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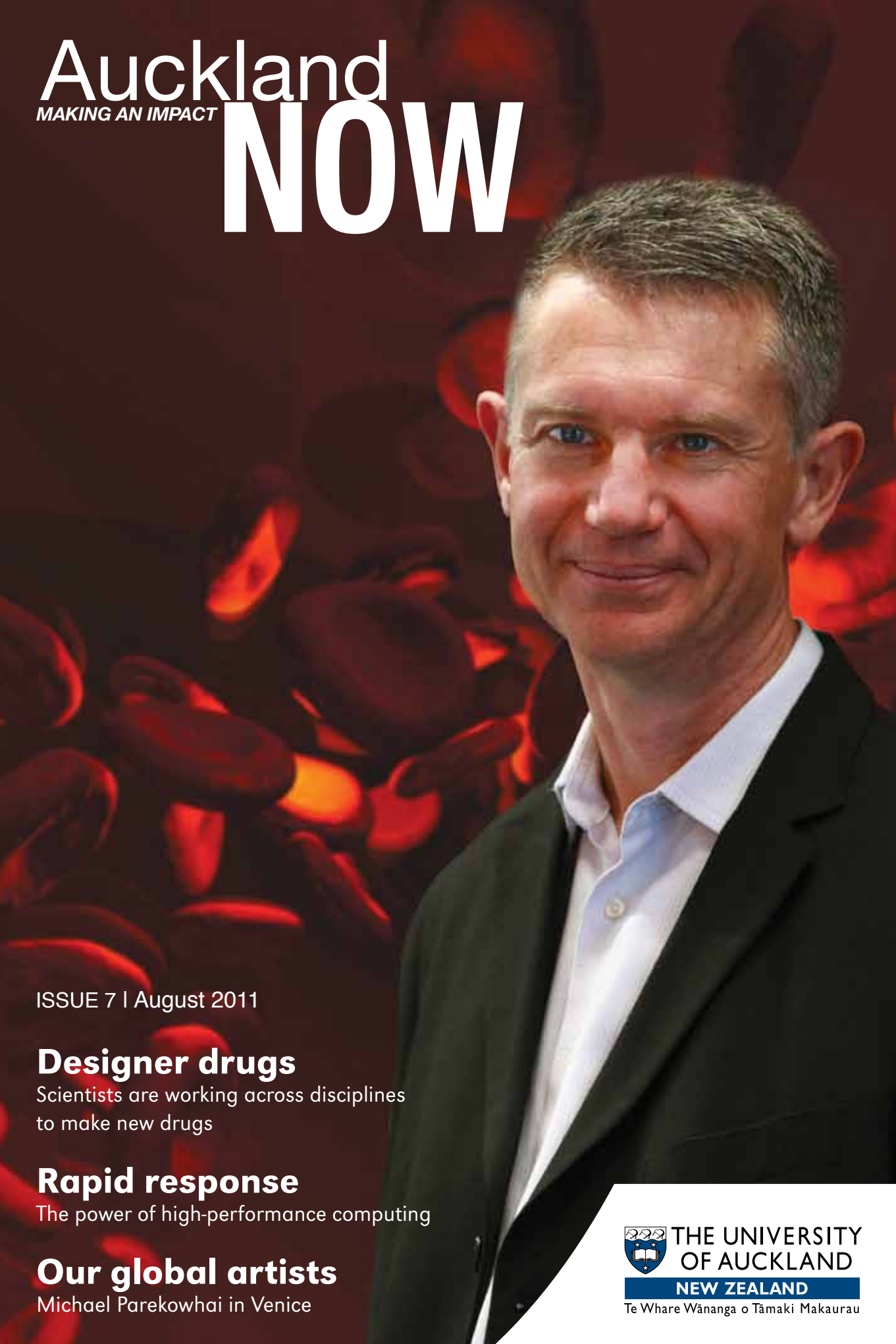
MAKING AN IMPACT



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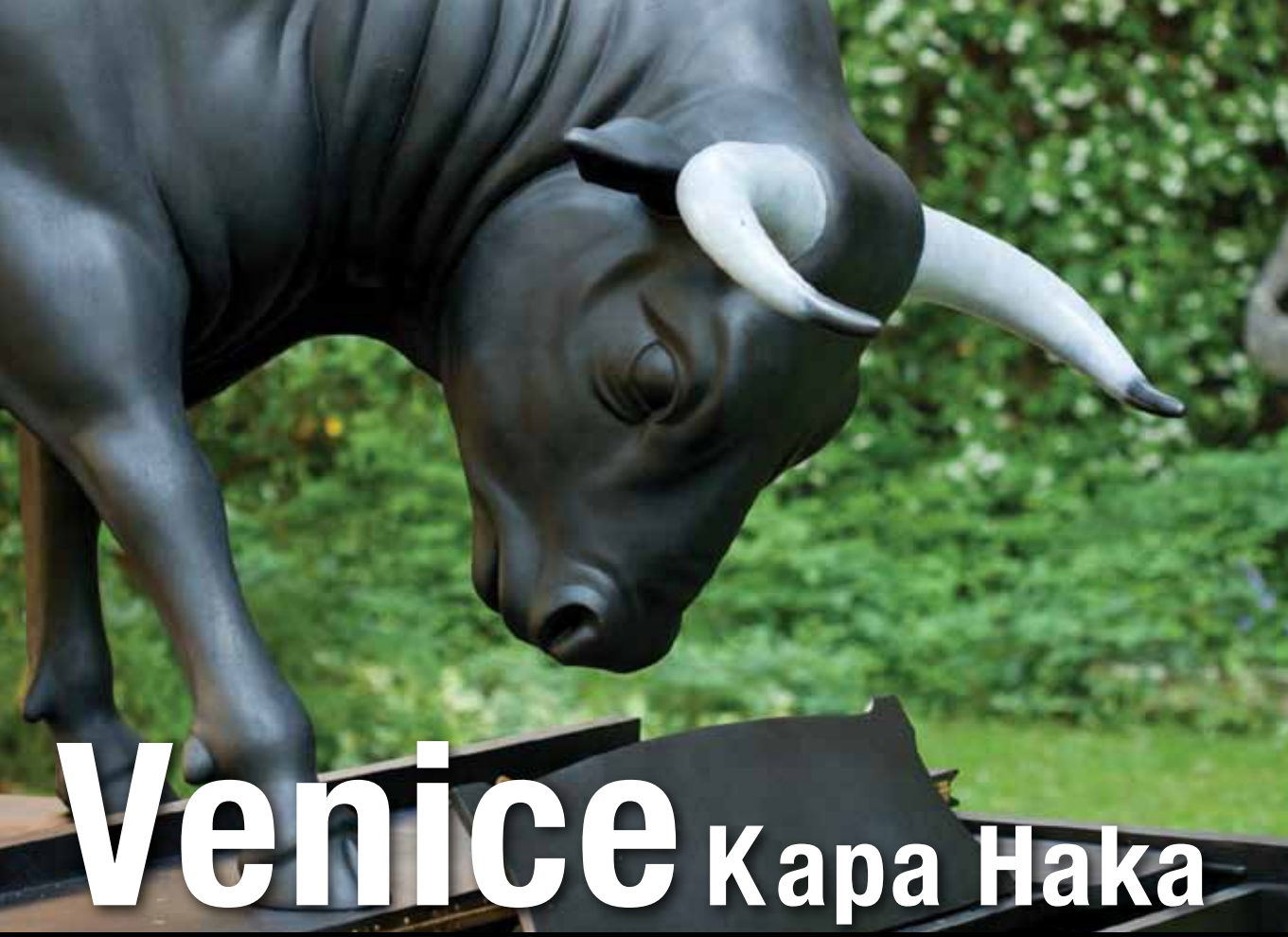
Designer drugs
Scientists are working across disciplines to make new drugs

Rapid response
The power of high-performance computing

Our global artists
Michael Parekowhai in Venice

THE UNIVERSITY OF AUCKLAND
NEW ZEALAND
Te Whare Wānanga o Tāmaki Makaurau



Venice Kapa Haka

The serenading gondoliers of Venice have some competition this summer, with the New Zealand installation at the 2011 Venice Biennale being as much about music as art.

Michael Parekowhai, sculptor, artist and Associate Professor of Fine Arts at The University of Auckland's Elam School of Fine Arts, has created the exhibit: a red and gold Steinway grand piano intricately carved with Māori designs accompanied by two blackened bronze pianos with life-size bulls on top, a staunch security guard and pot plants.

"With six tonnes of bronze the works themselves are indeed heavy and impressive," Michael says. "But once the music starts [played live on the Steinway throughout the exhibition] they just float away. Music fills a space like no object can and magic lies in the intangible: listening to an opera singer from New Zealand singing a Māori lament in Italy."

New Zealand first officially participated at the Biennale in 2001, and since then four of the seven representatives have been staff members from Elam. The others were Associate Professor Peter Robinson, the et al collective and Judy Millar.

This year's installation, "On First Looking into Chapman's Homer," refers to John Keats' sonnet of exploration and discovery. "Michael's work is capturing the attention of the global art community," says Professor Jenny Dixon, Dean of the University's National Institute of Creative Arts and Industries.

"No one who sees the installation will go away without being engaged and impressed – Michael continues a fine tradition of Elam staff and alumni who have represented New Zealand at the Biennale."

Michael Parekowahi is of Māori (Ngati Whakarongo) and Pākeha descent. He graduated with a Master of Fine Arts from Elam in 2000 and has taught at the school since the late 1990s. In 2001 he was made an Arts Foundation of New Zealand Laureate. Today he has work in several permanent collections across the Asia-Pacific region and Europe and is renowned as an artist who often confounds art critics with his complex, multi-layered narratives.

"I see the pianos as empty vessels waiting for history to be created for them," he says. "As the work gets shown in different places and as people run their hands across the keys, its value will grow and its currency will go beyond Venice. Only time will tell the notion of success. I hope that the more people who play it, the more valuable it becomes."

Jenny Harper, the New Zealand Commissioner for the 2011 Venice Biennale, says Michael creates a sense of drama and surprise for visitors to the installation in the garden and ground floor of Palazzo Loredan dell'Ambasciatore, a 15th-century Gothic palace on the Grand Canal.

"The work has several components, each of which is familiar and also uncannily unique and of New Zealand. The whole is an unexpected Māori Kapa Haka presented in Europe with confidence."

www.nzatvenice.com

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Drug discovery

In a previous life, after completing registration as a medical doctor in the 1980s, Professor Rod Dunbar wrote musical plays for professional production. His ability to pull together actors, writers and musicians to create a successful stage show translates easily into his current mission to get scientists from different disciplines collaborating to create new drugs and vaccines.

Rod is director of the Maurice Wilkins Centre for Molecular Biodiscovery (MWC), a centre for research excellence based at The University of Auckland.

"New Zealanders are very good at cutting edge, frontier science," he says. "We have strong skills in biomedicine but too many of our lead investigators have had to be lone pioneers – single-handedly hacking into the bush to make pasture. Innovation can both rise and fall with isolated leaders. We can now do much better as a nation by pooling our talents."

And that's exactly what the Maurice Wilkins Centre, named after the New Zealand-born physicist, molecular biologist and Nobel laureate, is doing under Rod's leadership. More than 100 top scientists from traditionally separate disciplines, backed by the early career scientists and graduate students they are training, are working together to create new drugs, vaccines and diagnostic tools for cancer, diabetes and infectious diseases.

"For example, to design a new cancer drug we've always needed biologists who can study the cells in a tumour and how they behave right down to the molecules. Now we get chemists who are designing the drug to understand the biologists and vice versa. They both then go to computer scientists to see how a drug works using a computer model."

Rod's own work in human immunology is typical of the centre's approach. His research group of 18 people is developing a vaccine that will stimulate T-cells in the body to fight melanoma. Working with other MWC partners – medicinal chemist Professor Margaret Brimble and scientists at Industrial Research Limited – Rod's team is developing a vaccine that will be put into human trials by the Malaghan Institute of Medical Research in Wellington.

One of the most successful MWC-funded projects so far is the spinout company Pathway Therapeutics, founded by University biologists and chemists, which has just received approval from the US Food and Drug Administration to begin clinical trials for its drug PWT33597. This is a dual inhibitor of two key molecules implicated in cancer tumours and is the first drug with this biological profile to enter clinical trials.

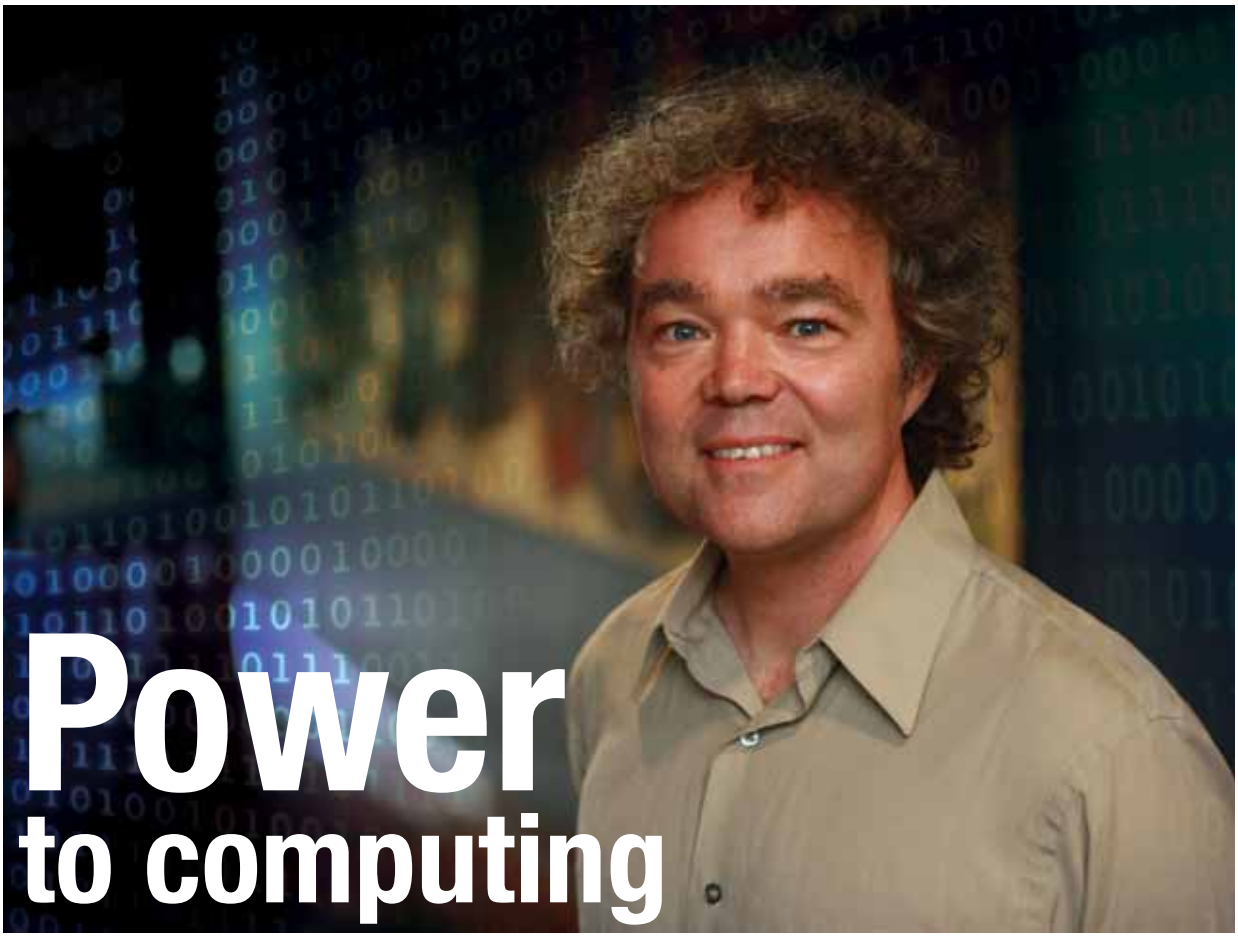
"It is an indication of the strength of drug discovery in this country," says Rod, "and a very tangible example of the value of interdisciplinary collaboration in tackling complex scientific problems."

As director of the MWC, he is keen to see leading biologists and drug developers pass on their knowledge to mid-career and young researchers. "In traditional science the world is divided into strict disciplines. If you train students in those strict disciplines you can miss out on a whole lot of innovation. We want our biomedical science to keep expanding.

"If we can inspire people to get together in new combinations then we'll spark the really exciting new ideas that are risky, edgy and difficult but are also those most likely to lead to major advances in human health."

www.mauricewilkinscentre.org

Photo: Postdoctoral fellows Dr Vaughan Feisst (left) and Dr Anna Brooks with Rod Dunbar.



Power to computing

When the earthquake hit Christchurch in February, emergency response teams around the country quickly called up large sets of data and images from the New Zealand Defence Force's Geospatial Intelligence Organisation and New Zealand Aerial Mapping to make informed decisions about how to help.

This rapid access to large amounts of vital information was made possible by The University of Auckland's Centre for e-Research. Established in 2009, the centre's high-performance computing capability and data storage, as well as expert staff, are transforming the work of New Zealand scientists.

"High-performance computing and its related infrastructure have become an indispensable part of modern science," says Director of the Centre, Professor Mark Gahegan. "Researchers regularly face complex computational challenges in their work and e-Research works closely with them to tackle these challenges. Computer scientists and the research community are now deeply engaged – it's not just about providing the hardware."

The Centre for e-Research connects researchers to BeSTGRID (Broadband-Enabled Science and Technology GRID), which is led by The University of Auckland and includes all New Zealand universities and some Crown Research Institutes. BeSTGRID allows extensive data sharing and data processing via a coordinated data fabric that spans the country.

In the days following the Christchurch earthquake, e-Research handled more than 660GB of data storage and distribution across New Zealand, with the help of BeSTGRID and KAREN (Kiwi Advanced Research and Education Network). KAREN is a super-fast private internet dedicated to the New Zealand research and education sector. "We've moved past radio communication and a paper map," says Mark. "Disaster response now requires and generates massive amounts of data with hundreds of gigabytes streaming daily."

A world away from using e-Research to help a devastated city, the University's Auckland's Cancer Society Research Centre is creating new drugs with the same technology. A computer technique called virtual screening can rapidly scan hundreds of thousands of chemical compounds to find one that might block the action of certain proteins implicated in a specific cancer. Instead of taking weeks, virtual screening does the sleuthing job in a day.

The extra computing resources also enable researchers to make detailed investigations of the interactions between drugs and targeted proteins, without the use of a biological "wet lab".

The Centre for e-Research has also just been selected to host the National e-Science Infrastructure (NeSI), to be built over the next four years. NeSI supports the Government's priorities for research and economic growth and it has invested $27.4 million in the project. "NeSI will greatly enhance the centre's work in using advanced information technology and high-performance computing for research," says Mark.

NeSI brings together new and existing supercomputer hubs at The University of Auckland, Canterbury University, the University of Otago, NIWA, AgResearch and Landcare Research. It will use KAREN to connect researchers throughout the country to its national data and computing infrastructure.

The NeSI project is an important and much-needed infrastructure investment for science in New Zealand, says Mark. "New Zealand relies on scientific research to support its fundamental industries, and research institutions around the country require this step-change in computational ability."

www.eresearch.auckland.ac.nz

Predict and respond

In the chaos of the Christchurch earthquakes St John has to get its ambulance service right: are there enough ambulances and paramedics in the worst-hit areas? Are their responses fast enough? If not, what has to be done to get them there and quickly?

Software packages designed by Operations Research company Optima help dispatchers make these crucial decisions. The software analyses different variables such as traffic flows, road quality and weather conditions to provide information for ambulance movements.

"The model has been likened to the video game Sim City, where you can explore all your 'what if' scenarios," says University of Auckland Engineering Scientist, Dr Andrew Mason (pictured above), who originally developed the software with colleague Dr Shane Henderson. "You can ask: What if I open an ambulance base here? What if I move an ambulance base?" The software quantifies the impact of these changes, replacing hunches and gut feelings with detailed statistical analysis; it is now being used by emergency services in North America, Europe and Australia.

That is quite an evolution from when the company was founded in 1998 to optimise Air New Zealand crew rosters, saving the airline $15m a year. At that time, Andrew and Shane were also working on a University research project into rostering for the St John Ambulance Service.

"It soon became clear that we needed mathematical tools to work out how many staff were needed," says Andrew. "We developed a simulation in computer code that we called BARTSim – Better Ambulance Rostering Technology Simulation.

"BARTSim showed tiny flashing ambulances on the city streets, picking up and dropping off patients before returning to base. For the first time, this graphic visualisation let managers see the problems they faced in crew deployment. It helped St John with decisions about where to locate and how to run their bases."

Word spread, and in 2001 Andrew got a call from the Melbourne Metropolitan Ambulance Service. "Melbourne was a real challenge – it had about five times as many calls, vehicles and roads as Auckland, and much more complexity in its vehicle types, dispatch rules and operational procedures. However, we had an advantage in that we were probably the only group who could demonstrate actual working software."

Optima won the tender, completed a successful implementation for Melbourne, and took the first steps to becoming the dominant international player in this niche market.

"The years spent by Optima developing this software have taken it to new levels," says Andrew. Optima Predict™ and new product Optima Live™, which provides real-time decision support for emergency services, is now gaining traction in North America with 12 deals signed – the latest with Denver.

Keeping his links with Optima, Andrew runs a University research programme in Ambulance Logistics. Engineering Science students at honours, masters and PhD level use their Operations Research skills to solve difficult mathematical problems to help save lives.

Former masters student David Richards is now working at the St John Ambulance Service and is helping crews in Christchurch better respond to the disruptions caused by the earthquakes.

"I could never have predicted the impact this software would have," says Andrew. "Many years of hard work by my colleagues at Optima have grown this seed of an opportunity into one of New Zealand's most technically advanced software companies."

www.des.auckland.ac.nz www.theoptimacorporation.com

A helping hand

When Futa 'Ofamo'oni enrolled in a BA at The University of Auckland he joined Tuākana – a learning community for Māori and Pacific undergraduates.

In Māori, "tuākana" means older brother or sister and that's the role of the Tuākana tutors and mentors, who are senior students.

"When you arrive at University you have to learn to speak a whole new language," says Futa, who is of Tongan heritage. "Tuākana helps with everything from how to use the library databases to exam skills, essay-writing and pastoral care. Through Tuākana I went to workshops in Anthropology and they helped me come top of my class. "

Tuākana helps Māori and Pacific students feel comfortable and do their best academically. It provides a familiar learning environment, complements the University's lectures and tutorials, and gives students an important sense of belonging on campus.

Fourth-year BA/BSc Māori student Leilani Walker is a Tuākana tutor and says the programme has broadened her networks and relationships at the University.

"Tuākana develops a culture of sharing," says Leilani (Whakatohea), "and it's good to help other students."

"We're like older brothers and sisters in the academic environment," adds Futa, who is now completing a BA Hons in Anthropology and is a Tuākana mentor. "The relationship is one of respect but it's not hierarchical We're not teachers so we're more approachable."

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

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