“The financial sector in New Zealand is remarkably underdeveloped. The stockmarket is pretty thin, so a lot of stuff goes on. Only if I knew New Zealand really well would I dare to invest – it’s still the wild west here.

“It’s the whole financial industry – look at the finance companies,” Jacobsen says.

He says there’s a need for more training and better – though not necessarily more – regulation.

“Some things need to be regulated to protect people, because financial literacy here is not high.”

He says New Zealanders should probably avoid investing in their home market.

“That holds for any country. Only if you have an informational advantage should you invest in your home market. If you don’t [have that advantage], it’s better to invest overseas, because you are diversifying.”

from Kiwisaver is certain to have an impact, he says, and paradoxically New Zealand’s location gives it a competitive advantage: our markets are open when others are closed.

When Jacobsen has tested his theories by trading index options or exchange-traded-funds, which mimic a basket of shares, he has often used overnight information, which could be overlooked in the heat of the trading day.

“New Zealand is open when the rest of the world is asleep, so we have a huge advantage in being able to monitor financial markets when people in the US and Europe are sleeping.

Given this, New Zealand could easily have a future as a niche operator, he says, particularly if overseas businesses in the sector were to be given tax concessions to set up in New Zealand.

A large amount of international currency trading already goes on in New Zealand, he says, and at relatively low transaction costs.

He says New Zealand undervalues academia, with the media, in particular, instead preferring to turn to bank economists (who, he says, represent vested interests) or to overseas pundits for comment.

Is he a market player himself? Of course, partly to test and apply his own work, partly because he enjoys it, and partly because “you can’t advise [people to do] anything you are not doing yourself”.

And he is not the only one actively applying what he has learned.

“All the work I do is used by hedge funds. So here is something produced by universities that is immediately picked up by industry.

“Actually, industry should be paying us more,” he laughs. ■

a life with insects

The career and fortunes of Professor Qiao Wang.

Malcolm Wood writes.

It is a biologically cosmopolitan world we live in. Pines from Monterey flourish in New Zealand. Cabbage trees from New Zealand adorn the gardens of Britain. And in California the shelter belts lining roadsides and on golf courses are often stands of Australian eucalyptus. So there was consternation in the late 1980s when the eucalypts began to die. Would I like to see the culprit? asks Professor Wang, conjuring a plastic bottle from the back of his desk. Inside, preserved in alcohol, is a brown densely-packed mass of beetles, their legs and feelers matted together.

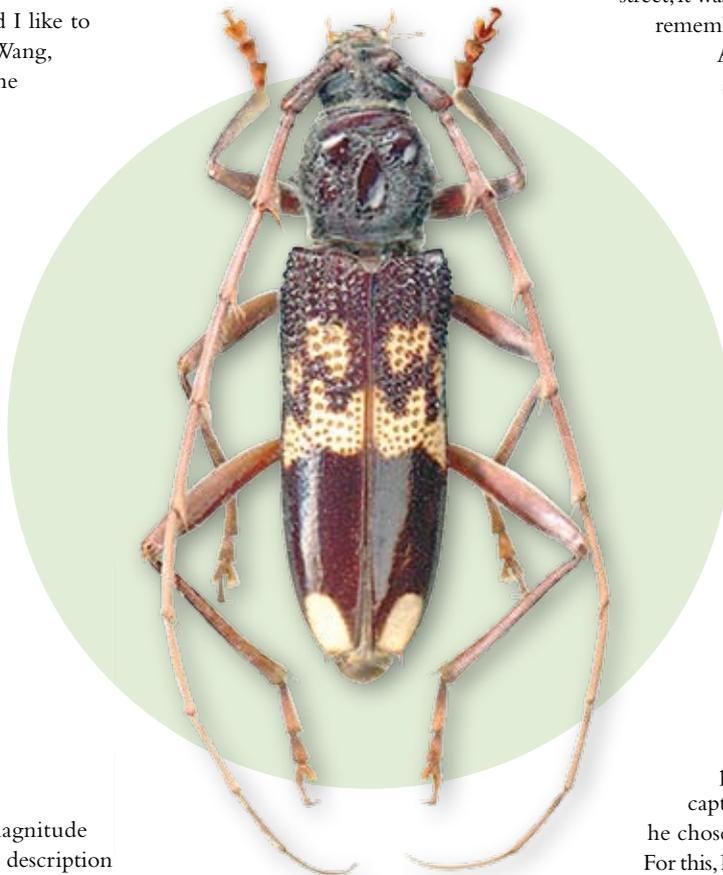
These are specimens of a species of woodboring Australian longicorn beetle; it was Professor Wang who found the means of biological control and so helped save California's eucalypts.

A Chinese-born academic, a New Zealand campus, an Australian beetle, a Californian problem. How did these elements come together? Professor Wang's life story is one of personal endeavour and historical contingency.

An "error comprehensive in magnitude and protracted in duration" is the description the Chinese Communist Party now applies to the 10-year-long Great Proletarian Cultural Revolution.

It was during the Revolution that Qiao Wang spent his primary and secondary school

years. He did not expect to go to university – the university system was in abeyance. As a recently graduated middle-school student, he expected to be sent to the countryside to be re-educated among the peasantry. His parents had begun provisioning for this.



But fortune favoured him. As he was about to leave school, the Cultural Revolution came to an end; Mao's successors, the so-called Gang of Four, were arrested; and the university

system was hurriedly reconvened. Lecturers and professors out labouring in the fields were recalled, and it was announced that a nationwide university entrance exam would be held within three months. A hush descended on China as people of all ages did what they could to prepare. "There was nobody in the street, it was completely quiet," Professor Wang remembers. Few passed. He was one.

At 17 he was the youngest in his class at Guizhou Agricultural College (now Guizhou University after mergers with other colleges).

Some of his fellow students, denied university in earlier years, were twice his age. Some were married. For the first two years, Professor Wang recalls, there were no textbooks; the students relying in their absence on mimeographed handwritten notes. "It was a very 'special' period of time."

Professor Wang wanted to specialise in agronomy, the science of soil management and crop production, but his parents insisted that he pursue plant protection. Accidentally entomology captured his interest, and this was what he chose for his masterate.

For this, Professor Wang moved to Southwest Agricultural University in Chongqing. Living out of a tent for months within today's Wolong National Natural Reserve – China's most famous panda reserve – Professor Wang clambered, alone and unarmed, from the



dense jungles of the lowlands to the barren mountainscape four-to-five-thousand metres above, sampling insect communities along the way. He came on groups of black bears, and on one occasion a family of them visited his tent, coming upon Wang when he was semi-befuddled; after a long and lonely day he had broached his store of liquor. Fortunately, he says, “they don’t attack people unless very hungry”. Once he happened on a leopard. Poisonous snakes were commonplace, and tree leeches were constant companions.

It was at Southwest Agriculture University that Professor Wang fixed on the particular insect family that has been his preoccupation ever since, the Cerambycidae, also known as longhorn or longicorn beetles, taking his cue from his thesis supervisor, who was a cerambycid man. There are about 35,000 described species of cerambycids worldwide.

In January 1985, one month after Professor

Wang obtained his MSc, he was appointed an assistant lecturer. It was the beginning of a happy and productive period: he published prolifically (his honour’s year had already resulted in two published papers and his masterate in six or seven more); he met and married a horticulturist at the same university, Liyuan Chen, who would be the mainstay of his life and his best friend; they had a son.

Then came 1989 and Tianamen Square – the misleadingly geographically-specific name given to the student protests that took place widely in China’s universities. One day Professor Wang discontinued his lecture and led his students to the streets. It was risky decision.

How risky became apparent when a knock came at his door at three in the morning. It was a worried but protective head of department. Professor Wang’s activities had been reported and photographed. Defended by his students



Although you probably have not thought overmuch about what to call them, you are very likely to have come across longhorned beetles or longicorns at some point or other. There are about 35,000 of this family of beetles worldwide, and while some of them are pest species the overwhelming majority are not. Generally — but not without exception — the family is characterised by extremely long antennae, often as long as or longer than the beetle’s body. Shown is *Phoracantha semipunctata* F.

What insect is that?



Images supplied by Professor Tim Paine

Asked what he could infer about the Creator from a study of His works, the British scientist J.B.S. Haldane is reported to have replied, that He has “an inordinate fondness for beetles”. Haldane had his reasons. There are now upwards of 350,000 described beetle species, making up almost a quarter of the total of all described species of any kind.

If this seems extraordinary in itself, then think of the work of the taxonomists who identified these species and who are adding to that tally every day.

Wang began his career as a taxonomist, and while he is now more engaged in research into insect behaviour and control, he still enjoys the thrill of the wild beetle chase and the meditative enchantment when a specimen goes under the binocular microscope. “You see the different colours, the metallic sheens. You hunt for the different defining characteristics of each species. You don’t rush.”

In this unstressed Zen-like state, says Wang, it is easy to dissociate and vividly revisit the lost times of childhood or adolescence.

“If you concentrate on taxonomy,” he says with a smile, “I guarantee you are going to live a very long time.”

A microscope, an eye for detail and time: these are the elements of taxonomy as it has been practised since the days of Joseph Banks or Charles Darwin, and, despite advances such as the electron microscope and genetic analysis, Wang says these well-established methods remain fundamental, being far faster and cheaper than the alternatives.

“I still believe morphology [the study of body structure and structures] is the best. Gene sequencing [really only] comes into its own where you have two species that you can’t distinguish using morphology. Then you use DNA to separate them.”

The skills of the taxonomist are particularly called on when it comes to identifying and controlling pest species.

It has been estimated that worldwide the crop damage caused by insects amounts to \$500 billion.

New Zealand, with its surrounding oceans as its moat, does not so far have many of the pests found elsewhere. Were any one of a number of species of insect pests to arrive and establish, the nation, so heavily dependent on agricultural exports, would suffer.

Hence the \$62.4 million aerial spraying campaign to rid New Zealand of that unwanted Australian immigrant the painted apple moth.

So are we producing and employing enough entomologists and taxonomists?

Professor Wang worries that we may not be. Over the years he has noted a continuing decline in the numbers of both entomologists and taxonomists as people have either switched to other better acknowledged and supported specialities or retired.

In New Zealand, while there are pockets of insect taxonomic expertise among museum staff, in the Crown Research Institutes – particularly Landcare – and within the Ministry of Agriculture and Fisheries, there are very few people working as senior level taxonomists within the university system.

In the US, says Wang, almost every state university has a department of entomology and each department will have one or more taxonomists. Professor Wang is now New Zealand’s only titular professor of entomology.

Nor does he believe that there are enough insect taxonomists in training. In his 12 years at Massey he has supervised three postgraduates working in taxonomy: one Thai, one Australian and one New Zealander.



Professor Wang, at front, with, from left, Anand Yadav, Xiong Zhao He, Abdul Hanan, Muhammad Shakeel, Rashmi Kant, Casey Flay, and Diwas Khatri. Massey's Entomology and Integrated Pest Management Laboratory, established by Professor Wang, includes an insect systematic laboratory, an insect chemical and molecular ecology laboratory, an insect behavioural ecology laboratory, three controlled temperature and photoperiod rooms, and a shared general operation laboratory.

– who said the protests had been at their own instigation – and by others within the university, Professor Wang was not arrested. But in himself he was seriously unsettled. Not wanting to draw attention, he delayed the submission of his PhD thesis and started to cast around for scholarships abroad.

By now he had more than 25 papers to his name; the problem was Professor Wang's proficiency in English. Although he had published extensively in English and often translated for foreign visitors, his first attempt at TOEFL (Test of English as a Foreign Language) did not give him the score he needed to take up any of the three scholarships he was offered in the US. But in Australia a sympathetic head of department at La Trobe University, which was also offering a scholarship, was able to use Professor Wang's record of English-language publications to justify waiving the requirement.

Professor Wang arrived in mid-1990, only to realise that was not quite the deal it seemed. True, he had a scholarship of \$12,000 p.a., but he still had to cover fees of \$15,000 p.a.. He began a mad scramble to find supplementary funding, writing about 200 letters to any institution that might need a project done in Australia.

One of them found its way to the Department of Entomology at the University of California at Riverside. They had just such a project. An unwanted arrival, a woodboring Australian longicorn beetle (*Phoracantha semipunctata* F.), was killing California's eucalyptus trees.

Eucalyptus had been a part of the Californian landscape since the 1850s when they arrived during the gold rushes; now great swathes of them were dying, their inner bark and cambium riddled with beetle larvae. In the land of their origin there had to be something that kept the population of longicorn beetles in check. For Professor Wang's help in finding a biological control agent, California would pay him his fees and some living expenses.

Within six months Professor Wang had his candidate parasitoid, a tiny wasp, *Avetianella longoi* Siscaro, that parasitised the beetle's eggs. Soon after the first shipment arrived in California in May 1991, Professor Wang received an elated call from the boss, a professor from Riverside: "I am going to double your pay from today." Professor Wang, working towards his PhD in the systematics and ecology of Australian cerambycids, was now earning more than a lecturer.

The parasitoid was later released in California, and the pest *P. semipunctata* has been under successful control there since early 1990s.

As Professor Wang's doctoral scholarship at La Trobe drew to a close, Riverside offered him a postdoctoral fellowship in chemical ecology. Although he knew it was the right career move, Professor Wang was torn. He and his wife – who together with their son had arrived in Australia a year after Professor Wang – liked Australasia and they had no desire to go elsewhere. Nevertheless, he took the offer, only to find within weeks of his arrival that he was homesick for the Antipodes. It was then that his wife mailed him a situations vacant advertisement for a job he would apply for and get: a lecturer's position at Massey University. He and his family settled into Massey and Palmerston North. His wife – who was also occasionally his academic collaborator – found a job as a technician at AgResearch. Now happy and settled, Professor Wang continued to publish prolifically. (He has authored and co-authored more than 100 peer-reviewed papers, their subjects varying from taxonomic and biogeographical analyses, to behavioural

studies, biological control and, in several papers, the role of pheromones.)

As part of his fundamental research, Professor Wang has looked at the biogeography – the geographical distribution – of a number of insects. Often this has been biogeography with a historical slant: working out the story of how a particular distribution came to be. Among the factors that influence historical biogeography are changes in climate, geographical barriers such as deserts or oceans, and, of course, the workings of evolution. Historical biogeography can be used to explain how a cerambycid beetle in China can be a near relative of another in Africa.

But biogeography also has uses in the here-and-now, such as determining whether or not, for instance, an introduced species is likely to establish itself as a significant pest.

A distinct risk, says Professor Wang, is that in the absence of good information large sums of money will be spent trying to eradicate an insect that for any number of reasons – predators, parasites, competitors, climate – is unlikely to become a pest in its new home.

“When a new insect arrives from overseas we need to do a pest risk analysis,” says Professor Wang. “Many millions of dollars can be wasted on trying to eradicate something that is not going to be a pest.”

What he often observes is a predictable sequence. “The farmers make noise, the scientists make noise, and then the government, which needs to be seen to be doing something, finds the funding for two or three year’s work. There’s seldom any follow-up. But to do good ecology you need decades; it’s a long term thing.

“In New Zealand we have introduced more than 200 insect species to try to control various pests. Most of them have established, but aren’t working. We don’t know why. That’s why I think we should be focusing on the mechanisms of biological control. We need to know: If they are working, why are they working? If not, why not?”

A case in point can be found in Professor Wang’s own work. At his first attempt, Professor Wang found a successful parasitoid for California’s longhorn beetle problem. But of the next five species of parasitoids introduced to control the beetle, one vanished and none of the four that established had a significant effect.

Some of Professor Wang’s current work addresses New Zealand pest species. He is, for example, under contract to Pipfruit New Zealand to conduct a study of the apple leaf curling midge and one of his more recent papers addresses the reproductive strategies of a particular aphid parasitoid.

He has also worked on the role of insect pheromones in insect behaviour – insect pheromones once having been believed to

offer great potential as a pest control measure. Professor Wang explains that not all insects use pheromones, and, of those that do, many use them only at close range for such things as discriminating between males and females. Longer range pheromones do have their uses in monitoring populations or in the insect traps used at airport or port quarantines, but saturating an environment with female pheromones to confuse the males is working in fewer than ten pest species.

Does Professor Wang ever return to China? His first visit since his departure in 1990 was with his wife and son in 2004, and he has visited a number of times since, among other things visiting his thesis supervisor, now 95.

On his first visit he found his home town had been swallowed by development, and his warnings to his son about the perils of Asian toilets were misplaced; the toilets, in fact, were European-style and had infrared-triggered flushes.

Chongqing is one of the world’s fastest growing metropolises and Southwest University (established from the merger of Southwest Agricultural University and another university) has more than 80,000 students. Among Professor Wang’s old classmates there are now three vice-chancellors.

“I am happy about my contemporaries’ achievements and I feel relieved. They live in better houses and drive better cars than I do.” But the material standard of living comes at price, he says. People work harder than in New Zealand – harder than is good for them – and his classmates are taking work-related cell phone calls late into the night.

Professor Wang’s life is more measured. He teaches, supervises postgraduate students – currently six PhD and four masterate students, eight of whom are based at his laboratory – and continues to research and publish. He also edits and referees international professional journals, and reviews grant applications for national and international funding bodies.

He is still in touch with the University of California too, which in recent times has again called on his help to find a parasitoid, this time for another introduced species of eucalypt-pest longicorn (*Phoracantha recurva* Newman) against which the existing parasitoids were proving ineffective. In 2006 and 2007 Professor Wang made return trips to the foetid, mosquito-ridden swamplands that lie alongside the Murray River to search for and collect candidate parasitoids.

The first batches were recently released in to California under permit.

“The parasitism rate is over 80 percent in Australian bush, but I don’t know what will happen in California. Soon we will hear the news.” ■



Anand Yadav, Xiong Zhao He and Diwas Khatri at work in an insectary. MSc student Anand Yadav is working on reproductive biology of Tasmanian lacewing. Staff member and postgraduate Xiong Zhao He has spent the past three years working with Professor Wang on the biological control ecology of an apple leafcurling midge parasitoid. His recently submitted PhD thesis addresses the reproductive behaviour of pea aphid parasitoid. MSc student Diwas Khatri is working on the biology and reproductive behaviour of a diamondback moth parasitoid.



Abdul Hanan, Muhammad Shakeel and Xiong Zhao He. PhD students Abdul Hanan and Muhammad Shakeel are working on the behavioural ecology of whitefly parasitoid (with special reference to sex ratio regulation) and the reproductive behavioural ecology of brassica leafminer parasitoid respectively.



Postgraduates Casey Flay, Diwas Khatri and Rashmi Kant recording the behaviour of an insect parasitoid. MSc student Casey Flay is working on reproductive behaviour of rice weevil. PhD student Rashmi Kant is working on the behavioural ecology of cabbage aphid parasitoid.





To understand how best to help troubled young people and their families you have to understand how they see themselves and the world, says **Dr Jackie Sanders**.

She speaks to **Malcolm Wood**.

As the twig is bent the tree inclines. The child is father of the man. Or how about, our children are our future. As commentators as wide-ranging as Virgil, Wordsworth and Whitney Houston have all observed, our experiences during childhood – and as young adults, one feels compelled to add – help make us who we are.

These are the years that determine the options we have and the choices we make. This is when we arrive at our dreams and aspirations, and our own particular ways of seeing the world.

But when it comes to today's young people we forget what it was like for us. Or we fail to realise how things have changed, that the world has become more complex. Or we cannot see how someone's situation is different from our own.

Full of the wisdom of age we lose touch with the truths of what it is to be young.

Dr Jackie Sanders has not. Over the past 15 years or so she has spent hundreds of hours interviewing young people, many of them falling within the catch-all categories of 'at risk', 'vulnerable' or 'troubled'. These are young people whose everyday life experiences – of abuse, poverty, neglect – are very different to those of middle New Zealand.

The strange thing is that despite this Dr Sanders is optimistic. She is confident in the natural strengths of the individual and in society's ability to help people turn their lives around.

Dr Sanders did not set out to be a university-based researcher – indeed she still has difficulty categorising herself as such. When

she graduated from Massey in 1984 with a masterate in sociology, her career path led her into a variety of policy jobs before she shifted to Palmerston North in the early 1990s to become the regional director for Barnardos.

Barnardos is one of New Zealand's largest children's organisations, providing early childhood education and care for children under five and of out-of-school care for older children before and after school.

But there is another side to its work, for Barnardos is also in the front line when things go wrong. Families under stress or coping with grief or crisis, sole-parent families, at-risk children, children with special needs, children who are distressed or disadvantaged: these are part of the Barnardos domain.

As a regional director, it was for Dr Sanders to account for the results of Barnardos' work. But there was a difficulty. >>>

Kids' stuff

If the stuff of your daily life is all too frequently trauma and unhappiness, it is perhaps understandable if you turn elsewhere for your studies. So when it came to pursuing a PhD, Dr Sanders decided to follow a group of individuals at a remove from her usual subjects. Her topic: an ethnography of normal small-town ten-year-olds – “children who hadn’t come to attention,” as she puts it.

“I wanted to know what is it like to be a ‘normal’ child? What is it like to be a child in a particular place and time?”

The choice of age group gave her children who were largely free of the angsts and confusions of adolescence, who had yet to grapple with the dislocation of high school, and yet were old enough to understand what research meant and could give their consent.

For the next two years, Dr Sanders became a fixture in their lives. For several terms she sat in their classes as an observer and she interviewed each of her subjects a half dozen or so times.

They were very generous children, she says, and she enjoyed the experience. And oddly enough, she was to see some parallels with some of the work she is doing now with the concept of resilience.

One of the explanations put forward under the banner of resilience for young people acting in socially unacceptable ways is that they are engaged in the business of ‘playing at being bad’: experimenting with violence and delinquency as a means of trying out alternative identities and of securing resources they needed.

In her sample Dr Sanders saw the obverse of this: girls who were ‘playing at being good’. Yet they were not exclusively good. “They would talk [to me] about how they would watch and pick their time. When they were really naughty the teacher would turn around and never think it was them.”

The teacher’s lack of suspicion was the reward for the good girl persona; the boys, being naughty “almost by definition”, found no such latitude.

How much is the choice of personal identity a matter of considered choice? Dr Sanders talks about one of her subjects, “a very manicured, incredibly good girl who did everything right, and was really busy with activities”.

“One day she said she was tired of talking and asked if she could just draw... So she drew herself in the future – it was this wild child, all spiked hair and piercings – and I thought ‘so this is what’s inside’. Like, *whoa, does your mother know about this?*” ■

Barnardos was delivering a US model of intervention called Homebuilders, which, as Dr Sanders explains it, was then novel in its choice of venue.

“Instead of having clients come to you in your office, you went to them. You worked alongside people in the context in which they were living their lives and you tailored your approach to their realities. By being in their context you got a rich view of their world.”

All well and good. But it meant that as a manager Dr Sanders had only a limited exposure to the people Barnardos was working with. What she knew came from the reports put together by case workers and supervisors.

And certain questions were always with her. Just how effective were the Barnardos family

support programmes? What was it about Barnardos’ services that families valued?

Her curiosity was shared by her old teacher, Professor Paul Spoonley, who happened to be on the Barnardos governing council.

In the early 1990s the research funding regime had become more accepting of applications from organisations outside the university system. Professor Spoonley suggested Dr Sanders make a bid for research funding from the Foundation for Research Science and Technology on behalf of Barnardos and he had a Massey-based collaborator in mind: Professor Robyn Munford.

The bid was successful.

She and Professor Munford began by extensively reviewing 12 months of case files.

Breaking the cycle

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

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

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

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

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

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

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

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

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

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

Perhaps the best time to begin intervening is during early

They then took a sample of 21 individual cases, interviewing the families, the family support worker and the supervisor at three-month intervals for the duration of each case and following up once more three months after it finished.

Finally they conducted a statistical analysis of client interventions over a 12-month caseload to see if they could work out what had happened and why.

What generally happened to the families Barnardos set out to help?

“Lots of things improved for them – we clearly saw the value of a strong, carefully developed support relationship in family change. The research reinforced the significance of services that are flexible and able to adapt to the individual realities

childhood. Whatever their circumstances, Dr Sanders observes, most people want the best for their children.

One of the agencies she has worked with extensively is Te Aroha Noa Community Service in Palmerston North's decile-1 suburb of Highbury. Te Aroha Noa, which began its life running playgroups for children and parents and providing counselling for families and whānau, now also offers such things as adult education, individual counselling and community-based social work.

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

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

"When you have a vulnerable population of parents and children, you don't necessarily want the parents to go away and leave their

children in the care of other people; you want them to stay."

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

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

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

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

What will happen to the young men who committed those

terrible crimes in Manukau?

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



of each family or whānau and we learned how important it was that support be able to take time."

This was the beginning of a pattern of research that would soon become very familiar to her: reading and preparation; surveys and extensive interviews; analysis and, finally, publication. It was also the beginning of a lasting association with Professor Munford. This research partnership between Professor Munford and Dr Sanders is one of those perfect pairings. As Dr Sanders puts it, either of them can sit down to seamlessly edit or continue a piece of work the other has begun.

And their productivity has been extraordinary. Their academic papers have

covered such things as young women and marginalisation, the role of community and early childhood centres and the processes of social research.

Dr Sanders became a full time researcher for Barnardos, and in 2004, shortly after graduating with her PhD, took up her present position with Massey, soon securing a number of research contracts.

Her latest is the \$3.75 million Foundation for Research Science and Technology-funded 'Pathways to Resilience' project, which will involve extensive local and international collaborations, over 5 years and involving 1600 interviews. [See page 62]

Throughout all of their research, a constant has been their commitment to helping people

– those who would otherwise only be seen from the viewpoint of various social agencies – to articulate their own stories

"Very often we get everybody else's point of view, but not theirs." Perhaps this is understandable, says Dr Sanders. It can be difficult to build and maintain an engagement with someone whose life is at a difficult point. But that person's view of themselves is very important. "It tells us a valuable story."

The trick is to suspend, for a moment, moral judgement, and step into the context of someone's life to understand their horizons and why they do what they do.

Take, for example, two young women, one of them 'vulnerable' – perhaps from a home where there is family violence – the other, middle class. >>>

The Pathways to Resilience project

Why do some people confound expectation? We all know the narrative of that person who turned their life around: the child from wrong side of the tracks who became a pillar of the establishment; the child raised in poverty who rose to riches.

People like this are, in a word, resilient; despite all of the good reasons they should not succeed, they still do it. But is resilience all about the individual? Although it may suit some to think so, probably not. More likely it is a combination of things: the traits of the individual, the community they are part of, their culture and their personal and family relationships.

Knowing just why some people rise beyond their circumstances while others go on to damage themselves and others can tell us a lot about how to intervene effectively.

In 2002 Professor Michael Unger of Canada's Dalhousie University, a leading exponent of the concept of resilience, founded the International Resilience Project, a collaboration which in its first phase consisted of 14 sites on five continents including such disparate locations as Imphal in India; Sheshatshui in Labrador, Canada; and Moscow in Russia.

Now New Zealand has joined the ranks of the second phase of the IRP. New Zealand's Pathways to Resilience project has been funded to the tune of \$3.75 million by the Foundation for Research, Science and Technology as part of its Building an Inclusive Society portfolio. The project, which is based at Massey, includes collaborators at Victoria and Otago universities and the Donald Beasley Institute in Dunedin. Professor Munford and Dr Sanders are the lead researchers.

The first phase of the New Zealand project will draw on a cohort of 480 'high risk' young (ages 11 to 17) people. These are individuals who appear on the books of at least two statutory services: Child, Youth

and Family Services, Youth Justice and Special Education.

The 16-page questionnaire, says Dr Sanders, will capture such things as their experience of social services, the issues of risk and vulnerability they face, their behaviours and their experience of education.

Each young person will also have been asked to nominate the adult who knows them best, and he or she will be asked to fill out a companion version of the questionnaire.

The intention, says Dr Sanders, is to be able to assemble a risk and service use profile for each young person. A comparison group of 480 young people from similar communities who are not involved in multiple services will also be surveyed. "They may have some involvement but not that same level of extreme need."

In the second stage of the project, 120 young people will be selected from those already surveyed. Sixty of these will show high resilience despite the risks they face; the other 60 will show low resilience and high risk.

This time the research will take the form of interviews with the subject and his or her nominated knowledgeable adult.

In all, 1600 interviews will be conducted over the five-year study. "It is a massive undertaking, but we have a

strong team and good project management in place."

For the moment, Dr Sanders is engaged in making sure the project meets the requirements of the University Research Ethics Committee, and refining the questionnaire, which is taken from a Canadian model (the Canadians are 150 interviews into a similar project) and needs to be tailored to New Zealand's characteristics. Dr Sanders is eager to gather information that the government agencies she has enlisted will find useful.

The results from the project should appear in 2010. ■



"The young women who are marginalised, who are vulnerable and struggling, think about their future in very pragmatic and practical terms. They want a house, they want a car, they want safety and security."

For the middle class these things are assumed: of course they will have a car, of course they will eventually have a house. Ask for their aspirations, and they will more likely talk about a university education, careers, fun and travel.

"The experiences you have constrain your world view. I found the stark contrast in aspirations deeply troubling – we like to think of our country as one that is fair," says Dr Sanders.

For many young women their greatest ambition will be getting a driver's licence,

says Dr Sanders. "They will say, 'With a drivers licence I can control what I do. I can get away from places. I can make myself safe.' That says it all for me."

Taken together with the views of social workers and key adults, the personal accounts allow Dr Sanders and Professor Munford to 'triangulate' where someone's life is situated and to understand how best to open up possibilities for change.

Small changes, says Dr Sanders, can often make remarkable differences. "We saw some wonderful work at the alternative education programme here in Highbury. Really solid transformations."

Sanders favours a strength-based approach to interventions. "When people have needs, when they are in difficulty,

everything in their lives isn't necessarily a disaster. You can often make more progress by focusing on what people do well, than by constantly focusing on their problems and seeing things through a lens of those problems."

In each of her research projects, Dr Sanders works closely with social service agencies, setting out to give them information they can use to practical effect.

There are, however, no easy fixes. "If you are talking about where people start and where you want them to end up, then that is a huge distance for a child to traverse on his own. They aren't going to get there on their own. You have to put in place resources and supports that really function well and you have to put them in early." ■



The art of the interview

One of the staples of qualitative research – human experience expressed in human terms – is the recorded interview.

Much like a working journalist, Dr Sanders will take a sequence of eight-to-twelve questions into the interview as conversation starters. These will have been arrived at in consultation with her team members. But when the interview is under way, the questions and their order are not immutable.

If Dr Sanders wants to modify a question to suit the subject or to digress to explore some new area, she is at liberty to do so.

“We might ask ‘How do you see yourself now and in the future? In a year’s time, five years’ time, ten years... If you had a child who was like you, what would you do? How would you be a good parent?’”

Often she uses props to overcome the social distance between herself and her subject, particularly if this is a child or young person.

“We want them to be able to see us as a different sort of adult to those already in their lives,” says Dr Sanders.

The props and the accompanying activities help both parties to feel more comfortable. “We play games, we draw pictures, we use maps.”

With the interview complete, the recording is later transcribed, a duty that typically falls to the researcher who conducted the interview.

Then comes the art and science of analysis. Each transcript is broken up and reassembled according to the agreed themes that govern the research. (In earlier times this was quite literally cutting and pasting; nowadays qualitative data management packages such as NVivo are used.)

Then the researchers look for other unthought-of themes, which cut across the transcripts. They look for material that confirms or disconfirms propositions they have put forward. And they propose descriptions, explanations and ideas that fit with what they have found, often turning to the established literature to see if connections can be made.

Part of the quality assurance is the involvement of everyone in every stage of the project.

“In our projects everyone has to do everything. There are no prima donnas. You have to interview, you have to transcribe, you have to code, you have to write. You are not allowed to get away from data – which means you aren’t allowed to get away from people.”

The research is freighted with ethical issues around the well-being of both the researcher and the subject. Should, for example, an interviewer respond if someone is in a situation of immediate need and, if so, how? How does the interviewer cope if the information divulged at interview is deeply disturbing or compromising?

All of the research must first be approved by the university ethics committee, and Dr Sanders and her team adhere to protocols around safety and harm.

To avoid harm to themselves – and sometimes, says Dr Sanders, an interview can leave the interviewer “absolutely gutted” – the team members offer mutual support.

To avoid harm to the subject, it is sometimes impossible to remain clinically detached.

“You can’t just say, ‘That’s interesting, so later on what happened?’ You can’t be abstracted from it. People are telling you things that are disturbing and distressing.”

If matters become too fraught, the interviewer will talk to the subject about places they could go to find support (they go to interviews with lists of local service organisations that can help) or, indeed, offer to stop the interview – though the offer is seldom taken up.

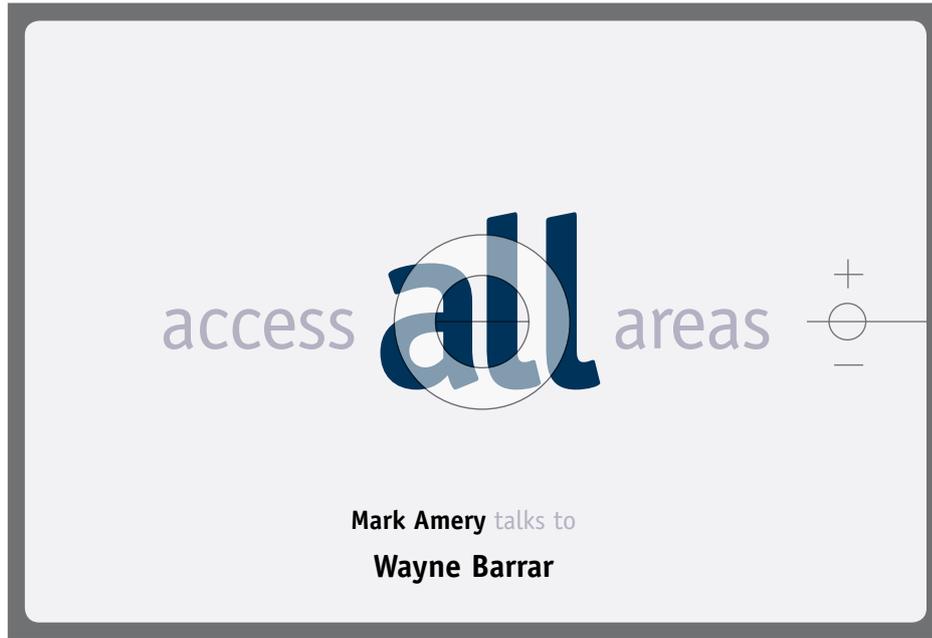
“Usually people are very generous. They will say, ‘no, no, if this is going to help someone else, let’s carry on’.”

On the other hand, says Dr Sanders, it pays to remember that what the interviewer hears is not the sum of someone’s life – and that because the questions focus on problems, problems are what the interviewer will hear about.

“We train our interviewers – and it’s a little bit of strengths-base intervention – to try to bring things back to the things the person has done really well.”

An ultimate test for Dr Sanders is whether or not her interview subjects can recognise themselves in her findings. Often she will take her conclusions back to them, asking “Does this make sense? Does it have resonance?”

“If someone says, ‘no I can’t see myself anywhere in this’ we have probably made a mistake. At the very least, I would expect someone to say, well, I can see how someone else would see that.” ■



Consider, if you will, the camera as a gate – a gate providing access to other worlds through the walls that bound our current experience of the world. Be it 19th century spiritualist and landscape photography, or 20th century war and celebrity photography, photographers as gatekeepers have negotiated access to spaces on our behalf.

Yet photographers also frame up those spaces for us. They not only open space up to us with light, they define our view, and work to articulate something out of what they have found.

Now consider that university researchers act in similar ways. They open up new fields and direct us to look at those fields from a certain perspective.

Artist Wayne Barrar’s photography has always been both art and research project. International contemporary art practice has in recent years moved ever closer to Barrar’s longstanding interest in photography as a research tool, making him a natural leader for the creative research work of Massey’s School of Fine Arts.

Barrar is Director of Photography at Massey, and the school is at the forefront nationally of treating contemporary art as a field of creative research. One of this country’s most notable photographic artists, over several decades Barrar in his practice has explored concerns we associate more readily with scientific and geographic research.

From Wanganui riverbank retention and a visit to the phosphate-mined landscape of Nauru, through to his current forays around the Waikato to look at koi carp infestation, Barrar has an enduring interest in the complex

relationship between culture and nature. His photography has provided a fascinating ongoing discussion about the way we contain and shape nature and landscape, and in so doing become part of our environment. In turn each image mirrors this discussion by considering the way a photograph as a chamber frames and contains the world.

The fine art outcomes are strong and diverse, from solo exhibitions such as *Landscapes of Change* in 2001 at the Nevada Museum of Art in the United States, and the University of Otago Press-published survey of Barrar’s work, *Shifting Nature*, to smaller suites of works in prestigious exhibitions like the biennial national survey show *Prospect 2004* at City Gallery Wellington, and the International Museum of Photography and Film (George Eastman House, Rochester, USA) exhibition *Picturing Eden*, which has been touring in the United States since 2006.

Barrar has recently completed his biggest research project yet, a look at commercially mined underground spaces and how they are put to new uses when the mining stops. The project took five years and saw him visit working and reused mine spaces in America, Australia and New Zealand.

“I was struck by how these underground environments are normalised for people, and the way things are arranged to make them feel at home there. I was also interested to explore the way that underground spaces are commodified. It hadn’t occurred to me before that underground areas could be used in this way, as a sort of subterranean real estate.”

In the United States Barrar photographed an enormous underground car storage facility, a university that mines out spaces underground

as it expands, the world’s largest mushroom farm, a space which will store nuclear waste from the Cold War weapons programme, and an underground paintball arena (the carcasses of the exploded balls leaving a field of abstract pop delight).

“Some re-uses appear almost counter-intuitive at first, like the former salt mine that has proved to be an ideal location for a film archive. You imagine that a salt mine will be a corrosive environment, but the reality is that it is almost inert.”

Disused mines have also proved appealing sites for commercial office space. There are not only economic advantages (why build structures when spaces lie vacant?) but the environment provides minimal distraction for employees and security is more easily handled.

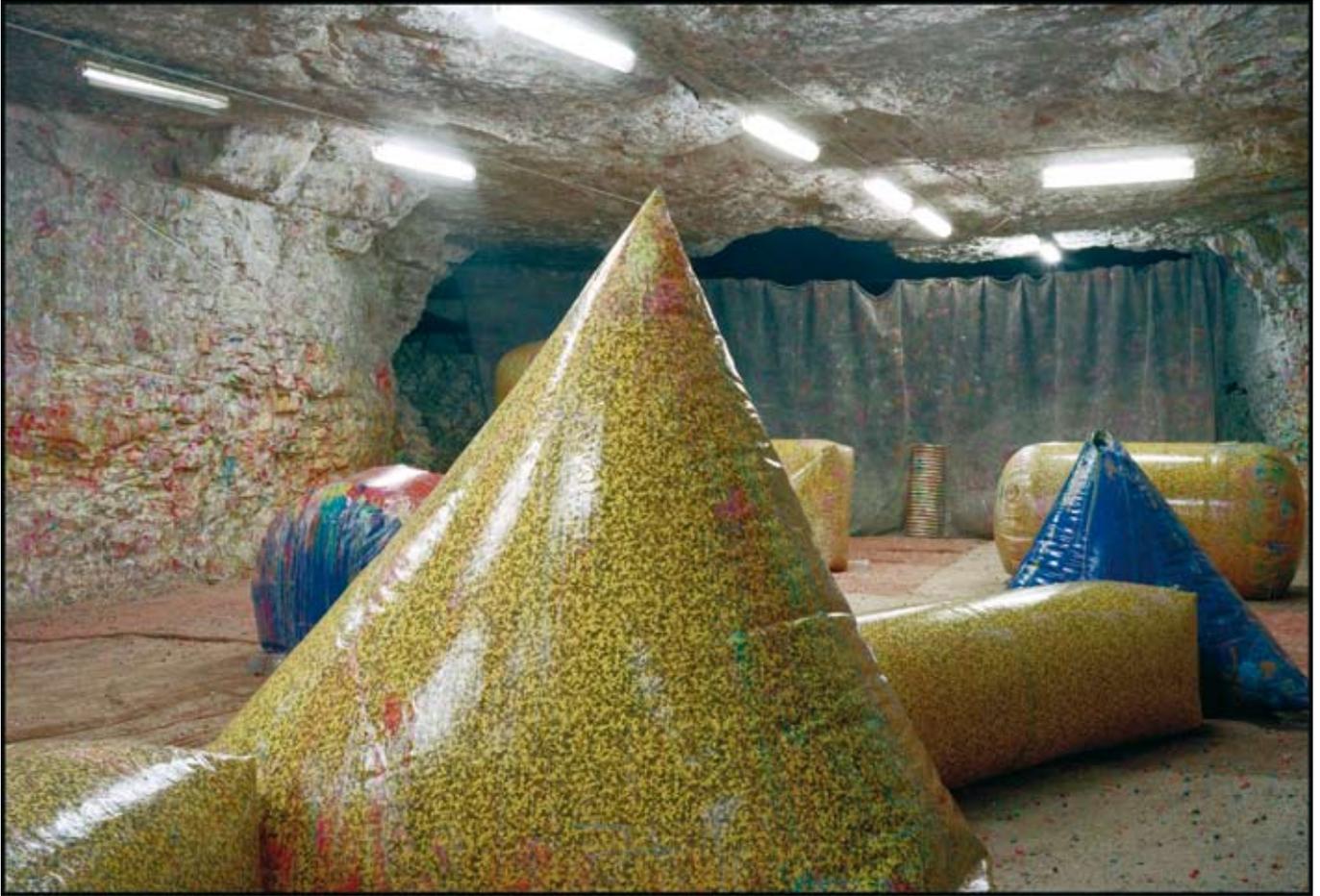
“Mining sites have limited access, often a single portal or shaft,” Barrar has written. “They represent private rather than public spaces, able to be promoted as places of exclusion. In a sense, an underground industrial park such as Subtropolis in Kansas City, Missouri is the ultimate gated community.”

Barrar is interested in how these restrictions lead to highly controlled, aestheticised human landscapes within rock. While each site’s dramatic lighting and unusual natural architecture provide the framework for Barrar to take striking photographs, at the centre of each are the ironies of how we order the underground world to represent above-ground.

The photographs play on the conflicting feelings we have about control underground: a place of shelter and refuge, but also a place of burial and limited escape. >>>



Wayne Barrar with an exhibition image from *An Expanding Subterra* (photo Stephen Rowe)



Underground paintball (Speedball) field, Subtropolis underground industrial park, Kansas City, Missouri 2006

These responses are minimised by reforming the environment to make it as close as possible to the above-ground. However, Barrar came to recognise consistent features in underground offices, like the retention of a natural rock wall. “You’ll usually find a signifier of the underground. You’ve got everything finished, except they leave one little bit to remind you of where you are.”

With working mines Barrar’s interest was particularly in those chambers where workers seek some respite from the earth: fully lit crib rooms where the workers have lunch, the ‘refuge cuddy’ and emergency life support chambers. Huntly coalmine has a makeshift New Zealand variation on a crib room – a chopped up container.

“They normalise these spaces. Workers leave their marks and it’s a form of territorial placemaking.”

Another tangent of this project is a series of black and white photographs of underground homes at Coober Pedy, South Australia. Originally these homes were converted opal mines, but are now planned dugout pockets of suburbia. They’re attractive real estate

because they offer respite from the extreme temperatures of the desert above. Again there are a number of economic advantages (“in constructing a new bedroom, you get the chance to add to your income through opal extraction”). Barrar’s series also shows underground facilities like churches and a hotel complex.

Barrar’s photography has always played on the incongruity of things that seem to be in the wrong place. Here it’s the insertion of domestic furnishings and architecture into rock faces. Barrar’s camera soaks up the unusual aesthetics underground, with strange plays of light and an unusual confluence of textures.

It’s clear he also relishes the technical challenges. Electricity is expensive at Coober Pedy, so he found himself photographing in 40 watt lightbulb environments. Barrar’s image of an underground hotel bar isn’t just surreal because of its context, but because of the eerie glow from a jukebox in the dimness, and the soft light spilling across the rich scarred surface of the rock walls.

“People are essentially recreating a familiar suburbia here, rather than being responsive to

the particulars of the environment. I mean look at this,” he says, directing me to a photograph of the entrance to an underground house. “You’ve got this almost Sydney suburban frontage transplanted on to the outback. Again, there’s this normalisation process going on.”

This project has also been out of the ordinary because research around the re-use of underground spaces has been rare.

“There are very few books on this issue. While there’ve been a few commercial things done photographically there are no art-based projects of any note engaging the underground. That’s why I’ve always positioned this as a project with international interest.”

Barrar was interested in ensuring he had a variety of samples, rather than collecting as many underground sites as he could.

“A year or so ago I knew I’d shot enough because I felt I’d collected enough aspects and ideas around these spaces as commodities. A key aspect of the project is the fact that this is globalised space; there’s a real tendency for these sites to be similar, wherever they are in the world.”



Film and tape storage, Underground Vaults and Storage Inc. Hutchinson, Kansas 2004

Barrar is opening gates to allow us to see new landscapes, but gaining access isn't automatic. In fact, he says, the process of obtaining access and permissions is a thread that runs through his recent projects.

The underground series is yet to be exhibited in its entirety, though images have appeared in various exhibitions to date. However, the extraordinary nature of his research has also meant presenting in other contexts. In 2006 he presented a paper at *Going Underground: Excavating the Subterranean City*, a conference at the Centre for Sustainable and Renewable Futures (Salford and Durham universities) in Manchester.

"This is an arena I like crossing over into, which is interdisciplinary and a broader cultural practice. That's a mode of operation I'm comfortable with."

Barrar's current project focuses on biosecurity – the boundary between the native and exotic and the complexities of how it is controlled in New Zealand.

Photographic assignments thus far have included a visit to a DOC lake poisoning

operation in Whitby to get rid of invasive noxious fish species; a secure quarantine facility at Lincoln testing biological control agents (flies are put in to eat weed species to see if they can be released as biological control agents); and, would you believe it, the national algae collection in Nelson.

"Algae is being kept alive in a constantly monitored secure facility, and it takes daily attention to keep it going. It's a reference library, so when there's a toxic algae bloom they have something to compare it against."

Largely New Zealand-based, the project is in its early stages and Barrar thinks it will keep him busy for the next three years. The project is totally integrated into his Massey work, funded by small grants, and when he is out on assignment he is representing Massey with research outputs for the University.

It involves ongoing negotiation and contact with organisations to obtain access to different facilities and activity. "As with the underground sites, you can understand their concerns," Barrar says. "There are often issues such as security and intellectual property that need to be taken into account, so I need to be

absolutely clear about the sorts of things I'm interested in photographing, and why.

"Once they get a sense of what I'm doing and see some of my other work, they're usually fine, and in fact can get quite excited because it's quite novel to have someone approach it in that way. In many cases, there is also an educational component to what they're trying to achieve, and they're aware that my work can feed into public awareness of the issues. I also make the work pretty freely available for dissemination for people doing research.

"Being based at the University is an advantage, because they understand that people research visually now. It's a good time to be doing this work."

Barrar has a grounding in science as well as fine arts, with his first degree having been a Bachelor of Science in Zoology. "I don't think of myself as a science photographer, but that grounding certainly helps in terms of understanding what these scientists are doing. I think this sort of crossover and interdisciplinary work is really appropriate for work coming out of a university in a fine arts context." >>>



Underground company frontage (ATP), Space Center, Kansas City, Missouri 2004

A look at some fresh prints shows Barrar's interest remains aesthetic as well as scientific. He has a keen eye for how we organise laboratory spaces as interiors and landscapes.

"This project is quite interesting to me because I hardly ever used to photograph interiors until I did the underground works. It's now interior landscapes that I've become particularly interested in – as a close view of an encapsulated nature."

A commonality across this and the *Subterra* project is Barrar's interest in globalisation and the breakdown of borders. While this new project is largely nationally based there can't help but be international strands. He loves the irony, for example, that pohutukawa grows so well in South Africa that it's considered an invasive species.

What Barrar dubs a subproject is research into the explosion of koi carp in the Waikato. It's again a subject full of ironies and complexities around something being in the wrong place. A fish which he says is often dubbed "the possum of the waterways in New Zealand" is conversely highly revered in Japan, where a prize fish could fetch \$100,000 at auction.

"All around the world there are competitions and fanatical collectors of these massive fish, yet in New Zealand they are at the other extreme in terms of social value. They just have such a devastating effect on our waterways. There's a containment area you're not allowed to move them from. They're a serious problem.

"I find it interesting to be concentrating on something that might seem as meaningless as koi carp when there is actually a major international story there around the movement of an organism."

Barrar is also in the business of storytelling – the camera has the freedom to capture beautifully what statistics or words can't show as dynamically.

Take the koi. Barrar talks of portraying the 'Koi Carp Classic' sponsored by DOC. This is an annual weekend in the Waikato when people come together to remove about six-to-nine tonnes of the pest from local waterways. Barrar has documented the process, from the bow-hunting of the fish and the trophy-boards, to the recycling of the koi into burley.

"One of the things I've photographed is sequences of these dead koi as they fly through the air balletically, thrown into 'Stormin' Norman', a machine that crushes them and turns them into a pulp. People actually back up whole trailers to get them filled with the pulp. It's poured straight into the trailer, and they head off down the road with this stuff wobbling around."

Barrar's interest in photography and science have paralleled each other since childhood.

"The first camera-based thing I did was buying a camera that took photographs down my microscope. I started making circular images of things that interested me, so there was always that aesthetic interest as well as the interest in science – and experimentation with microscopes and equipment and so on.

"Even when I was at university studying zoology I was involved in a very active photographic society, as PhotoForum was in the 70s. In those days most people didn't go to art school like Elam or Ilam to do photography. But there was an independent photography scene and I used to look forward to reading the latest issue of the



Above: Mulching koi carp from bowfishing event, Waikato 2007

Left: Wayne Barrar photographing with 8x10 inch camera at Lake Tutira (photo Kerry Hines)

classic British journal, *Creative Camera*, in the public library.”

Barrar joined the staff of the former Wellington Polytechnic in 1998. Massey University’s School of Fine Arts was established in 1999 – Barrar helped develop New Zealand’s first photography department within a Fine Art programme.

Part of the department’s reputation lies in its roll call of outstanding photographic artists on staff with a proven interest in research. Alongside Barrar are Anne Noble, Ann Shelton and until recently Gavin Hipkins – all among New Zealand’s most recognised artists.

“Creative-based research is no longer a luxury or an add-on, it’s become an integral part of the University and we’re accountable for our research. There’s a long-term academic focus on creative-based research, which is what we do here, with the government-initiated Performance Based Research Fund rewarding excellence in research activity.

“That’s why I say the projects that I’m doing are so in line with university research and they make up a significant part of my

work. The time that artists working in universities have for their research can help them push boundaries and undertake projects that maybe aren’t typical.”

Barrar’s lifelong interest in photography and science also meet in his research interest in photographic technology and history. As well as collecting historic prints he has worked across an eclectic range of formats, with an interest in non-conventional printing processes and how they provide a different dimension to the photograph’s subject, from the 19th century cyanotype blue print to the salt print.

These days Barrar’s practice is mostly digital and he laments that working with black and white film and using darkroom printing is getting harder because the materials are vanishing. Soon he won’t be able to reprint the Coober Pedy work as he intended because the company that produces the photographic paper has gone bankrupt.

Barrar considers an important component of the research work at Massey is the attention being paid to excellence in digital printing, and the difference looking at

some of Barrar’s recent large format prints compared to other large prints I see exhibited is very clear.

This is an area Barrar says has developed significantly in recent years at Massey.

“The quality of those prints is fairly outstanding because we’ve tweaked and worked the process. Even though the machinery isn’t much different from what you can buy to use at home, the support of our highly skilled technical staff means you can print high resolution work with real control, often to a level far beyond normal commercial standards. In exhibition photography that’s really important.”

When I see Barrar he’s about to head back up to the Waikato to do some landscape photography around the koi carp containment area (it stretches from Helensville, northwest of Auckland, to Otorohanga).

“There’s also quite a nice case study there. There’s a giant weta, the Mahoenui, that was almost extinct and they found some of them in a patch of gorse in the King Country. What’s really interesting there is that it’s a pest, the gorse, that has protected them.” ■



Approaching fa'a Samoa

Professor **Cluny Macpherson** and Samoa – a story of life, love and work.

Jennifer Little writes.

Cluny Macpherson spent his youth dreaming of becoming a vet. But a year of teaching English with Volunteer Service Abroad in a Samoan village after he left school made him overturn his lifelong plan.

He set off at age 18 in 1965 with one other volunteer to live with a Samoan family in the rural village of Vaito'omuli, on the island of Savaii, where few of the locals spoke English. Instead of recoiling from the culture shock he experienced there, he revelled in it.

It was a life-changing sojourn, sparking an epiphany that set him on the path to becoming a professor of sociology and world authority on contemporary Samoan society and culture, and Pacific migration and economic development.

He vividly remembers his debut in Samoa. "All the certainty and predictability was suddenly gone, and when it's suddenly gone you can do one of two things – you can panic and leave, or you can say 'gee, I wonder how this all works?'"

"In fact it was the first time anybody had ever said 'gosh, you're remarkably ignorant – you don't understand this and you don't understand that'."

Cluny's response: "I became fascinated. I thought 'there must be rules. You must be able to understand how a society works.'"

"It was this experience that led me to an interest in sociology and in the Pacific, because it was the first time I'd ever been the member of an ethnic minority.

"I wondered how the society and economy worked. I was intrigued."

"...you can do one of two things – you can panic and leave, or you can say 'gee, I wonder how this all works?'"

Intrigued and captivated. "I loved it there. People were warm and kind and generous, and they spent a huge amount of time teaching me to speak the language and understand things," he says.

His youthful initiation into Samoan life "shaped everything I've done since then", he says.

By the time he returned home fascinated by the culture he'd just been exposed to, he had decided veterinary science held no

real interest, even though he'd always been passionate about science and animals. His father was extremely concerned at the news, he recalls.

As a concession to his erstwhile ambitions and his father's expectations, he prepared to study tropical agriculture, which would have to be done at the University of the South Pacific in Apia, and included a practicum with the Department of Agriculture in Samoa.

While working and saving back in New Zealand for the study fees, he met his wife-to-be, a Samoan nurse La'avasa Aisea

Ironically, meeting and falling in love with La'avasa prevented him from returning to Samoa as soon as he'd hoped. Her obligations meant she had to stay and work in New Zealand to help support family back home through sending remittances – a common expression of Pacific Island economic practice that Professor Macpherson would later examine and write about.

He changed tack again, and enrolled to study anthropology at the University of Auckland to pursue his interests in Pacific culture, languages and prehistory. (He would have studied sociology if it had been available at the time.) There he was fortunate to take classes taught by such Pacific authorities as anthropologists Sir Hugh Kawharu, Antony



Hooper, Garth Rogers; archaeologists Roger Green, Les Groube and Wilfred Shawcross; and linguists Bruce Biggs and Andrew Pawley.

Although the newly-wed Macphersons settled in Greenlane in central Auckland, their day-to-day experiences were thoroughly Samoan. The couple shared one of two

He was intrigued by the way in which tangible skills – such as fixing a car – were equated to the value of being able to offer certain kinds of helpful information regarding work, dealing with bureaucracy, legal matters, or to interpret information.

His PhD explored why people continued

could combine them in ways that balanced their respective influences.

In 1973 he joined Professor Pitt in the newly-established Department of Sociology at the University of Auckland, where he was free to explore his newfound interest in the political economy in the Pacific context. This



neighbouring houses occupied by between eight and 16 members of La'avasa's extended family, the numbers fluctuating as family members came and went from the islands to find work or settle.

"This is where my interest in urban Samoans living in New Zealand all started," says Professor Macpherson. "You got a real insight into the challenges of adjusting to a new society."

A scholarship to do his PhD in Sociology at Waikato University enabled him to study the economics of kinship – a matter he witnessed every day at home where he observed how Samoan migrants lived, worked and helped each other through a parallel, unofficial economic model.

"What I realised was that within these kinship networks, people swapped services with one another. If I needed a new bathroom floor and my wife's cousin was a builder he'd say 'I'll do it if you do my tax for me'."

He used case studies from his extended family to track the volume of goods and services exchanged to find out how people built up credit by helping others over time – the first academic study of its kind to reveal "quite a remarkable economic institution", he says.

to belong to kin groups in migrant cultures. In the case of Samoans "it was for very good economic and cultural reasons. The same thing was going on in Samoa – social and economic reciprocity had been directly transplanted."

The practice of reciprocity is a well-known feature of fa'a Samoa, or the Samoan way, and subsequent studies have documented its function as a vital aspect of Samoan communities, churches and workplaces in New Zealand.

Alongside doctoral study, Professor Macpherson became involved in a Nuffield-funded sociological study of some 1000 Samoans in New Zealand, which was later published in book form as *Emerging Pluralism: The Samoan Community in New Zealand* (1974).

He began an important working association with Professor David Pitt, who had just published a seminal book on the Samoan economy entitled *Tradition and Economic Progress in Samoa*. He also discovered something which has influenced all of his work since then: many economic models do not attach sufficient weight to the influence of culture and many social anthropological models fail to appreciate the significance of economy in human activity. Sociology, it seemed to him,

was part of the opening phase of a lifetime's dedication to researching, understanding and writing about the experiences of Pacific Islanders, both in the islands and in New Zealand and elsewhere as immigrants. His books, papers, journal articles and contributed chapters have explored a diverse array of topics from a sociological perspective. They include the evolving Pacific identities in New Zealand, the Samoan diaspora, evangelical religion among Pacific Islanders, the role of cruise ship tourism in Pacific development, Pacific labour and migration trends, and traditional Samoan medicine and healing practices.

It was his work on Pacific migration in New Zealand that led, in 1977, to an invitation to become Pacific Visitor at the Centre for Pacific Studies at the University of California at Santa Cruz. As the Pacific Visitor he worked with Pacific scholars in the United States who were planning a similar study of migrant communities in California as the foundation for a number of policy-related initiatives.

Much of Professor Macpherson's work is undertaken in collaboration with his wife. The co-researching and writing, he says, is a natural offshoot of their marriage and shared interests. She brings to the work her

insider knowledge, her social connections, her understanding of culture and language, and something Cluny describes as a questioning, critical spirit.

There are other ways too in which the research partnership works. “There are a whole lot of questions [when doing research] a man

look, informed us that she recognised the condition and that she had treated it successfully on numerous occasions,” he says in the book.

But they had to plead with her to treat the children. “She [told us she] only ever treated real Samoans’ for this condition and

in their temperatures returning to normal and the children bouncing back to health.

“I said to my wife at the time, ‘I’ve got to understand this – this is altogether too interesting!’

“I wanted to understand the science as well as the aspect of faith when it came to the

“Samoan medicine is not some body of ideas that was slowly eroding as people abandon it but something that was drawing on all sorts of ideas. It’s still going on today.”



couldn’t ask a woman, for example, in relation to health and gynaecological conditions, and conversely questions she couldn’t ask men about health issues,” he says.

Their most challenging project, encompassing more than 10 years of research, investigated Samoan traditional medicine. One result is the book *Samoan Medical Belief and Practice*, published in 1990 and reprinted in 2006.

As with most of their projects, the idea sprang from a real life. Professor Macpherson had been treated from time to time when he was ill by Samoan healers. His interest in and respect for traditional healing deepened when a fofo, or healer, successfully treated a serious wound he sustained from a chainsaw accident that the hospital in Apia had treated “with only partial success”, he says in the introduction to the book.

But it wasn’t until his two children became ill while the family was living in Samoa in 1977 that he was prompted to pursue a serious study of Samoan medicine and healing practice.

When he was unable to get his feverish youngsters to hospital, his wife, in desperation, called in her aunt, a healer.

“She asked us about the onset and duration of the illness and finally, with a triumphant

our children, Tahamoana and Penina, were not ‘real Samoans’. Maybe their bodies, which were part European, would not respond to Samoan medicine.”

The Macphersons convinced the aunt that their children were too young to doubt the power of Samoan medicine – a prerequisite for its success, she told them.

Her remedy for the children’s soaring

terms on which she treated it,” he says. “We spent about 10 years off and on going back to Samoa collecting information, talking to healers and watching them at work, talking to patients and listening to their accounts of what worked, and tried to make sense of how Samoans thought about health and illness.”

What struck him was that Samoans don’t see traditional and Western medicine

Samoa is now a trans-national reality – it has enclaves in a whole lot of cities all around the Pacific Rim, and each of these versions of Samoa has its own characteristics.

temperatures and respiratory distress was a carefully scheduled treatment which involved giving them a medicine made from local plants and vegetables followed by several hours’ sleep to reduce their temperatures. She predicted the symptoms would return, but a further treatment, followed in the morning with a special restorative soup – containing high levels of vitamins and carbohydrates – and more sleep the following day resulted

as incompatible. In fact, qualified medical doctors will sometimes suggest to a patient that they see a traditional healer as well or instead of using conventional medicine.

“The surprising thing we found was that the system was not in decline but expanding. Samoan medicine was not some body of ideas that was slowly eroding as people abandoned it but something that was drawing on all sorts of ideas. It’s still going on today.” >>>

As well as satisfying his curiosity, the book documented the subject for the first time and answered vital questions about the hitherto little understood nature of Samoan medical belief and natural medicine.

Soon after completing his project, Professor Macpherson won a Rockefeller Fellowship. This took him and his family to Hawaii in 1990-91. Based at the Centre for Pacific Island Studies at the University of Hawaii at Manoa, Professor Macpherson and his wife found themselves invited to join an international group studying youth suicide throughout the Pacific and Pacific Rim. The couple researched the escalating rate of youth suicide in Samoa – a subject requiring a delicate, sensitive approach in order to find out the truth beneath cultural and behavioural assumptions. While Professor Macpherson examined economic data because he suspected youth saw their opportunities deteriorating, his wife talked to others in the community about why they thought it was happening. They uncovered varied explanations for the suicides, and wrote a series of “multi-layered, multi-dimensional” articles bringing together whole range of perceptions.

“We were able to say ‘this is what Samoans believe, so if you want to change things you would have to understand this logic’. Our work became central to policy formation.”

A second consequence of his time at the University of Hawaii was a growing interest in the social and economic impacts of globalisation in the Pacific. Over the past two decades Professor Macpherson’s primary research interests have embraced a broader approach to understanding Pacific economic development through examining the relationships between small Pacific states and their larger metropolitan neighbours, such as New Zealand, Australia and the United States. It also led to his involvement with the establishment of both the Centre for Development Studies and the Centre for Pacific Studies at the University of Auckland.

“I’ve been interested in the dynamics of these relationships and they way they can both constrain economic growth and encourage it.

“You can’t understand Samoa without understanding its relationship with New Zealand, because the Samoan and New Zealand economies are so vitally connected, and in some respects the role of Samoans

is fundamental to understanding the New Zealand economy.

“Once you understand that, you start to view Samoa not as a place but as an entity. Samoa is now a trans-national reality – it has enclaves in a whole lot of cities all around the Pacific Rim, and each of these versions of Samoa has its own characteristics,” he says.

This work led to a series of invitations to visit Japan to work with scholars there who were also becoming concerned with these issues and with the impact of Japanese aid on Pacific economies and societies.

But a growing administrative load as Head of Department and Associate Dean at the University of Auckland was preventing Professor Macpherson exploring new interests. So in 2004 he moved to a half-time position in School of Social and Cultural Studies at Massey Auckland in order to spend more time on research, writing and consultancy in the Pacific.

In 2005, the Royal Society of New Zealand awarded Professor Macpherson its Sir Peter Buck (Te Rangi Hiroa) Medal for, according to its citation, “his major contribution to research on the social, cultural and economic development of New Zealand and the Pacific”.

His assessment of Samoan society and economy as a “trans-national phenomenon” led to an invitation to deliver the Macmillan Brown lectures at the University of Canterbury in 2007. The lectures, entitled *The Warm Winds of Change in the Contemporary Pacific*, focused on this process of trans-nationalisation.

In the lectures, he shared fresh insights into the changing nature of Samoan life, many based on his own observations and experiences of the impact of globalisation on village economy and society.

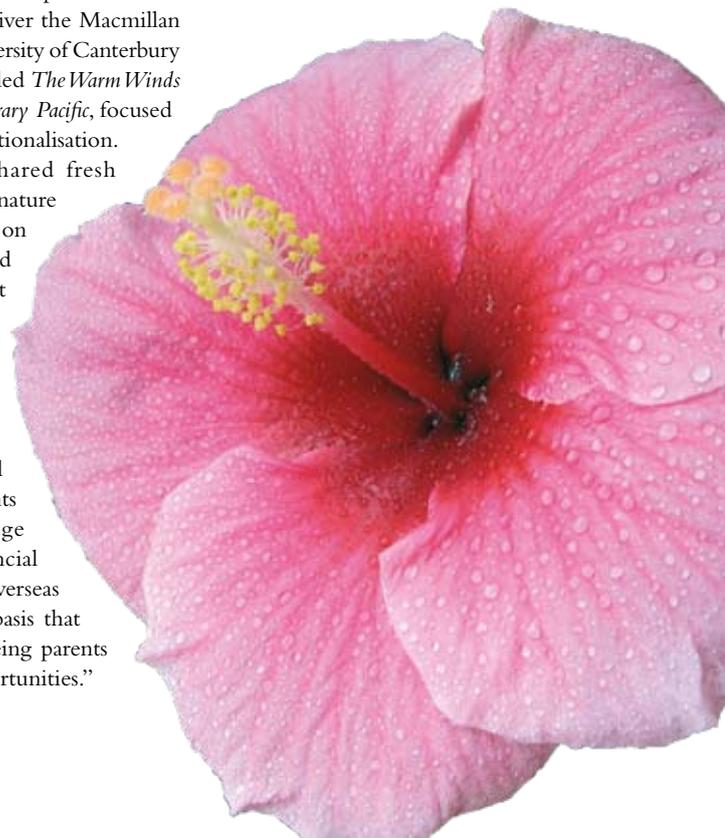
“Samoans are getting more entrepreneurial at home as they have more access to overseas capital now with so many migrants abroad. A Samoan village might negotiate for financial support from wealthier overseas family members on the basis that they are looking after ageing parents and sacrificing other opportunities.”

The lectures were broadcast on Radio New Zealand and are now being rewritten as a book to be published next year by the University of Auckland Press.

Beyond academic research, the Macphersons enjoy rural life growing feijoas commercially on their coastal Mahurangi property north of Auckland. But it’s no surprise they spend about four months each year in Samoa. Daily life and academic research overlap here too – they are looking at the economic impact of church donations within the Samoan village and national economies.

Professor Macpherson describes the home built for his parents-in-law in the village of Vaigaga 10 kilometres from Apia as “very much a second home”. On about two hectares of land, they grow papaya, taro, bananas and mangos as well as exquisite tropical flowers and are now considering replacing old coconut palms with new low-fruited hybrid palm, the fruit of which can be used for a new diesel fuel substitute .

Framed photographs of his beloved bright orange and yellow blooms adorn the walls of his Massey Auckland office, bringing a touch of tropical paradise to his academic bolthole, as well as a reminder that his intellectual and personal lives are inextricably fused wherever he is. ■





leader of the pick

Massey-developed robots will soon be working in New Zealand orchards.

By Lindsey Birnie and Malcolm Wood.

It was a bulletin on Radio New Zealand's 6.30am rural report that made Garth Atkinson pause. The kiwifruit industry was going through one of its perennial crises. The fruit were ripening on the vines, but growers could not find the labour to pick them.

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

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

Dr Rory Flemmer, the expert in robotics to whom he took the problem, was more certain.

With what he knew and the expertise he had to hand, an automated picker was definitely do-able.

In a industrial workshop on Massey's Palmerston North campus the proof of Flemmer's assertion is taking shape. At a series of workstations postgraduate students are designing the specialised circuitry that will link the picker's servomotors to its central controller.

In a forecourt, PhD student (and project managing director) Alistair Scarfe is fabricating the four articulated arms that will do the picking. Close by is the gleaming metal chassis with its oversize Tonka-toyish tyres on which the picker will manoeuvre.

Some time in mid-2008 the picker will despatch itself on its maiden voyage out into an orchard. Its instructions, says Flemmer, will be simple: go to a set of GPS coordinates; identify a row of vines; pick that row and successive rows; if your bin is full, go and change it; and when you

have finished picking, come back and stop.

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

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

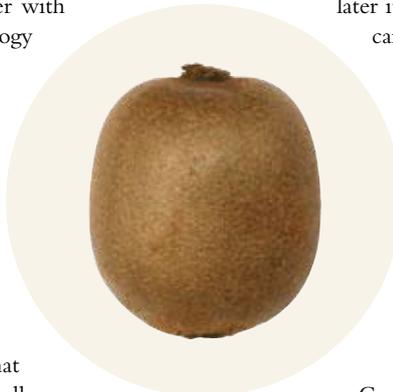
In the early 1980s, when the Japanese became converts to the new technology, the field began to take off.

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

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

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

"The modern economy is completely dependent on robotics," says Flemmer. Everything you purchase is made by robots. If it weren't made by a robot you couldn't own it – it would be too expensive. If you had a car that was made by hand it would cost you hundreds of thousands of dollars. And in fact it couldn't be made by hand. All of the electronic





aspects are made by robots because the components are too small to see, never mind place and solder.

“We think [a product] is made in China by people; it’s not, it’s made in China by robots.”

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

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

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

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

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

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

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

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

Kiwifruit Growers Incorporated general manager Mike Chapman sketches the industry’s labour needs. “Through winter into spring we have repacking and winter pruning, and we have about 11,000 full-time workers. We need about 9000 extra workers for the kiwifruit season, starting from the end of March to a finish mid-to-late June. Every year it’s a challenge finding those additional workers. We expect this year 5000 of that 9000 will be from existing staff, and approaching 2000 brought into New Zealand under a recognised seasonal employers scheme. The rest are people on working holidays – backpackers.”

A fruit picker in New Zealand may not earn a fortune, but he or she earns far more than someone in China or Chile and the cost of wages, a large component of the cost of production, must be passed on to the producer and ultimately the consumer.

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

Previous attempts at mechanisation have proved difficult in the orchard, Chapman says, but he’s “interested” in how Massey’s kiwifruit picker pans out.

“Anything is useful that will improve the dynamic and the quality of work done, anything that maintains the quality of fruit is most welcome, anything that makes utilisation of labour better.”

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



The visionary

Ask development manager Garth Atkinson about his colleague Rory Flemmer and he will at one moment describe him as someone who never stops thinking and at the next as someone who knows how to *do* things. In fact, over his career Flemmer seems to have amassed an almost perfect command of practical hands-on experience and theoretical skills.

Born in South Africa, Flemmer graduated with a BSc and MSc in mechanical engineering and a PhD in chemical engineering at the University of Natal.

But Flemmer could, as he puts it, see the writing on the wall, and in 1985 he left his increasingly violent and anarchic homeland for the US. His girlfriend Claire, whom he had met at university, followed to pursue her PhD, and the two married and together established both a family and a company specialising in building advanced automation machinery.

The Flemmers soon accrued clients such as General Motors, Siemens and Bausch and Lomb. Machines designed by the Flemmers were used for everything from processing timber to handling precision optics (in harsh, hot, glycol-and-glass impregnated environments).

The family migrated to New Zealand in 2005, where the Flemmers both took up positions with Massey’s School of Engineering and Advanced Technology.

“We have pretty much shared an office almost all our lives. A day spent apart is a day wasted,” says Flemmer.

Flemmer was a leading light in introducing Massey’s new engineering major of Industrial Automation.

Currently he has five PhD students. The first of these – Alistair Scarfe – is working on the kiwifruit picker. The others are working on translating the visual field into an aural field so that blind people can ‘see’; on pure artificial vision in a project called “If there is an object in this field, what is the object, and what is the orientation of the object?”; on applying spectral analysis to Landsat images of kiwifruit orchard canopies to determine the state of the crops; and on one of the big issues, robotic consciousness.

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

Robots may have become smarter, faster, stronger, smaller, cheaper and more accurate, he says, “but you don’t hire blind workers. Robots really need to see what they are doing.”

And artificial vision is complicated and demanding.

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



The managing director

No one who knows Alistair Scarfe's background should be surprised at his choice of career. Scarfe grew up on a series of dairy farms in the Wairarapa and his father, he says, always had a basic workshop.

What is more, a family friend who lived a couple of kilometres away had a full machine shop of mills and lathes. "He showed me what to do, and he'd bring me home steel off-cuts from his work."

Scarfe built a number of projects in his father's workshop (a trailer was one) and when someone gave him a motorbike that had burnt out after an encounter with an electric fence he removed the forks and installed them on his mountain bike. His verdict: "Heavy but effective." He also tinkered with electronics, again with the assistance of his father, a former ham radio operator.

Senior lecturer Rory Flemmer, who is working with Scarfe on the kiwifruit picker, describes him as driven, grounded, and extraordinarily smart. "He's a very fine fellow. He can look at a mechanism, understand it and build it. His skill in mechanical design has raised the picker from the merely utilitarian to a work of art – if you like that sort of art."

For Scarfe, the picker is a dream assignment. "There is just nothing else that I could think of doing that includes mechanical engineering and electronics and ties them together in a package this advanced in all of its aspects."

Scarfe, who graduated from Massey in 2007 with a BE in mechatronics with first class honours, will use the kiwifruit packer project as a means of pursuing his PhD. His academic investigations are likely to address aspects of artificial vision and of managing 'swarming behaviour', using algorithms to calculate the optimum path for each picker to follow when several are working in an orchard.

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

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

The short focal length allows the lens to take in a usefully wide span – around 120 degrees – but an uncorrected image looks like a reflection from a fun-house mirror. To locate objects such as fruit in



Alistair Scarfe uses an arc welder on the forks that carry the picker's bin. The picker will be powered by either a generator or the low-carbon-footprint option of a rechargeable battery. The controller is quad-core-chipped computer – a high-end PC – running the open source operating system Linux. Like the computer and generator, the cameras and electric motors are also off-the-shelf. What won't be off-the-shelf are the picking arms, each of which will work in three axes. Arms like these are commercially available, but the team will fabricate these themselves at a fraction of the cost. Also being assembled is the base station that the pickers will interrogate remotely whenever instructions are needed. It is the base station that will coordinate the picking paths when two or more pickers are in action. Once the prototype is perfected, the fabrication of the more specialised parts (but not of the final assembly) is likely to be outsourced to local manufacturers. The Massey-designed pickers and packers (see adjacent page) will be owned by an independent commercial enterprise, which will lease them to industry.

Four kiwifruit a second are being placed in the bin. That's 14,000 kiwifruit-an-hour-per-machine...

three dimensional space the picker must reconcile the information from two of these lenses and hence two of these highly distorted images in real time.

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

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

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

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

Flemmer and Atkinson are now eyeing other automation projects. Work has already begun on automating the apple industry – which will, in fact, install their packing machines before the kiwifruit industry.

Flemmer anticipates having eight packing cells working this packing season and a specialised apple picker ready for the season beyond.

Apples are New Zealand's third most profitable horticultural export, coming after kiwifruit and wine.

Atkinson says strawberries would be "easy".

"They are just sitting there so all you'd need is the machine to see a flash of red ..."



The business development manager

An industry worth hundreds of millions of dollars has a problem. A university-employed engineer fresh from a commercial career in North America proposes to build a solution. You would think someone could be found to fund the development?

Not so. Grant Atkinson describes the early days of looking for funding as “encountering one brick wall after another”. FRST (the Foundation for Research Science and Technology) had a fund that seemed to fit called Technology for Business Growth, but for some reason the proposal for a robotic kiwifruit packer that Atkinson took to the Foundation wasn’t seen as fitting an export emphasis. Atkinson suspects that the very rapidity with which it was proposed to develop the packer caused the unease. ZESPRI, another potential investor, also balked at what was now a packer-and-picker proposal; it already had ties to HortResearch and it was reluctant to risk its shareholder funds in other ventures.

In the end the project was rescued by an angel investor – Atkinson will not name him – from within kiwifruit industry. “At that stage he was interested in robots for pollination. We said we can build that, but why not let us build a robot picker and we can change the arms. Then he became interested in the kiwifruit packer as well.”

Atkinson is a relative newcomer to the world of university commercialisation. For the past twenty years his career has been in aid and development, first as an employee and in later years as a much-travelled consultant based out of Auckland. His move to Massey was happenstance: a daughter studying at Massey in Palmerston North had been in a car accident and needed his support. Atkinson moved

to Palmerston North, and when his daughter graduated and left to pursue her career, he stayed on.

Atkinson’s career as a consultant had given him some experience in cutting through bureaucracy and, while his experience was not explicitly within the commercial sector, he had worked in developing commercialisation initiatives for rural communities. He had been at Massey for little less than a year when Rory Flemmer arrived on staff. Atkinson was soon impressed by the newcomer. “Rory can just do things.

“He wanted to do something here – something with a bit of wow to make people start taking notice.”

This was the partnership: “Rory with his ability to see exactly what is needed and what has to be done, and me to think my way through the bureaucracy.”

How does Atkinson view New Zealand’s ability to fund commercial research and development? A fundamental problem, he says, lies in scale. Most New Zealand businesses fit the category of Small to Medium Enterprises, and with ten or fewer employees most lack the resources to support research and development.

Within the universities there is a subset of problems that arise from the expectations and obligations placed on academic staff: teaching, research and commercial development.

Academic careers – and the Tertiary Education Commission’s Performance Based Research Funding – are built around publication records rather than commercialisation initiatives. If a government wishes to encourage commercial development within the university system then it must arrive at a balanced set of incentives.

Ideally, says Atkinson, people like Rory Flemmer should be able to migrate from industry to academia and back, cross fertilising both, without sacrificing their career prospects.

Atkinson also believes that universities should be more measured in their expectations of return from successful commercial ventures.

How does he feel about his career shift? The months ahead are going to be hectic. The first of the apple packers will be installed in Washington State as part of an alliance with a group of Nelson growers.

He’s looking forward to seeing the picker out among the vines – a shared achievement that began as “a few drawings on a piece of paper after discussion in a packhouse”.

“I think lots of New Zealanders have that I-want-to-be-an-inventor feeling,” he says.

Leader of the pack



Judicious, diligent, untiring, and very, very gentle with fruit, the latest recruit to New Zealand’s kiwifruit industry is a welcome arrival. Run by 27 computers, the \$125,000 packing machine with its 10 robot arms and

advanced artificial vision will eventually be able to pack 250 to 400 trays per hour.

The packer grades fruit to within 0.1 gram and using its artificial vision to grade to ZESPRI standards, it can assess blemishing, detect soft spots, and label, pick and pack complex orders.

“The robot will not only reduce packing costs but will inspect and pack more consistently for 24 hours every day. It will also collect data that will enable coolstore operators to decide which fruit to market and at what time,” says Flemmer, who more than anyone else has been responsible for the packer’s design.

The packer can custom-pack and label fruit according to the specifications set for a particular market and assess the quality of the fruit that comes down the processing line.

“For example we will know how many fruits are coming in too large or small, too ripe or too blemished,” Flemmer says.

It has been estimated that spoiled fruit costs the New Zealand kiwifruit industry up to \$20 million a year.

The packer will also help solve a perennial problem for the industry: the shortage of seasonal labour. A conventional packing line can require as many as 120 workers; the packing machine will need a couple of skilled workers in attendance.

The economies offered by automation should also equip the industry to outperform overseas producers who are advantaged by very low cost labour. ■

This article first appeared in MASSEY magazine.

Making babies

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

An honours degree in bioprocess engineering has taken Dr Gabe Redding in an unusual direction: fertility research. As a PhD student, he mathematically modelled the human oocyte – aka the ova or egg – and its immediate environment. Now a postdoctoral fellow, he is soon to head away to France to digitise the world’s largest collection of cross-sectioned slides of ovarian follicles. His work at the interface between engineering and medical science may crucially affect decisions about how oocytes are cared for in the laboratory and about how embryos are selected for transfer – decisions with huge implications for the would-be parents who turn to IVF as their treatment of last resort.

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

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

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

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

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

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

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

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

That this was not a standard engineering project was something Redding soon came to understand. Bronlund and Hart suggested that the new boy should see something of the practical reality of IVF, which is how Redding, who is needle phobic (“I cringe when I see a needle on TV”), came to find himself an awkward spectator in the corner of

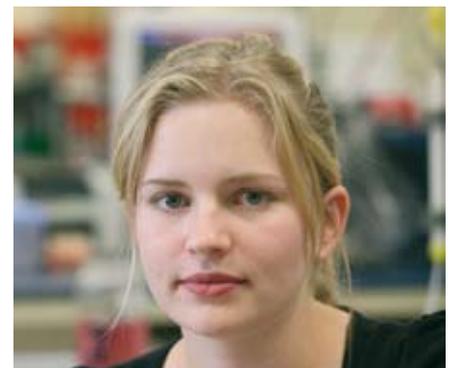
a surgery in the presence of very long needle which was being used to take the eggs from a female patient.

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

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



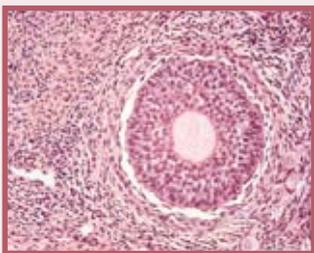
Associate Professor John Bronlund



Sophie Blomfeld



Dr Gabe Redding



The developing follicle shown as it begins to fill with fluid.



A follicle in the early stages of development, with the circular follicle and the egg, at centre, being surrounded by a thick red membrane. Encircling the egg is a thick rind of granulosa cells, and around that a thin moat of follicular fluid.



As fluid builds up inside the follicle, the egg and follicular cells can be seen to be pushed off to the left hand side. In a preovulatory follicle the central fluid-filled space will be much larger still, and very many times the size of the egg.

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

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

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

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

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

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

In the same way, the follicle becomes a sac of cells, filling with fluid at its centre until the pressure ejects the egg into the fallopian tube in ovulation, an event so physically dramatic

that many women actually feel it take place. The build up of fluid has always been seen as part of the mechanism of ovulation; Redding’s mathematical modelling for his PhD has shown that physics holds sway as well: without the build up of liquid at the follicle’s core the egg would be starved of oxygen.

(Oddly enough, cancer tumours are the other place where this structure is seen: a layer of live cells surrounding a liquid filled “necrotic core”.)

Redding’s work, published in *Reproduction*¹ attracted wide interest and may help account for his success in gaining a postdoctoral fellowship worth \$261,000 over three years from the Foundation for Research Science and Technology.

During his fellowship, Redding will develop models of the transport of glucose and the products of its breakdown, carbon dioxide and lactate, and of the key hormones in follicle development.

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

The virtual follicle – the first ever – will be constructed after Redding has made a visit to France, where he will digitise one of the world’s few collections of slides of cross-sectioned follicles, most likely applying the same work ethic that sustained him through his PhD: often rising at 5.00 in the morning and working until exhaustion sets in. And a holiday? Perhaps, time allowing.

Once the model is complete, Redding intends to put it at the disposal of other researchers.

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

The other by-product of Redding’s research is the cluster of IVF engineering expertise now beginning to form within Massey. During the course of Redding’s doctorate, he and his supervisors formed links with New Zealand’s Fertility Associates, who provided their entree into the intricacies of IVF.

Massey PhD bioprocess engineering student Sophie Blomfield is currently hosted by Fertility Associates where, funded by Fertility Associates and a Technology in Industry Fellowship, she is following the IVF process from egg collection to embryo transfer, identifying where the eggs, sperm and embryo are most vulnerable to stress and how to reduce what stresses there may be. Her supervisors are Drs Bronlund and Redding from Massey and scientists Drs John Peek and Bert Stewart from Fertility Associates.

“Because IVF grew from zoology and biochemistry, embryologists have largely focused on improving embryo culture solutions”, says Peek, “with only cursory attention to what happens to eggs and embryos during handling in the laboratory. Moreover, biologists like to measure things before they believe them. Many of the steps in IVF are too intricate to lend themselves to measuring changes in temperature, pH or oxygen concentration. The engineer’s perspective that you can model what you can’t measure is very liberating.”

In the past 10 years IVF pregnancy rates have doubled due to advances in the culturing of embryos, says Peek.

“We are hoping that the knowledge gained from Gabe’s and Sophie’s work makes another significant improvement.”

A small group of engineers with expertise in reproductive technologies – that would be good for Redding, good for Massey, and good for New Zealand, which, he says, while unable to compete on economies of scale can yet host clusters of world-leading research excellence. From the time Bronlund first invited him to take on his PhD, everything has worked out to out to an extraordinary degree.

“I have been so lucky.” ■

1. Redding G. P., Bronlund J. E., and Hart A. L. (2007). Mathematical modelling of oxygen transport-limited follicle growth. *Reproduction*. 133, 1095-1106.

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Taking the temperature

The early days of IVF entailed a series of engineering problems. How do you locate and remove an egg from the follicle in which it grows? How do you keep it at body temperature? But as these problems were surmounted and the methods became well established, the advances increasingly came from molecular biology.

Generalisations are risky things, but there are differences in approach between engineers and medical professionals, one of them being that whereas engineers are inclined to work through problems from first principles, medical science is often more conservative, preferring to place its faith in long established practice.

Redding experienced the difference in world view early on when he submitted a paper to a journal of reproductive science on the changes in temperature an egg is subjected to when being aspirated – sucked from the follicle using a fine needle. Anyone versed in the physical sciences, he says, would expect applying a vacuum to a fluid to lead to a drop in temperature, and sure enough this was what happened, both in his mathematical models and when he conducted experiments using cow’s follicular fluid.

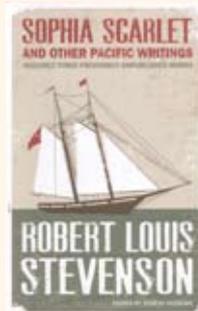
In fact, the drop in temperature was so sudden and dramatic that he was certain the IVF community would want to take notice.

Using a standard aspiration kit, he found the temperature fell abruptly from about 37 degrees to 29 degrees Celsius.

“And then the practice is to place the egg on a heated platform.”

So he was nonplussed to have his paper refused by first one journal and then another. The rationale behind the refusal? Humans and cows may both be mammals, but cow follicular fluid is not human follicular fluid. Yet from an engineering standpoint, says Redding, both fluids are essentially the same thing – water.

In the end, his findings were published as a short communication.



Sophia Scarlet and Other Pacific Writings

by Robert Louis Stevenson, edited by Robert H. B. Hoskins, AUT Media, ISBN / ISSN:9780958282925 NZ\$25.00
Reviewed by Malcolm Wood

Well, as I advanced, it seemed to me the stair grew airier and a thought more lightsome; and I was wondering what might be the cause of this change, when a second blink of the summer lightning came and went. If I did not cry out, it was because fear had me by the throat; and if I did not fall, it was more by Heaven's mercy than my own strength.

Associate Professor Robert Hoskins vividly remembers his first encounter with the writings of Robert Louis Stevenson. He was age 10 and it was the Christmas holidays:

“I had purchased this comic called *Kidnapped* from the dairy in Castor Bay. I remember lying on the sea wall, picking up the brand new comic, and being enthralled in a completely new way. Here I was on this hot January day by the sea, yet following David up these rickety stairs to the top of a tower that we know has no top step, sent to his death by his uncle.”

Robert Louis Stevenson had made a convert. From *Kidnapped* the comic, Hoskins swiftly graduated to *Kidnapped* the book, and from there it was on to *Treasure Island* and *The Strange Case of Dr. Jekyll and Mr. Hyde*, (these three being the works that account for Stevenson's hold on the popular imagination) and the many, many lesser known works.

So when Hoskins visited Samoa as an adult he could not do other than make a pilgrimage to Stevenson's grave, which lies atop a hill

overlooking Vailima, the house that the Edinburgh-raised Stevenson, together with his American wife Fanny, built and lived in for four years until his death at age 44.

Stevenson had been buried in a place of deep spiritual significance, says Hoskins, his body, in the rarest of honours, carried up a path cut by Samoan chiefs. How had Stevenson come to be held in such esteem? Hoskins wondered. “How on earth did he come to understand Samoa – it's an intricate society filled with subtleties – so well in the course of four years? And then I thought, what did you write here, what did you do?”

“I knew of *Island Nights' Entertainments* and *The Ebb Tide*, a novel that strongly prefigures *Heart of Darkness* by Stevenson's friend and admirer Joseph Conrad. But what else was there? I looked up the bibliographies and catalogues and I began to see that there were unpublished and forgotten things, and maybe a collection would give that answer to what he was saying to Samoans rather than to his friends at home, what he was the thinking about in Samoa and what was written about the Pacific.”

He began putting suitable pieces aside. “I called it my knitting because it wasn't my mainstream musical work.”

Some years in the making, this particular piece of knitting is now complete. *Sophia Scarlet and Other Pacific Writings*, a handsomely produced book from AUT Media, brings together the outline of a novel-to-be, *Sophia Scarlet* with the highly accomplished short story *The Bottle Imp* and a number of what are best termed occasional pieces: addresses to Samoan chiefs and to Samoan students; abbreviated legends; letters and articles that appeared in journals and newspapers of the time.

With the notable exception of *The Bottle Imp* (which also appeared in Samoan and may help account for Stevenson being dubbed Tusitala, ‘writer of tales’), most of these are ‘fugitive pieces’, previously unpublished or published only in their original sources. The most intriguing is the book-that-might have-been, *Sophia Scarlet*. Here, in 20-odd pages, is the incomplete schema for a very atmospheric novel and the very beginnings of a first draft.

However – again with the exception of *The Bottle Imp* – these are not the writings to turn to if you want to strike up an acquaintance with the well-known Stevenson. They achieve just what Hoskins has set to achieve: they locate Stevenson in his Pacific environment.

How was Stevenson able to achieve regard among the Samoans? Partly because as a writer he was an outsider: his concern was the welfare of Samoans without obligation to empire or commerce. And strangely enough his Scottish roots were useful. From the beginning he had some understanding of the affiliations and allegiances of tribe and clan, of the workings of oral culture and tradition, and of the threat of expropriation and cultural disintegration. Behind him were the Highland Clearances, the crofters removed to make way for sheep. Now, says Hoskins, quoting from memory, Stevenson would tell the Samoans: “There is but one way to defend Samoa, hear it before it is too late. It is to make roads and gardens ... etc. To occupy and use your country, for if you don't, others will.”

Associate Professor Robert Hoskins, who is better known as an expert in 18th century and New Zealand music, is currently working on a collection of the writings of New Zealand composer Douglas Lilburn.

Helping hands



In the wake of co-editing a book on social policy and history in New Zealand, Professor Margaret Tennant found she had something of a problem: “I had grossly over-researched things”. Over the course of a host of early mornings spent at her laptop, her cat in faithful attendance, that left-over research – extended by further investigation – has been transformed into her recently published book, *The Fabric of Welfare: Voluntary Organisations and Welfare in New Zealand, 1840–2005*. She spoke to Malcolm Wood.

Before the arrival of the welfare state was New Zealand a better, more generous place?

Some organisations have tried to promulgate the idea of the 19th century as a golden age of charity before it was corrupted by the welfare state. It wasn't.

We lacked that tradition of wealthy philanthropists giving to the poor. On the whole, 19th century New Zealand was a place where status was gained by making money, not by giving it away.

And right from the start charities seem to have expected state support. Take the Auckland Ladies' Benevolent Society formed in 1857: within four or five years of its formation it was off to the provincial government asking for a subsidy. And the emergence of the welfare state didn't spell an end to voluntary welfare. The architects of the welfare state saw the state and charities as working hand in hand. Then, as now, the voluntary sector was seen as being more human and more flexible than the state in delivering community-based and face-to-face services. Whether this is so in every case today can be debated, but certainly that's the rhetoric still informing the devolution of welfare services.

What about the influence of the church?

Churches were the mainstay of the voluntary welfare sector until quite recent times. But early on they had their own problems. Some have argued that the processes of churchgoing were broken by immigration, and in any case the churches had to establish themselves and their own infrastructures before they could involve themselves in social service work beyond their own congregations.

They also found it very hard to sustain ongoing effort. It was one thing to raise money for emergency needs – say a family's house burns down, or a man is injured and can't support his family while recovering, or a widow with children needs the fare to return to her extended family back in England. It's quite another to give long-term assistance to the more unpopular elements of society – that's where charities really stumbled.

It wasn't really until the late 19th century that the churches were able to take on more of a social welfare role. When they did, it was at first in providing for moral reform for prostitutes, so-called 'fallen women' – the popular understanding of a 'women's refuge' in the 19th century was very different from

today's. Then the churches tended to get into work with orphans, partly perhaps as a way of sustaining their own numbers. After World War II government subsidies led to the church providing a wave of welfare and residential services for the aged – services from which they are now increasingly exiting in order to provide community support and counselling services.

How do you think New Zealand compares with less secular, more faith-based societies like the US?

How secular are we? It depends on your measure, whether it's church attendance or personal belief. As a historian, one of the things that struck me was that many in the voluntary sector were very active indeed, and that they acknowledged their strong Christian belief as a motivating force. And there were individuals within the public sphere – politicians and public servants – whose Christian faith influenced them in an official capacity. And yet, many denominational social services agencies today no longer require Christian belief of their workers, and struggle to articulate just what is different about 'Christian social services'.

Do you have any thoughts about the changing role of women?

Women have always been the backbone of the voluntary social services, out on the street collecting or dealing with clients face to face; the men would more typically be on the executive deciding how the finances would be spent. That said, there were some men whose involvement was more direct, in dealing, say, with discharged prisoners or recalcitrant youth, and I'm interested in the gender dynamics which decided the division of labour within various organisations.

One of the challenges today is the declining availability of women's voluntary labour as women have moved into the paid workforce, both generally and within the voluntary sector.

How do you think the nature of volunteering will change, particularly as the baby boomers enter their retirement years

I think the trend has been for people to be involved more in individual pursuits at the expense of more communal endeavours. For example, organisations like the Boy Scouts – with its strong tradition of service and helping others – have declined in vigour. In

Professor Margaret Tennant is Professor of History and Dean of the Graduate Research School. She has published widely on New Zealand social history, with a particular emphasis on women's history, and the histories of health, disease and social policy. Previous books include *Past Judgement: Social Policy in New Zealand History* (co-edited with Bronwyn Dalley, 2004), *Children's Health, the Nation's Wealth: A History of Children's Health Camps* (1994), *Paupers and Providers: Charitable Aid in New Zealand* (1989) and two collections of essays on women's history, co-edited with Barbara Brookes and Charlotte Macdonald (1992, 1986).

the past these youth associations provided a training ground for a strong ‘other-directed’ voluntary ethos in adult life.

So just because there are retired people able to volunteer doesn’t mean that’s what will happen. Some overseas studies have shown that volunteering in retirement is predicated on experience of volunteering in earlier life. In retirement it’s just as easy to sit in front of the television or follow your own interests.

The nature of volunteering may also be changing. Workplace volunteering, one-off volunteering, or event-based volunteering – as opposed to more sustained volunteering for a single cause or cluster of causes – may be the patterns we see emerging.

The fourth and final section of your book is called the contract crunch. Why “crunch”?

Angst just seeps from the records of the organisations I was studying from the late 1980s on. The governmental contracting requirements and the need for more professional approaches created deep conflicts. Organisations had to change their entire ethos and culture. In the early days the compliance costs associated with contracts were enormous, and many saw the way in which contracting was rolled out as inflexible and heavy-handed.

Looking at things from the other side, the issue for public servants today is the same as it was in the nineteenth century – making sure that taxpayers’ money is properly accounted for. The issue of accountability makes public servants very nervous, particularly when, as occasionally happens, there are disclosures in the media about expenditure that’s misappropriated or that’s regarded as a weird or inappropriate use of public funds.

More and more people are being employed to do jobs that once would have been undertaken voluntarily. Partly this is because the legislative requirements and expectations of professionalism have increased so enormously. It’s one thing to volunteer thinking you are going to be making cups of tea and another to find you are on a committee and suddenly responsible for large sums of money and have to comply with the law and OSH requirements.

Or volunteering because you want to make a difference and then discovering you are only allowed to make cups of tea?

Yes, the rise of professionalism and a managerial ethos have seen some organisations sideline volunteers, many of whom have considerable practical experience. Managers of organisations are concerned nowadays

that errant volunteers might damage the ‘brand identity’!

How has the “crunch” affected New Zealand’s best known home-grown charities, Plunket and Children’s Health Camps?

Children’s health camps started out as the idea of a public servant, Dr Elizabeth Gunn. She brought a whole raft of volunteers on board, running and staffing the camps and selling health stamps. Then the movement was drawn closer to the Government in the late 1930s when legislation was passed and a central board was assisted by a secretariat from the Department of Health. In the 1980s and 1990s, the Government pulled back and now the health camps movement is back to being, if you like, a purer form of non-profit under a charitable trust [the New Zealand Foundation for Child and Family Health and Development/Te Puna Whaiora]. Whether the children’s health camp movement will survive and regain the iconic status it once had remains to be seen.

Plunket was the main women’s organisation for much of the 20th century; it flourished remarkably despite decades of Health Department opposition. Many of its leading women advocates had the ear of the Minister of Health of the day. They were very effective politically, but the leadership of these women volunteers was undermined by professional and managerial appointments from the 1980s.

The controversy surrounding the loss of Plunket’s contract to run what is now termed the ‘Well Child’ telephone support service [to a branch of the multinational helpline McKesson Corporation in 2006] was hugely symbolic. But then even the wording ‘well child’ sounds odd to my generation. Once upon a time everyone knew that Plunket meant infant health.

We now have a contestable environment in which such dominant entities as the children’s health camps and Plunket are two providers among many.

How do matters now stand between the state and the voluntary sector?

They’ve improved. In the early 2000s there was a deliberate softening of the Government’s approach, part of which was the appointment of Steve Maharey as the first Minister for the Community and Voluntary Sector. However, I don’t think the softening has gone as far as he had anticipated or the sector would like.

Do you see your book leading on to other things?

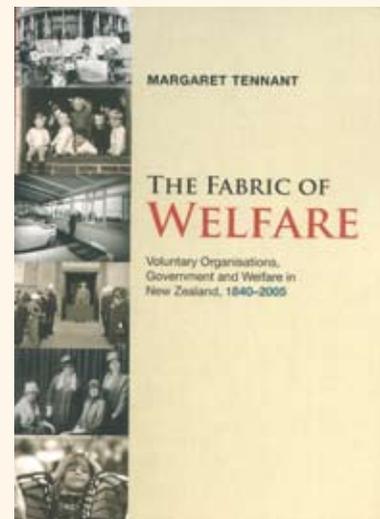
I’d hoped to move historical analysis away from the history of the welfare state and more

towards voluntary effort. One of the nice things about writing such a wide-ranging survey is that it uncovers a whole range of other research topics. I’m already having other academics ringing up and saying ‘I see there’s a reference to something on page such-and-such, do you think there’s a PhD or masterate topic in this?’ It’s lovely to feel part of an on-going research conversation – that’s what I hoped would happen.

Has writing the book changed your thinking about the roles of the state and the voluntary sector?

As the title of my book puts it, the provision of welfare in New Zealand is a fabric: the activities of the state and voluntary organisations have been particularly closely interwoven in New Zealand. I came to see the immense value of the voluntary sector as both a supplement and a complement to the state.

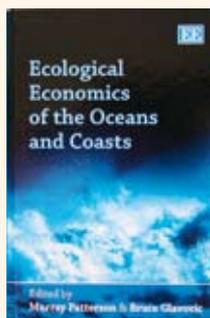
But I still certainly believe in a welfare state and I don’t think the voluntary sector could ever replace it, even if the boundaries between the sectors are getting increasingly blurred. Still, there was also something wonderful for me as a historian to see an organisation like the Onehunga Ladies’ Benevolent Society, which goes back to 1863, still hanging in there as a symbol of continuity and voluntaristic commitment.



The Fabric of Welfare: Voluntary Organisations and Welfare in New Zealand, 1840–2005

by Margaret Tennant, ISBN 978-1-877242-37-3, Bridget Williams Books, \$49.99

This interview first appeared in MASSEY magazine.



Ecological Economics of the Oceans and Coasts

Edited by Murray Patterson and Bruce Glavovic, Edward Elgar
 ISBN-13: 9781845423193 US\$140.00

An ecological approach to managing coastlines and oceans is required to ensure their resources are sustained. *Ecological Economics of the Oceans and Coasts* is edited by Associate Professor Bruce Glavovic, from Massey's School of People, Environment and Planning, and Professor Murray Patterson from the New Zealand Centre for Ecological Economics, a joint venture between Manaaki Whenua-Landcare Research and Massey University.

Dr Glavovic says the book explores fresh ways of managing oceans and coasts.

"Oceans are the last frontier on Earth but we're currently exploiting them like they're a limitless resource. Marine ecosystems are under huge pressure and it's not sustainable."

He says ecological economics approaches coastal management with a fresh perspective.

"We've tended to use an economic model that ignores nature's limits as we have exploited marine resources in the past, but here we are bringing ecology and economics together in an integrated approach to ocean and coastal management. The focus is on sustainability."

The book addresses key issues relevant to the New Zealand context, but contributors include scholars and practitioners from across the world, Dr Glavovic says.

Dr Glavovic is also one of the editors of the forthcoming book *Integrated Coastal Zone Management*, which also looks at real-world experience and innovative ways of managing coastal zones, presenting case studies from around the world including many Asian countries, Africa, North and South America, Europe, the Middle East and island nations.



Evolution on Pacific Islands: Darwin's Legacy Philosophical Transactions of the Royal Society Biological Sciences (2008)

Edited by Robert Cowie and Steve Trewick

To mark the bicentennial of Darwin's birth and sesquicentennial of the publication of *The Origin of Species*, the International Union of Biological Sciences has declared 2009 Darwin Year. Darwin Year will be marked by such events as the launch of a replica of Darwin's vessel, the *Beagle*.

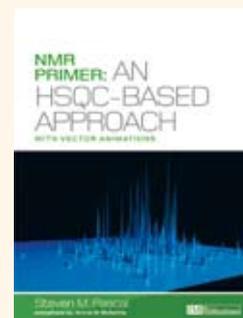
At Massey Dr Steven Trewick of the Allan Wilson Centre for Molecular Ecology and Evolution is making his own contribution to the year. Alongside Robert Cowie of the University of Hawaii, Trewick is the co-editor of *Evolution on Pacific Islands: Darwin's legacy*, a themed edition of the *Philosophical Transactions of the Royal Society*. Darwin's observation of island biotas, write the editors in their introduction, led him to important inferences. Of the Galapagos, Darwin wrote:

It is the circumstance that several of the islands possess their own species of tortoise, mocking-thrush, finches, and numerous plants, these species having the same general habits, occupying analogous situations, obviously filling the same place in the natural economy of this archipelago, that strikes me with wonder.

The edition begins with an overview of the formation of the islands of the Pacific and their travels courtesy of plate tectonics, proceeds to five regional biological reviews, and concludes with a number of research articles addressing the evolution of a number of animal groups on archipelagos through the Pacific islands.

No other published compilation, write the editors, has focused explicitly on molecular approaches to Pacific-wide biogeography nor taken an explicitly phylogenetic perspective.

Darwin would surely approve.



NMR Primer: An HSQC-Based Approach (with vector animations)

by Steven M. Pascal with animations by Jennie M. McKelvie, IM Publications

Senior lecturer in physics and director of the University's BioNMR Research Centre for Structural Biology, Dr Steven Pascal has authored a new book to "demystify the process of an NMR experiment".

The work is supplemented by a password-protected site offering vector animations by physics tutor Jennie McKelvie.

"NMR is used by biophysicists to study the structure (shape) and dynamics (motions) of the molecules of life, such as DNA, RNA and proteins," Dr Pascal says. "Unlike a microscope, you can't directly see the molecules. You can infer the shape from the results of a large series of complicated experiments. The scientists doing these experiments need to understand how they are run and what information results in order to put it all together into a structural model.

"Up until now, descriptions of how the experiments work are either very sketchy or have very involved quantum mechanical calculations, which younger biophysicists and non-specialists might find difficult to follow," Dr Pascal says. "We've introduced a new way to understand the experiments, using animated cartoons essentially to visually follow the path and orientation of the magnetism on the molecules during the experiment.

"What we hope is that new students entering the field of structural biology will be able to more quickly grasp the physical meaning of the experiment once they can see how the experiment works."

Target audiences for the book are scientists and students entering the field of structural biophysics and using NMR spectroscopy as a tool.

"There is nothing else like it out there," Dr Pascal says, "and we are already receiving praise from abroad. It has been ordered for the library at Cambridge University, for instance."

College Research Awards



College of Business Early Career Research Award

Dr Rei Wu is a senior lecturer in the Department of Economics and Finance at the Palmerston North campus. Professor Martin Young, head of the department, nominated Dr Wu for the award. Professor Young said that since Dr Wu arrived in June 2004, he “has impressed us all with his enthusiastic dedication to research”. “To have achieved the quality and quantity of publications that Fei has done in the little over three years since completing his PhD is an exceptional achievement. In terms of conference attendance his record is equally impressive. In particular, Fei has had papers accepted at the Western Finance Association meeting two years running. This conference ranks as one of the top three conferences in finance internationally, with many of the top finance academics competing for the limited number of paper acceptance spots. To get one acceptance here is an excellent achievement. An acceptance two years running is exceptional.” Dr Wu completed a BA in Industrial Economics at the South China University of technology, an MSc in Finance and Investment at Aberdeen University in Scotland, and a PhD in Finance from University College Dublin before starting work as a lecturer at Massey in 2004. Dr Wu supervises both masters and PhD students, and has, with a colleague, restructured the course research methods in finance.



College of Humanities and Social Sciences Supervisor

Dr Ross Flett has supervised 80 graduate research projects since his arrival at Massey University in 1990. Among these are 25 PhD dissertations, 20 honours projects and 32 master’s theses. Dr Flett’s commitment to supervision also extends to a Thesis Preparation Course for psychology students involved in honours projects, master’s theses and PhD dissertations. The course helps students with many issues regarding research, from applying for funding to overcoming writer’s block. Dr Flett says he has worked with some of the best and brightest scholars New Zealand has to offer and the award reflects their successes.

Postdoctoral Fellowships



Dr Andrew Sutherland-Smith of the Institute of Molecular Biosciences has been funded for a postdoctoral fellow to work on the project *Regulating skeletal development*. The project has arisen from successful collaboration with Professor Stephen Robertson of Otago University, and is focused on a novel protein that has the potential to be the first protein marker for the membranous ossification pathway of bone formation, a finding that may open up further avenues of study on what is currently not a well understood developmental process.



Dr Vyacheslav Filichev and **Dr Gareth Rowlands** of the Institute of Fundamental Sciences, have been funded for a postdoctoral fellow to work on the project *DNA: a new code for catalysis*. The project will answer fundamental questions about the ability of DNA to induce selectivity in organic reactions, opening up new vistas in asymmetric catalysis and will ultimately enable development of a new type of catalyst. The project is at the interface between chemical biology and organic chemistry, and is interdisciplinary yet at the cutting edge of both areas.

Dr Filichev has also received a Massey University Early Career Medal, see page 19.



Dr Stephen Marsland of the School of Engineering and Advanced Technology has been funded for a postdoctoral fellow for the project *Geodesics in diffeomorphism groups*. The postdoctoral fellow will work between computer science at SEAT and mathematics at the Institute of Fundamental Sciences, joining a small group of researchers in the area of partial differential equations, dynamics and related topics. This ambitious research has implications in fields as diverse as computer vision, fluid dynamics and plasma physics.

Research Fellowship



Associate Professor Martin Perry of the Department of Management will use his research fellowship to complete the book *Controversies in Local Economic Development*. The sole-authored book is currently being considered for publication by Routledge (London), which has worked with Dr Perry on two previous projects. The book will focus on seven controversies attracting debate within the theory and practice of local economic development. It will draw together the outcomes of various research projects and consolidate material from a variety of published and unpublished papers.

Women's Awards



Images shown in order of text.

In 2005 **Dr Robyn Andrews** completed a PhD in social anthropology. Her thesis was an ethnographic account of Calcutta's Anglo-Indian community based on fieldwork in Calcutta. Her project titled: *Being Anglo-Indian in Calcutta* aims to convert it into a book, incorporating new research she has undertaken during two more visits to Calcutta since completion of the original thesis.

With the Internet becoming a ubiquitous communication and commerce platform, and with multi-stakeholder collaboration accepted as the modus operandi for global governance, **Dr Slavka Antonova's** *Powerscape of Internet Governance* project aims to investigate who rules the critical resources of the global Net and who really benefits from the emerging institutional and regulatory regime.

For the past five years, **Dr Jenny Coleman** has been researching the life of Amy Maud Bock, New Zealand's most notorious female criminal con artist, with the intention of writing a full-length biography, using research conducted in Australia, and in various archives and research institutions throughout New Zealand.

Dr Cathryn Conlon is to embark on an explorative study designed to assess women's knowledge and attitudes towards preconception nutrition, dietary intakes and lifestyle practices. She has found that efforts are needed to increase the awareness of the importance of nutrition in women of child-bearing age and to encourage planned pregnancy. The research is to be written and submitted for publication within a peer reviewed journal.

In preliminary studies, **Dr Ganesharane Ravindran** has successfully created low glycaemic extruded cereal products that deliver specific health-promoting and disease-preventing benefits. She is interested in the area of functional ingredients, and in particular, low glycaemic foods based on novel ingredients, and her research aims to further evaluate the functionality of combinations of ingredients with results that could have considerable commercial implications in developing healthy snack products.

Learning a language by distance is a challenging experience. However, collaboration via the Internet allows students to practise their target language with native speakers, exchange points of view to obtain feedback on the language used and develop a social presence. **Dr Ute Walker's** research project aims to promote content-based language learning and intercultural experience through online collaboration.

Mei Wah Williams' PhD research investigating a theory of crime was awarded this year and investigates the sufficiency of low self-control to predict crime. The study found low self-control was unable to explain behavioural intentions with university students but did so in a prison population. Her results suggest that significant others and behavioural self-control are important variables in understanding the causes of crime and may be potential targets in the reduction of criminal behaviour. She aims to further publish articles from the study.

The main objective of **Dr Liping Zou's** project is to empirically investigate share price reactions to corporate name changes. Like the quality of its products and services, the name of a corporate is considered to be an important part of its image as it is the main component of the organisation's identity. Any decision of corporate name change has strategic marketing, and financial impacts on firms' operations. The next step in the research is to expand the project to investigate approximately 5000 United States firms' share-price reactions to name changes since 1996.

Technicians Awards



Dr Austen Ganley and **Dr David Raubenheimer** work in different fields, molecular biology and nutritional ecology respectively, but share a research interest in the causes of ageing. Both have discovered through independently generated data that protein may play a key role in ageing, which challenges conventional dogma. They believe that by bringing their approaches together they can establish a unifying hypothesis for ageing. The cause of ageing, a fundamental problem in biology, is subject of intense public interest.



Dr David Rowlands of the Institute of Food, Nutrition and Human Health is pursuing research in the area of muscle biology and exercise nutrition. His team is looking at the actions and effects of target nutrients on the muscle molecular, immune and inflammatory processes associated with the recovery from exercise. Working with Nestlé, the team has developed a new product concept and will investigate the effects of this formulation on the physiological, molecular and immune processes associated with enhanced recovery and performance.

The Technicians Awards provide for an annual salary of up to \$35,000 to be paid for two years to provide technical support and assistance for a specific research project.

Professor Batt in 1989

PROFESSOR RICHARD DEAN BATT

Massey Archivist Louis Changuion writes

Richard Dean (Dick) Batt was born in Wanganui in 1923. After completing his schooling in Wanganui, he studied at the University of Otago from 1942 to 1947, where he obtained BSc and MSc degrees in Chemistry and a PhD in Organic Chemistry. For his MSc thesis he analysed the essential oil of the mountain cedar or Pahautea (*Libocedrus bidwillii*), while for his PhD thesis he also looked at the structure of a new sesquiterpene, called gamma-curcumene.

In 1948 he was appointed a junior lecturer in Chemistry at the University of Otago. Not long after his appointment, he was awarded a Nuffield Demonstratorship in Biochemistry at Oxford University. From 1949 to 1952 he studied at Oxford University where, through expedited study, he completed a BA and MA in Physiology and a DPhil in Biochemistry.

Professor Batt returned to New Zealand at the beginning of 1953 to a lectureship in the Department of Biochemistry at Otago Medical School. He lectured at the medical school until the end of 1963. At the beginning of 1964 he took up a new role as the foundation Professor of Biochemistry and Head of the Department of Chemistry and Biochemistry at Massey University.

His research work during his studies and early career made him aware of the value of mass-spectrometry. As a result, shortly after coming to Massey University, he successfully applied for a grant to purchase a high resolution mass-spectrometer and scintillation counting equipment. At the time, this achievement was a great morale booster for the Department of Chemistry and Biochemistry as it meant that, in terms of equipment and esteem, the department was leading the way in New

Zealand. As head of department, Professor Batt knew that the research activities of its staff were of prime importance to shaping a department's identity and he valued staff freedom in terms of research areas and topics. He was also a firm believer that the application of research finding in industry was as important as fundamental research itself.



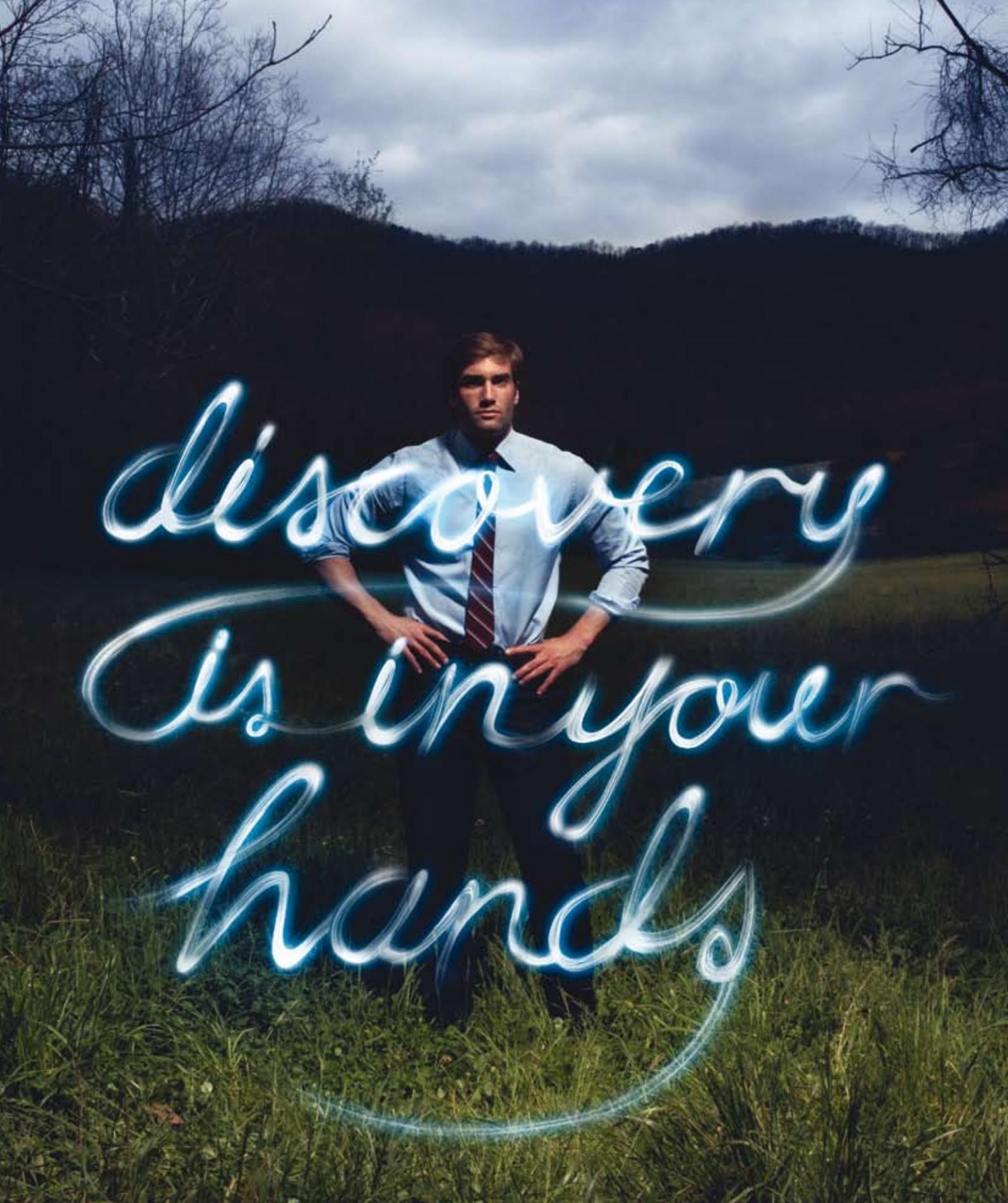
Ken Couchman, a senior medical technologist, takes a blood alcohol reading from a volunteer subject in 1974. The metabolism of alcohol was one of Professor Batt's research interests.

In 1964 Professor Batt was appointed foundation Dean of the Faculty of Science. His responsibilities as dean and head of department encroached to a large extent on his time for research. He nevertheless made a valuable contribution to biochemical research at Massey. This can be seen through his encouragement of others in their scientific research work, through his coordinating a number of important research projects and by the introduction of a number of biochemical research areas. One such area of research was protein research. At the time,

protein (in the form of wool, meat and dairy products) accounted for more than half of New Zealand's export earnings and yet no New Zealand university trained protein chemists or biochemists. Through his efforts Massey became the first local university to train such protein researchers.

The metabolism of alcohol in the human body was another of Professor Batt's research interests. Because of the impact of alcohol abuse on society, he regarded this area of research as of economic importance. As coordinator of a group of researchers he became a national authority on this topic and was frequently called as an expert witness in court cases. He became a well-respected campaigner against drunk-driving and during the introduction of breath alcohol testing in New Zealand, he frequently helped and advised the Ministry of Transport. His particular research focus was the evaluation of techniques for measuring the levels of alcohol in the breath and the blood-stream and methods for making reliable extrapolations of these results from the time of an accident to the time of measurement.

Several honours were bestowed on Professor Batt for his contributions to science. In 1976 he was awarded the MBE "for services to scientific research". He was elected to the Fellowship of the Royal Society of New Zealand and also served for a time as chairman of the New Zealand Biochemical Society and president of the New Zealand Institute of Chemistry. On his retirement from Massey University in 1988 he was awarded the title of Emeritus Professor. For his services to the University Professor Batt was honoured with a Massey Medal in May 1993. He passed away in Palmerston North in January 1994.



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