IceSked

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Newsletter of Te Puna Pātiotio—Antarctic Research Centre
Te Herenga Waka—Victoria University of Wellington

A word from our Director

The past few months have seen a wave of funding and award success for Te Puna Pātiotio—Antarctic Research Centre (ARC) researchers. We also reflect on the passing of Dr Lee Seng Tee, a benefactor to the ARC, whose donation at a critical moment in our history almost 20 years ago still helps support an annual lecture series and young scientist exchange with University of Alaska Fairbanks. We remain heavily indebted to all our supporters whose generosity have provided support for the young scientists who have been central to fulfilling our research ambitions over this time, and contributing to a better understanding of the impacts of Antarctic environmental change on New Zealand.

Rob McKay

Paleoclimatologist receives Blake Leader Award

Joint ARC and GNS Science researcher, Professor Richard Levy, received one of four prestigious Blake Leader Awards on 10 November for his commitment to helping us understand climate change issues and lead the necessary changes. Blake awards recognise and celebrate people whose leadership has contributed to a more sustainable future for New Zealand.

Richard's 23 years of scientific research includes more than a decade leading the Past Antarctic Climates and Future Implications programme at GNS Science. This work explored the distant past to help understand how warming temperatures will affect our planet in the future. It has taught us that Antarctic ice sheets are even more dynamic and vulnerable than we previously believed. He is currently co-leading the new SWAIS 2C drilling project, which is designed to reveal the sensitivity of the Ross Ice Shelf and West Antarctic Ice Sheet to past warming.

Closer to home, Richard also co-led the NZ SeaRise: Te Tai Pari O Aotearoa programme over the last five-years and now he is co-leading, Te Ao Hurihuri: Te Ao Hou—Our Changing Coast, programme learning how climate change and sea-level rise will affect different parts of New Zealand's coastline.

This project is geared towards practical solutions. Richard has personally connected with iwi, councils, and many other people to help them understand the risks of sea-level rise and plan more resilient infrastructure.

"Action and leadership are needed right now if we are to meet the challenges of climate change and build a sustainable future for our planet," says Richard.

The message is starting to get through, and more governments around the world are agreeing to cut the amount of carbon dioxide going into the atmosphere. A certain amount of warming is inevitable, but there is still time to keep this to manageable levels by focusing on mitigation and adaptation. Richard says,

"I'm much more confident that we as humans are trying to get on top of this problem. We've acknowledged it at last—and we're actually coming up with solutions."

Richard Levy at the Blake Awards ceremony (photo credit: BLAKE)

Remembering Dr Lee

Te Puna Pātiotio—Antarctic Research Centre wishes to acknowledge the passing of Lee Seng Tee (Dr Lee) in July this year at 99 years of age and give thanks to the Lee Foundation and Lee family for his support and generosity.

Dr Lee's significant financial support over 20 years has recognised and bolstered the University's strong contribution to Antarctic research. It established the annual S.T. Lee Lecture in Antarctic Studies and the S.T. Lee Antarctic Reading Room in the University's library. Many early career researchers and students, both in New Zealand and Alaska, have benefited from the S.T. Lee Travel award—an exchange programme with the University of Alaska Fairbanks.

Dr Lee was the second son of visionary businessman Lee Kong Chian, who made a name in the rubber, pineapple, coconut oil, and sawmill trades. In 1952, Lee Kong Chian created the Lee Foundation, one of Singapore's largest charitable organisations that supports education, healthcare, welfare, and disaster relief. A bibliophile, Dr Lee liked to support libraries, reading rooms, and public lecture series believing that for disseminating information these gifts produced the most "bang for buck". While Chinese convention is to display the family name first, Dr Lee recognised the European convention by naming his projects 'S.T. Lee.'

Lee Seng Tee by Wang Qing Yu, Wolfson College, University of Cambridge collection

Dr Lee's connection with Te Herenga Waka—Victoria University of Wellington was through Emeritus Professor Don Trow of the School of Accounting and Commercial Law. Professor Trow was introduced to Dr Lee during a visit to Singapore in 1999. Professor Trow explains how the relationship came about:

"Dr Lee's connection with our University commenced in the late 1990s at the time of a reunion in Singapore of commerce graduates from Victoria University of Wellington. One of those graduates was a personal friend of Dr Lee, and had arranged a lunch for those at the reunion to meet Dr Lee."

"Dr Lee was a most impressive host for the occasion. A perfect gentleman, he was proud of his Chinese heritage and the remarkable growth and success of the Singapore nation. He was quietly spoken but engaging, and remarkably well versed on international affairs and the role of New Zealanders in worldwide activities."

From this beginning, Professor Trow developed a close personal friendship with Dr Lee that continued with several meetings in Singapore in succeeding years.

Having established lectures in the Northern Hemisphere, Dr Lee was keen to develop projects in the Southern Hemisphere. He noted the closeness of New Zealand to Antarctica and was drawn to supporting research activities there, but with a proviso. He had to be convinced that the activity had world class ranking and that Victoria University of Wellington could stand as a quality institution alongside the other universities he supported, notably Oxford, Cambridge, and Harvard.

A meeting was arranged between Dr Lee and Emeritus Professor Peter Barrett, Director of the Antarctic Research Centre at the time and one of New Zealand's foremost Antarctic scientists. This proved to be most successful. Peter was a good fit with Dr Lee's quiet, thoughtful, and polite personality and was also greatly admired for his leadership and high-quality research activity, much of it at the coal face—or rather ice face.

In 2003, Dr Lee made an endowed gift to establish the annual S.T. Lee Lecture in Antarctic Studies. This was his first gift to an educational institution in the Southern Hemisphere.

While Dr Lee was never able to visit New Zealand, Peter and another former ARC Director, Professor Tim Naish, enjoyed visiting him at his offices in Singapore. We are very grateful for his endowments, which will continue to develop Antarctic science and climate change research for years to come.

View the full story here:
https://125.wgtn.ac.nz/dr-lee-seng-tee/

S.T. Lee Lecture in Antarctic Studies

The 19th annual S.T. Lee Lecture 'Antarctic Ice: Ancient, Beautiful and Unforgiving' held on 15 November, was presented by Professor Robin Bell, Lamont-Doherty Earth Observatory, Columbia University, USA. Robin arrived in New Zealand in her yacht after sailing across the Pacific from New York!

Robin's research accomplishments emerge from her approach of looking holistically at Earth's large ice sheets on our planet with the goal of understanding how they work and how they will change in the future.

Robin's presentation focussed on the Antarctic ice sheet which is over 4 km thick and has persisted for 34 million years. She has spent much of her career uncovering the secrets within and beneath Antarctica's featureless surface, including hidden mountains, volcanoes, and giant lakes. Robin discovered an active volcano beneath the vulnerable West Antarctic Ice Sheet, studied Lake Vostok, a large lake beneath more than 3 km of ice, and led an international expedition to the Gamburtsev Mountains. During the lecture the audience was shown inside the ice, revealing folds, bends and bulbous structures that record its history including subglacial water flows—which apparently run uphill!

Robin Bell presenting her lecture in the Hunter Council Chamber

While in Wellington, Robin attended a round table discussion at the Parliamentary Commission for the Environment on some of the emerging science around the Antarctic ice sheet and sea-level rise, and implications for mitigation and adaptation. She is motivated by the goal of enabling coastal communities around the globe to develop scientifically informed strategies to respond to changing sea levels, creating a future that is thriving and sustainable for all.

S.T. Lee Travel Award

PhD candidate Ian Blixt from Te Kura Mātauranga Koiora—School of Biological Sciences returned from an exchange at the International Arctic Research Center (IARC), University of Alaska Fairbanks in August, as part of the S.T. Lee Travel Award exchange programme. Ian was chosen for the exchange due to his research focus on Antarctic sea ice bacteria.

"We have recently discovered that these bacteria can use sunlight as an alternative source of energy, similar to plants. My research focuses on the effect this new form of bacterial phototrophy (ability to use light as an energy source) has on the wider sea ice and marine ecosystems," Ian says.

"This unique form of light-harvesting was only discovered in 2000, but it now appears that these 'energiser microbes' convert sunlight into chemical energy at a rate that is approximately equal to the energy consumption of fossil fuels by the human population."

During his two weeks in Alaska, Ian had the opportunity to present his research at the IARC, the Microbial Ecology Seminar, and to the Sea-Ice Persons working group, alongside meeting with subject matter experts. He says the advice he received on every aspect of his research was hugely valuable. Ian also attended the opening night of Arctic Fest 2022, an opportunity which he describes as "the most memorable" part of his trip.

Ian Blixt in Alaska

"This festival is all about the combination of Indigenous knowledge, art, and science. It was a pretty unique event. I haven't really heard of anything like it before."

The exchange, usually awarded to one researcher per year, alternates between the two universities. However due to travel restrictions in the years prior, there were five recipients in 2022 (three from Victoria University of Wellington and two from the IARC). The other Victoria University of Wellington recipients will travel to Alaska next year. PhD student, Yaowen Zheng, will work with IARC researchers on the positive degree-day (PDD) model to determine surface melting of Antarctic ice sheets in response to climate change. While Billy van Uitregt (Te Kura Tātai Aro Whenua—School of Geography, Environment and Earth Sciences) and colleague Cecelia Kumeroa (IHI Design Studio) wish to build relationships with the IARC and the Indigenous peoples of the Yukon River and Alaskan Arctic to explore how environmental data can be collected and interpreted to reflect Indigenous environmental values and ethics.

Meanwhile, IARC Research Associate, Eric Petersen arrived in New Zealand on 3 December and is interested in periglacial science involving the incorporation of glacier ice into permafrost landscapes and will work with ARC's Warren Dickinson while he is here. The other IARC recipient, Kristin Timm, is currently conducting social scientific research at the intersection of the cryosphere and climate change communication. She will fly to New Zealand in February 2023.

Remarkable research funding success

ARC researchers have had a great result with funding applications this year, being awarded a Ministry of Business, Innovation and Employment Endeavour Fund grant, a Royal Society Te Apārangi Rutherford Discovery Fellowship, a Standard Marsden and a Marsden Fast-Start.

Endeavour: $13m project to focus on predicting impacts of sea-level rise

Led by the ARC, Te Ao Hurihuri: Te Ao Hou—Our Changing Coast, aims to improve understanding of the impacts of sea-level rise on coastal communities and infrastructure. Programme co-leader Professor Tim Naish, says,

"We know the sea around Aotearoa is rising but we don't yet know enough about how coastal regions will be affected to ensure our adaptation measures will be effective and appropriate."

A key focus of the project is on improving the models currently used to understand the effects of sea-level rise, such as coastal flooding and groundwater salination, and risks to key infrastructure and cultural sites. The research will produce a new, publicly available online tool showing sea-level projections, at 100 metre spacing, along the New Zealand coastline. Risk assessment will be possible at the scale of individual houses and buildings. Estimates will also include the probability of major earthquakes causing changes in land elevation along the coast.

Co-leader Professor Richard Levy says the programme involves a multi-disciplinary team including researchers from GNS Science, University of Auckland, University of Canterbury, University of Waikato, Oceanum Ltd, Takiwa Ltd, and Te Whare Wananga o Awanuiarangi. The research team will work with central and local government agencies, iwi, and community organisations.

Marsden: Past Antarctic ice sheet melt

Professor Rob McKay's Marsden project, Past abrupt Antarctic ice sheet melt events and impacts on sea level and climate, was awarded $929k over three years.

His research will investigate past millennial-scale (1,000-10,000 years) climate events that can produce abrupt global changes over decadal timescales. While proxy data and models indicate the Antarctic ice sheets may have contributed to such events, it is widely considered that collapse of past marine-based Northern Hemisphere ice sheets played a dominant role. Most of these Northern Hemisphere ice sheets are now gone, so these ocean-ice feedbacks will likely not play out in the same manner during future ice sheet collapses. Models indicate the marine-based Antarctic ice sheets may display instabilities and associated meltwater release will widely impact global sea level, precipitation and wind fields. Rob will use sediment cores to assess if the Antarctic ice sheets experienced "millennial-scale" melt events during warmer than present climates in the deeper geological past when Northern Hemisphere ice sheets were absent.

Rutherford: Understanding the role of phytoplankton in a warmer world

ARC Research Fellow, Dr Holly Winton, has been awarded an $800k Rutherford Discovery Fellowship for her research titled, Southern Ocean phytoplankton and climate: Understanding the ability of phytoplankton to modulate climate in a warmer world.

Southern Ocean phytoplankton (tiny marine plants) interact with the Earth's climate by using sunlight to convert carbon dioxide into organic carbon. They also produce aerosols which help form clouds and regulate the Earth's energy balance. Phytoplankton blooms are seasonal and altered by sea ice conditions, temperature, wind, and nutrient availability. Given our current warming climate, it's important to understand how seasonal phytoplankton blooms have responded to Earth's previous warm periods.

With this Fellowship, Holly will measure and compare the expanded suite of biomarkers found in ice cores and present-day aerosols for a more complete picture of how and why Southern Ocean phytoplankton have changed in the past and what we might expect in the future.

Another aspect of her Fellowship partners with mātauranga Māori experts to explore connections and co-create a maramataka—a Māori environmental and lunar calendar of Antarctica, providing a Māori worldview and holistic perspective of environmental change in the region.

Marsden Fast-Start: Glacier melting

Research Fellow, Dr Lauren Vargo, was awarded a $360k Marsden Fast-Start grant for her project titled, How much are glaciers melting due to climate change?

Billions of people will be impacted by melting glaciers. Scientific consensus is high that human influence is the main driver of glacier retreat. However, methods to quantify how much of annual glacier melt is due to anthropogenic climate change do not exist. Lauren's project will develop and apply an innovative framework to 230 glaciers worldwide, to determine how much melting in individual years is due to anthropogenic climate change by using computer models to simulate glacier mass change 'without climate change' (greenhouse gases are ~1/3 of modern) and 'with climate change' (greenhouse gases at modern levels). Lauren will also project future changes in extreme glacier melt as temperatures continue to rise. The results will inform climate change assessments and decision-makers as the impacts of glacier melt, including declining water availability and increases in natural hazards, continue and intensify.

Te Puna Pātiotio—Antarctic Research Centre, Te Herenga Waka—Victoria University of Wellington,
PO Box 600, Wellington 6140, New Zealand
www.wgtn.ac.nz/antarctic | +64-4-463 6587 | Antarctic-Research@vuw.ac.nz