

IceSked

Issue 34: July 2020

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

Winner's of the 2019 Prime Minister's Science Prize

Led by the Antarctic Research Centre, the “Melting Ice and Rising Seas” team comprising 23 earth and social scientists from Victoria University of Wellington, GNS Science and NIWA has been awarded the New Zealand Prime Minister's Science Prize for 2019. Due to COVID-19 the usual ceremony at Parliament was abandoned, and Prime Minister Jacinda Ardern announced the winner in a delayed event online via livestream on 30 June <https://www.youtube.com/watch?v=hLe43P1Gbol>. The Prize recognises world-class, excellent research conducted in New Zealand, that has had impact and benefit. It comes with a \$500,000 award. The majority of this (\$400,000) has been invested into the ARC Endowed Development Fund and will be used to fund a PhD scholarship in perpetuity. The remaining \$100,000 was split up evenly amongst the 23 members with suggestions they may like to spend it on lowering their personal carbon footprint.

ARC's, Tim Naish, led the team and says the impact of their work can already be seen around New Zealand. “Our science on Antarctic ice melt and sea-level rise projections feeds directly into national policy and guidance on how to manage sea-level rise. We are working with central government, regional councils and local authorities.”

While the Prize recognises research over the last five years, the team acknowledges the pioneering contribution of over 30 years by key

team members, Peter Barrett (founding ARC Director) and Alex Pyne (world-leading polar science drilling specialist), which laid the foundations. Geological and ice drill core records acquired in the 80s, 90s and early 2000's by NZ-led international projects in the Ross Sea region have provided many fundamental insights, that are now central to our understanding of current concern over the future stability of Antarctica's ice sheets. Peter was well-ahead of the time, when in 2004 he prophetically stated, “civilisation as we know it will be over by the end of the century if we don't change course”, based on what he was learning from Antarctica.

Other ARC key team members included Nancy Bertler (Director of the Antarctic Science Platform), Lionel Carter, Nick Golledge, Huw Horgan, Richard Levy (Leader of the NZ SeaRise Programme), and current ARC Director Rob McKay, along with Brian Anderson, Ruzica Dadic, Warren Dickinson, Michelle Dow, Gavin Dunbar, Sean Eaves, Liz Keller, Andrew Mackintosh (now Monash University), Darcy Mandeno, and Dao Polsiri. Other leading climate change researchers at the University were also key members of the team: James Renwick (Head of SGEES), Rebecca Priestley (Director of the CSIS), and adaptation expert Judy Lawrence (CCRI). Nancy, Richard, and Liz also hold positions at GNS Science, and the other key team member, Rob Bell (NIWA), is New Zealand's leading coastal hazards expert.

During the past six years, members of the team have produced a plethora of papers, with 205 published in peer-reviewed journals, and an incredible list of 30 papers in the world's leading interdisciplinary scientific journals (e.g. *Nature & Science*). Three members of this year's winning team have also been recipients of Prime Minister's Science Prizes in the past. Rob McKay won the PM's MacDiarmid Emerging Scientist Prize in 2011, while Rebecca and James both secured the PM's Science Communication Prize, in 2016 and 2018, respectively. Tim, James, Nick and Judy have also been lead authors for the fifth and sixth IPCC Assessment Reports, while Andrew was lead author on the IPCC's Special Report on the Oceans and the Cryosphere. Judy and Rob Bell are also lead authors of the Ministry for the Environment's 2017 document on Coastal Hazards and Climate Change: Guidance for Local Government.

The winning team



The first Antarctic Science Platform field season completed

The 2019/20 Antarctic field season deployed 17 ARC staff and students to Antarctica, making it one of the largest Victoria University of Wellington Antarctic Expeditions ever!

The season saw the Antarctic Ice Dynamics Project team working alongside the NZARI Ross Ice Shelf Project to directly access the ocean cavity beneath the Ross Ice Shelf near the grounding zone of Kamb Ice Stream on the Siple Coast. The Antarctic Ice Dynamics Project is a collaborative study led by GNS Science as part of the MBIE-funded Antarctic Science Platform's (ASP) Project-1 and will be a major focus for the ARC over the coming years. The interest in the Siple Coast region is motivated by the knowledge that the West Antarctic Ice Sheet (WAIS) has an important role to play in future sea-level rise. A key control on whether the WAIS grows, or shrinks are the large ice streams by which most ice leaves the ice sheet and enters into the floating ice shelves and ocean. These ice streams are capable of speeding up and slowing down (or even stopping) on geologically short (years to centuries) timescales, and our limited understanding of the processes governing these behaviours introduces significant uncertainties to models used to conduct future projections.

The 2019/20 field location, approximately 850 kilometres from Scott Base, was primarily supported by a traverse of sleds that took 14 days to reach the site. A 584 metre access hole was melted through 150 tonnes of ice using the University's Hot Water Drilling system. The hole was kept open for nine days before the deployment of a long-term oceanographic mooring. Numerous experiments were run throughout the season, examining the ice shelf, ocean cavity, and underlying sediment properties. Highlights included retrieving shallow cores that record past ice sheet and ice shelf behaviour, seeing the underside of the ice shelf through the eyes of our US collaborators tethered ROV (Icefin), and

NIWA recording the previously unknown temperature and salinity structure of the water column at this remote and important location.



Gavin Dunbar and MSc student Theo Calkin preparing the gravity corer

Beyond the Siple Coast, Jamey Stutz and Shaun Eaves were on Byrd Glacier, one of the largest glaciers in East Antarctica working on a project aimed to provide terrestrial constraints on past changes in ice sheet geometry using cosmogenic surface exposure dating. The priority was Byrd Glacier as it's a major outlet glacier draining approximately 10% of the East Antarctic Ice Sheet to the Ross Ice Shelf – the gatekeeper of the marine-based WAIS. They targeted Lonewolf Nunataks, a remote site situated upstream of the Byrd Glacier fjord, on the edge of the polar plateau. At each of the three nunataks visited, they found the dolerite bedrock to be littered with cobbles of exotic lithologies – a clear sign that ice had previously covered these outcrops. The collected samples will be analysed in the University's Cosmogenic Laboratory to unveil when and how fast the Byrd Glacier changed in the centuries and millennia prior to human observations.



Shaun Eaves and Jamey Stutz collecting samples

Then in January, Nick Golledge and PhD students Alanna Alevropoulos-Borrill, Laurine van Haastrecht, and former PhD student Dan Lowry (now GNS Science), headed down to Scott Base to install global positioning system receivers on the Ross Ice Shelf. The project aims to measure the velocity of the ice shelf continuously through at least two full years, in order to identify whether any seasonal changes occur. If so, this would indicate that short-term environmental changes influence the flow of the ice sheet and would allow modellers to improve the way that such processes are incorporated in simulations used for future projections. The field event managed to successfully install half of the receivers, but a run of bad weather unfortunately prevented access to many of the field sites. Nick and the team will hopefully return to the sites in the 2021-22 season to download data and set up new receivers to extend the data coverage.



Alanna Alevropoulos-Borrill on the Ross Ice Shelf at the first of the K045 GPS installations

Overall, ASP Project-1 is off to flying start, and we are grateful to everyone who pitched in to help make it happen - in particular, Antarctica New Zealand for getting us to this remote, but critically important region.

Antarctic science and sea-level rise impacts feature in Chile's Congreso Futuro

In January, Tim Naish along with ex-Prime Ministers, Nobel Laureates, leading thinkers and scientists were invited to give talks at Chile's annual Congreso Futuro (Congress of the Future). The Congress aims to open a national debate regarding the urgent need for Chile to have more and improved science and technology, for the benefit of the society, economy and environment. Speakers were invited to share insights based on their experience. Tim spoke on climate change in an event in Santiago, visited the ALMA radio telescope array in the north of the country at 6000 m in the Atacama Andes, and travelled to Punta Arenas in the south to present a public talk on Antarctic ice sheet melting and sea-level rise along with Dr Marcelo Leppe, Director of INACH, the Chilean Antarctic Institute.

Chile is an incredible country geographically that spans from the tropics to Antarctica, and the Pacific coast to the high Andes. It is 90% renewable for domestic electricity and is developing a plan to be net carbon zero by 2050. It is also incredibly proud of its connection with Antarctica. It is endowed in natural resources, but its economy and social well-being are still weighed down by the legacy of years of extreme free market nationalism and oppression under the Pinochet

S.T. Lee Lecture in Antarctic Studies

The 17th Annual S.T. Lee Lecture in Antarctic Studies titled "Tropical Tales of Polar Ice" was presented on the 16 June, by Professor Andrea Dutton, Department of Geoscience, University of Wisconsin-Madison, USA. Andrea is a world-renowned expert on past climate and sea-level change. Her main research focus is to establish the behaviour of sea level and polar ice sheets during past warm periods to better inform us about future sea-level rise. One hallmark of Andrea's approach is the strong interdisciplinary nature of her work that blends field geology, geophysics, coral reef ecology, sedimentology, and geochemistry.



Tim Naish presenting at Congreso Futuro, Santiago

dictatorship. This year's Congress was more important than ever as it was set on the backdrop of months of civil disobedience and riots following the social uprising that began on 16 October 2019. The Congress is organised at the highest governmental level by the Chilean Senate and is largely co-ordinated and run by young people, the same young people who were also protesting in the uprising. With the government now consulting the people via referendum on

a new constitution for the country, there was a real feeling of positivity. Tim and a selection of the invited speakers including, 2019 Nobel Prize Winner in Chemistry Professor Frances Arnold, were invited to meet with the President of Chile, Sebastian Pinera, and Science Minister Andrés Couve Correa. The meeting, which was held at the President's Palace in Santiago, discussed how science and technology could help improve the social and economic issues facing Chile.

Andrea is very active in communicating her research to the public and her combined impact within academia and in the sphere of public outreach has earned her numerous accolades, including being named as a fellow of the Geologic Society of America, as one of Rolling Stones' "25 People Shaping the Future", and most recently, as a MacArthur Fellow.

Andrea came to visit New Zealand in January as a United States Fulbright Scholar and has been working with ARC's Tim Naish, Rob McKay and Nick Golledge. Her captivating, S.T. Lee Lecture focussed on describing how her work on the impacts of sea level on fossil coral reefs on tropical islands has helped

inform us about the dynamics of Antarctic ice sheet retreat during past warm periods and what that means for the future of coastlines around the world under future sea-level rise.



Andrea Dutton presenting her lecture

Wellington hosts the SIRG Workshop 2020

On 3-5 February, the New Zealand Snow and Ice Research Group (SIRG) held its annual meeting, organized this year by the ARC. The meetings are usually held in unique locations around New Zealand, with this year's meeting held on Mitiu/Somes Island, located in the Wellington Harbour.

About 30 participants presented, including New Zealand-based research on mapping snow cover using drones, measuring snow accumulation in the Southern Alps, investigating the drivers of calving of Haupapa/Tasman Glacier, direct measurements from Rolleston and Fox/Te Moeka o Tūwae glaciers, and using cosmogenic dating to understand past glacier history. Lynda Petherick and Cliff Atkins (SGEES), who recently received funding to study dust on glaciers in the Southern Alps, gave a talk to get feedback from the snow and ice community. This was especially timely, as the fires in Australia from October 2019 through January 2020 have deposited huge amounts of dust on New Zealand's glaciers. Research outside of New Zealand

focused on Antarctica, with talks on modelling sea ice, and sea ice movement, as well as Antarctic ice sheet processes, from large scale ice shelf fracturing and subglacial drainage, to smaller scale deformation and ice mechanics.

The newly established International Glaciological Society's Early-career Glaciology Group (EGG), whose aim is to provide more support and community for young glaciologists, held a mixer on the first night. Thanks to the Garage Project and Good Buzz Kombucha, for supporting this event.

The student talk prize winners included Florence Isaacs (SGEES) who presented links between sea ice and East Antarctica and El Niño, and Maren Richter (University of Otago), who presented a new method to more-accurately measure sea ice thickness. Thanks to the New Zealand Alpine Club, Bivouac Outdoor, and Icebreaker for the student prizes.

Thank you to our major sponsors NIWA, Antarctica New Zealand, and the Antarctic Science Platform for their support, enabling the meeting to have free registration for students. *Lauren Vargo*



The SIRG Workshop attendees on Mitiu/Somes Island

Welcome to new staff

The ARC welcomed four new staff in 2020. In February, Liz Keller and Alexandra Gossart joined as part of the Antarctic Science Platform National Modelling Hub, a joint Victoria University of Wellington, GNS Science and NIWA facility, with a space hosted by the ARC. Liz, also at GNS Science, joined as Modelling Hub Co-leader alongside Nick Gолledge. Her role is within the 'Future Projections Expert Group' a component project of the Antarctic Science Platform and will contribute to the delivery of research goals as well as help mentor the junior research fellows within the Hub. Together, Liz and Nick have successfully led the international search for four new research fellows to be employed across the three institutes involved in the Hub. The University's appointment, Alexandra, completed her PhD at Université Libre de Bruxelles, Brussels, Belgium, prior to arriving in New Zealand. Alexandra's role

is to provide expertise in regional climate modelling by running climate simulations at a range of spatial and temporal scales. The climate model will be integrated with regional scale ocean and ice sheet models used by other members of the Hub.

Then in April, the ARC employed Lauren Vargo and Jamey Stutz who both completed their PhDs recently within the ARC. Lauren has a three-year role as Postdoctoral Fellow in New Zealand Glacier Monitoring & Modelling and will continue her research on climate change and the resulting influence on the cryosphere through NIWA's ongoing monitoring of New Zealand glaciers. Jamey, has been employed as a Research Fellow in Antarctic Geology for one-year to analyse cosmogenic samples collected during the 2019/20 Antarctic field season to Byrd Glacier,

and publish these data alongside other cosmogenic datasets previously collected and analysed by expeditions led by the ARC.



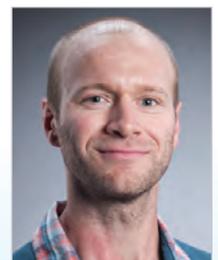
Liz Keller



Alexandra Gossart



Lauren Vargo



Jamey Stutz

