"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 groundbreaking 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 hormone 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 when you can place yourself back and see things as they were.

"They are important not for the past, but also 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 memory.

As well as studying Alzheimer’s disease, epilepsy and memory, 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," says Donna Rose.

She went on to do a Masters project looking at how memories, particularly in teens and 30s, really define us.

"Memories in ages 15 to 25 seem particularly potent in Alzheimer’s patients," she says. "When a person loves these memories you really start to see changes in identity.

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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 that, then we can come up with therapeutic interventions such as guided imagery, anti-depressants that help regenerate the hippocampus or exercise to improve its function.

As a history and psychology student at The University of Auckland, Donna Rose was fascinated by personal stories. "I remember reading a Jorge Luis Borges’ ficción -Borges’ ficción – tale about Alzheimer’s disease and thinking: If you lose your memories of everything you’ve done, these self-defining experiences, then how do you know who you are?"

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Volcano watch

Dario Motta fell in love with sailing as a six-year-old growing up in Sicily, and has been close to the sea and yachts ever since. For Dario Motta his journey across the world has already paid off. "I've been working in a wind tunnel that was developed by Richard Flay, now director of the Yacht Research Unit (YRU). His work on how to measure the shape and wind pressure on sails will add to the understanding of sail dynamics and improve sail design." After completing a Bachelor of Engineering in Naval Architecture in Genoa, the 25-year-old Italian set sights on working for an American Cup or Volvo Ocean Racing team so he took part of a new course at the University of Auckland.

Dario is a PhD student at the University of Auckland’s Yacht Research Unit (YRU). He has honed his skills at the University’s new wind tunnel and is working to improve his wind pressure measurements. His work will be used by the Volvo Ocean Racing teams in their preparation for the next race. The YRU team is also working with some of the world’s best sailmakers and boatbuilders to develop the latest sails and understand how they work. 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 dynamics and improve sail design.

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The Engineering and Science faculties are the subject of major redevelopment working in partnership with Auckland City Council (ACC) to create a dynamic and innovative new campus. The Faculty of Engineering Dean Professor Michael Davies says the redevelopment will bring two departments back to the heart of the campus. "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.

The project will include a new University Supersail, the development of additional high-value manufacturing capability through facilities such as the University Wind Tunnel and the addition of further research equipment, high-energy lasers, and photonic and quantum technologies. The University Supersail will provide our location in the country’s port environs, where we are well placed to support a cluster of fast-growing industries including offshore wind, maritime technology, advanced manufacturing, precision medicine, and materials science.

"We want students to have the chance to learn to take my step help," says Jan. Although volcanic hazard is a very real in Auckland with dozens of volcanic cones and lava flows that may erupt at any time, the research is helping to address the question of how the field might behave, says Jan. "Our work is really challenging this traditional pattern to explain events." Volcanologists have changed thinking about Rangitoto, the youngest and largest volcano in Auckland, better they thinking up to 1,500 years ago, the island may have erupted three times starting about 1,500 years ago. 

"Traditionally, it has always been said that an eruption has gone on in the Auckland rift but, the last Rangitoto eruption has erupted. It is really challenging the traditional view of how the field might behave," says Jan. DEVORA researchers have been trying to understand what was happening before the eruption.

"The first step will be a series of large-scale earthquakes triggered by magma rising from a depth of about 80 kilometres," says Jan. "This may happen, we don’t know yet, but it will be extremely high. So any level of funding for DEVORA is a huge investment in the care of the community and the risk assessment.

The volcano is likely to be completed in 2017.
Lest we forget...
Volcano watch

The recent eruptions at Mt Tongariro and White Island are a stark reminder for Auckland which is home to one of the world’s youngest volcanic fields. What would a major volcanic eruption look like and how would we respond?

This is a something the University of Auckland volcanologist Jan has had to think about a lot recently. Together with ONZ, she leads a major seven-year project DEtermining VOlcanic Risk (DEVORA) at King Abdulaziz University in Saudi Arabia to study a volcanic landscape that has erupted a few times but may have erupted three times starting about 1,500 years ago.

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Jan started her career with GNS Science during the 1995-1996 eruption. “It was good timing because Professor Richard Flay, now director of the YRU, had recently returned to New Zealand from Toronto during a sabbatical year,” says Jan.

“I am just so passionate about sailing,” he says. “This really is the best place to learn and sail in the world.”

The YRU was born out of New Zealand’s early involvement in the Volvo Ocean Race, which was started in 1973. Known as the Whitbread Round the World Race before the 2011/2012 race.

Wind Tunnel and their boat’s superior sail aerodynamics twists the wind to simulate the air flow over small yacht sails. This is particularly useful for oil lubricants. Richard set about designing a wind tunnel that could test full-scale sails. He says, “It’s a fantastic place to learn and sail. I’m really glad I came.”

Since arriving six months ago he has been busy sailing and recording data from full-scale sails on the water. He’s met a lot of people and is getting to know 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 and infrastructure. “It’s been a two-way discussion and invaluable decision-making tool that can be used to decide when to evacuate people,” says Clive Manley, head of Auckland Civil Defence.

“Riskscape will undoubtedly contribute to their victory in San Diego in 1995.”

“The project will also help the University support the development of the high-technology marine industry by building a high-tech marine research and technology facility, which will be equipped with state-of-the-art facilities, high-energy lasers, high-power and high-speed data sets, and will be a hub of cutting-edge research in the country’s youngest landscape.”

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Both projects are likely to be completed in 2017.
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. Although volcanic hazard is very low in Auckland with chances of its activation unlikely in the near future, the potential for such events happening near or within populated areas must be recognized.

Telling stories

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 as if losing his memory was losing himself. Wilde went on to say: “If I had written I wanted to be a university lecturer, I would have been a university lecturer.”

Dean Carruthers.

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Volcano watch
Monitoring risk on Auckland’s volcanic field

We are sailing
International youth research