

Auckland

MAKING AN IMPACT

NOW

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**THE UNIVERSITY
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NEW ZEALAND

Te Whare Wānanga o Tāmaki Makaurau



Volcano watch

The recent eruptions at Mt Tongariro and White Island are a timely reminder for Auckland which is built on one of the world's youngest volcanic fields. What would a major volcanic eruption look like here and how would we respond?

This is something University of Auckland volcanologist Jan Lindsay thinks about every day. Together with a GNS scientist, she leads a major seven-year project DETERmining VOLcanic Risk in Auckland (DEVORA).

Working with 30 senior researchers and 10 doctoral students, Jan (pictured with Lucy McGee, who has recently completed her doctorate) is dating the city's 50 volcanoes to see if there is a pattern to past eruptions. At Lake Pupuke in Takapuna, a painstaking assessment of sediment in ash layers has changed thinking about Rangitoto, the youngest and largest volcano in Auckland. Rather than erupting once 600 years ago, the island may have erupted three times starting about 1,500 years ago.

"Traditionally, it has always been said that once a volcano has erupted in the Auckland field it's done, but the fact Rangitoto has erupted a few times is really challenging this traditional view of how the field might behave," says Jan.

DEVORA researchers have also been trying to understand what an eruption might look like.

"The first sign will be a swarm of earthquakes triggered by magma rising from a depth of about 80 kilometres," says Jan. "As it gets closer to the surface, the earthquakes will become shallower and centre on a particular site. The chances are an eruption will start with an explosion and then we'll get base surges as hot magma meets water in or above the ground."

As Jan and her team process this geological information it is fed through to Auckland Council and the Earthquake

Commission who are both funding DEVORA. "We want everything we have learned to make its way into policy."

Although volcanic hazard is very low in Auckland with chances of an eruption once every 2,500 years on average, if it does happen our vulnerability will be extremely high. So another key focus of DEVORA is to assess the impact of an eruption on Auckland society. A tangible outcome of this will be the customisation of a new computer-based, risk evaluation tool called Riskscape for the Auckland volcanic field, which can predict the impact of an eruption on things like building collapse, transformer failure, economic loss and ash clean-up costs. "It'll be a fantastic tool for planning," says Jan. "If we were about to have an eruption it could simulate it in advance and predict what would be affected on the day aiding evacuation and contingency planning."

She is also working directly with Civil Defence to develop a decision-making tool that can be used to decide when to evacuate people. "It's been a two-way discussion and invaluable process," says Clive Manley, head of Auckland Civil Defence.

Jan started her career with GNS Science during the 1995-1996 Ruapehu eruption and has since studied Chile's La Pacana caldera, one of the world's biggest volcanoes, and spent four years working in a volcano observatory in Trinidad. She and her team are now using a DEVORA-style approach with researchers at King Abdulaziz University in Saudi Arabia to study a volcanic field near the holy city of Medina.

"New Zealand is a leader in this integrated approach to a hazard," says Jan.

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Lest we forget

“Memory is the diary that we all carry about with us,” wrote Oscar Wilde. And when he suffered from depression it was like losing that diary as he struggled to remember what he’d done or to plan for the future.

The links between memory, severe depression and what physically happens in the brain are being investigated at The University of Auckland’s Memory Lab in a ground-breaking study with people who have a history of depression.

It focuses on the hippocampus, the part of the brain that is involved in emotions, learning and memory. Recent research shows that stress hormones damage the hippocampus and in depressed people it may even start to atrophy.

“We’re looking at how stress-related damage to the hippocampus might affect our ability to remember and imagine,” says cognitive neuroscientist Donna Rose Addis, Director of the Memory Lab in the Department of Psychology.

Donna Rose has studied at Toronto and Harvard universities and specialises in episodic memory. “Memory is more complex than we think,” she says. “Episodic memories are the recollections of experiences from your childhood where you can place yourself back and see things around you.

“They are important not only for the past, but also what we imagine for the future. They allow us to build up the sense of who we are, our identity,” she says.

Research shows that the hippocampus is crucial for these types of memories. “There was a famous case, Patient HM, who had his hippocampus removed to help with epileptic seizures. After that he couldn’t remember episodes in his life but he could remember facts and figures. He was the one who taught us there are different types of memory.”

So if hippocampal function is impaired in people suffering from depression, that might explain why they can’t remember or imagine in as much detail, says Donna Rose.

“If we can prove this, then we can come up with therapeutic interventions such as guided imagery, anti-depressants that help regenerate the hippocampus or exercises to improve its function.”

As a History and Psychology student at The University of Auckland, Donna Rose was fascinated by personal stories. “I remember sitting in a Stage Three Psychology lecture about Alzheimer’s disease and thinking if you’ve lost your memories of everything you’ve done, these self-defining experiences, then how do you know who you are?”

She went on to do a Masters project looking at how memories, particularly in our teens and 20s, really define us.

“Memories in ages 15 to 25 seem particularly potent in Alzheimer’s patients,” she says. “When a patient loses those memories you really start to see changes in identity.”

As well as studying Alzheimer’s disease, epilepsy and depression, the Memory Lab investigates how memories can become distorted and inaccurate.

“Not only does memory inform who we are; but who we think we are can also change what we remember and how we remember it,” Donna Rose says.

www.memorylab.org



We are sailing

Dario Motta fell in love with sailing as a six-year-old growing up in Sicily, and he's been close to the sea and yachts ever since.

After completing a Bachelor of Engineering in Naval Architecture in Genoa, the 25-year-old Italian set his sights on working for an America's Cup or Volvo Ocean Racing team so his next port of call was Auckland.

Dario is studying for a PhD at The University of Auckland's Yacht Research Unit (YRU). His work on how to measure the shape and wind pressure on sails will add to the understanding of sail aerodynamics and improve sail design.

"I am just so passionate about sailing," he says. "This really is the best place in the world to learn everything I can."

The YRU was born out of New Zealand's early involvement in the America's Cup. In Fremantle for the 1987 challenge, merchant banker Sir Michael Fay was impressed by the engineering graduates working on the campaign and decided to fund a part-time manager, computers and research student scholarships for a University research unit focused on yacht engineering.

It was good timing because Professor Richard Flay, now director of the YRU, had recently returned to New Zealand from Toronto where he designed wind tunnels to test everything from missiles to oil lubricants. Richard set about designing a wind tunnel that twists the wind to simulate the air flow over small yacht sails.

Team New Zealand was soon testing its sails in this Twisted Flow Wind Tunnel and their boat's superior sail aerodynamics undoubtedly contributed to their victory in San Diego in 1995.

The wind tunnel was used again for Team New Zealand's defence in 2000, and crews from other countries, including BMW Oracle

Racing, Team Shosholoza and Alinghi, have all tested their sails at the YRU. Last year most of the Volvo Ocean Racing Yachts used the tunnel before the 2011/2012 race.

The YRU has since spawned a spin-off company VSPARS, which has invented a revolutionary deck-mounted system that tracks and calculates sail shape and position in real time.

The YRU has also become a magnet for masters and doctoral students, with projects ranging from finding the optimum fin keel design for America's Cup yachts to an archaeological and engineering study of prehistoric Pacific migration. Meanwhile New Zealand PhD student Alex Blakeley is studying the design of wing sails for multi-hulls like those competing in next year's America's Cup.

"Undertaking research at the YRU has fast-tracked many graduates into leading yacht-design positions worldwide," says Richard. "They work on everything from mast design to race software and they are sailing and designing for the America's Cup and Volvo Ocean Racing teams."

For Dario Motta his journey across the world has already paid off. Since arriving six months ago he has been busy sailing and recording data from full-scale sails on the water. He's met a member of Emirates Team NZ and has taken the opportunity to sail on a variety of yachts on Auckland Harbour.

"It's a fantastic place to learn and sail. I'm really glad I came," he says.

Pictured from left: Dario Motta, Alex Blakeley and Richard Flay.

Campus renewal



One of the most significant investments in New Zealand's science and innovation sector is underway at The University of Auckland.

The Engineering and Science faculties are both the subject of major building renewal programmes to the combined tune of more than \$400 million.

"This is part of a ten-year campus renewal plan valued in excess of \$1 billion that is bringing our facilities up to the highest possible standard," says Vice-Chancellor, Professor Stuart McCutcheon. "It demonstrates our commitment to science and engineering, and reflects the importance of science and innovation to New Zealand's future."

The Faculty of Science is the highest-ranked and largest in New Zealand, and its research activity, staff and student numbers are forecast to grow substantially over the next ten years. The \$200 million redevelopment, led by the University's Property Services and architectural firm Architectus, will give 38,000m² of new or refurbished space to accommodate most of this growth and bring together scientific disciplines previously dispersed across the campus.

The School of Environment, Institute of Earth Science and Engineering, National eScience Infrastructure, Department of Psychology and School of Chemical Sciences will move into a new purpose-built Science Centre tower joining colleagues from Physics, Mathematics, Statistics and Computer Science accommodated in buildings in the same complex and increasing the opportunities for cross-disciplinary collaboration. "This will support teaching, research and the vital interface with businesses which will collectively underpin our goals for the future," says Dean Professor Grant Guilford.

The project will also help the University support the development of the high-value manufacturing sector by housing a wide array of high-technology equipment including micro-fabrication facilities, mass spectrometry instruments, nuclear magnetic resonance equipment, high energy lasers, and photonics and acoustic suites.

"From our location in the country's commercial capital we are well-placed to support key challenges facing today's world including climate change; security-of-supply of food; water and clean energy; pollution and loss of biodiversity; health and wellbeing; information management; and sustainable economic development."

At the same time as Science is getting a makeover, the Faculty of Engineering is undergoing a \$216 million redevelopment working with architects Jasmx to create high-tech laboratories, a new engineering research facility and the expansion of the existing buildings on the City Campus.

Faculty of Engineering Dean Professor Michael Davies says the redevelopment will bring two departments back to the heart of the faculty and create state-of-the-art teaching and learning spaces as well as providing facilities for research that are of an internationally-leading standard.

"All of this will be within an environment that has been designed to encourage interactions between students and staff from different disciplines and encourage interdisciplinary research," says Michael.

"It also recognises that there is continuing strong demand for engineering graduates and that the faculty has been very successful in growing its postgraduate numbers and external research income, particularly in recent years."

Both projects are likely to be completed in 2017.

Telling stories



Toeolesulusulu Damon Salsea grew up in a family of story tellers and he recalls one of his Samoan father's favourite tales: "My father went to a parent/teacher evening at Glen Innes Primary School, which was a pretty hard-bitten school back then. We kids had pinned up on the wall what we wanted to be when we grew up.

"Apparently I had written I wanted to be a university lecturer," laughs Damon.

He can't remember that but his father, who was then a factory worker at Fisher & Paykel in East Tamaki, may have known something his son didn't. Today Damon is Associate Professor of Pacific Studies at The University of Auckland and teaches Pacific Studies and History.

"My father wanted me to be an engineer and I think my mother wanted me to be a lawyer, which is very typical first generation Pacific Island," he says. Despite his parents' wishes, he was immediately drawn to Samoan role model: author and historian Albert Wendt. During his first-year course with Wendt, Damon began to realise "how much history matters".

Damon went on to complete his MA and was the first person of Pacific Island descent to become a Rhodes Scholar at wOxford University.

He has recently won the prestigious international Ernest Scott prize for his work *Racial Crossings: Race, Intermarriage, and the Victorian British Empire* described by judges as a "landmark contribution to the scholarship on race and racial boundaries within modern imperial regimes".

Damon sees the role of the historian as helping us understand our own genealogies and answering the question: how did we become who we are?

He is now writing a social history of Samoa by telling the story of ordinary Samoans. "It's a project that makes sense to me," he says. "I've had a lot of time in the archives and most of the stories I find moving and engaging are not only about the chiefs."